AstroPlanner

V2.3

User Manual

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Star Forming Region LH 95 in LMC. Credit: NASA, ESA & STScI/AURA

1 Introduction

Software applications for astronomy on the Macintosh are not nearly as abundant as applications on other platforms. Although there are several planetarium-style applications (TheSky, Starry Night, SkySafari, etc.) and a few others for telescope control, CCD camera operation (iCCD, CCDSoft, etc.) and a few minor utilities, there are some serious gaps. One of these is astronomical visual observation planning and logging. AstroPlanner attempts to fill this particular gap.

Although originally developed on and for the Macintosh, a Windows version is available which is functionally identical to the Macintosh version. The examples and descriptions in this manual are illustrated with screen shots from the macOS version, but the Windows version behaves identically (except where noted).

1.1 What AstroPlanner does

AstroPlanner is a stand-alone application that allows the user to plan and execute an observing session. The user can enter objects to be viewed manually, import them from text files, look them up in several supplied catalogues, or use observing plans previously created by others. These objects can be both deep-sky and solar system objects (planets, sun, moon, asteroids, comets, etc.).

Once a list of objects has been created, they can be observed and log entries recorded for each of them. The application will also control a wide range of computerised Go To telescopes, in order to slew to selected objects. Several Digital Setting Circle (DSC) systems are also supported. Telescope control is optional, so AstroPlanner can be used to great effect even if you don’t have a computerised telescope mount.

The application computes the visibility of the objects for the current observing session, shows the sky for that time and can show the field-of-view for the current object as if it was being viewed through a virtual eyepiece, or the sensor of an imager.

Additionally, if you have a network connection, you can download high-resolution photographs of any part of the sky from the Digital Sky Survey (DSS and SDSS).

1.2 What AstroPlanner doesn’t do

AstroPlanner is not a full-blown planetarium application. It will not produce detailed sky maps or do the kinds of things an application such as Starry Night, Voyager or TheSky will do. It will also not do other specialised stuff like controlling CCD cameras or autoguiders, or astronomical image processing.

It is also not a "one button does it all" application, but rather an intricate set of tools that gives you full control over your observation planning. It's not difficult to learn to use the application in its basic form. If you run through the quick start tutorial (Chapter 5 on page 16) you'll get a good feel for the basics. Using the application to its full extent does have a learning curve, but you can assimilate new skills as and when you need them.

You don't need to read this entire manual. We recommend you read through the first dozen chapters. The rest is reference material which you can use when you need to. If you are already familiar with previous versions of AstroPlanner, you might not need to crack the manual at all.

Feel free to experiment!

2 Installation

This chapter runs through the process of installing AstroPlanner V2 on your computer (whether you are a first-time user or upgrading from an older version).

If you are upgrading from AstroPlanner V1.x you should be aware that the installations are independent, so that you can run both V1 and V2 together without them interfering with each other.

2.1 Hardware and operating system requirements

AstroPlanner is a 64-bit application (32-bit also available for Windows).

For both platforms a screen with an *absolute minimum size* (width and height) of 1024 x 600 pixels is required. If you are connecting to a telescope, you'll also need a built-in serial port, an USB-to-Serial converter (the Keyspan products are recommended), or a SkyFi/StarSeek WiFi-to-serial device.

2.1.1 macOS

AstroPlanner V2 currently requires macOS 10.11 or later running on an Intel-based Macintosh. You'll need at least 250MB of disk space, and for a complete installation with all optional catalogues, 2GB+ of disk space.

2.1.2 Windows

AstroPlanner V2 requires Windows 7 SP1 or later. You'll need at least 250MB of disk space, and for a complete installation with all optional catalogues, 2GB+ of disk space.

2.2 Telescope mount compatibility

AstroPlanner V2 has built-in drivers for the following computerised telescopes and mounts:

Astro-Physics GTO	**Orion** Intelliscope with COL
Celestron NexStar	**Orion** SynScan GoTo
Celestron Ultima 2000	**Sky Engineering** Sky Commander
GTD Pulsar 2	**Starmaster** Sky Tracker
iOptron GOTONOVA and V2	**StellarCAT** ServoCAT
Meade LX200 Classic	**Takahashi** Temma
Meade LX200 GPS/R/ACF (Autostar II)	**Tasco** Starguide
Meade MAX Mount	**Vixen** SkySensor
Meade RCX400	**Vixen** SkySensor 2000PC
Meade ETX, DS, LX, LXD, LS series (Autostar)	**Vixen** Star Book
Meade Magellan	**Wildcard Innovations** Argo Navis

These drivers are available for both Mac and Windows.

Additionally, basic ASCOM is supported for the Windows version, so that if your telescope mount isn't listed above, you can use the ASCOM driver of your choice (note that only telescopes can be driven via the ASCOM system, not focusers, etc.)

2.3 Macintosh application installation

2.3.1 On-line

Download the application from the download web page:

https://www.astroplanner.net/download.html

The application is in the form of a disk image file (.dmg extension).

Figure 1: .dmg file in the Finder

If your browser does not mount and open the disk image for you, do so by double-clicking it in the Finder.

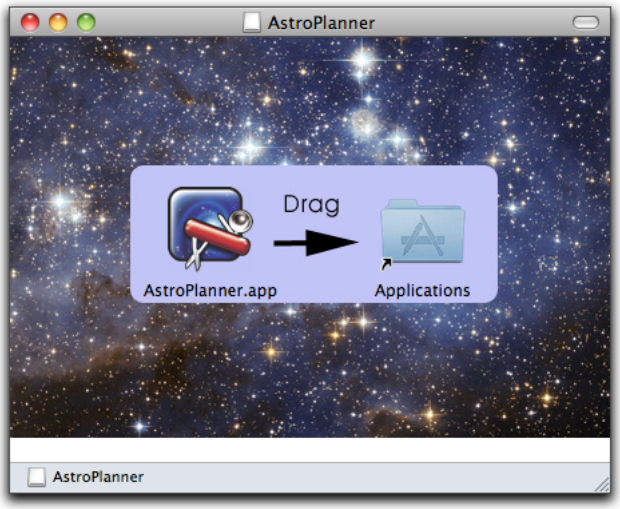

Figure 2: Disk image opened

Drag the application file to your Applications folder (or drag in onto the Applications icon in the disk image window). There is no installer - just run the AstroPlanner application.

2.3.2 DVD-ROM or USB Flash Drive

If you ordered the DVD-ROM or USB Flash Drive with the application, then mount the disk in your computer, find the AstroPlanner disk image and proceed as for the on-line installation above.

Note that if your DVD-ROM or USB Flash Drive is outdated, you might want to download the application since it will guarantee the latest version. If you don't have the ability or desire to download the application, you can always order the latest version of the application and catalogues on DVD-ROM or USB Flash Drive for a modest fee.

2.3.3 V2.3 and macOS 10.15 Catalina

Due to issues in the final development process, V2.3 is neither code-signed or notarised. This means that macOS 10.15 might complain when you first run the application. We hope to resolve this issue in V2.3.1.

2.4 Windows application installation

2.4.1 On-line

Download the application from the download web page:

http://www.astroplanner.net/download.html

The application is in the form of an installer application (InstallAstroPlanner.exe).

Figure 3: Windows installer icon

Double-click the installer to install the application and supporting files on your hard disk.

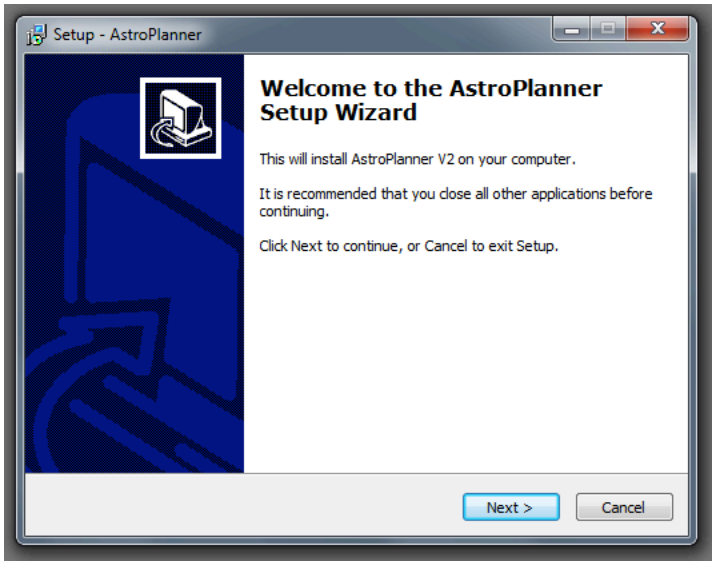

Figure 4: Windows installer in action

2.4.2 DVD-ROM or USB Flash Drive

If you ordered the DVD-ROM or USB Flash Drive with the application, then mount the disk in your computer. The installer should run automatically. If not, find the InstallAstroplanner.exe on the disk and double-click it. Proceed as for the on-line installation above.

Note that if your DVD-ROM or USB Flash Drive is outdated, you might want to download the application since it will guarantee the latest version. If you don't have the ability or desire to download the application, you can always order the latest version of the application and catalogues on DVD-ROM or USB Flash Drive for a modest fee.

2.4.3 Uninstalling

When AstroPlanner is installed it also includes information required to uninstall AstroPlanner and an Uninstall application.

2.5 Installing catalogues

When you first run AstroPlanner it only installs a few minimal catalogues by default (Bright Star, Messier, NGC). You will need to install more catalogues to make full use of the application. You can elect to install these catalogues by downloading them from the on-line web site or, if you have a DVD-ROM or USB Flash Drive containing catalogues, by installing them directly from there.

If you are running AstroPlanner for the first time, the Setup Wizard will give you the opportunity to install catalogues (see Section 4.2 on page 8 for first time users, or Section 23.1 on page 325 for installing catalogues via the Setup Wizard at a later date).

Otherwise you use the Catalogue Manager ***(File > Catalogue Manager...***) to manage your catalogues. This is detailed in Chapter 23 on page 325.

3 Unregistered users

If you are an unregistered user (i.e. you haven't yet paid for a licence, or need to pay for an upgrade to the current version), then you will find that some features are limited or unavailable to you. While you are welcome to continue using AstroPlanner you will need to register in order to remove these restrictions and limitations.

3.1 Limitations

The most obvious limitation is that each time you run the AstroPlanner application, you will be asked for your licence number. This is irritating, but might help to give you the incentive to register.

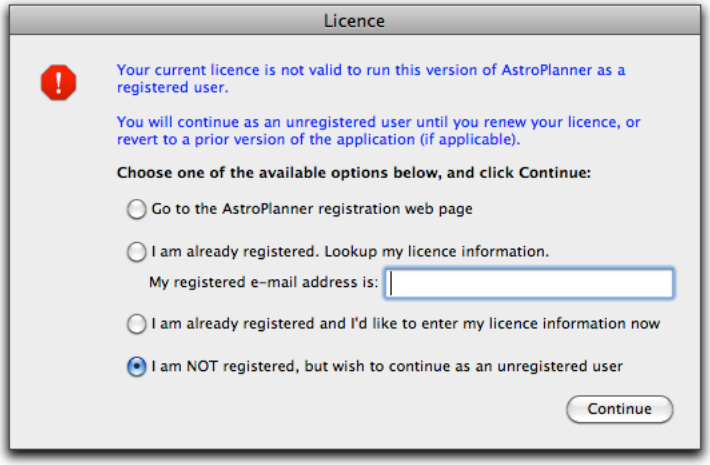

Figure 5: Unregistered user dialog

The second major limitation is that you are limited to the three installed catalogues (Bright Star, Messier and NGC). You cannot download or install any other catalogues. Note that if you are a registered AstroPlanner V1 user, but have not paid the upgrade fee (if required), you are also restricted to using these three catalogues, even if you have others installed via AstroPlanner V1.

Other limitations:

- No external catalogues can be used (USNO A2.0, USNO B1.0, UCAC3, etc.).
- No SIMBAD searches can be performed.
- You can download user-contributed plans only if they contain objects from your installed catalogues (i.e. Messier and NGC objects only)
- You cannot upload user-contributed plans or user-contributed scripts.
- You cannot import objects from files, or by downloading them (e.g. comets, minor planets, tour files, etc.)

3.2 How to register

Go to the web site in your browser:

https://www.astroplanner.net/

Navigate to the Purchase page where you will be able to see what your options are.

4 First-time users

If you have never used AstroPlanner before, this is what will happen the first time you run the application after installing it.

4.1 Licence

You'll be asked to agree to the (fairly liberal) AstroPlanner application licence. If you agree, click ***Yes***. If you don't, click ***No*** and the application immediately terminates.

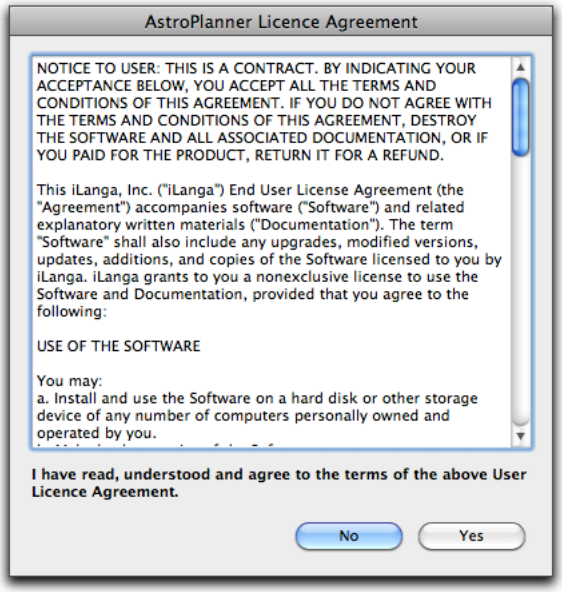

Figure 6: Licence agreement dialog

For your convenience, the text of the agreement is given below:

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4.2 Setup Wizard

As you are a first time user, the application needs you set up or customise various settings so that you can get going without further issue. To do this it presents a Setup Wizard dialog to lead you through the setup.

4.2.1 Licence information

The first thing you'll need to do is enter your licence information in the fields given (unless you have not yet registered, in which case leave the fields blank).

If you've misplaced your licence information, you can get it sent to you via e-mail by entering your e-mail address in the field on the right and clicking the ***Retrieve*** button. If you have changed your e-mail address since you registered, then you will not get a reply. Please contact support with your new e-mail address, remembering to include your name and the old e-mail address:

support@astroplanner.net

Once you have entered your licence info (or not), click the ***Next*** button.

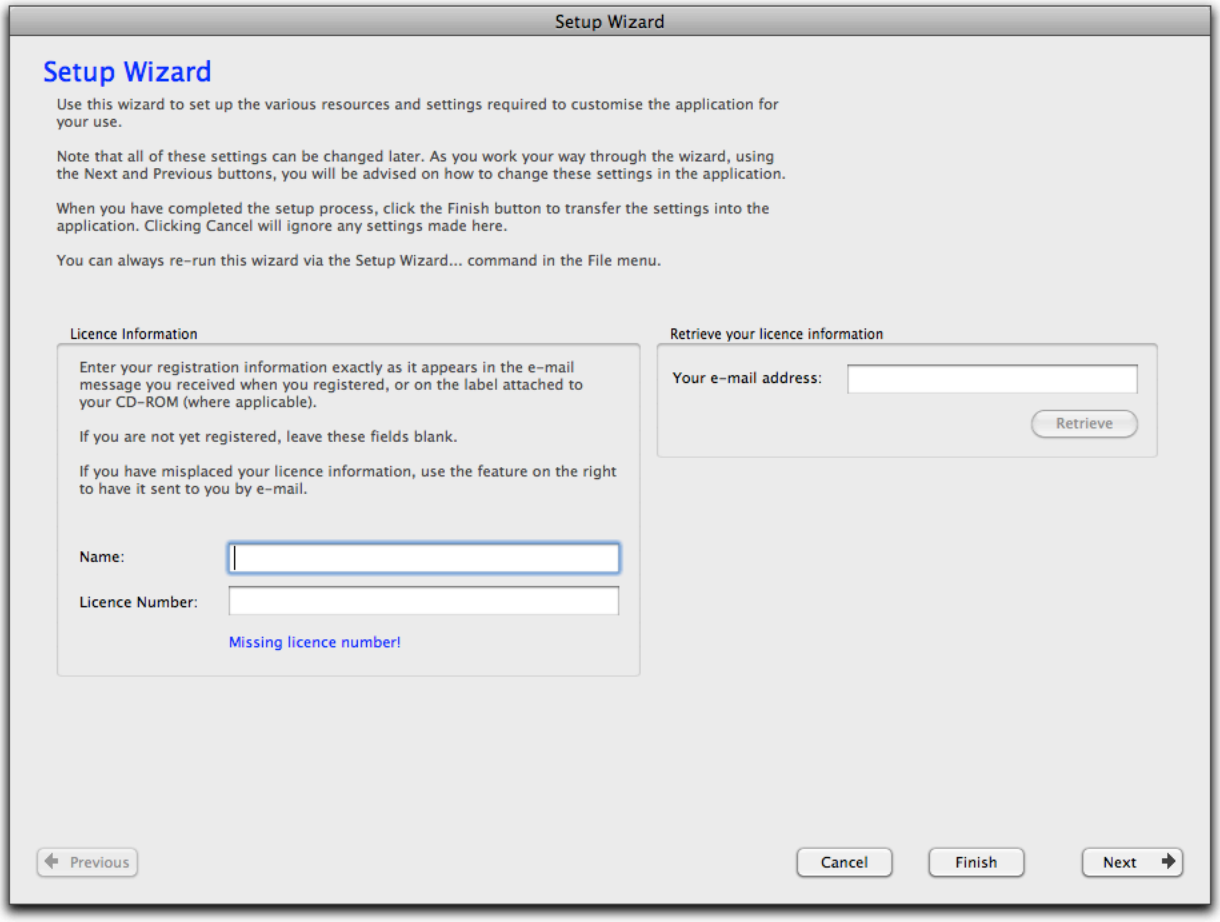


Figure 7: Setup Wizard - licence information

4.2.2 Observing site data

AstroPlanner requires you to specify information about your observing site or sites. This information is used to figure out visibility at those sites. At least one site must be specified. You'll need to know the latitude and longitude where your site is situated, and its time zone.

However, if you live in the USA or Canada, AstroPlanner includes a database of place names and their geographic locations. Note that you don't have to be particularly accurate with defining the latitude or longitude. Even if you're out by a degree or two, it won't make much difference.

Enter the site information in the given fields. The world map will show where the site is (in case you give E/W or N/S mixed up), and will tell you if your GMT offset is acceptable. Click the ***Add this site*** button to add the site data to the resources.

Read the text on the right side of the dialog for additional instructions.

Note that you don't have to enter *all* of your possible observing sites at this time, since you can enter and edit them later. Just add your main site.

When you have finished, click the ***Next*** button to continue.

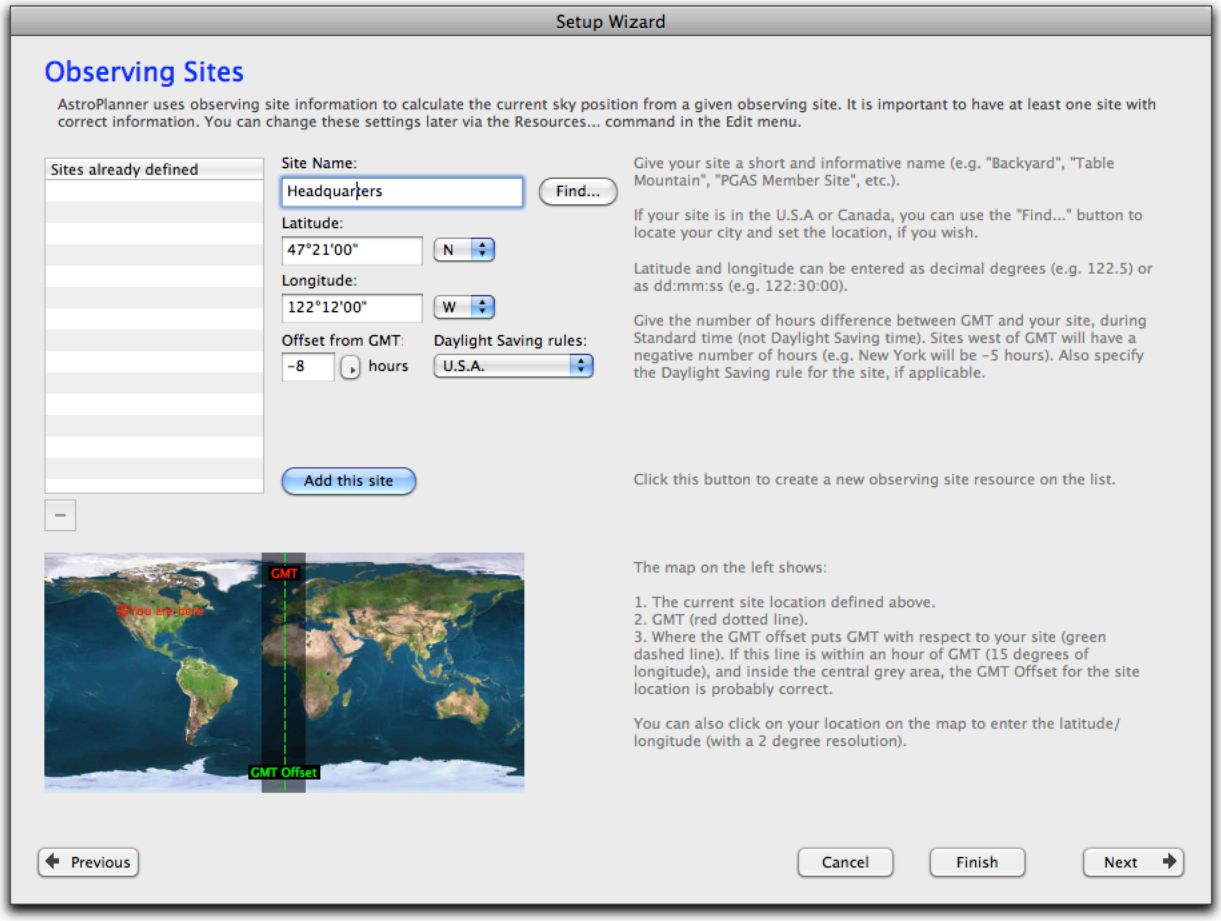


Figure 8: Setup Wizard - Observing Sites

4.2.3 Telescope data

AstroPlanner also expects you to enter information about any telescopes you plan to use. The information is used to construct charts showing the view through such a telescope, and what you are likely to see.

The dialog includes a comprehensive list of commercially-available telescopes. If your telescope or telescopes are in that list, select the entry and click the ***Add*** button.

You can also add the information manually, and use the ***Add this telescope*** button to add the new telescope entry.

Click the ***Next*** button when you've finished.

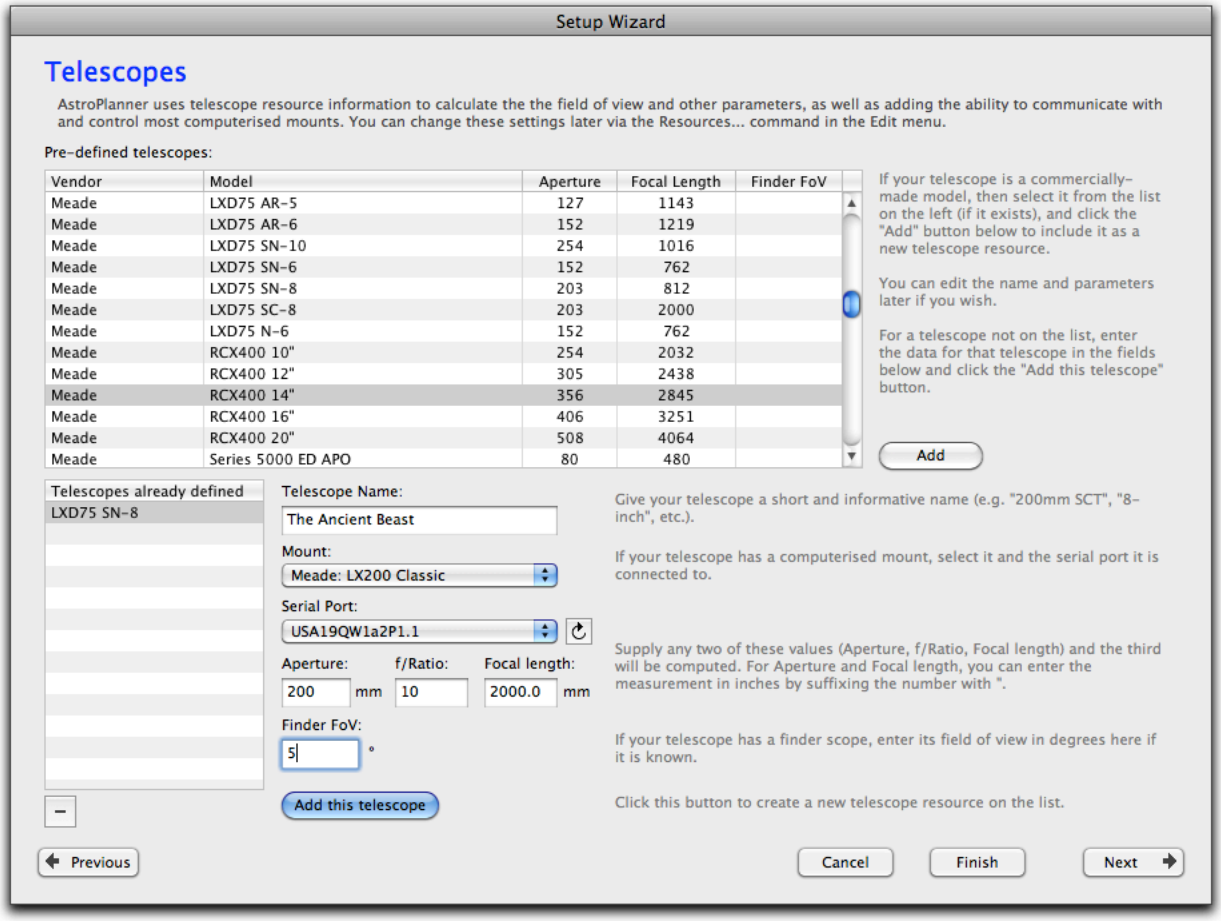


Figure 9: Setup Wizard - Telescopes

4.2.4 Eyepiece data

You can also enter information about any eyepieces you plan to use. The information is used in conjunction with the telescope information to construct charts showing the view through such a telescope/eyepiece combination, and what you are likely to see.

The dialog includes a comprehensive list of commercially-available eyepiece. If your eyepiece or eyepieces are in that list, select the entry and click the ***Add*** button.

You can also add the information manually, and use the ***Add this eyepiece*** button to add the new eyepiece entry.

Click the ***Next*** button when you've finished.

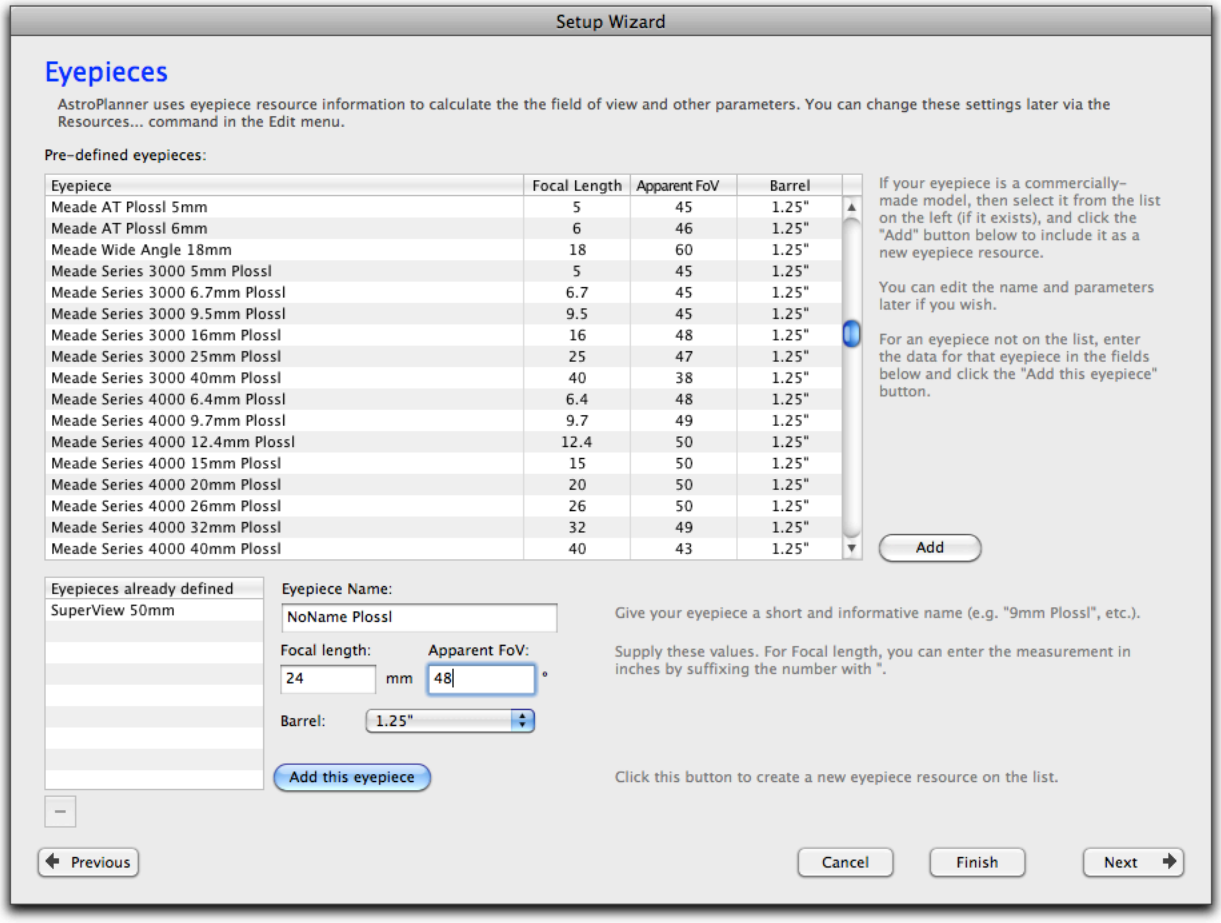


Figure 10: Setup Wizard - Eyepieces

4.2.5 Catalogues

When you enter the Catalogues part of the wizard, you'll be asked if you want to install your catalogues from an AstroPlanner CD/DVD-ROM or USB Flash Drive, if you have such a thing. If you do, make sure the disk is inserted and ready to read. Then click ***Yes***.

If you'd rather access the on-line inventory and download any catalogues you might need, click ***No***.

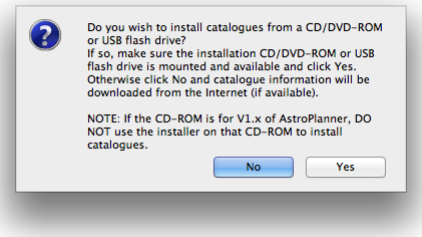


Figure 11: Catalogues from DVD-ROM or USB Flash Drive

A list of available catalogues is presented (on the right side). Check the checkboxes next to the catalogues you wish to install (if you want all of them, click the ***Select All*** button).

If you're not sure which ones you want, the application can choose some suitable ones for you. In this case, in the User Survey section on the left, check all the checkboxes next to equipment you own, and the kind of observing you plan to be doing. As you select options, suggested catalogues will be marked in green. You can use this as a guide, or just click the ***Select All Suggested*** button.

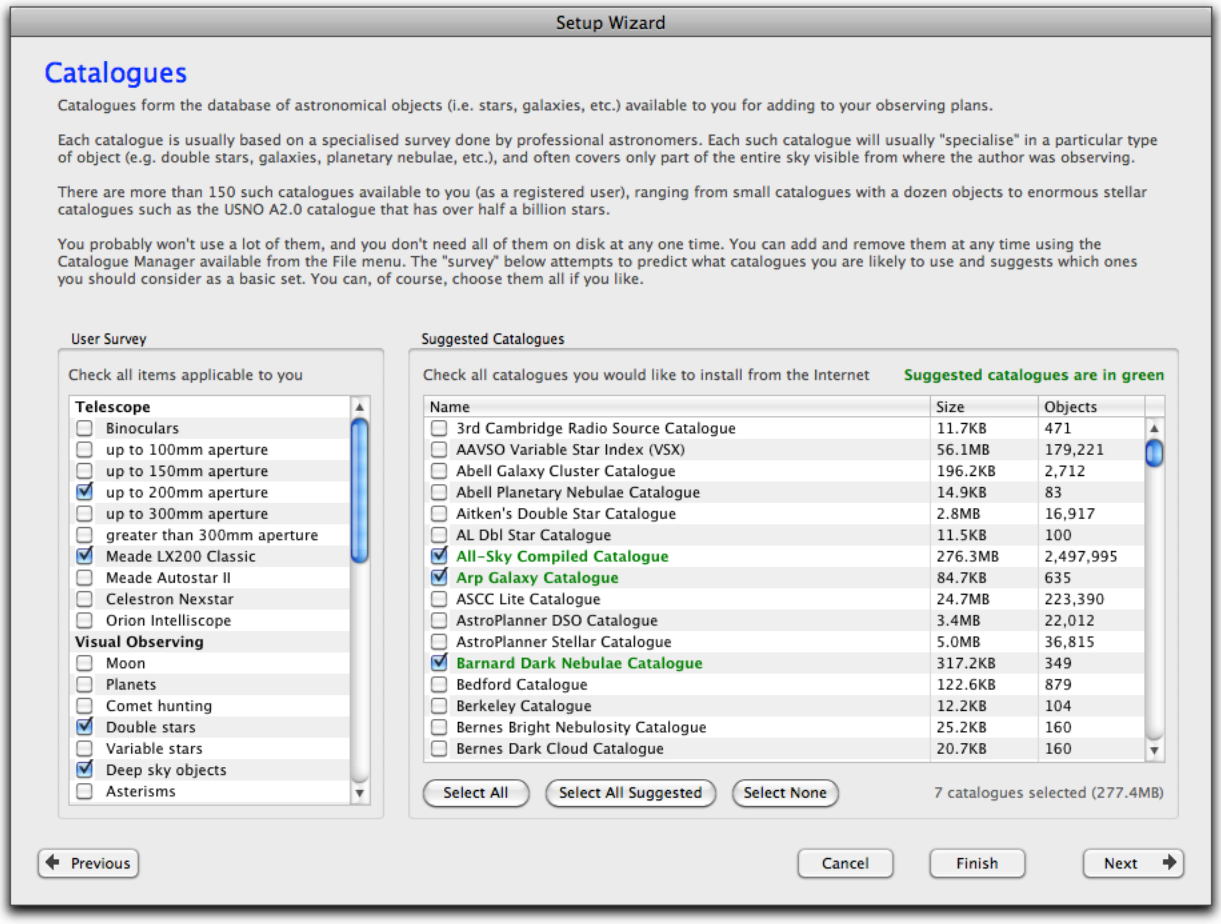


Figure 12: Setup Wizard - Catalogues

When you've finished, click the ***Next*** button. You'll be warned about the catalogues you selected.

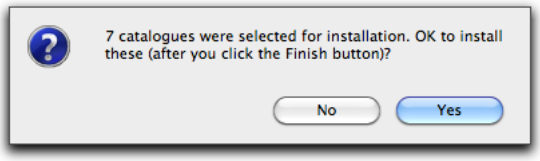


Figure 13: Catalogue warning

4.2.6 Sample Plan Document

This page of the wizard lets you create a sample plan document if you wish. Type in a suitable file name, and select some suitable astronomical objects to populate it with.

The file will be created on your desktop, and opened for you.

When you've finished, click the ***Next*** button.

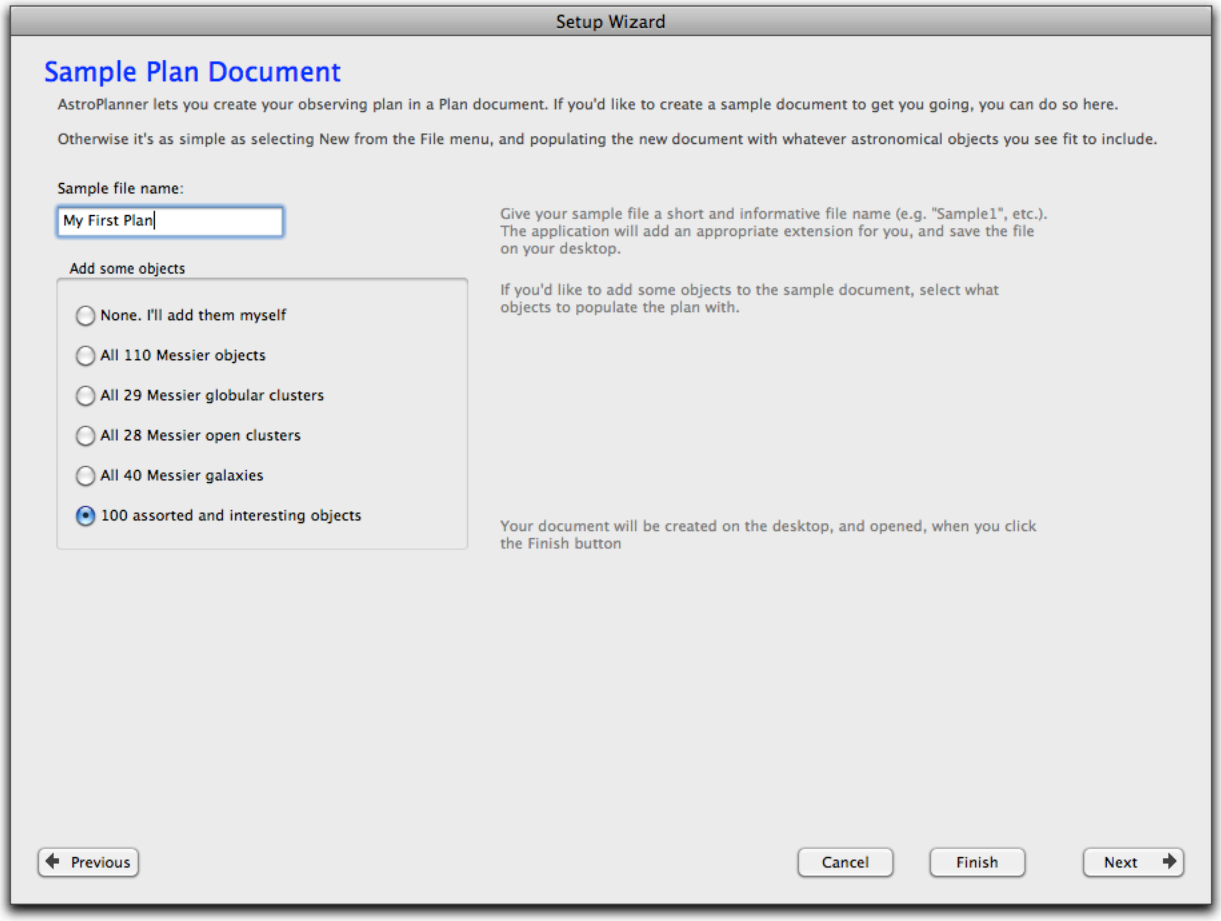


Figure 14: Setup Wizard - Sample Plan Document

4.2.7 Completion

Finally, the actions you performed will be summarised on the Complete page.

To go ahead and create the resources, sample file, and/or install catalogues, click the ***Finish*** button. Otherwise click the ***Cancel*** button and all actions will be cancelled.

Note that you can call up the Setup Wizard at any time via the ***File > Setup Wizard*** menu item.

If you click ***Finish*** and there were catalogues selected to install, then the Catalogue manager window is opened, and you'll need to click the ***Install*** button to finish off the installation.

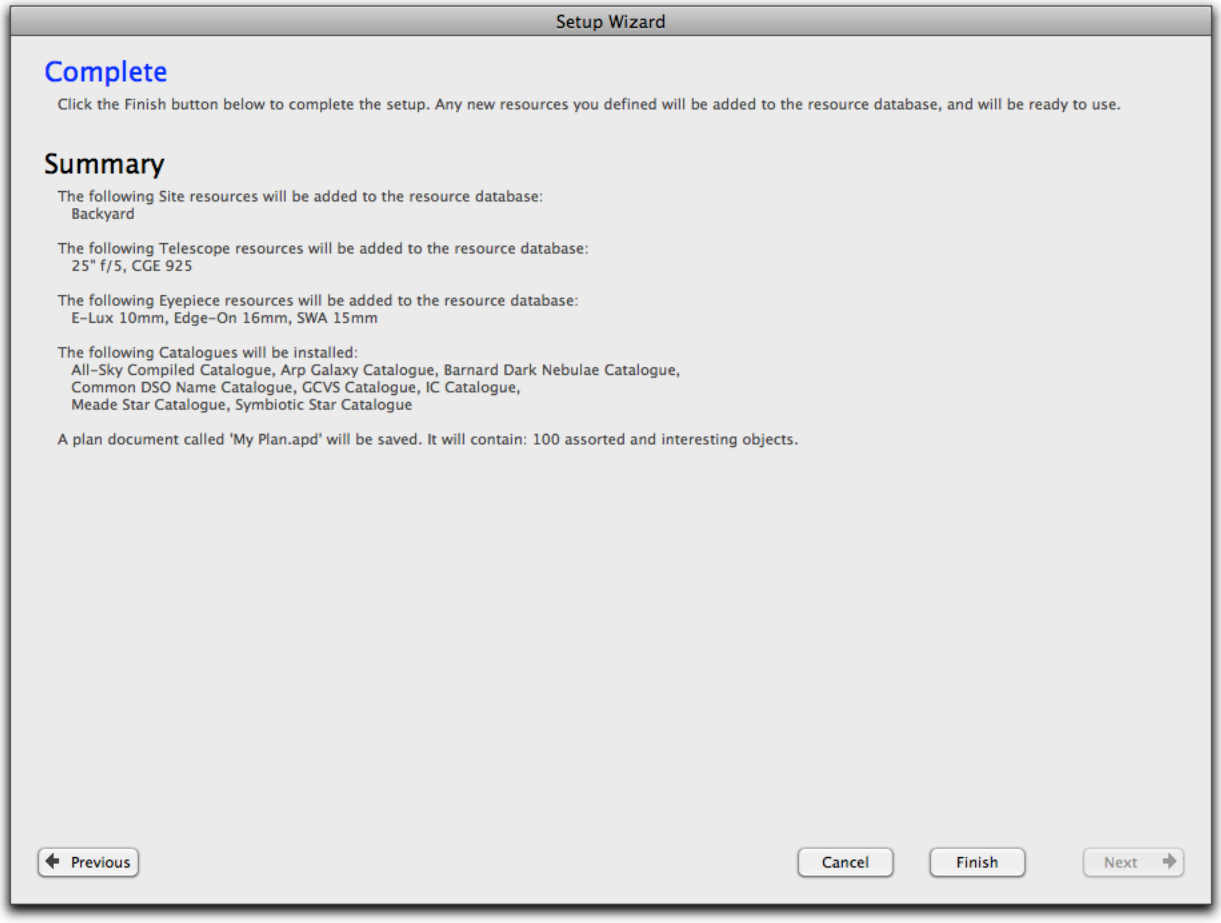


Figure 15: Setup Wizard - Completion

5 Quick start tutorial

The aim of this chapter is to lead you through some typical tasks you would use AstroPlanner for. By the end of this chapter you should be familiar enough with the application to use it without assistance, and be ready to start experimenting and exploring. We suggest you follow along and duplicate what is described here yourself, as it will aid in your familiarisation.

It's assumed that you have the application open, and that you've completed the installation tasks.

We're going to do the following:

- Set up an observing plan for an article in Sky & Telescope magazine, which just happens to be available for download.
- Set up another observing plan for another Sky & Telescope article that is not available.
- Use the Plan Creation Wizard and let AstroPlanner set up a custom plan for you.

Once we've done that we'll pick one of these plans and do some observing.

5.1 Creating a new plan

5.1.1 Setting up a plan that someone else has already done for you

For illustrative purposes, let's say we just read the article on pages 67 through 70 of the September 2011 issue of Sky & Telescope magazine, entitled *In Praise of the Great Dark North*, by David Rodger. This article talks about a selection of interesting objects in the northern sky. We'd like to set up an observing plan to look at these objects. Perhaps we'll get lucky and someone has already done the work for you and is willing to share. Let's check the on-line user-contributed plan depository.

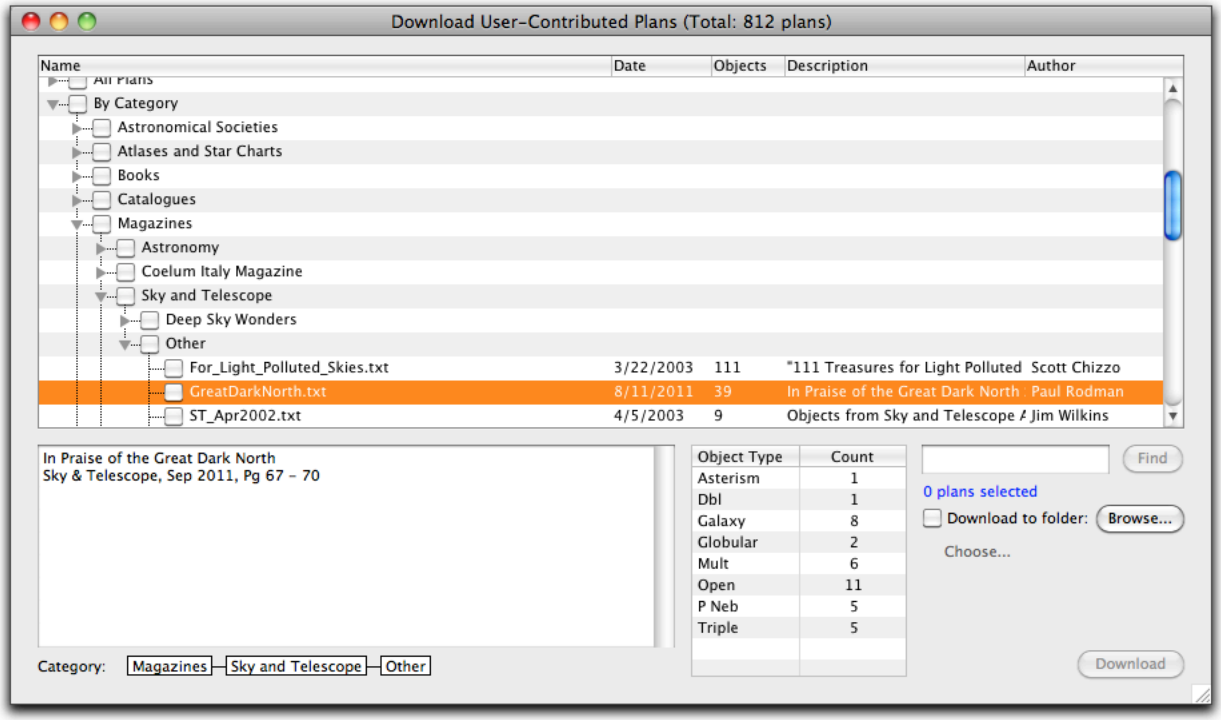


Figure 16: User-contributed plans

Use ***File > User-Contributed Plans > Download...*** (assuming you are currently connected to the Internet). The window shown in Figure 16 appears. You can look for the item manually in the hierarchical list (you'll find it under **By Category > Magazines > Sky and Telescope > Other**), or even quicker by typing *Great Dark North* into the Find field (centre right) and clicking ***Find***.

Figure 17: Using the Find feature

Select the *GreatDarkNorth.txt* entry by clicking the checkbox next to it and then clicking the ***Download*** button. The plan is downloaded and opened. Close the user-contributed plans window and, if you so choose, save the *GreatDarkNorth* plan on your hard disk.

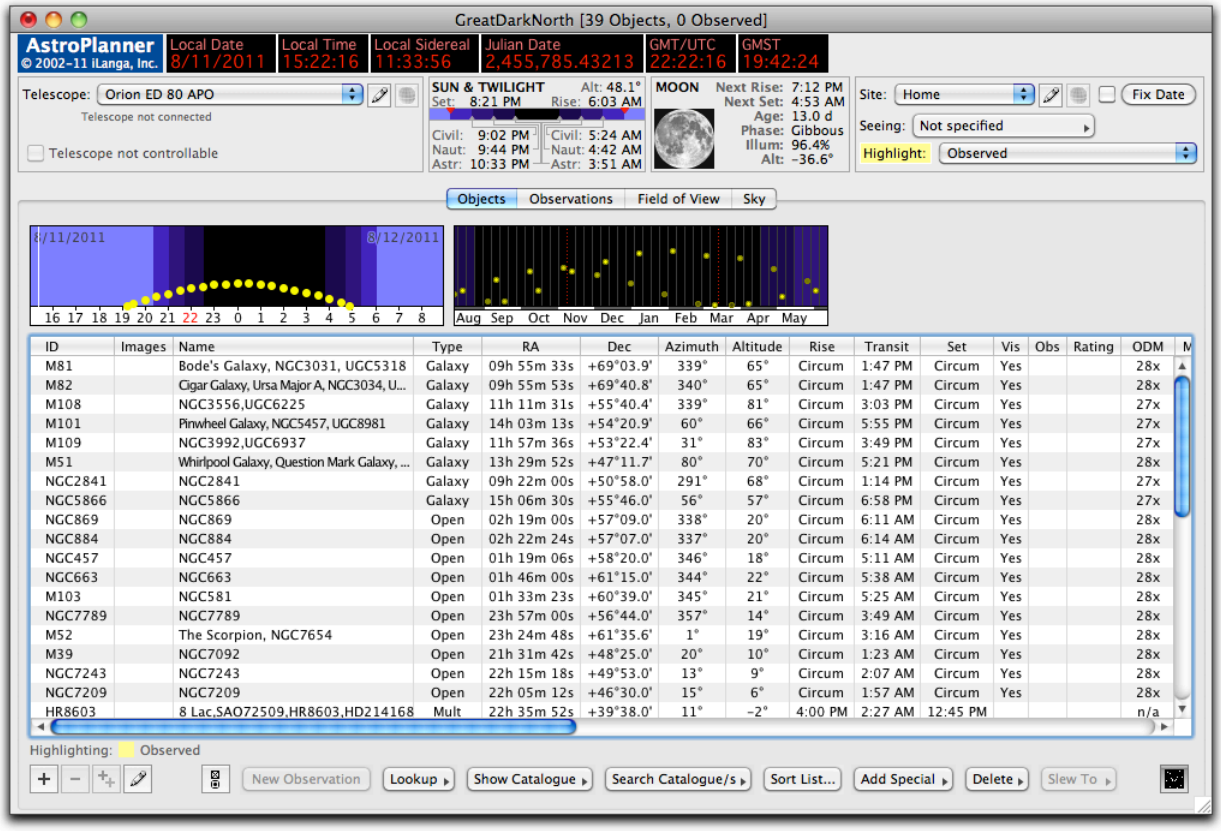


Figure 18: GreatDarkNorth observing plan

5.1.2 Setting up a plan manually

The next plan we are going to set up is for an article in the same issue of Sky & Telescope magazine: *Deep Sky Wonders: The Berkeley Clusters* by Sue French (pages 56 to 58, September 2011 issue). This time we won't assume someone else already uploaded the plan for our convenience, but we'll enter the objects manually.

Note that the Berkeley Catalogue is available (for registered users) which makes this a lot easier. However, for the sake of this exercise, we'll assume the Berkeley Catalogue has not been installed.

On page 57, French conveniently gives us a table containing details about the objects she refers to in the article. Here is a summary:

Object ID	Magnitude	Size	RA	Dec
NGC 6749	12.4	4'	19h 05.3m	+01° 54'
NGC 6791	9.5	10'	19h 20.9m	+37° 46'
IC 1310	~10	4'	20h 10.0m	+34° 58'
Berk 82	~9	4'	19h 11.3m	+13° 07'
Messier 29	6.6	10'	20h 24.1m	+38° 30'
Berk 86	7.9	7'	20h 20.2m	+38° 41'
Berk 87	~7	10'	20h 21.6m	+37° 24'

We're now going to enter these objects manually.

Create a new plan document (***File > New***).

Create a new object by clicking the ***+*** button at the bottom left of the object list. This reveals the New Object dialog. Type in the ID of the first object, NGC 6749 (you can skip the space if you like). Hit the Return/Enter key or click the ***Best*** button. NGC 6749 is found in the catalogues and added to the plan.

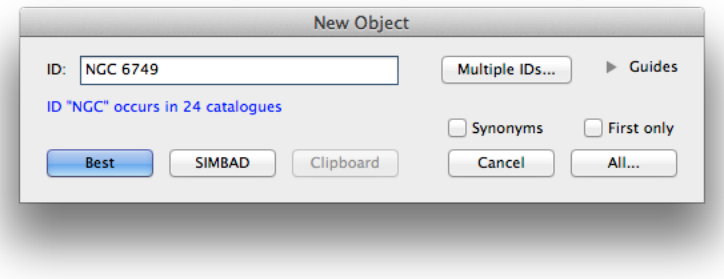


Figure 19: New object dialog

Repeat the above procedure for NGC 6791, and IC 1310[1]. The next object is Berk 82. This object can be found in the Berkeley Catalogue, but as mentioned above, we'll assume it isn't installed. Click the ***+*** button as before, but this time just click the ***Empty*** button. This creates an empty entry. To edit this entry you will need to reveal the editing fields by clicking on the ***Show editing fields*** button (the small button, fourth from the left underneath the object list).

Into the **ID** field type "Berk 82".

Into the **Right Ascension** fields type "19" and "11.3".

1. Note that you'll need the IC Catalogue installed. Unregistered users are out of luck, and should proceed as for Berk 82.

Into the **Declination** fields type "13" and "7".

Into the **Magnitude** field type "9".

Into the **Size** field type "4".

Use the popup to the right of the **Type** field to choose "Open" as the object type.

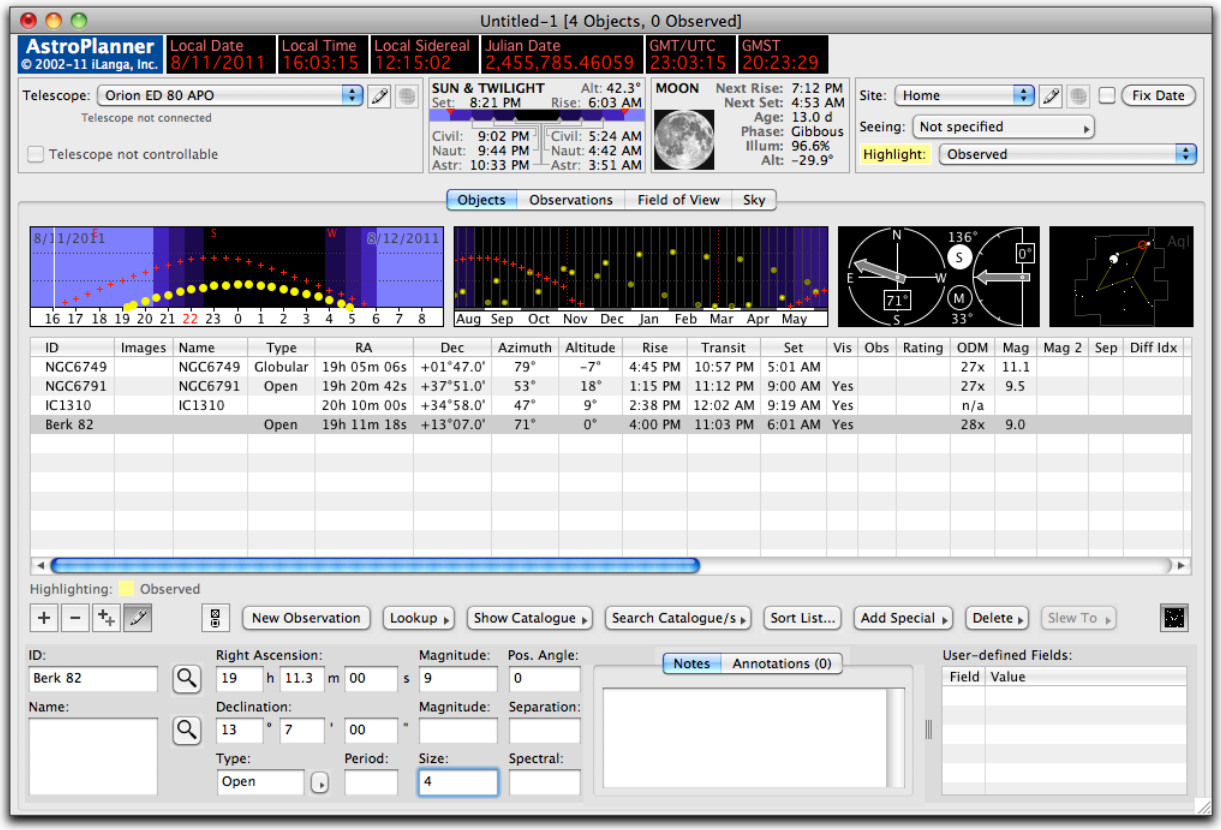


Figure 20: Entering Berk 82 manually

We're going to demonstrate another way to enter Messier 29 (M29). From the ***Show Catalogue*** pop-up button under the list of objects, choose to show the Messier Catalogue.

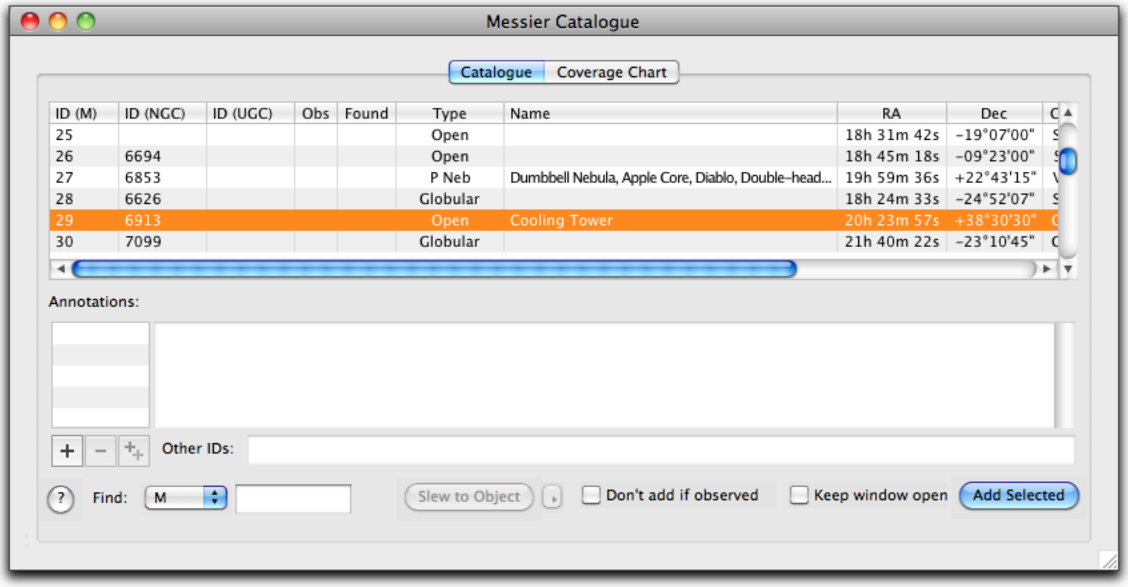


Figure 21: Selecting M29 directly from the catalogue

Select the entry for M29 and click the ***Add Selected*** button (or drag the object from the window onto the object list in your plan).

Add the final two objects (Berk 86 and Berk 87) using one the above techniques.

Save the plan document to hard disk if you wish.

5.1.3 Letting the Plan Creation Wizard create a plan for you

The Plan Creation Wizard creates a custom observing plan just for you.

Start the wizard using the ***File > Plan Creation Wizard...*** menu command.

Figure 22: Plan Creation Wizard dialog

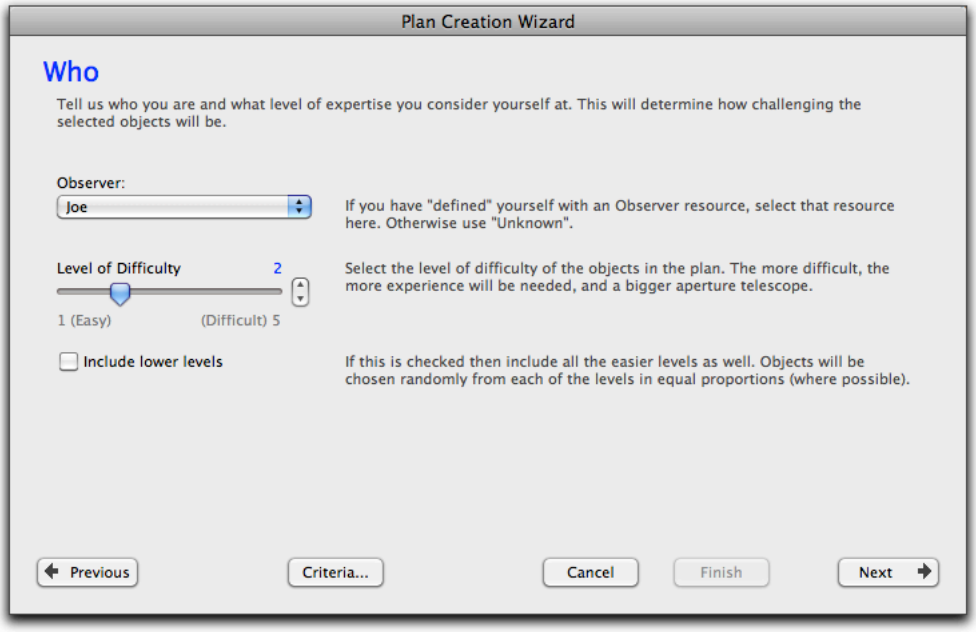


Figure 23: Plan Creation Wizard - Who

Use the ***Next*** button to move through the stages required to build a plan. At any stage you can also use the ***Previous*** button to go back and change an option if you need to do so.

The second panel (**Who**) lets you specify the observer (so we can take into account such aspects as age and visual accuity[1]). If you haven't created an Observer resource just use the "Unknown" setting[2].

We also specify the level of difficulty for the objects in the resulting observing plan. You can specify five levels, from **Easy** (probably observable in poor skies with minimal equipment and experience) through **Difficult** (probably requiring a lot of experience and large aperture telescopes).

The third panel (**Where and When**) specifies where you will be observing from (your observing site) and when you plan to do the observing. These settings are used to determine what objects will be visible for you. It's not reasonable to choose objects that either never rise above the horizon at your observing site, or objects that never rise during the observing period, but might be visible at other times of the year.

You select the Observing site resource[2]. You then need to specify the dates/times you plan to do your observing (make sure the **Restrict to** option is set to **Date/time**). In our case, we are doing our observing at the Winter Star Party site in Florida, during Winter (go figure), and we'll plan on doing our observing between the start of nautical twilight and 2am (when we collapse into our sleeping bag).

---

1. In the current version of AstroPlanner, these aspects are *not* taken into account, so any observer has the same weight as any other observer.

2. If you want to or need to set up such a resource you can skip ahead to Section 5.2 on page 24. However, you will need to cancel from this dialog first.

Figure 24: Plan Creation Wizard - Where & When

The next panel (**How**) lets you choose what instruments (telescopes or binoculars) you intend to be using. Check the appropriate entries[2].

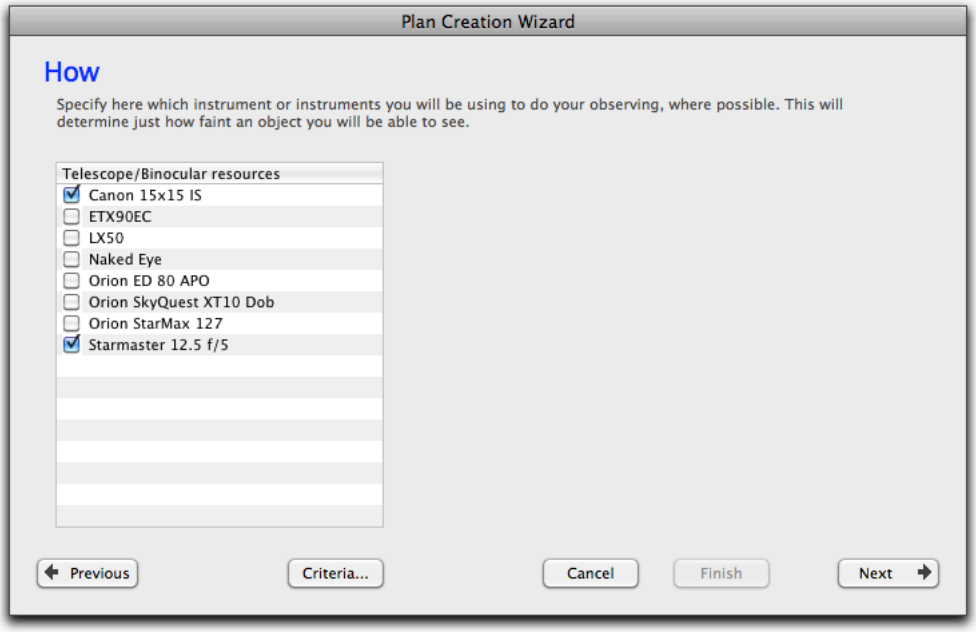


Figure 25: Plan Creation Wizard - How

The next panel (**What**) specifies the kinds of objects you want to observe and how many. Select one or more object types by checking the appropriate checkboxes. Don't worry about the list of catalogues - that's for more advanced and specialised work.

Select the maximum number of objects you'd like in the observing plan. In this case we'll choose a maximum of 20 (the actual number found might be fewer).

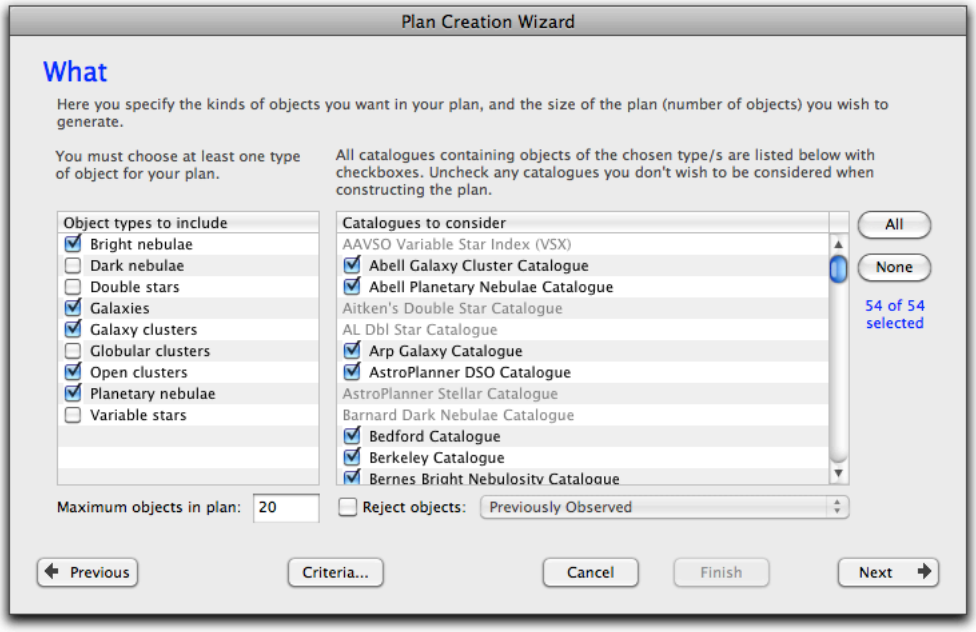


Figure 26: Plan Creation Wizard - What

The final panel (Complete) lets you select whether to create a new, untitled plan document for your objects, or to add them to a currently-open plan document. We'll choose a new document.

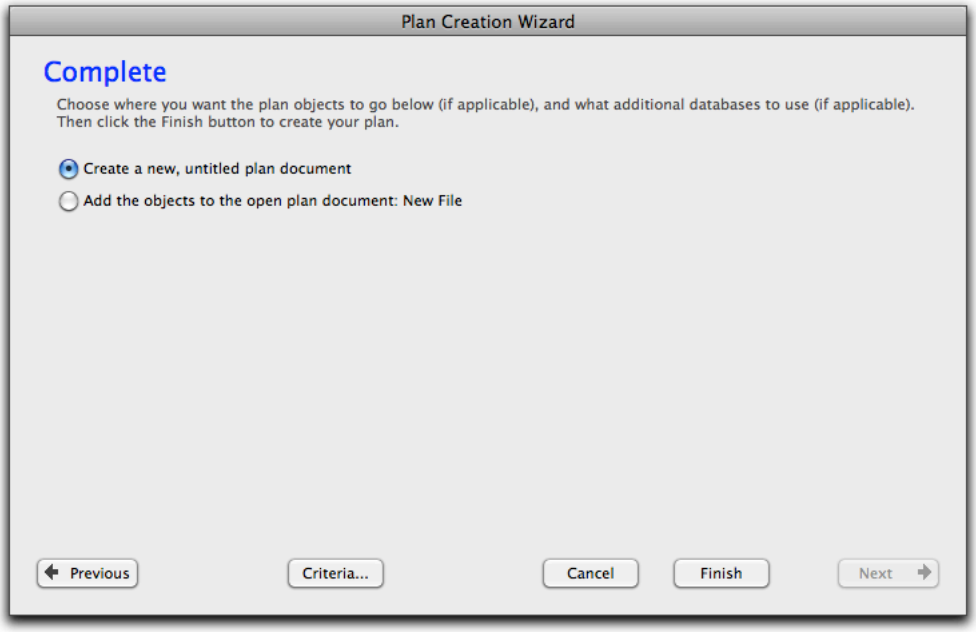


Figure 27: Plan Creation Wizard - Complete

When you click the ***Finish*** button a new document is created with (in this case) 20 objects in it. You can save the plan document with whatever name you see fit to give it.

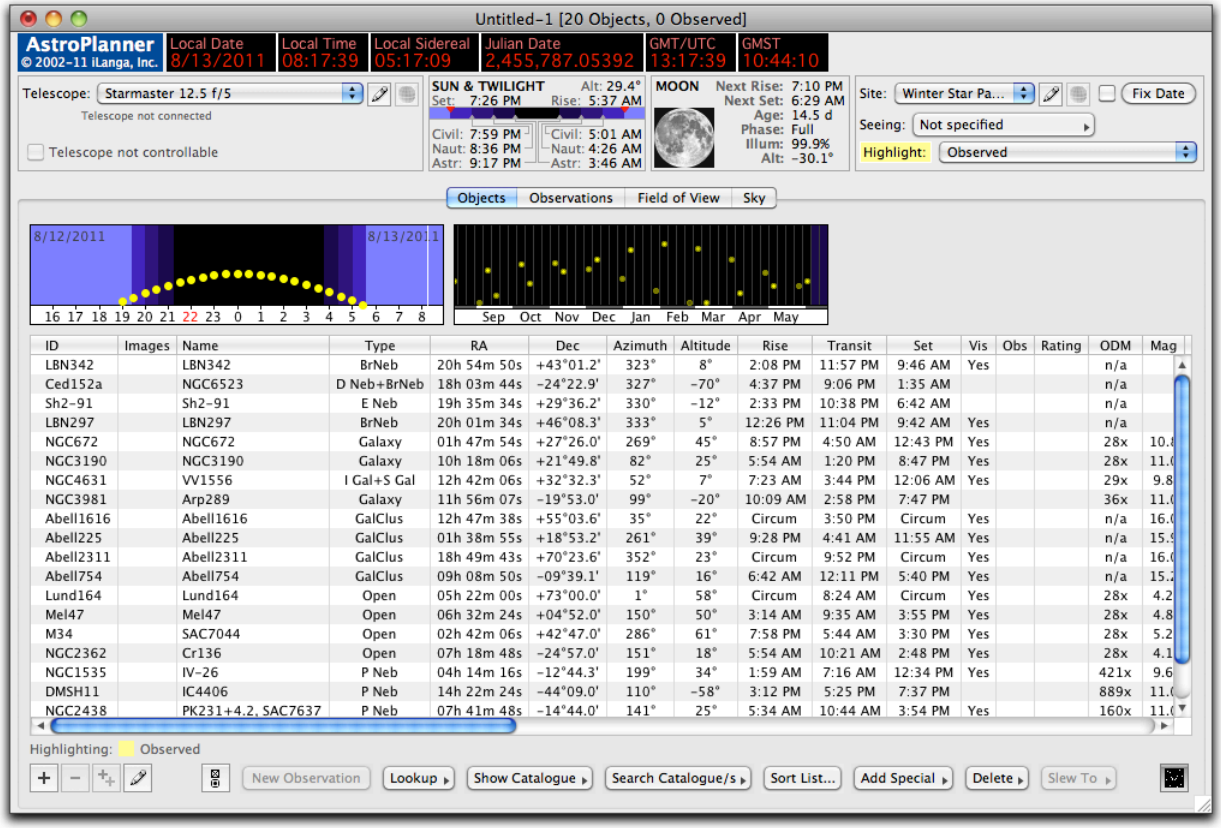


Figure 28: Plan Creation Wizard - The resulting observing plan

For more information on the Plan Creation Wizard see Section 10.3 on page 84.

5.2 Setting up resources

When you first used AstroPlanner (assuming you didn't upgrade from an earlier version, or cancel from the Setup Wizard), the Setup Wizard asked you to enter some basic information about your observing site or sites, telescopes and eyepieces. All of these entities are called "resources" (see Section 7.5 on page 40). You will occasionally need to edit these resources in order to add, modify or delete them. We'll do this to add a telescope with a computerised mount for use later in this chapter (don't worry if you don't have an actual computerised mount - we'll fake it).

To edit resources, use the ***Edit > Resources...*** menu command.

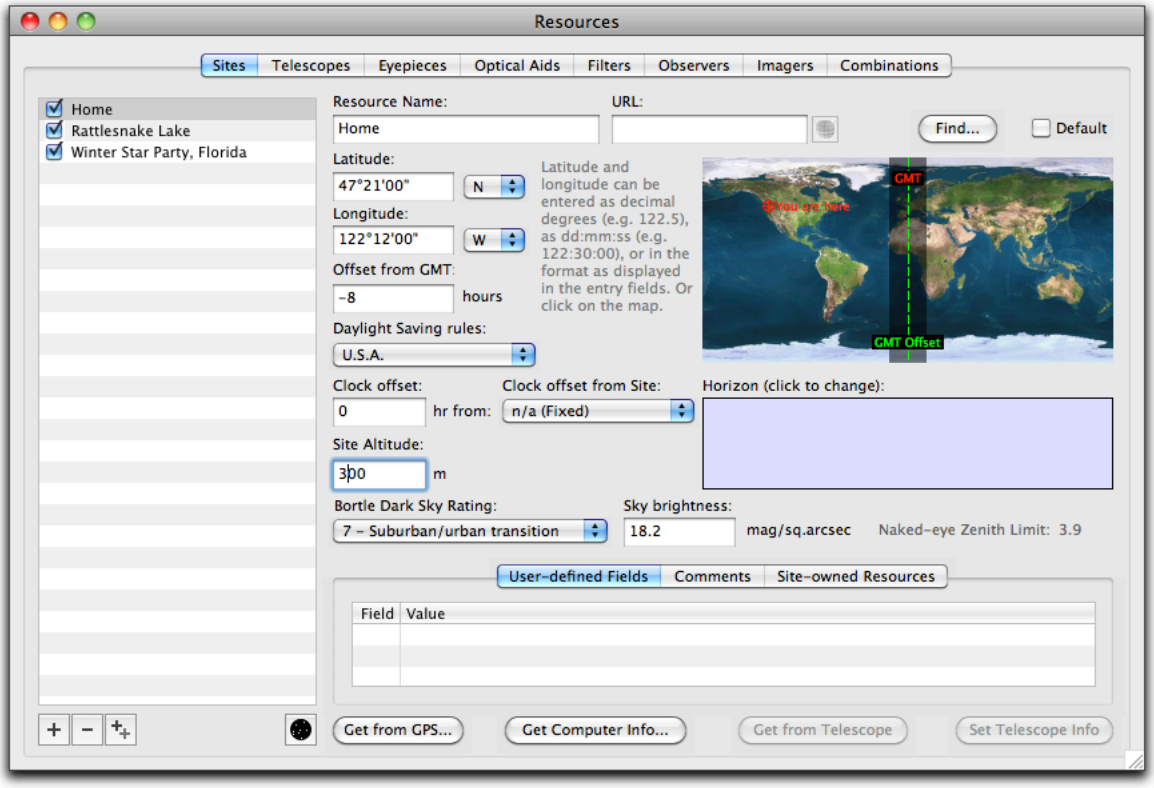


Figure 29: Resources database window

5.2.1 Sites

The window contains several tabs, each one containing a different type of resource. The first tab (**Sites**) contains your observing sites. You should have at least one entry here. If not, click the ***+*** button under the list on the left to create a new one. Make sure you enter the latitude, longitude and Offset from GMT values correctly (other settings are less critical).

5.2.2 Telescopes

Select the second tab (**Telescopes**). For this exercise you should have at least one telescope defined. You should also set up a telescope with a computerised mount, so that you can experiment with controlling that telescope (see Section 5.4 on page 32). Even if you don't have such a telescope, AstroPlanner includes a telescope emulator that lets you control an internal software telescope that looks to the application like a real telescope.

We are going to create such a "fake" telescope:

- Click the ***+*** button under the list of telescopes to create a new entry. Alternatively, you can click the ***Select from List...*** button and choose from a list of commercially-available telescopes.
- Change the **Resource Name** to "Experimental" (or choose your own name).
- Change the **Computerised Mount** via the popup menu to "AstroPlanner: Emulated Go To".
- Leave the other fields as they are.

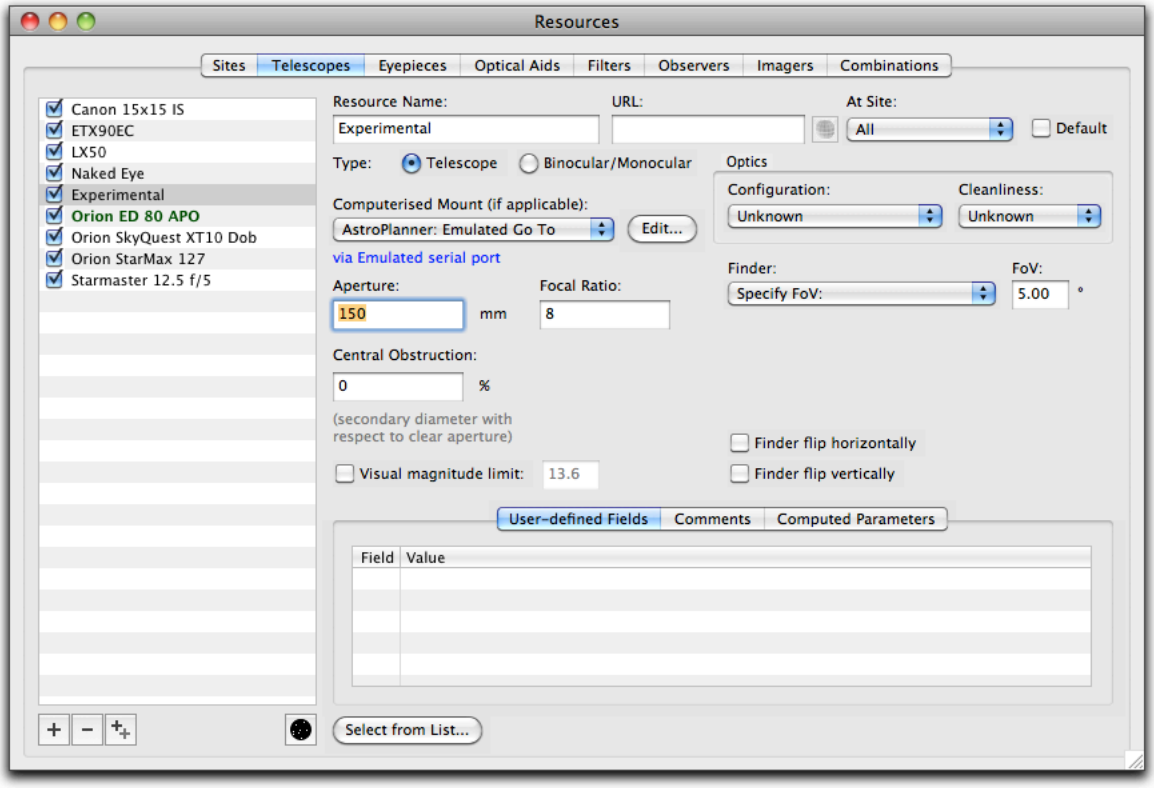


Figure 30: Telescope resources

If you have a physical telescope with a supported computerised mount (e.g. A Meade Autostar- or Celestron NexStar-controlled telescope), then you can set this up quite easily:

- Change the **Computerised Mount** via the popup menu to the particular mount you have (e.g. "Meade: ETX series").
- Click the ***Edit...*** button to the right of the Computerised Mount Popup. This opens a dialog to allow you to edit various settings of your telescope mount.
- Select the **Serial port** that your telescope will connect to (top left of the edit dialog).
- If available to you, also set the **Bit Rate** (top right of the dialog) to match your mount's bit rate setting. If this is disabled, it means you have no choice, and you can ignore it.
- Leave the other settings as they are, and click ***OK***.

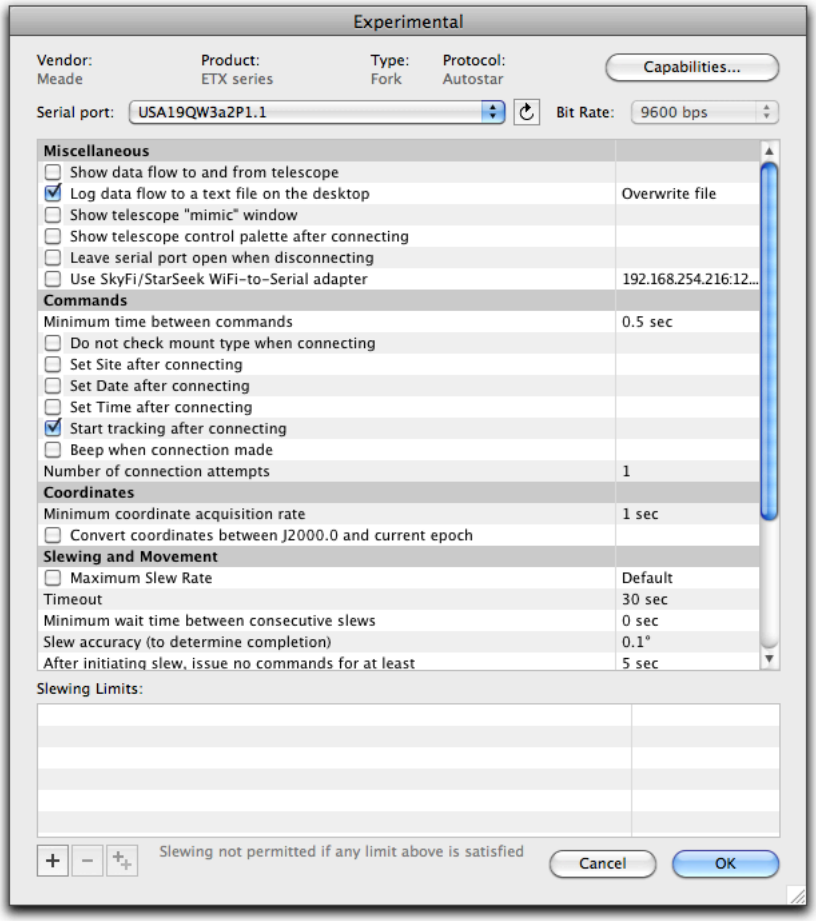


Figure 31: Editing the Computerised Mount settings

5.2.3 Eyepieces

Similarly, select the third tab (**Eyepieces**) and enter at least one eyepiece resource. Make sure, for each eyepiece, you enter the focal length and the apparent field-of-view correctly. Alternatively, you can click the ***Select from List...*** button and choose from a list of commercially-available eyepieces.

5.3 Visualising objects

We will use the plan we set up manually (see Section 5.1.2 on page 17), but you can use any plan you like, as long as it has a few objects in it. What we would like to do is answer the questions below regarding the actual object in the night sky. This is what observation planning is all about.

In the open plan document set the **Site** popup (top right) to your preferred observing site.

5.3.1 Is an object currently visible in the sky?

Right now (daytime or nighttime), can I see the object?[1] This is easily seen by looking at the Visibility (**Vis**) column of the object list. If the Vis column entry for an object is blank (or contains "Horz"[2]), it means that the object is not currently visible in the sky and is either below the horizon or is never

1. If it's daytime, this question is theoretical, unless the object is the sun or moon.

2. Hidden by the site horizon (e.g. a wall, trees, a house, etc.)

visible at the latitude of your site. If the Vis column is "Yes" then the object is currently visible. In Figure 32, NGC6749 and Berk 82 are currently not visible, and the others are all visible.

Additionally, you can look at the Rise Time (**Rise**) and Set Time (**Set**) columns to see when the objects will be visible. If Rise is "Never" then the object is *never* visible at the latitude of your selected observing site. If Rise is "Circum" then the object is circumpolar (i.e. is *always* visible at your observing site).

ID	Images	Name	Type	RA	Dec	Azimuth	Altitude	Rise	Transit	Set	Vis	Obs
NGC6749		NGC6749	Globular	19h 05m 06s	+01°47.0'	69°	-16°	4:34 PM	10:45 PM	4:56 AM		
NGC6791		NGC6791	Open	19h 20m 42s	+37°51.0'	44°	11°	1:03 PM	11:01 PM	8:59 AM	Yes	
IC1310		IC1310		20h 10m 00s	+34°58.0'	38°	3°	2:26 PM	11:50 PM	9:14 AM	Yes	
Berk 82			Open	19h 11m 18s	+13°07.0'	61°	-8°	3:49 PM	10:51 PM	5:53 AM		
M29		Cooling T...	Open	20h 23m 57s	+38°30.5'	33°	5°	1:56 PM	12:04 AM	10:12 AM	Yes	
Berk86		Berk86	Open	20h 20m 24s	+38°42.0'	34°	5°	1:50 PM	12:00 AM	10:11 AM	Yes	
Berk87		Berk87	Open	20h 21m 42s	+37°22.0'	34°	4°	2:10 PM	12:02 AM	9:53 AM	Yes	

Figure 32: Visibility of objects

5.3.2 Will an object be visible when I view the sky at a particular date/time in the future?

The above visibility test is for the current time. You can also check to see whether the object is going to be visible at another time (e.g. next Saturday at 10pm). To do this we use the Fix Date feature of AstroPlanner. This allows you to freeze the Date and Time at specific values and look at the visibility.

The Fix Date feature looks different depending on how wide your plan document window is. If your window is fairly small (e.g. you're using a netbook computer with a small screen) then you will see a ***Fix Date*** button and a checkbox at the top right of the plan document window (next to the Site pop-up) as shown in the left part of Figure 33. If you click the button, a Fixed Date/Time floating window appears. You choose the desired date and time using the controls on the window and click the ***Apply*** button. The visibility settings will all change to reflect the new date/time. You can go back to current real time by unchecking the checkbox next to the ***Fix Date*** button.

If your window is wide enough, the ***Fix Date*** button vanishes and is replaced by a **Date/Time** panel (see the right part of Figure 33). Just change the date or time controls to fix the date. Going back to real time occurs when you uncheck the **Fix date** checkbox.

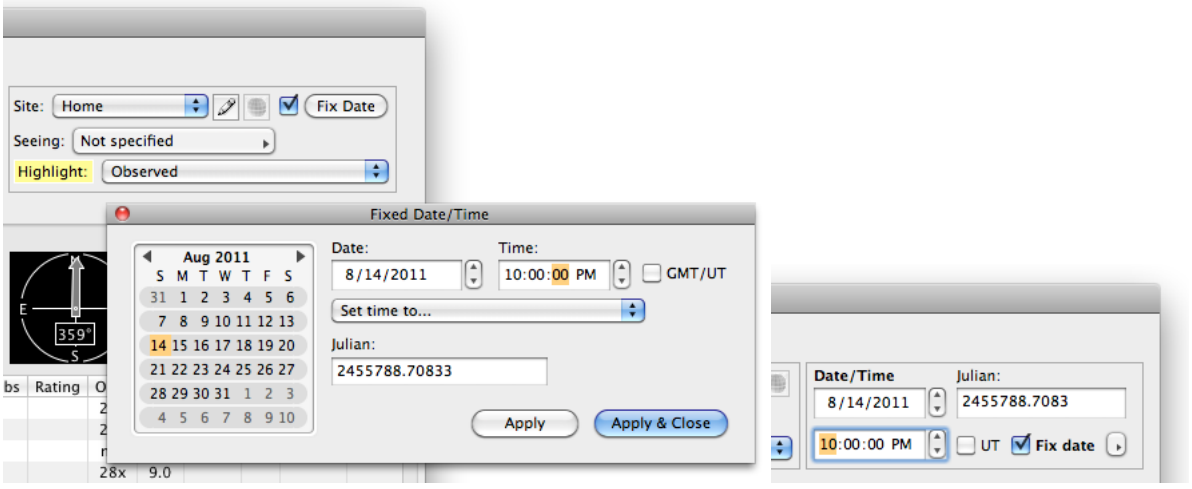


Figure 33: Fixed date/time

5.3.3 Where in the sky is the object?

This is where the **Sky** tab comes in. The tab contains an all-sky chart showing the whole sky as it appears at the selected Site at the current or selected date and time. If you had selected the object of interest in the object list before switching to this tab, the object will be shown on the chart if it's above the horizon (in the figure below, Berk 87 is selected).

Feel free to twiddle with the various Display Options on the right of the chart. You can also use the slider under the Display Options to see the chart at other times of the day/night.

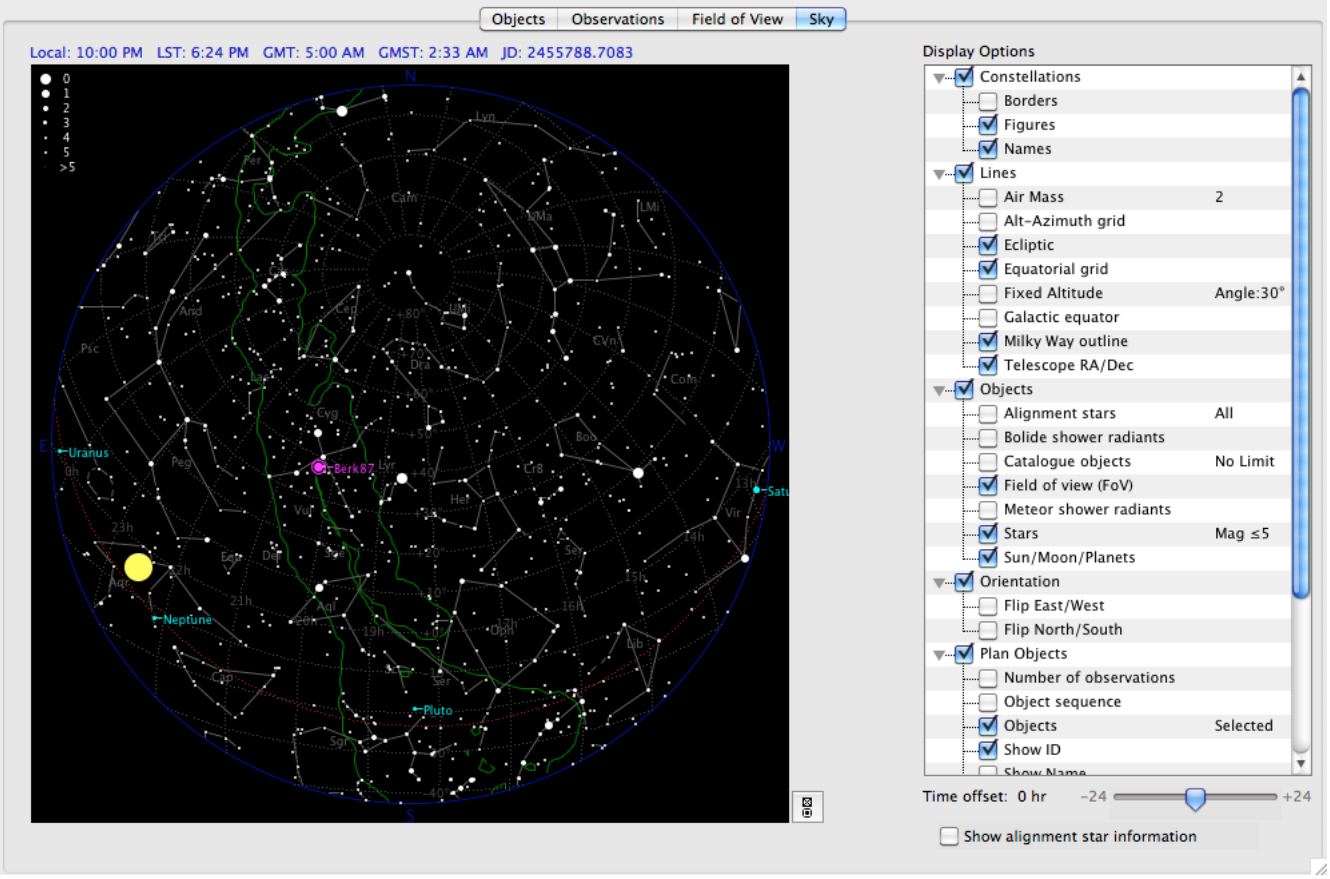


Figure 34: Sky tab

5.3.4 What am I going to see through my telescope?

The next question is figuring out what you are going to see when you look through your telescope with a particular eyepiece. This is done by selecting the object in question in the object list and switching to the **Field of View** tab.

For our example here, we will select M29 in the objects list and then select the **Field of View** tab.

This tab displays a chart that attempts to preview what you will see through a telescope. On the right side are various settings to help you with that. Most importantly, at the top are settings that let you select the telescope and eyepiece you are going to use.

In our case (see Figure 35), we are going to use a telescope called "Orion ED 80 APO" together with a "Panoptic 35mm" eyepiece. Once those are selected, the application computes the actual field diameter (in this case, 1.19°) and draws a chart centred on M29 of that computed diameter. You will also want to see what stars are going to appear in the field of view. You do that by selecting one (or

more) stellar catalogues in the list at the bottom right. If a catalogue's checkbox is checked then any objects in that catalogue that also appear in the field of view will be charted (if they are within the Magnitude Limits defined).

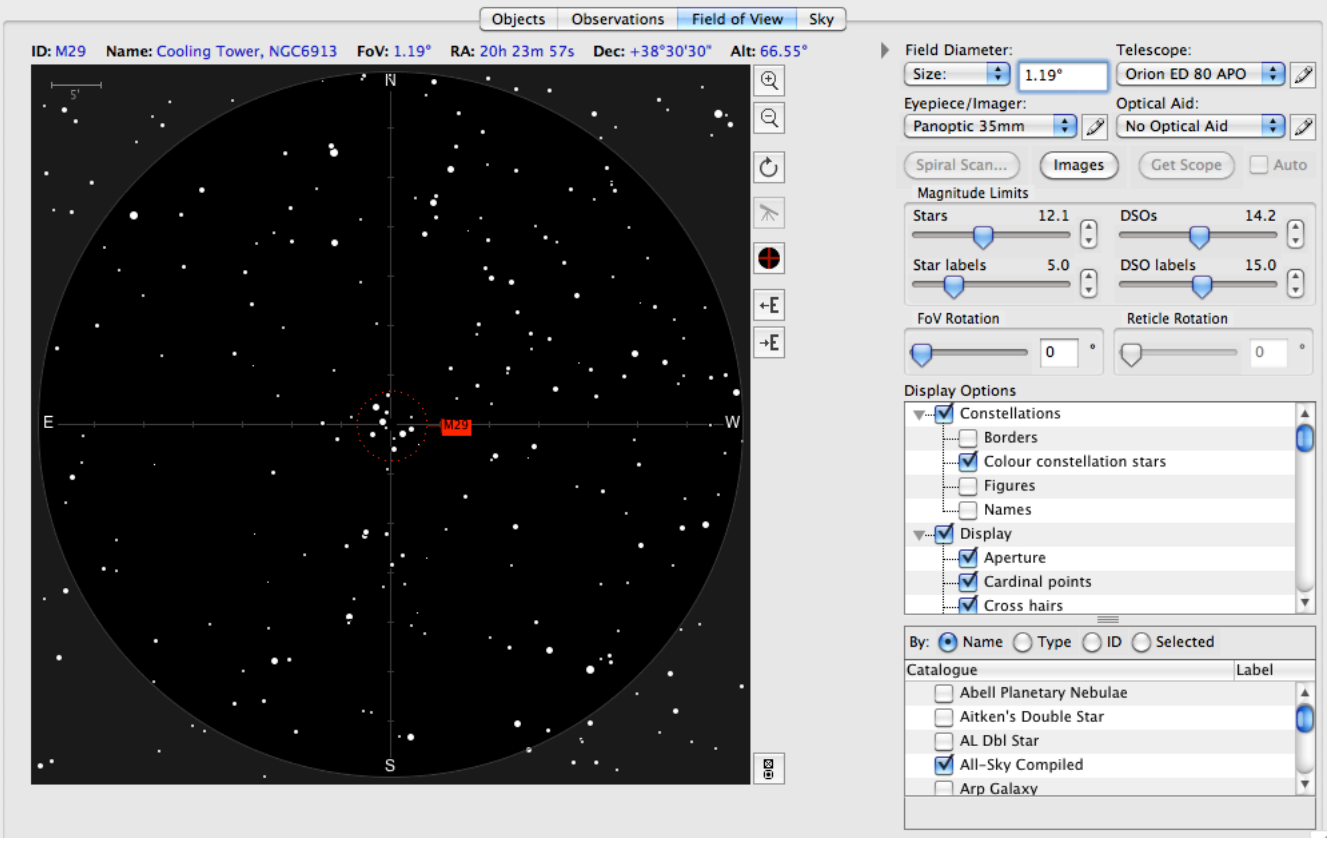


Figure 35: Field of View tab

In the field of view chart, non-stellar objects are displayed using symbols, which means the field of view chart is only a representation of what you will see.

5.3.5 What does the object actually look like?

Figuring out what an object actually looks like through a telescope is not an easy problem to solve. What can be done though, is to look at a photographic image of the object and use that, understanding the fact that in reality it will typically appear much dimmer when viewed visually through a telescope.

AstroPlanner includes the ability to download and save images of the objects you want to observe. These images come from photographic sky surveys (in particular the Digital Sky Survey (DSS)[1] and the Sloan Digital Sky Survey (SDSS)). We will download images for the objects in our plan. Proceed as follows (noting that this will require an Internet connection):

- Select ***Images > Download Images...*** from the main menu.
- In the Images window (Figure 36) select to download for all the objects (7 in this case).

1. Also known as POSS (Palomar Observatory Sky Survey)

- Select the checkbox to **Select image size from object**, and make the image size 200% of object size.
- Select the **POSS 1st Gen** data source by checking its checkbox.
- Click the ***Start Download*** button.

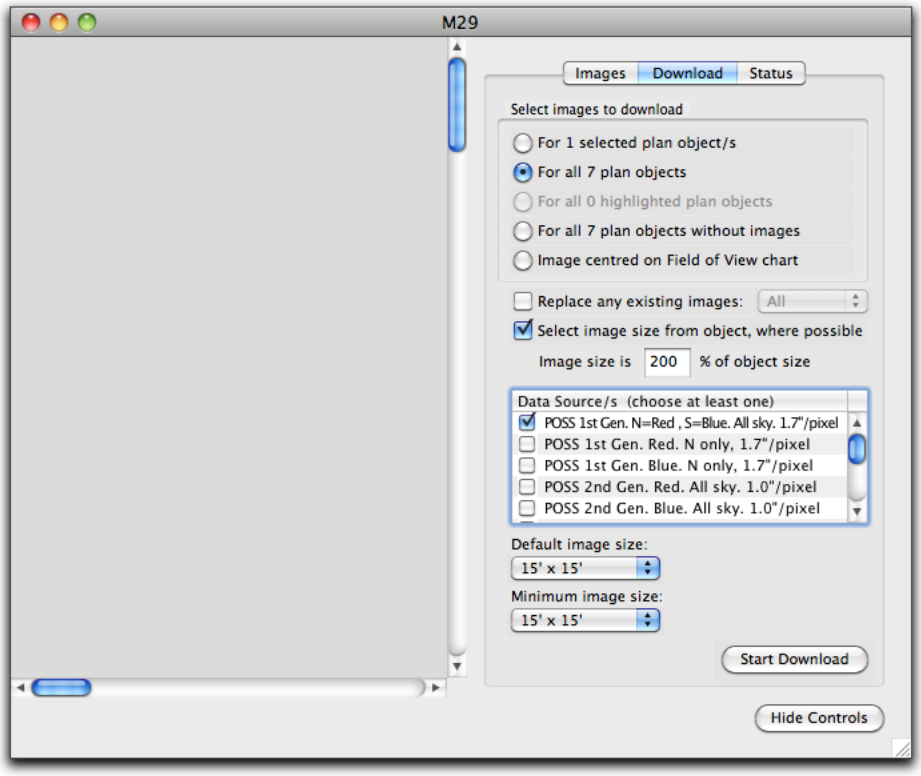


Figure 36: Download Images

The download then proceeds. The **Status** tab shows the progress.

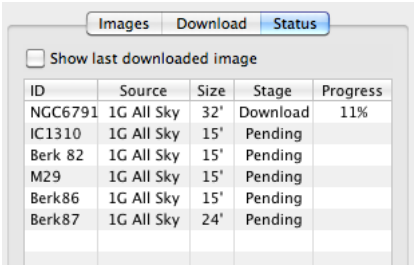


Figure 37: Downloading in progress

Once the download has completed (or before if you like), close the download window and go back to the **Objects** tab of your plan document. You'll see that the **Images** column of the list now has a "D" badge in it. This signifies that the object has one or more associated images. If you select such an object then the image of that object will appear on the right of the object list, as shown in Figure 38.

If you then switch to the **Field of View** tab, the image will be displayed as part of the chart, as shown in Figure 39.

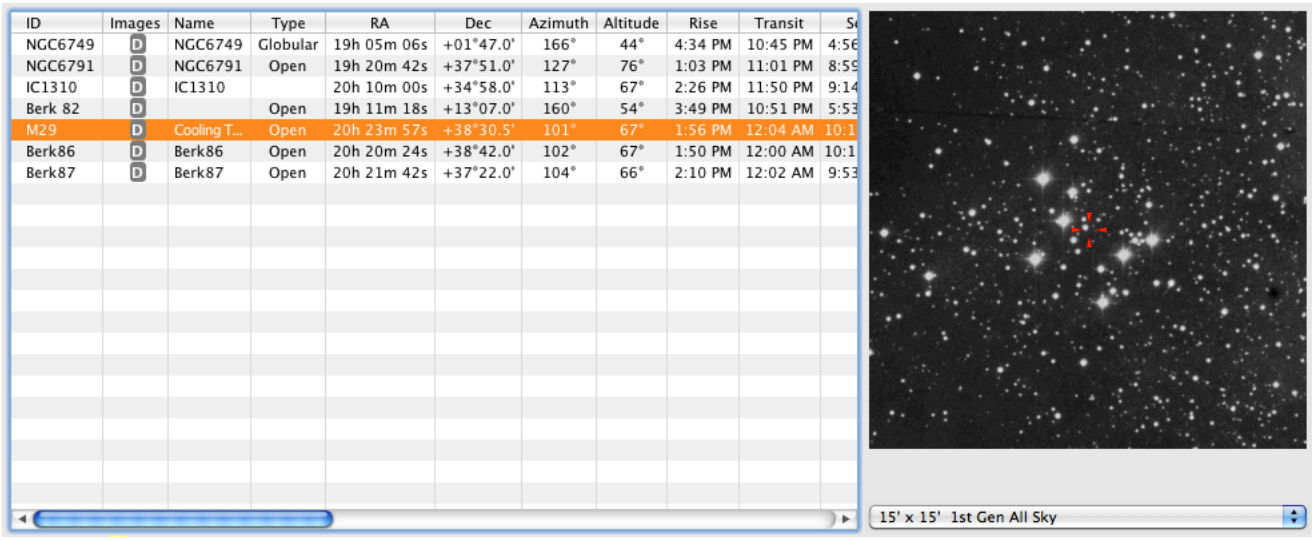


Figure 38: Objects list with images

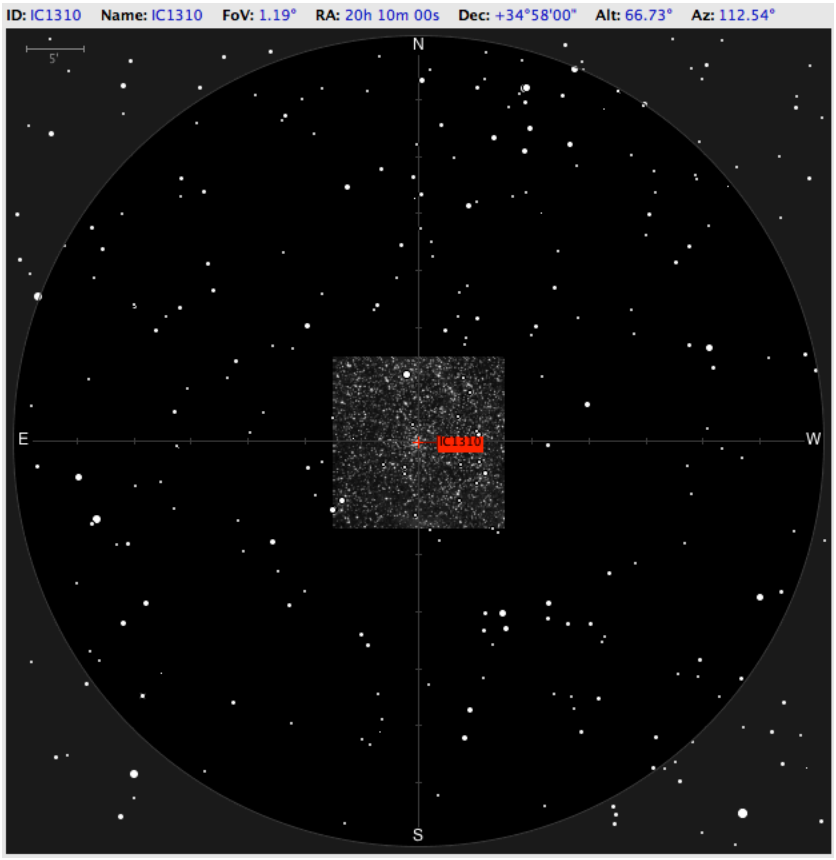


Figure 39: Image of IC1310 in field of view chart

5.4 Using a computerised telescope

For this demonstration we are going to use our "Experimental" telescope resource that we set up to use an emulated go to mount. You can use a real computerised mount if you wish, the process is identical (if somewhat noisier in the case of a real mount).

In the plan document window, choose your telescope resource in the telescope panel at the top left.

Check the **Connect to telescope** checkbox. The application then attempts to connect to the telescope mount, after which the checkbox caption changes to **Connected to telescope**, with the telescope firmware version number if applicable.

Figure 40: Telescope panel before and after connecting

In the case of the emulated mount, a small floating window appears showing the current status of the emulated telescope.

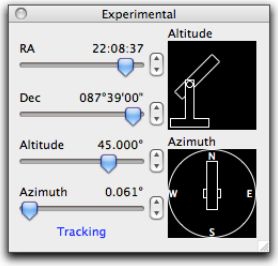


Figure 41: Emulated telescope floating window

At the top of the plan document window the "LED" displays will now include the Telescope RA, Dec, Altitude and Azimuth (assuming there's enough width to display them).

Now select an object in the object list. If it is currently visible the ***Slew to Object*** button next to the Telescope popup will be enabled. Click the button to slew the telescope to the selected object.

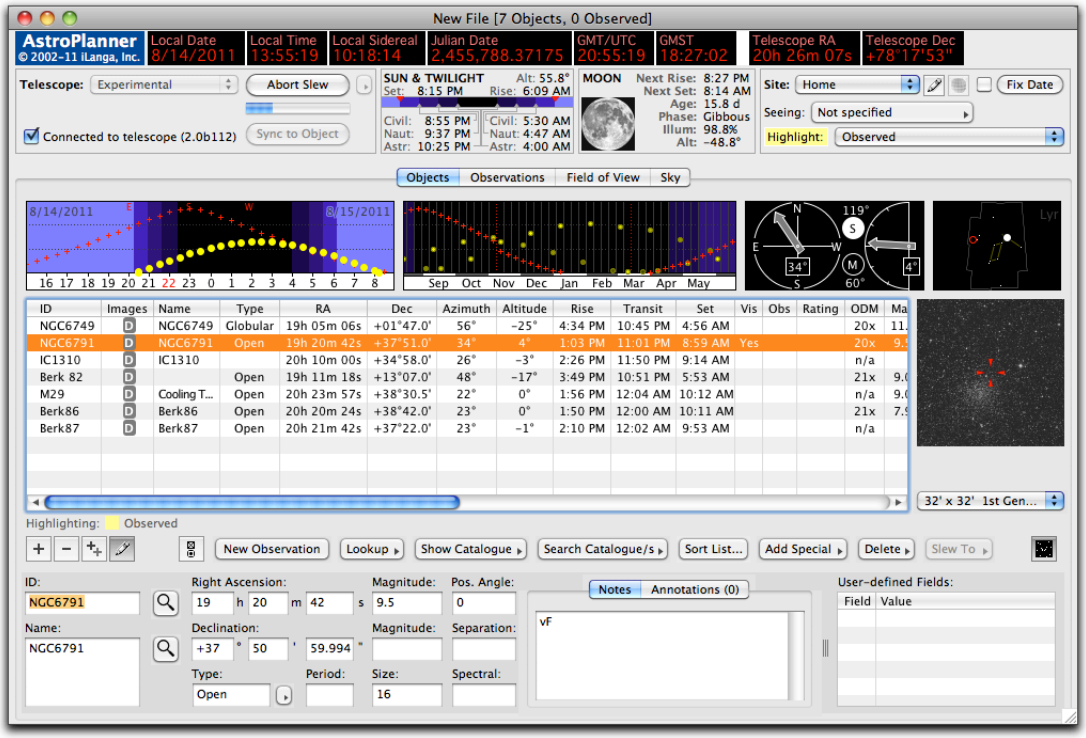


Figure 42: Telescope slewing to selected object

5.5 Making observations and logging them

So now we have an idea on how to construct an observing plan, how to get a heads-up on what we're likely to see, and how to control our telescope. Now we can observe. This section is a brief tutorial on how to log observations.

To log an observation:

- Select the object you are observing in the list in the **Objects** tab of the plan document window.
- Click the ***New Observation*** button under the list[1]. The Observation Date/Time dialog is opened.
- If you are logging observations at your telescope, you click the ***Now*** button, otherwise enter the date and time of the observation. The graphic at the top shows the current time of day/night and the altitude of the object (red crosses). Click ***OK***.

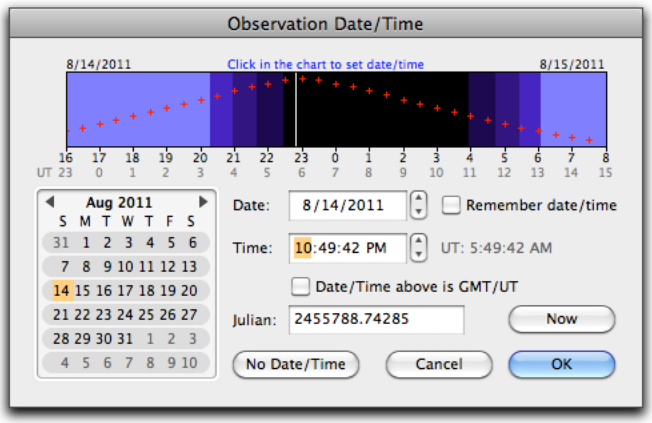


Figure 43: Observation date/time dialog

- The observation is added to list of observations for this object. It's now up to you to fill in the applicable fields for the observing session (this observation is the first observation logged for this session). You should also log a description of what you saw.

1. This is a short cut for switching to the **Observations** tab and clicking the **+** button under the list of observations.

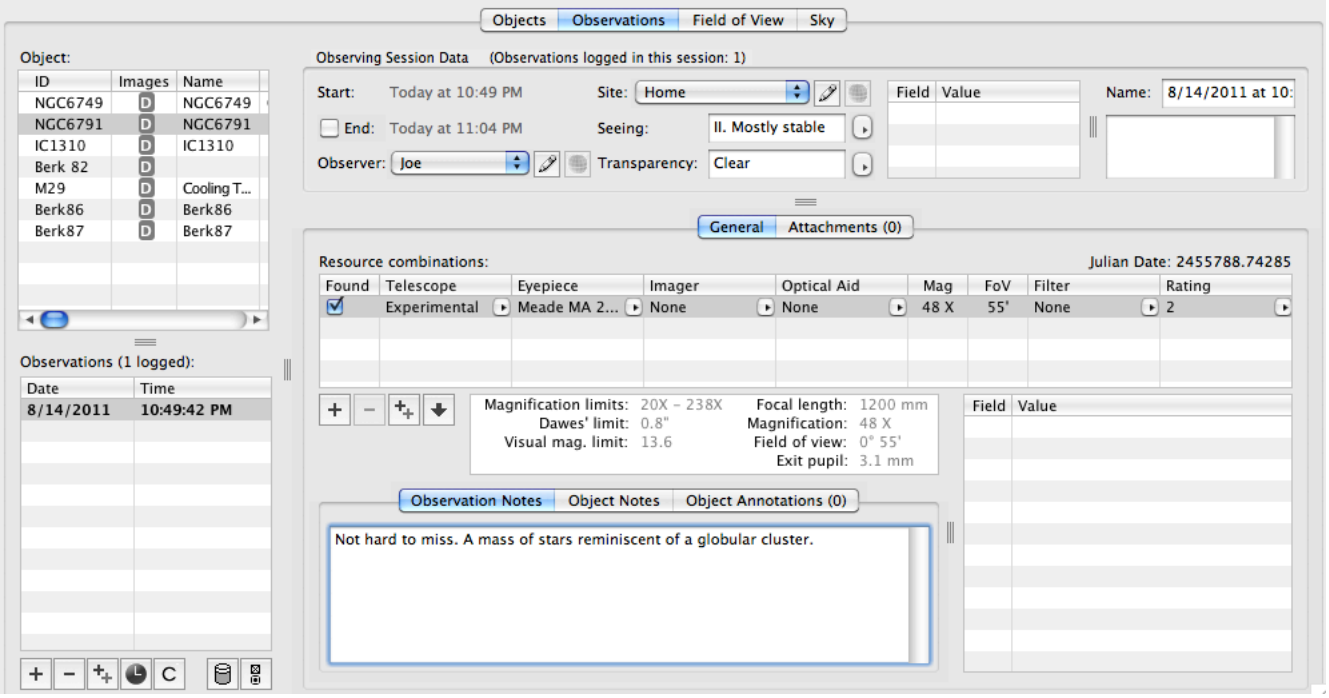


Figure 44: Observations tab with a logged observation

5.6 Printing reports

AstroPlanner includes features for printing observing forms (forms with blank spaces that you can fill in by hand), observing reports (a printed list of observations), and finder charts (for a particular object: charts at various resolutions that help you to find the object in the field).

We will continue using the small plan we devised earlier. Note that you can see the printed output as an on-screen preview without having to print it out on dead trees.

We'll look only at printing observing forms. The other types of printed reports are very similar.

5.6.1 Observing forms

Here's how to print observing forms for the objects in your plan:

- Go to the **Objects** tab.
- Use the ***File > Print...*** menu command.
- The **Print Objects** dialog is displayed. Choose **Observing Forms** from the **Task** popup.
- Select the informational fields you'd like printed out for each object (under Object fields), and the fields you'd like to print out as a blank template (Session and Observation fields).
- There are a number of Options you can play with. For this exercise we left the default settings, but added the **Object images** setting under **Images and Charts**. We also selected the **Sketching Templates** option. See Figure 45.
- Click the ***Preview...*** button. The first time you use this in a run the Printer Setup dialog will be displayed so that you can specify paper size, portrait vs. landscape, etc.
- The preview window is then generated (Figure 46). If you're happy with the report format then use the ***Print...*** button to print it out, otherwise close the preview window and try again.

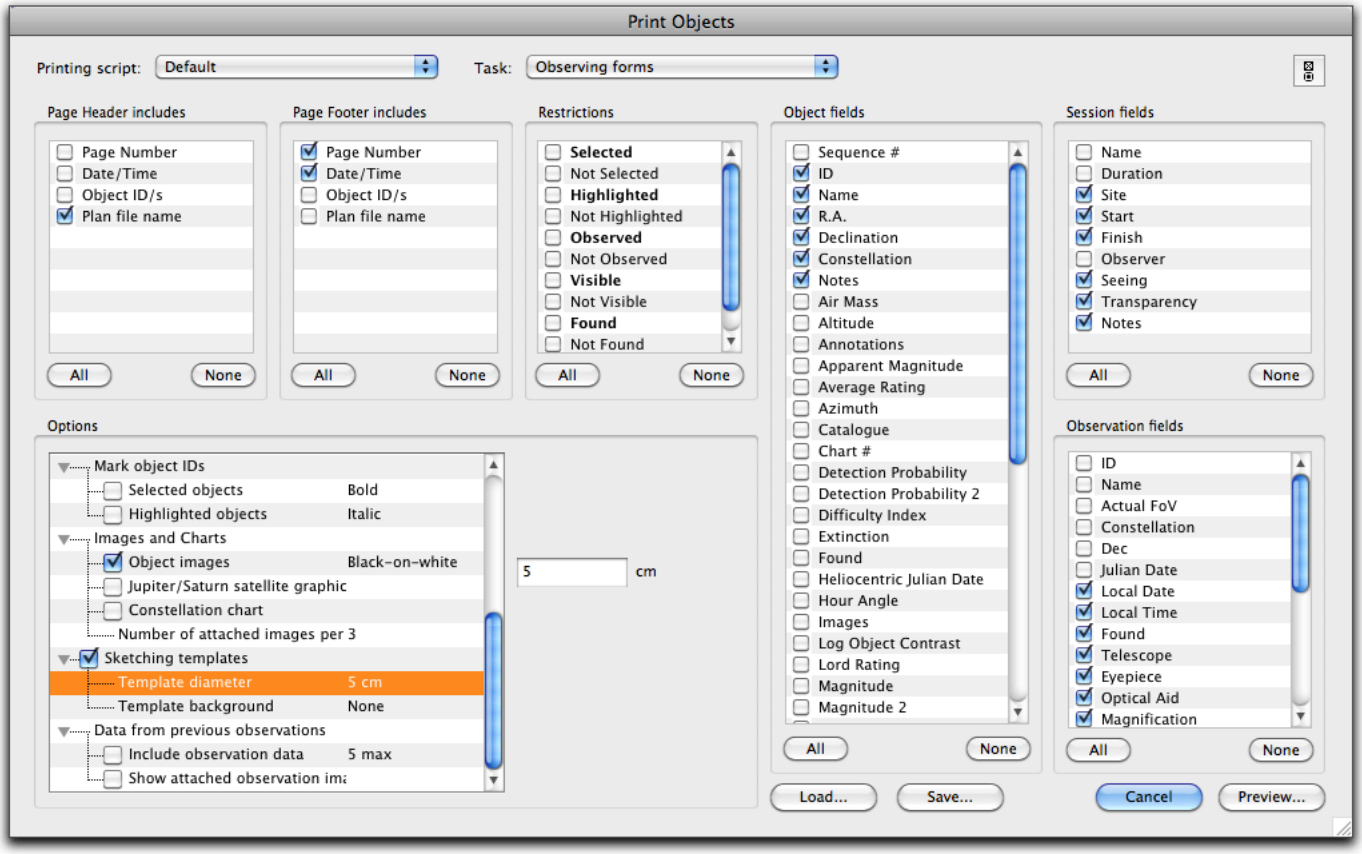


Figure 45: Print dialog for observing forms

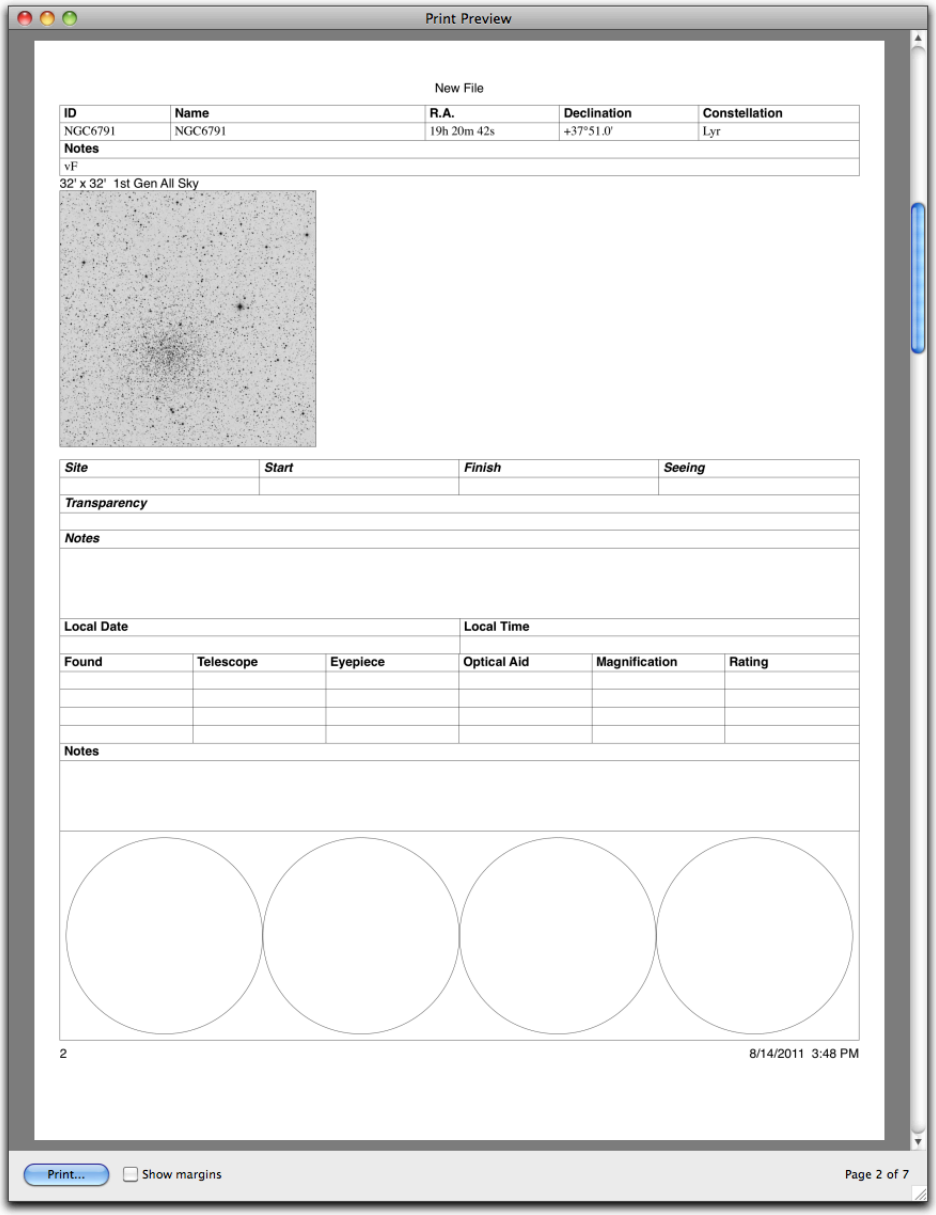


Figure 46: Print preview for observing forms

6 How to get help

AstroPlanner is a very rich application[1] and it takes some time and effort to get it to do your bidding. There are several ways to get help. Remember: no question is too dumb.

6.1 User Manual

This manual is the "definitive" source of assistance for the application. Use the PDF search features to find what you want within the manual, or just peruse the Table of Contents. If a feature isn't discussed in this manual, it's a bug! (please contact the vendor - see below)

There's a troubleshooting chapter in this manual if you are having problems that you think are abnormal (e.g. the application is crashing, won't connect to your telescope, etc.).

6.2 User group

There's a Yahoo group dedicated to AstroPlanner:

http://tech.groups.yahoo.com/group/astroplanner/

There are a lot of friendly people there, including the author of the application, who are ready to answer your questions. There's also an archive of posts, and searching it might throw light on your issue.

6.3 Vendor

Feel free to send your questions, requests, etc. to technical support:

support@astroplanner.net

Although we need sleep too, we'll get back to you as soon as we can.

6.4 FAQ

There's a FAQ (Frequently Asked Questions) page at:

http://www.astroplanner.net/faq.html

This will be updated as questions come in that are considered of interest to more than just the asker of the question.

6.5 Blog

Although it can't really be classified as a "help resource", there's a blog written by the AstroPlanner author that might occasionally offer some insight into the devious mind behind the product:

http://blog.astroplanner.net/

1. Some might use the phrases "overly-complex", "feature-laden", or "learning-curve challenged".

7 Anatomy of AstroPlanner

In order to understand how AstroPlanner goes about its functions, you need to understand a little about the entities that make up its “anatomy”. AstroPlanner manipulates these entities in order to plan and log observations, etc.

7.1 Plans

The fundamental entity that you will work with in AstroPlanner is the Plan. This is a list of astronomical objects that are to be observed (or have already been observed). Each plan is stored in a separate Plan document on disk. For example, you might have a plan containing the Messier objects, or a plan containing interesting galaxies in Andromeda.

These plans will contain anything from a single object to several hundred objects. In fact there is no limit to the number of objects you can have in a plan, although once you get to a few thousand, the application might become sluggish.

You can open several plan documents at a time. Each plan lives in its own window, which has several tabs.

7.2 Objects

An Object is a short term for “astronomical object”, and is the fundamental data type in the application. It might represent a particular galaxy, double star, planet, etc. There are two different types of object:

7.2.1 Plan object

A Plan object resides in a plan document. It has many different attributes, such as an ID, coordinates (RA and Declination), magnitude, etc. It can be added to a plan manually (by typing in the attributes), importing from a text file, or via a catalogue lookup (see below). You are free to change such plan objects as you see fit (for example, by adding some notes, or modifying an attribute)

7.2.2 Catalogue object

A Catalogue object is also an astronomical object, except that it resides in a catalogue (see below). Catalogue objects can be added to plans manually (by dragging them from a catalogue) or via a catalogue search. Once such a catalogue object is added to a plan it becomes a Plan object.

Catalogue objects are effectively immutable (i.e. they cannot be changed by a user).

7.3 Observations

When you are physically observing an object in your plan, you can log an Observation of that object. This consists of the date and time of the observation, what equipment (resources) was used, and notes on that observation. Observations are stored in a central observation database.

7.4 Sessions

When you create observations (above) you will have an associated observing Session. This is a record of the observing site, seeing conditions, etc. for the observations made during that session. Session data are kept in the central observation database.

7.5 Resources

A Resource is an item that is applicable to planning, and is different for each user. These resources include, observing sites, telescopes, eyepieces, astro-imagers, etc.. In order to facilitate planning, the user must define and add these resources to a database. For example, in order to be able to determine the current sky view, and position of objects with respect to the horizon, a Site resource must be defined (with latitude, longitude, etc.). In order to be able to visualize what you will see through your telescope, you must define a Telescope resource (aperture, focal length, etc.) and an Eyepiece resource (focal length, apparent field-of-view, etc.)

7.6 Catalogues

A Catalogue is a set of related catalogue objects. Such a catalogue contains objects that are typically of a single type (e.g. the PGC (Principal Galaxy Catalogue) Catalogue contains several thousand galaxies). In some cases there is a mixture of object types that were original catalogued by an observer (Messier Catalogue) or perhaps a well-known observing list (e.g. the Herschel 400 Catalogue). There are many catalogues available (each a separate file) that can be installed into the application and used. Currently all catalogues are supplied by the vendor. Future releases may add the ability to construct your own catalogues.

7.7 Scripts

AstroPlanner has a built-in scripting language that can be used to add functionality to the application, automate some tedious tasks, etc. A Script is a single “program” in the scripting language. Such a program can access, say, the objects in a plan, observations, etc. You can write your own scripts, or download scripts created by others.

8 Common user-interface elements

There are many common user-interface elements within the AstroPlanner application, most of which share common functionality and features.

8.1 Text fields

There are two types of text fields: single line fields (e.g. for entering numbers or strings) and multi-line text areas for entering significant amounts of text (e.g. entering observation notes, etc.).

8.1.1 Single-line text fields

Non-numeric text values

This type of field is used to enter text data. Generally, any text can be entered.

Figure 47: Text entry field

The contextual menu (attained by right-clicking the field) has various operations available:

- **Copy, Copy and Paste**. The same operations that are also found in the main ***Edit*** menu.
- **Check Spelling**. Check the spelling of the text in the field. See Section 8.1.4 on page 43.
- **Select All**. Select all text in the field.
- **Change Case**. Change the case of the text in the field, to all UPPERCASE, all lowercase, Title case (each word is capitalised), or Sentence case (each sentence starts with a capital letter).
- **Font**. Change the font face and size for the field (overriding the standard font). See Section 8.1.3 on page 43.

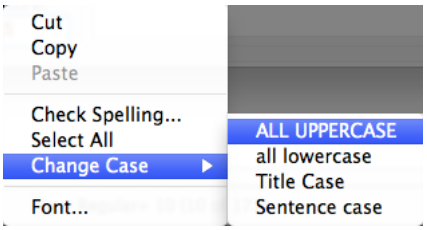


Figure 48: Text field contextual menu

Numeric values

This type of field is used to enter a single numeric value. This might be a floating-point or integer value, or a formatted number (such as latitude, declination, etc.). If the number is valid it will be displayed in the standard black colour. If it is not a valid number or falls outside the correct range, it will be displayed in red, and the tooltip below it will display the acceptable range.

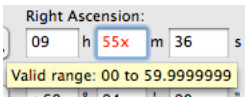


Figure 49: Numeric value entry field

The contextual menu (attained by right-clicking the field) has various operations available:

- **Copy, Copy and Paste**. The same operations that are also found in the main ***Edit*** menu.
- **Select All**. Select all text in the field.
- **Font**. Change the font face and size for the field (overriding the standard font). See Section 8.1.3 on page 43.

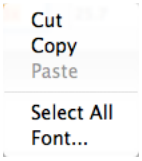


Figure 50: Numeric field contextual menu

8.1.2 Multi-line text fields

Multi-line text fields are used to enter substantial amounts of text, that might contain paragraphs and line endings. It has a scroll bar on the right which is enabled if the text fills more than the visible bounds of the field.

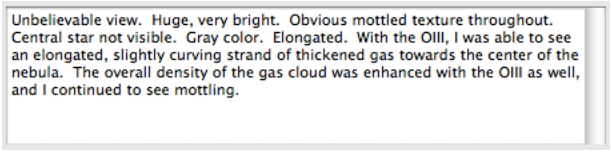


Figure 51: Multi-line text field

The contextual menu (attained by right-clicking the field) has various operations available:

- **Spelling suggestions.** If a word is selected then the spelling checker might offer suggestions to correct that word if it is not in the dictionary. Selecting one of the suggestions will replace the offending word in the text.
- **Learn**. If a word is selected and it is not in the dictionary, you can tell the spell checker to accept the word as being correctly spelled using this item.
- **Copy, Copy and Paste**. The same operations that are also found in the main ***Edit*** menu.
- **Check Spelling**. Check the spelling of the text in the field. See Section 8.1.4 on page 43.
- **Select All**. Select all text in the field.
- **Change Case**. Change the case of the text in the field, to all UPPERCASE, all lowercase, Title case (each word is capitalised), or Sentence case (each sentence starts with a capital letter).
- **Font**. Change the font face and size for the field (overriding the standard font). See Section 8.1.3 on page 43.
- **Print...**. Print the contents of the text field to your printer.
- **Edit Window**. If allowed, this will open a larger window with a text field that can be expanded as large as you like. Entering text into this window will be the same as entering directly into the field. This can be convenient if the field contains a lot of text.

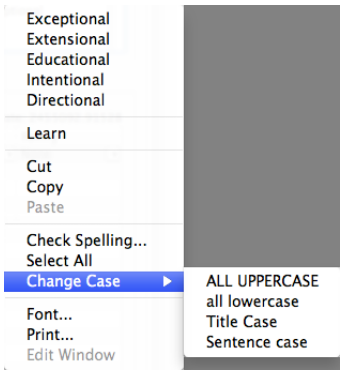


Figure 52: Multi-line field contextual menu

8.1.3 Changing fonts

You can use the ***Font...*** command in the contextual menu to change the appearance of the text in a text field. You can choose the font face, size, and style. The font change is for the targeted field only and is persistent.

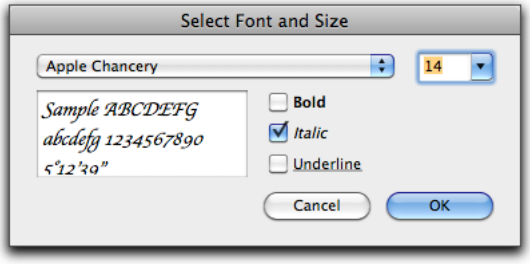


Figure 53: Font change dialog

8.1.4 Spell checking

You can manually spell check the contents of a text field by using the ***Check Spelling...*** command from the contextual (right-click) menu for that field.

Figure 54: Spell Check dialog

Any incorrectly spelled words are displayed, one by one, along with a list of suggestions for the correct word. You can select one of the selected words, or enter your own, and click ***Replace*** to replace the word in the text. You can also elect to ***Skip*** the word if you don't know what to do, or ***Ignore*** if you want to take the word as being correct. You can also use the ***+*** button at the top right to add the word to your user dictionary.

Additionally, if you have the **Inline checking** option on (see General Preferences: Section 20.1.3 on page 286), any incorrectly spelled words will be highlighted. Right-clicking the highlighted word will allow you to select a correct word to replace it, or get the spell checker to "Learn" that the word is actually correct.

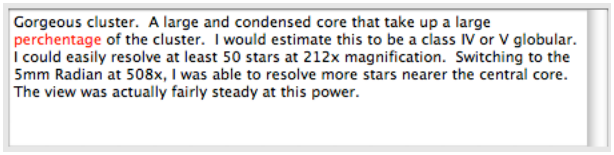


Figure 55: Inline spell checking

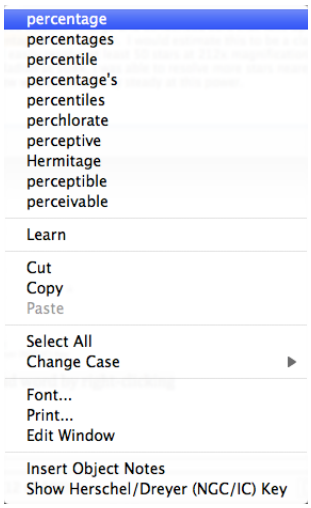


Figure 56: Correcting a bad word by right-clicking

8.2 Lists

Lists are used to display tabular data and can have one or more columns, and can also have column headings.

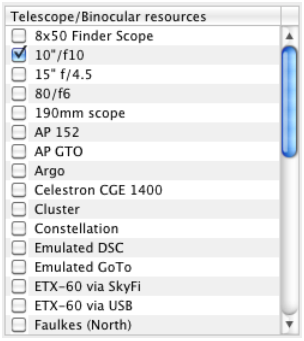


Figure 57: List

The contextual (right-click) menu for a list allows you to export the data and also change the appearance of the list.

You can **Copy** all rows or selected rows (where applicable) to the clipboard.

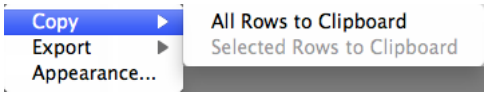


Figure 58: List contextual menu

You can **Export** all rows or selected rows (where applicable) to either a tab-separated text file, or an Excel file.

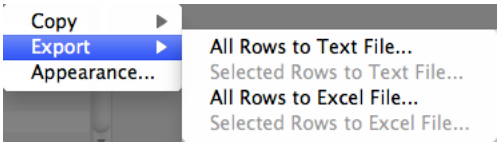


Figure 59: List contextual menu

You can also change the **Appearance** of the list, specifying the font, row height, grid lines, and alternate row striping. You can elect to make the change just to the list you right-clicked on, or to all lists.

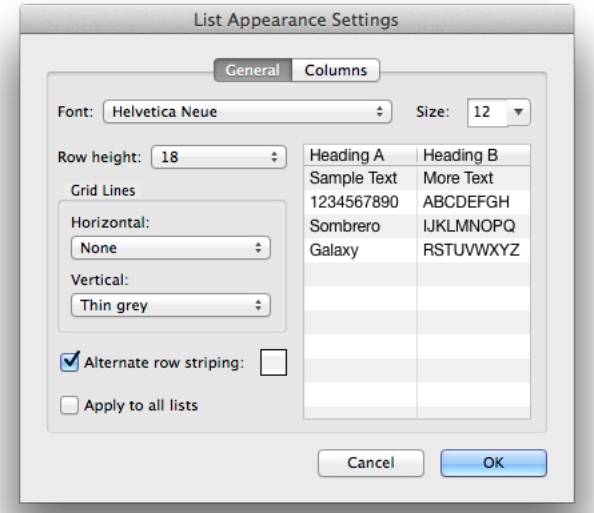


Figure 60: List appearance settings

On most (but not all) list widgets in the application, including the observation database window lists, object list, etc., there's now a **Columns** tab that allows you set the style separately for each column in the list: **bold**, italic, underline, the colour of the text, and the colour of the background.

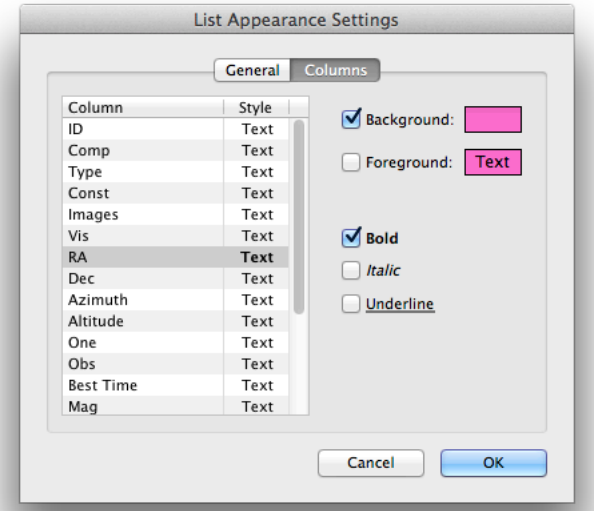


Figure 61: Setting list column styles

8.3 Resource choosers

At various places throughout the application you are required to select a resource (e.g. a Telescope resource - see Figure 62, or field of view chart parameters - see Figure 63). These are presented as a popup menu containing all active resources of the pertinent type. Resources are discussed in Section 7.5 on page 40.

The resource chooser popup can also have a button to the right containing a "pencil" icon. This allows you to edit the selected resource (by opening the Resources window, changing to the requisite tab and selecting the resource. See). There might also be a button containing a small globe. This will be enabled if the particular resource defines an Internet URL. Clicking the button will open the URL in your web browser application.

Figure 62: Telescope chooser

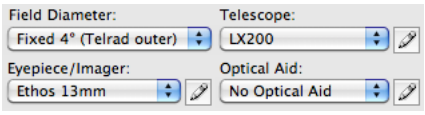


Figure 63: Field of view chart resource choosers

8.4 Hierarchical options lists

At various places in the application, a hierarchical widget is used to display options. Sections of options can be expanded or collapsed using the small grey triangles (Mac OS - See Figure 64) or small "+" and "-" widgets (Windows - See Figure 65). Each option has a checkbox associated with it that controls whether that option is enabled or not.

If a section also has a checkbox associated with its title, then that checkbox can be used to enable or disable all the options within that section. When the checkbox is switched off, all contained options are switched off and disabled.

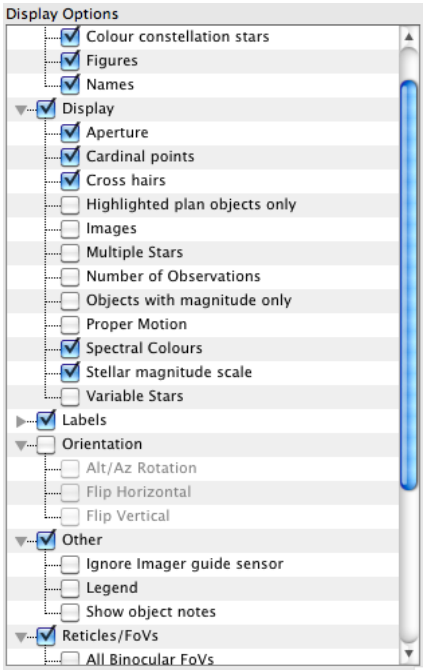


Figure 64: Field of View chart display options (Mac OS style)

If an option has an associated value, then it is displayed on the right. Selecting that option will reveal a means of editing the value at the bottom of the option panel (see Figure 65 for an example).

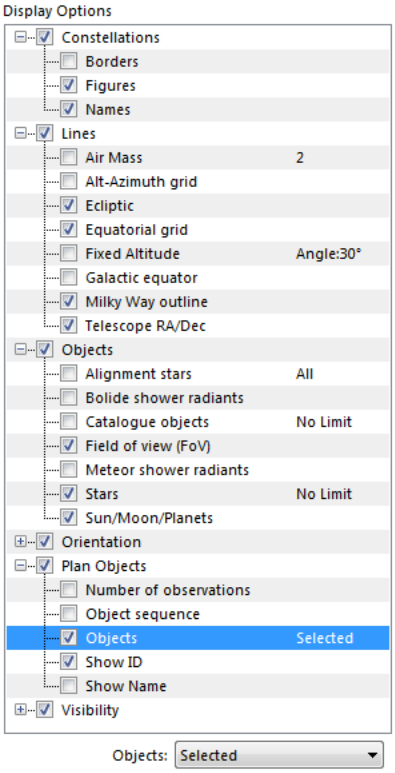


Figure 65: Sky chart display options (Windows style)

8.5 Date/time selectors

At various places in the application's windows there are date/time selectors, allowing the entry of the date and (usually) time. These will be customised to the date and time settings of your operating system by default.

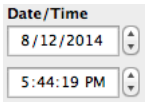


Figure 66: Typical Date/Time selector

Right-clicking the date selector widget (in most cases) will display a popup menu containing various convenience date/time values (e.g. Sunset, Moonrise, etc.).

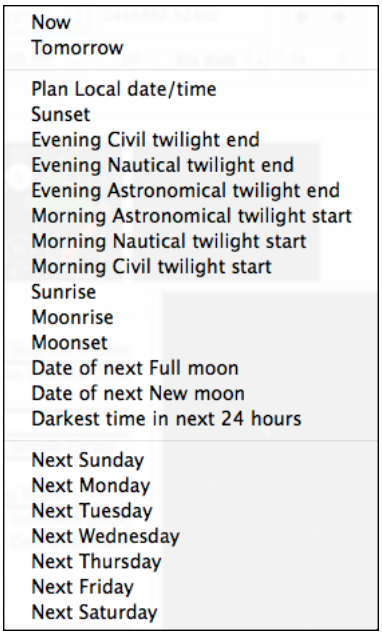


Figure 67: Date selector right-click menu

9 Setting up your resources

9.1 Using the Setup wizard

The simplest way to set up your essential resources is to use the Setup Wizard (***File > Setup Wizard...***). This is detailed in section 4.2 on page 8. This enables you to add observing sites, telescopes, and eyepieces. However, it's fairly simplistic and does not allow setup of other resource types, or the setup of some of the more esoteric settings for resources. To do that, you need to do manual setup, as detailed below.

9.2 Manual setup using Resources window

The Resources window allows you to edit the resources database manually. It is displayed by using the ***Edit > Resources...*** menu command.

The window contains a tab for each type of resource (and an additional Combinations tab described below).

9.2.1 Common resource elements

Each resource tab contains various editing controls, some of which are common to all tabs. These are described below.

Resource name list

The name list contains an entry for each resource of the type represented by the tab.

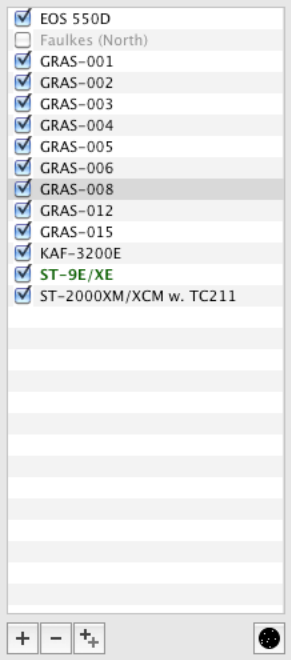


Figure 68: Resource name list

Each resource has a checkbox to the left of the name. If the checkbox is unchecked then the resource is deemed to be no longer in use, and will not appear in any lists of those resources elsewhere in the application. The reason for disabling an unused resource rather than deleting it is that it might have been used in, say, the observation database. If such a resource is deleted, the observation database

can no longer access the resource parameters (e.g. a telescope aperture, etc.) for that deleted resource.

If a resource has been marked as the Default resource of this type (see below), then its name is displayed in green.

The buttons below the list, from left to right, are:

- Add a new resource
- Delete the selected resource (see above for caveats).
- Duplicate the selected resource
- Redraw the field of view chart in open plan documents. This will update such charts using any changes to resources you may have made.

Resource name

Allows you to change the name of the selected resource. Note that resource names must be unique, and the single quote character (') cannot be used in the name.

Figure 69: Resource name, URL, At Site and Default settings

URL

An optional field that can contain an URL to an external web page for that resource (e.g. a login page for a remote telescope site, a page on the telescope vendor's web site describing the particular telescope resource, etc.). You can use the button to the right of the field to open the URL in your browser.

At Site/s

(*Not applicable to Site resources*) If a resource is only applicable to a particular observing Site or Sites, then use this button to select those Site/s in a check list (Figure 70). For example, if your telescope is permanently mounted at an observatory then specify the observatory site. If your resource is portable between sites (e.g. an eyepiece), then select **Common to All**. If you have several sites, and each of them has the same eyepiece, you can select the applicable sites.

When you select a particular Site in a plan document, any resources not marked **Common to All** or allocated to that Site will not appear in the resource popups.

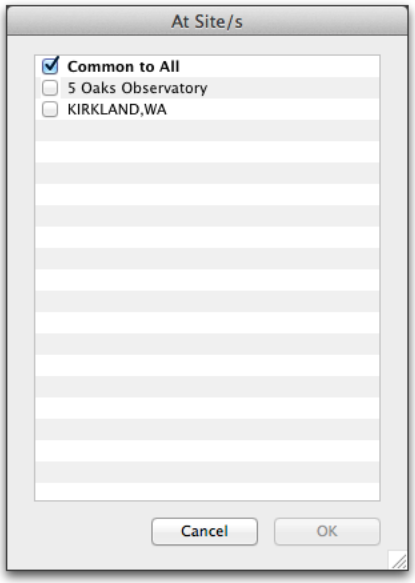


Figure 70: Choosing At Site/s

Default

One resource of each type can be marked as the default. When a new plan document, observation etc. is created and a specific resource is not specified, the default will be used. i.e. you should mark your most-often used resources as Default.

User-defined fields

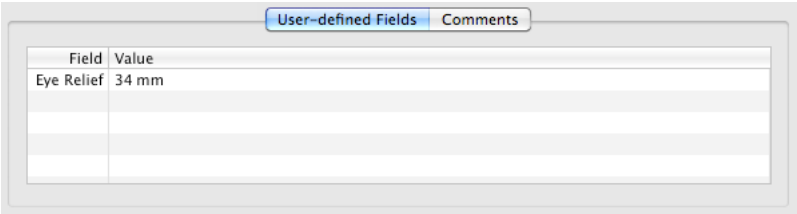


Figure 71: User-defined fields

Each resource type has a set of user-defined field definitions, and each resource can define values for those fields. See Chapter 19 on page 276 for more details.

Comments

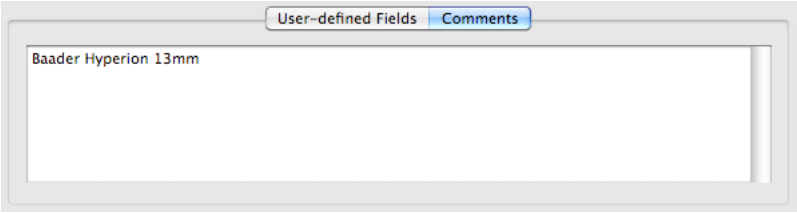


Figure 72: Comments

Each resource has a comment field. You can put whatever text you like here.

9.2.2 Site resources

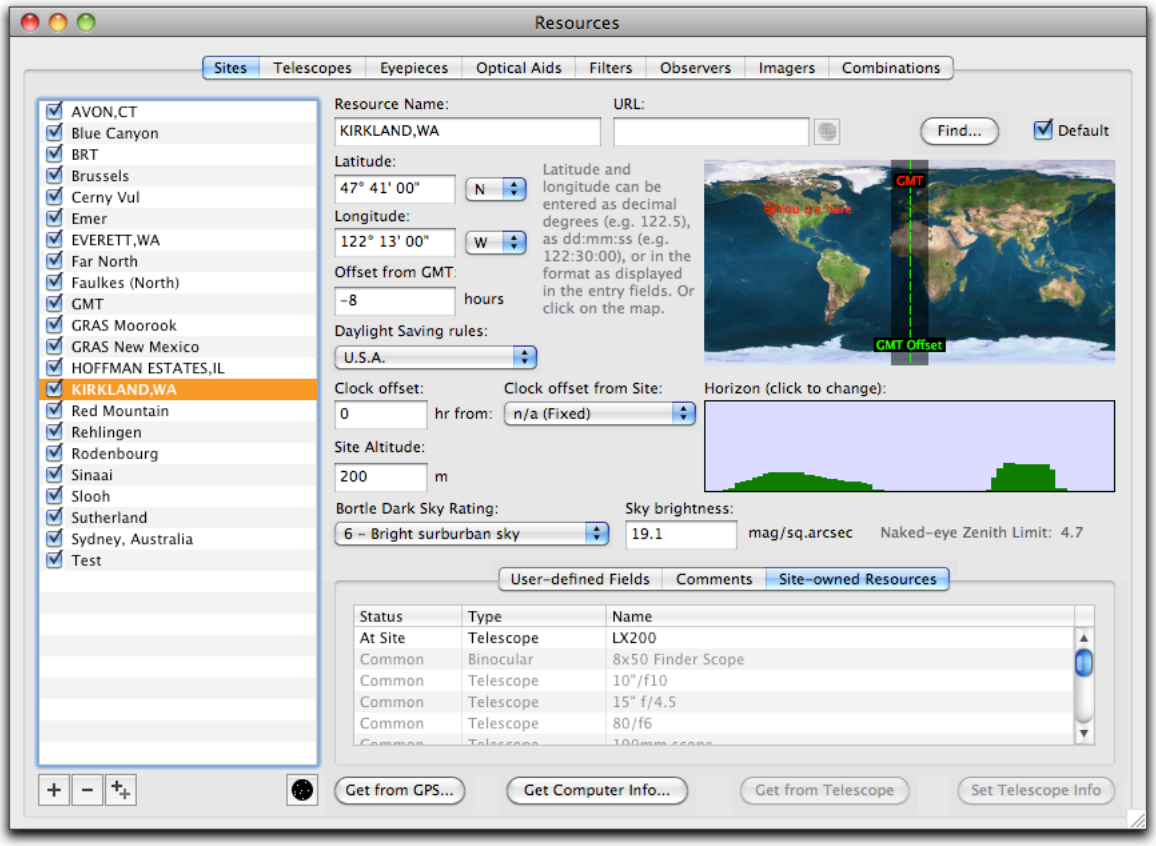


Figure 73: Site resources

Find...

This button allows you to search for your town/city if it is in the U.S.A. or Canada (sorry, no convenient databases are available for other countries). You can either select the U.S.A. or Canada tab and select by State/Province and City, or use the Find tab to search for any cities containing a search string.

Once you've selected a city, you can choose to create a new site (in which case a new Site resource with the given name, latitude and longitude will be created), or elect to modify the currently selected site (if applicable, in which case the latitude and longitude will be changed).

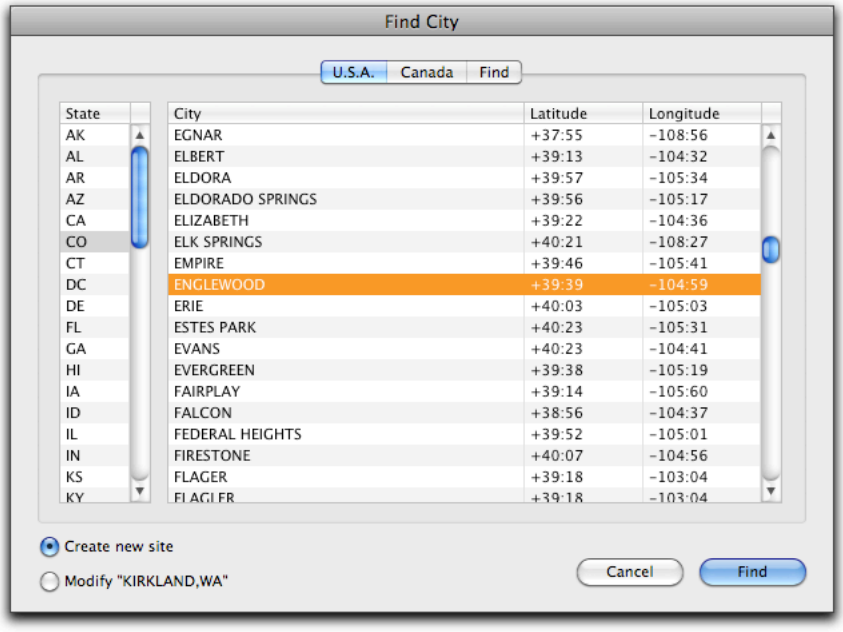


Figure 74: Select city by state

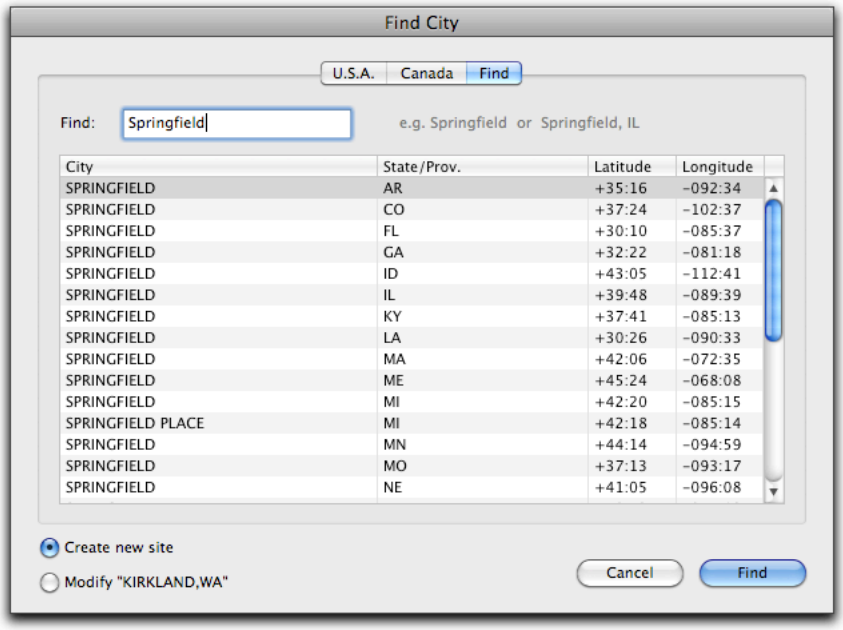


Figure 75: Find city

Latitude/Longitude

The latitude and longitude of the Site. You can enter these values manually, use the Find function described above, or you can click on the world map to the right to create a rough position. The current position is marked on the map.

(*Macintosh only*) You can right-click the map and elect to ***Show location in Google Earth***. This will start the Google Earth application (if available) and centre the Google Earth map window on your selected location. You can also right-click and use **Get location from Google Earth**. This will assume that the Google Earth application is running and the map window is centred on your required

location. The latitude/longitude of that centre will be placed in the fields. Google Earth can be downloaded from ***http://www.google.com/earth/index.html***.

Offset from GMT

This is the offset, in hours, of your local time from GMT, during standard time (i.e. not during the daylight-saving period if applicable). It is negative for sites west of 0° longitude, positive otherwise. e.g. in the U.S.A., East-coast time is -5 hours, Pacific coast time is -8 hours.

The offset is used to draw a vertical green dashed line on the world map. If this coincides with GMT (a vertical red dotted line) then your offset is most probably correct. However, it could be within the grey vertical stripe on the map and still be OK. If it's outside the grey stripe, you might want to double check your coordinates or offset.

Daylight Saving rules

If your site does not use daylight saving time during the year, then set this the **None**. If your site is in the U.S.A. and uses daylight saving, the select **U.S.A**. Similarly for the **European Union**.

You can also define up to four different custom rules for daylight saving, and use them by selecting the appropriate entry.

Select the ***Edit Custom...*** entry to edit those custom rules.

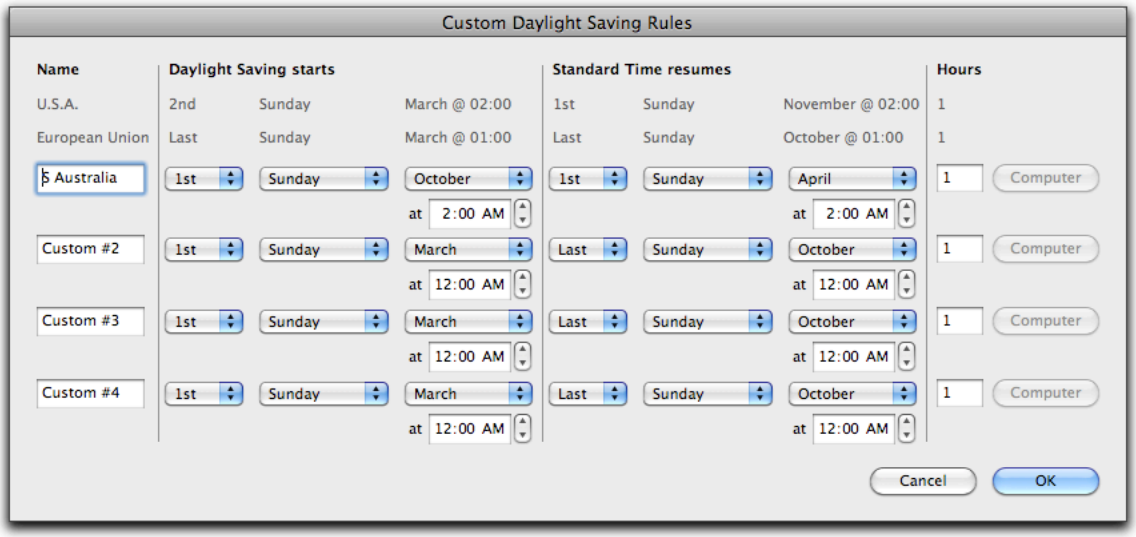


Figure 76: Editing custom daylight saving rules

Give a rule an appropriate name, specify when daylight saving starts and ends, and specify the number of hours that are added to standard time.

If your operating system allows, you can click the ***Computer*** button and insert information into the rule.

Clock offset

This specifies the number of hours the site is offset from the computer's clock. Normally your computer will be present at the observing site and this offset will be zero. However, if you are operating, say, a remote observatory site and that site is in a different time zone, then this offset should be set to the number of hours offset between the computer's time and the remote site's time. Then when you select that site in a plan document the local time, horizon and visibility will be computed for that site rather than the local site.

The best setting is to specify the **Clock Offset from Site** as being your computer's site. Then the current offset is computed based on daylight saving conditions at both sites.

Horizon

The default site horizon is completely flat down to 0° altitude. More often than not the actual site will not have horizon-to-horizon viewing conditions, but will have obstacles (e.g. trees, buildings, observatory walls, etc.) to contend with. You can define your own horizon here, and the application will use that horizon information to determine whether an object is currently hidden or not.

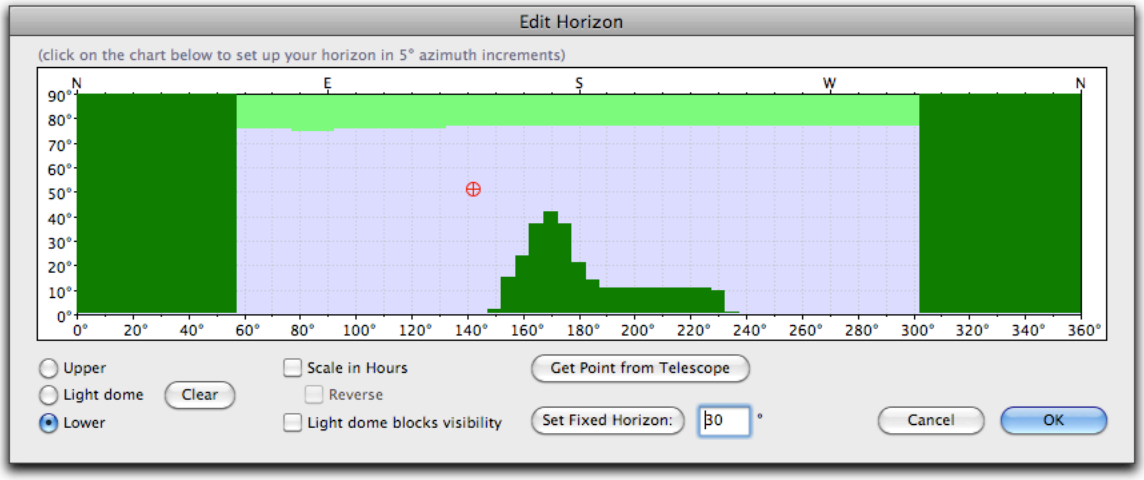


Figure 77: Horizon editing dialog

(Left-) clicking the horizon picture opens the horizon editing dialog. This is a mapping of the entire sky into a rectangular picture with azimuth along the horizontal and altitude on the vertical axis. The horizon definition is divided into three parts:

- **Lower horizon**. These are obstacles on the horizon the reach up from 0° altitude (the true horizon) up to the zenith (90° altitude) if necessary.
- **Upper horizon**. These are obstacles that prevent you from seeing the sky above a given altitude. Typically this might be a parapet on a balcony you are observing from.
- **Light dome**. Sky glow from a distant light source (e.g. a city centre or factory) that lights up the sky. If the **Light dome blocks visibility** checkbox is checked, then any defined light dome will be considered effectively to block object visibility.

The horizontal scale is in degrees from north through east. You can also show that scale in hours (0 to 24) using the **Scale in hours** checkbox, and **Reverse** it if necessary (24 to 0). This is useful if you are using an alt-az mounted telescope to trace out the horizon. In this case, the "polar" axis setting circles might be calibrated in hours rather than degrees.

You can use the ***Set Fixed Horizon*** button to set a fixed altitude horizon over the entire width.

If you have a computerised telescope, and it is connected to AstroPlanner, the current pointing of the telescope is displayed on the chart, and you can use the **Get Point From Telescope** button to use those pointing coordinates to set the horizon.

Site altitude

The altitude of the Site above sea level.

Bortle Dark Sky Rating
This is a scale of 1 through 9 that defines how good (or bad) your site is. If you select one of these ratings, it will set the Sky Brightness to an appropriate estimated value (which can be changed if necessary).

Sky Brightness
The sky brightness (magnitudes per square arcsecond) of the site. This value is used to compute (advanced) visibility ratings for the sky. The naked-eye stellar magnitude limit at the zenith (straight up) is computed and displayed to the right of this field.

Site-owned Resources
A list of resources available at the site (and any resources available at all sites in grey).

Get from GPS...
If you have a dedicated GPS device connected to a serial port of your computer, you can use this button to interrogate the GPS device and retrieve current latitude and longitude.

Get Computer Info...
(*Macintosh only*) Retrieves the latitude and longitude from the operating system settings and sets those fields for the Site.

(*All platforms*) Retrieves the GMT offset and displays it.

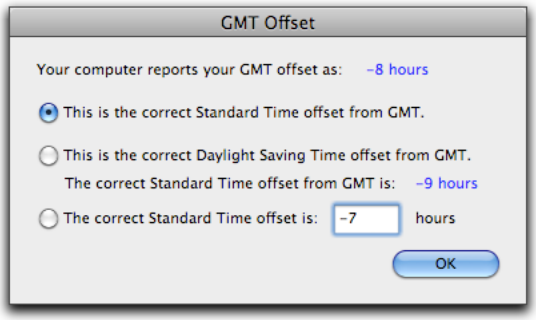


Figure 78: GMT offset selection

You select which option is correct.

Get from Telescope
If a telescope is connected, and allows the retrieval of latitude, longitude and GMT offset, then you can use this button to retrieve that data from the telescope and insert it into the relevant fields.

Set Telescope Info
If a telescope is connected, and allows the setting of site latitude, longitude and GMT offset, then this button will set those parameters on the telescope.

9.2.3 Telescope resources

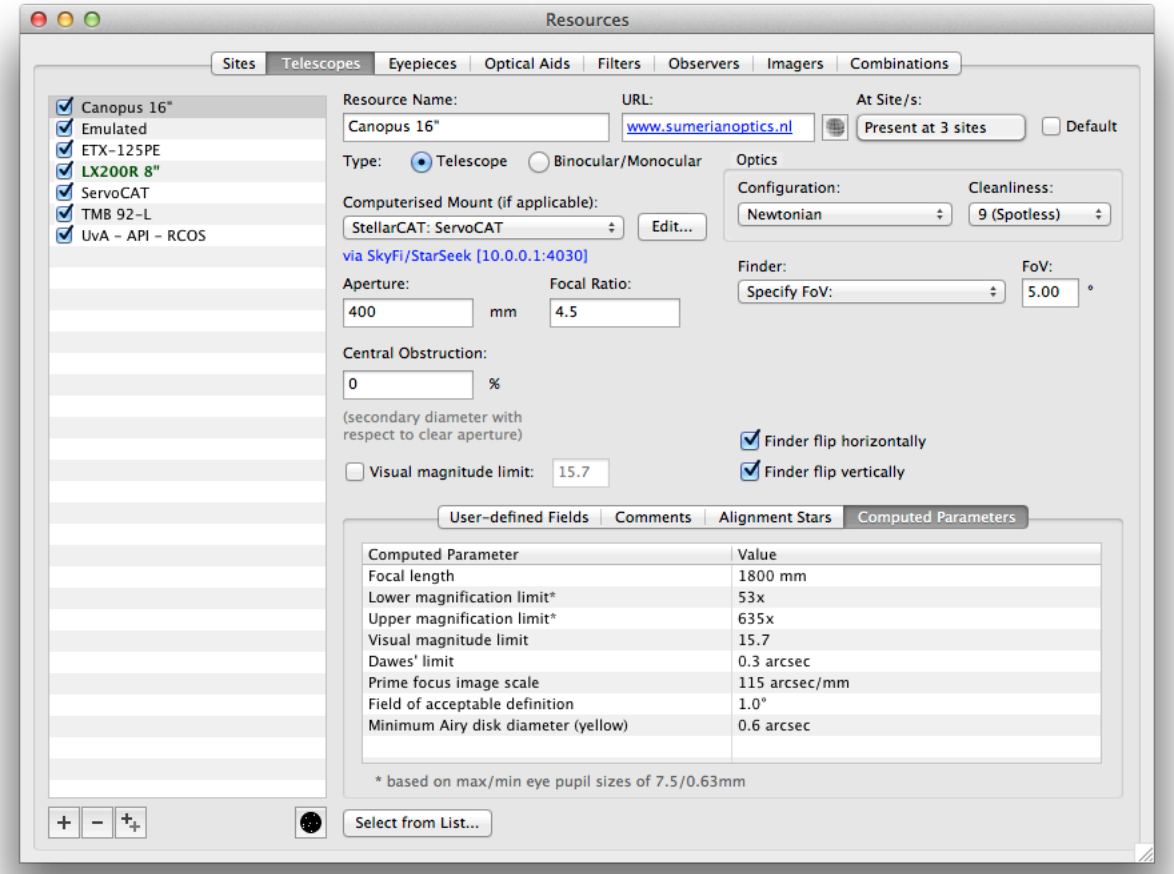


Figure 79: Telescope resources

Type

This is the type of instrument, and might be either a telescope or a binocular/monocular.

If the type is Telescope then the following fields are displayed:

- **Aperture**. The aperture (diameter of front opening) in mm. You can also enter the aperture in inches by adding " after the value (e.g. 4.5"), in which case the conversion to mm will be done for you.
- **Focal Ratio**. The f/Ratio of the telescope[1].
- **Central Obstruction**. If the telescope has a central obstruction (secondary mirror), then this is the percentage diameter of that obstruction (e.g. if a 250mm aperture telescope has a 50mm diameter secondary, then the obstruction value would be 20(%).

1. The equation for focal length is Focal Length = Aperture × Focal Ratio, so if you only know the Aperture and Focal Length of the telescope, then Focal Ratio = Focal Length ÷ Aperture

If the type is Binocular/Monocular then the following fields are displayed:

- **Magnification**. The magnification of the instrument (e.g. the magnification of a 8 × 50 binocular would be 8).
- **Aperture**. The aperture of the instrument in mm (e.g. the aperture of a 8 × 50 binocular would be 50mm). You can also enter the aperture in inches by adding " after the value (e.g. 2.5"), in which case the conversion to mm will be done for you.
- **Actual FoV**. The angular field of of view of the instrument in degrees (usually spelled out on the instrument's body).

Optics
Specifies the optical configuration (e.g. refractor, etc.), and how clean the optics are.

Computerised mount
If the telescope has a computerised mount (either Go-To or Digital Setting Circles), then you can select the mount type here (if supported). The ***Edit...*** button allows you to set up the mount parameters. This is covered in more detail in Section 13.2 on page 197.

Visual magnitude limit
The theoretical visual magnitude of the instrument is computed from the specified aperture. You can check the checkbox and change that value to something else if you feel that the theoretical value does not represent reality.

Finder
(*Telescopes only*) If the telescope has an attached finder scope, define it here. You can specify its field of view (FoV) in degrees if that is known. Otherwise, if you have a finder that's constructed from other resources (a monocular resource, or a telescope/eyepiece combination, you can specify them here and let the application figure out the FoV.

If the finder flips the sky view horizontally and/or vertically, use the checkboxes to specify that, so that the field of view chart can reflect this if the Finder option is used.

Custom Alignment Stars
This feature allows you to create your own set of alignment stars, independently of any alignment stars that might be defined by the telescope mount. Any such alignment stars will be used and appear as if they were defined for a mount, i.e. you can use the Best Pair mechanism, display them in the Sky chart, etc. Any star in the (Yale) Bright Star catalogue can be used.

This functionality is found in the **Alignment Stars** tab (Figure 80). When the **Use custom list** checkbox is checked, the defined alignment stars will be used when the currently-selected Telescope is selected in the plan document.

The stars are stored in "star sets". Use the "+" button to the right of the Star set popup to create a new star set. Once that has been done you can add stars to the set using the "+" button at the bottom left. The presented dialog (Figure 81) allows you to select one or more stars from the list and add them to the star set. You can limit the displayed stars by magnitude, constellation, or type in a search string.

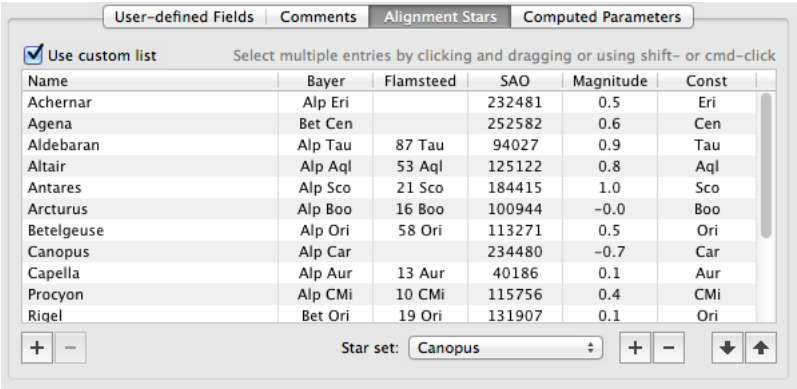


Figure 80: Custom alignment stars

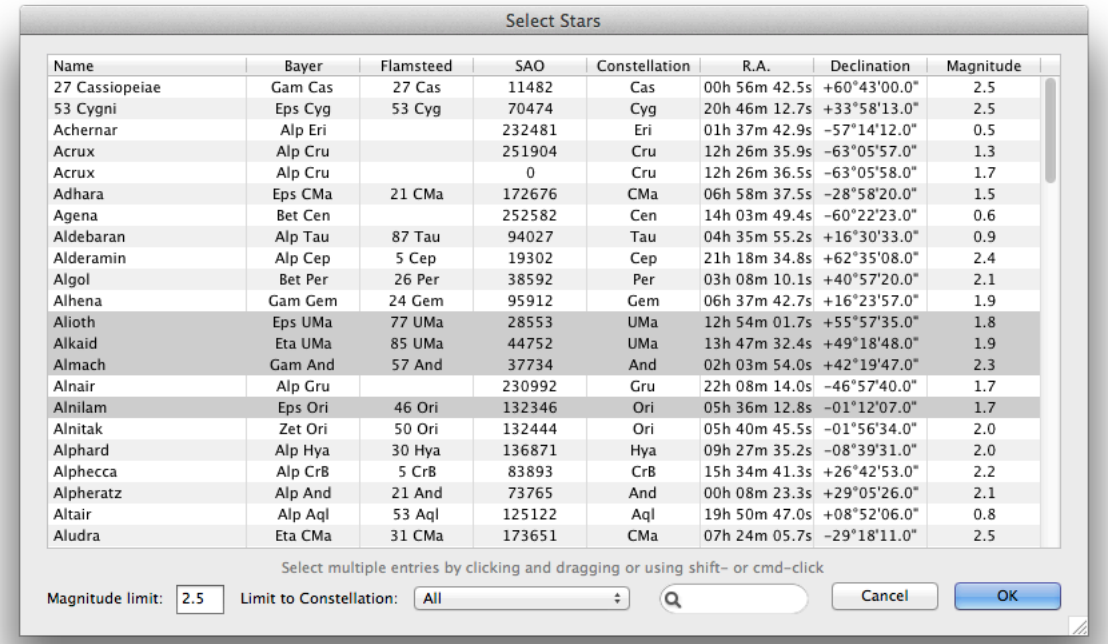


Figure 81: Adding custom alignment stars

You can also download star sets from a user-contributed repository by clicking the down-arrow button at the bottom right. Select one (or more) star sets from the repository and download them (Figure 82). You can also select your own contributions and delete them as necessary, using the **Delete...** button.

Conversely, if you wish to upload the currently-selected star set to the user-contributed repository, then use the up-arrow button and the bottom right of the Alignment Stars tab. This presents a dialog (Figure 83) that lets you enter a description and some keywords before uploading the star set.

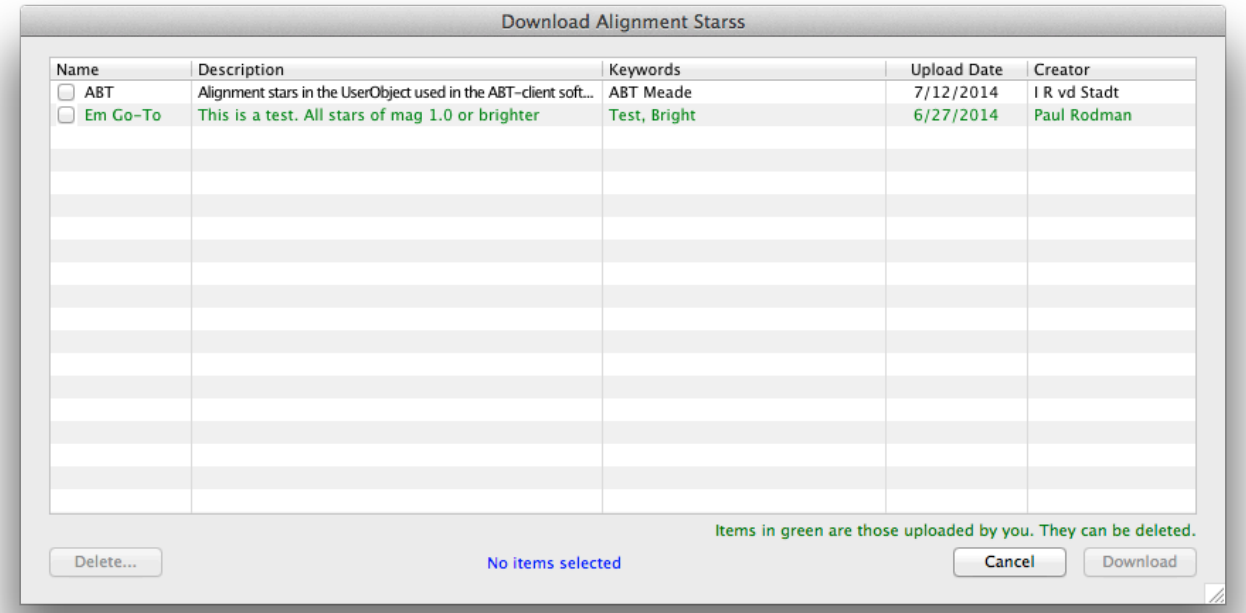


Figure 82: Download user-contributed alignment star sets

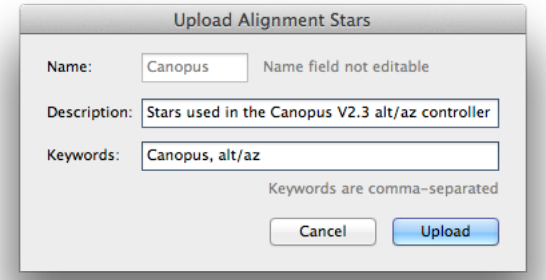


Figure 83: Upload user-contributed alignment star set

Computed Parameters

This is a list of computed values for the telescope, and reflects the settings for aperture, etc.

Select from List...

You can create a new Telescope resource by selecting from a list of common (and not-so-common) manufacturer's models using this button.

The listing dialog has three tabs, for Telescopes, Binoculars and Prime Camera Lenses (which are effectively telescopes). Each tab lists as many known telescope models as possible. Obviously keeping these lists up-to-date is time-consuming. Use the ***Update*** button to check on-line and see if there have been any updates to the lists. If you still don't see your commercial telescope on the list, feel

free to send an e-mail message to support@ilanga.com and complain. We'll try and get the list updated as quickly as possible.

You can select one or more entries manually, or use the **Find** field to specify a search term.

Once you have selected one or more entries, click the ***OK*** button to create a new resource for each of them.

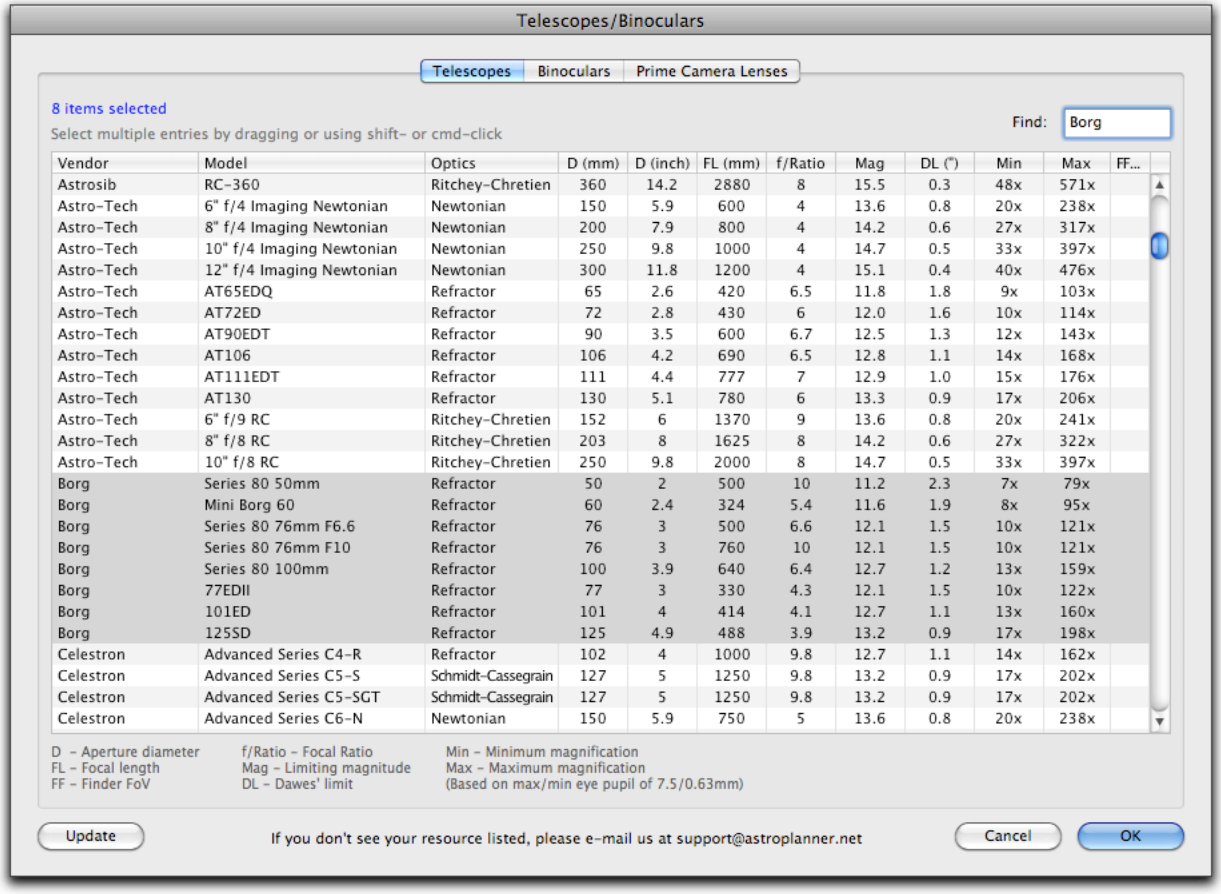


Figure 84: Telescope listing dialog

Get info from ASCOM

(*Windows only*) If your computerised mount is specified as an ASCOM mount, you can use this driver to attempt to retrieve some of the telescope parameters (e.g. aperture, focal ratio) from the ASCOM driver.

9.2.4 Eyepiece resources

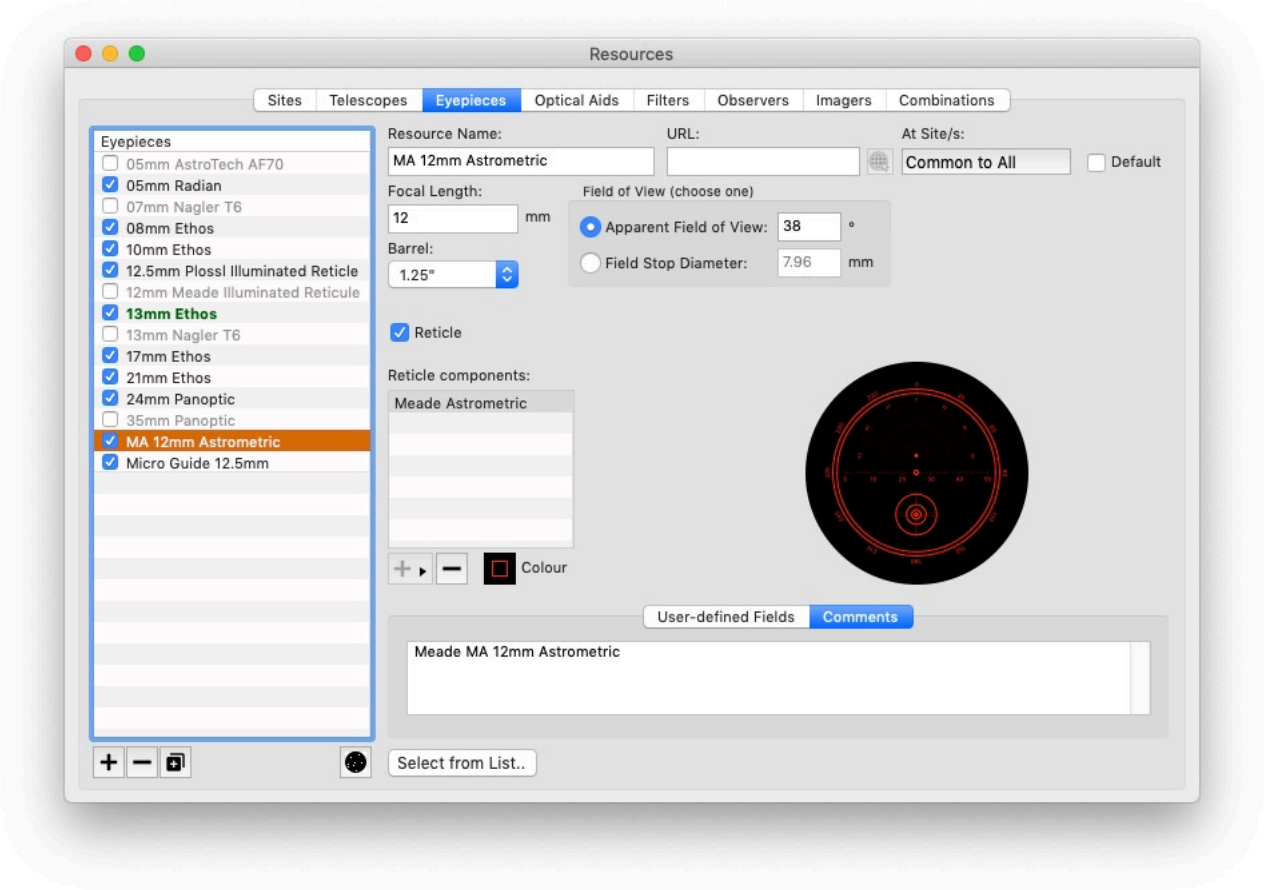


Figure 85: Eyepiece resources

Focal Length

The focal length of the eyepiece in mm. You can also enter the focal length in inches by adding " after the value (e.g. 4.5"), in which case the conversion to mm will be done for you.

Field of View

Choose the field of view of the eyepiece, either as the **Apparent Field of View** (AFoV) in degrees, or by the **Field Stop Diameter** in mm (e.g. Televue Nagler eyepieces all have an apparent FoV of 82°).

Barrel

The barrel size of the eyepiece.

Reticle

If the eyepiece has a built-in reticle, you can define it here. It will have one or more components. Select components using the **+** button.

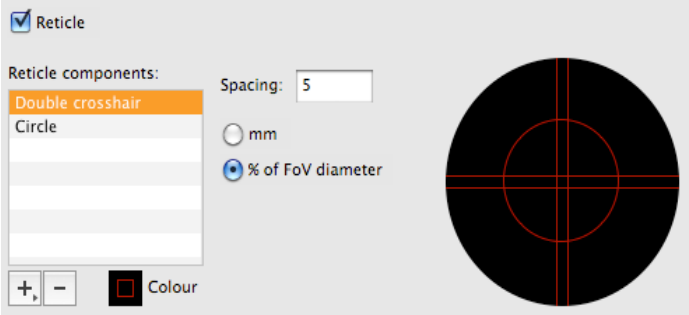


Figure 86: Sample eyepiece reticle

Select from List...

You can create a new Eyepiece resource by selecting from a list of common (and not-so-common) manufacturer's models using this button.

The dialog lists as many known eyepiece models as possible. Obviously keeping these lists up-to-date is time-consuming. Use the ***Update*** button to check on-line and see if there have been any updates to the lists. If you still don't see your commercial eyepiece on the list, feel free to send an e-mail message to support@ilanga.com and complain. We'll try and get the list updated as quickly as possible.

You can select one or more entries manually, or use the **Find** field to specify a search term.

Once you have selected one or more entries, click the ***OK*** button to create a new resource for each of them.

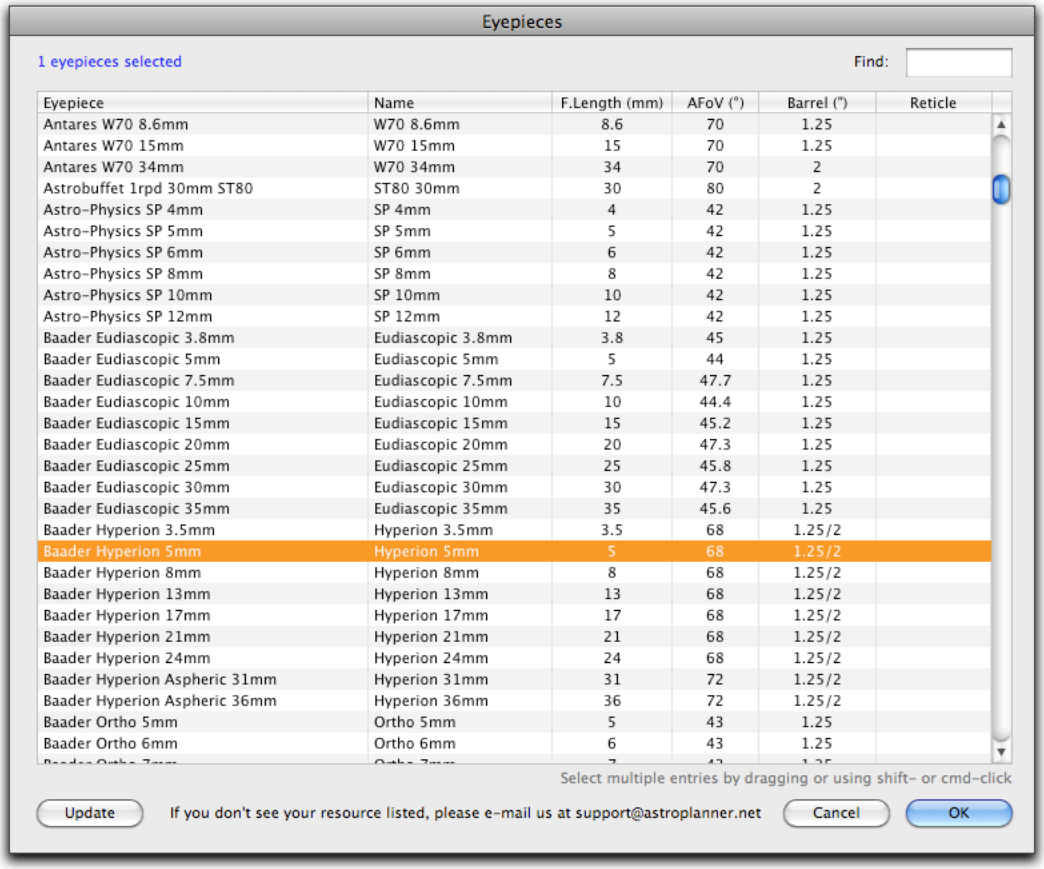


Figure 87: Eyepiece listing dialog

9.2.5 Optical Aid resources

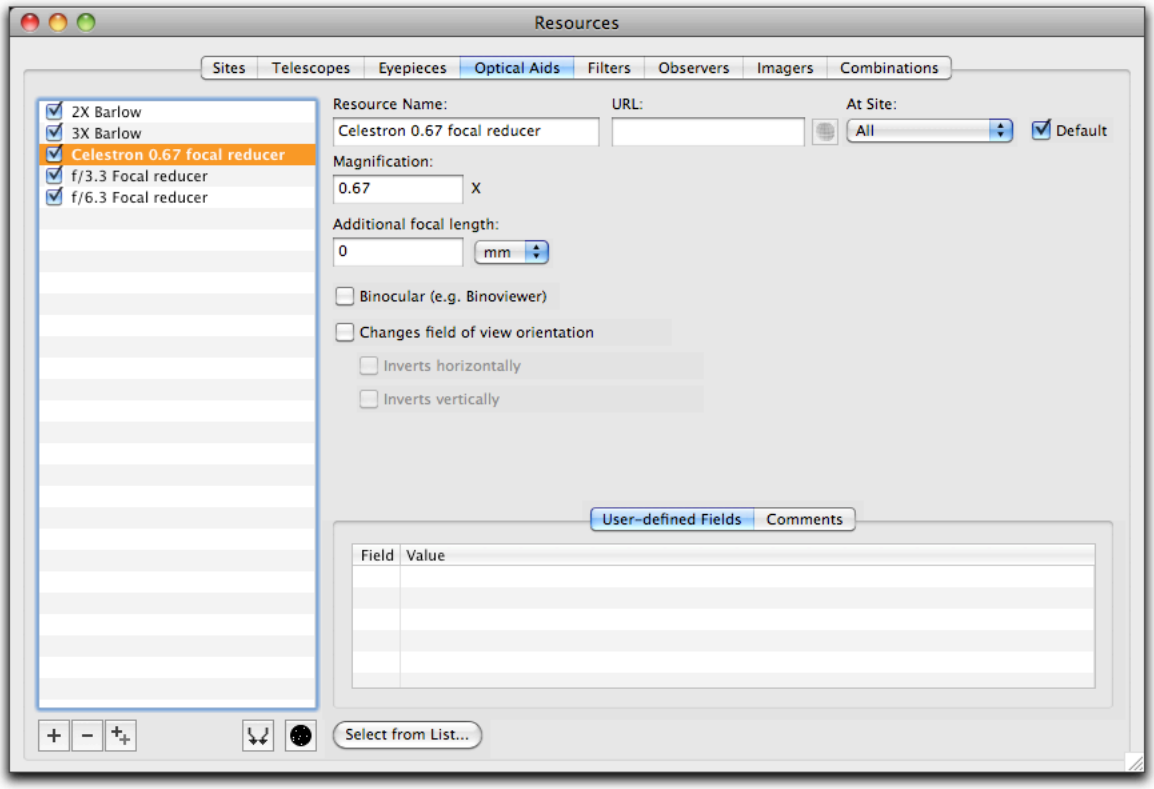


Figure 88: Optical Aid resources

Magnification
The amount of magnification added by using this optical aid.

Additional focal length
The addition focal length that the optical aid adds to the optical path, in mm. You can also enter the focal length in inches by adding " after the value (e.g. 4.5"), in which case the conversion to mm will be done for you.

Binocular
Check if this is a binoviewer.

Changes field of view orientation
The the optical aid changes the field of view orientation, specify how here.

Combine button
The combine button (under the list of resource names) lets you combine two or more optical aid resources into a new resource. The resulting resource will combine the magnifications, focal length extensions, etc. This is often useful since it is only possible to specify one optical aid resource at a time.

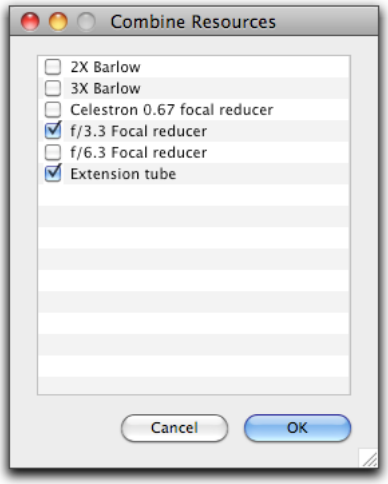


Figure 89: Combining optical aid resources

Select from List...

You can create a new Optical Aid resource by selecting from a list of common (and not-so-common) manufacturer's models using this button.

The dialog lists as many known optical aid models as possible. Obviously keeping these lists up-to-date is time-consuming. Use the ***Update*** button to check on-line and see if there have been any updates to the lists. If you still don't see your commercial eyepiece on the list, feel free to send an e-mail message to support@ilanga.com and complain. We'll try and get the list updated as quickly as possible.

You can select one or more entries manually, or use the **Find** field to specify a search term.

Once you have selected one or more entries, click the ***OK*** button to create a new resource for each of them.

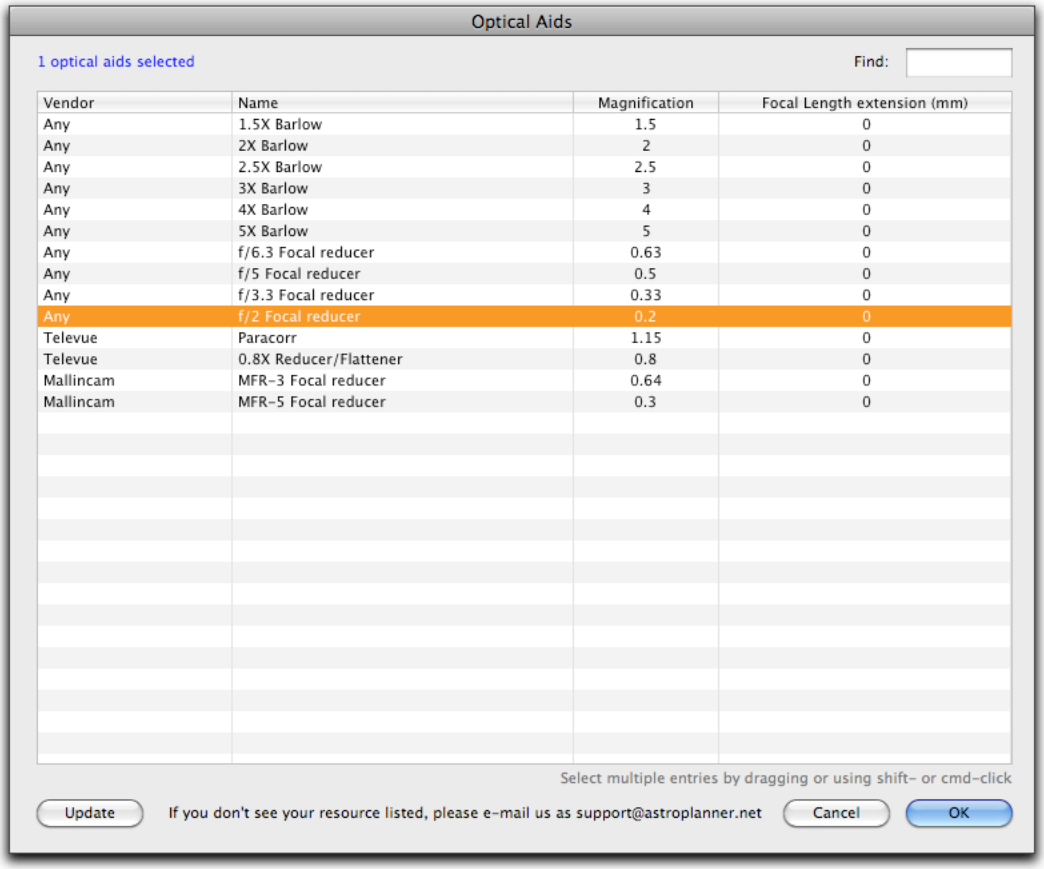


Figure 90: Optical Aid listing dialog

9.2.6 Filter resources

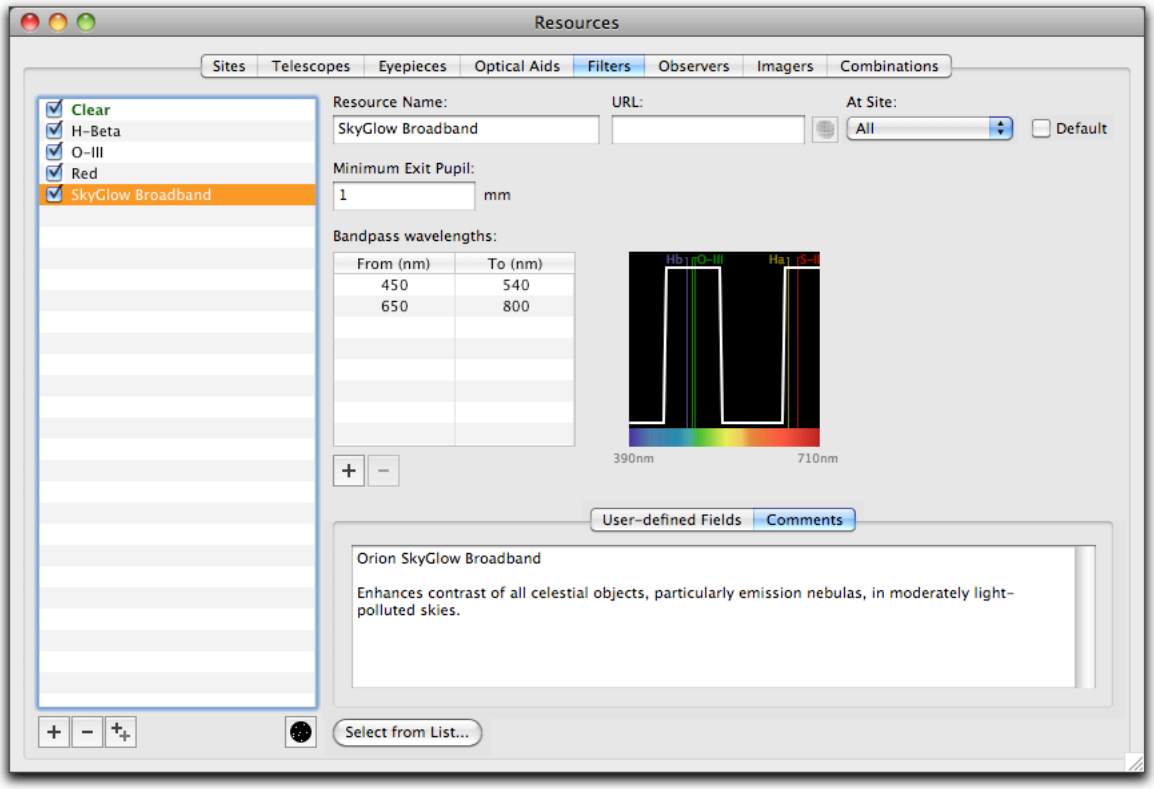


Figure 91: Filter resources

Minimum Exit Pupil

Minimum exit pupil size in mm.

Bandpass wavelengths

A list of filter bandpass wavelength ranges (in nanometers). Use the **+** and **-** buttons to add/delete entries. Click the values to edit them. Note that these values are not used in the application (but can be accessed from scripts if necessary). The graphic on the right of the list displays the bandpasses, as well as some common wavelengths (Hα, O-III, etc.).

Select from List...

You can create a new Filter resource by selecting from a list of common (and not-so-common) manufacturer's models using this button.

The dialog lists as many known filter models as possible. Obviously keeping these lists up-to-date is time-consuming. Use the ***Update*** button to check on-line and see if there have been any updates to the lists. If you still don't see your commercial eyepiece on the list, feel free to send an e-mail message to support@ilanga.com and complain. We'll try and get the list updated as quickly as possible.

You can select one or more entries manually, or use the **Find** field to specify a search term.

Once you have selected one or more entries, click the ***OK*** button to create a new resource for each of them.

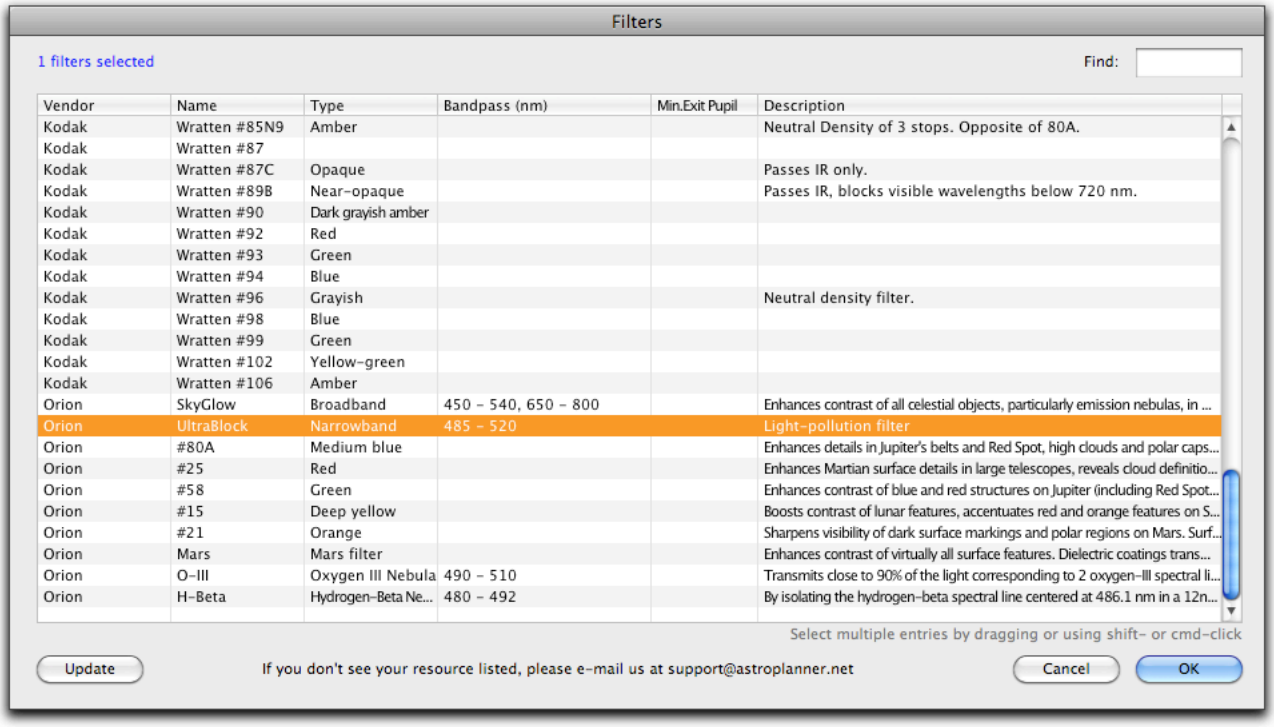


Figure 92: Filter listing dialog

9.2.7 Observer resources

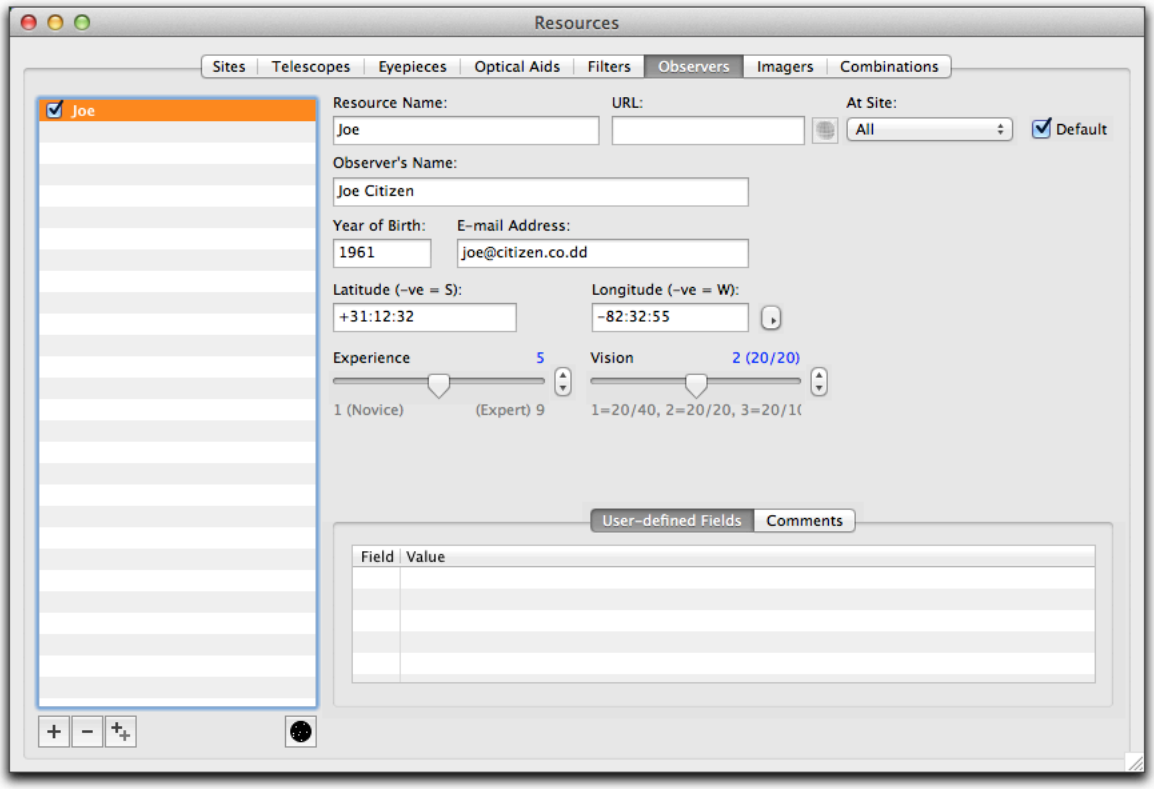


Figure 93: Observer resources

Observer's Name
Observer's full name. For informational purposes only.

Year of Birth
Observer's year of birth. Use for advanced visibility calculations.

E-Mail Address
Observer's e-mail address. Currently not used.

Latitude/Longitude
The latitude/longitude of the observer's home. Currently not used.

Experience
Observer's relative experience. Use for advanced visibility calculations.

Vision
Observer's vision acuity. Use for advanced visibility calculations.

9.2.8 Imager resources

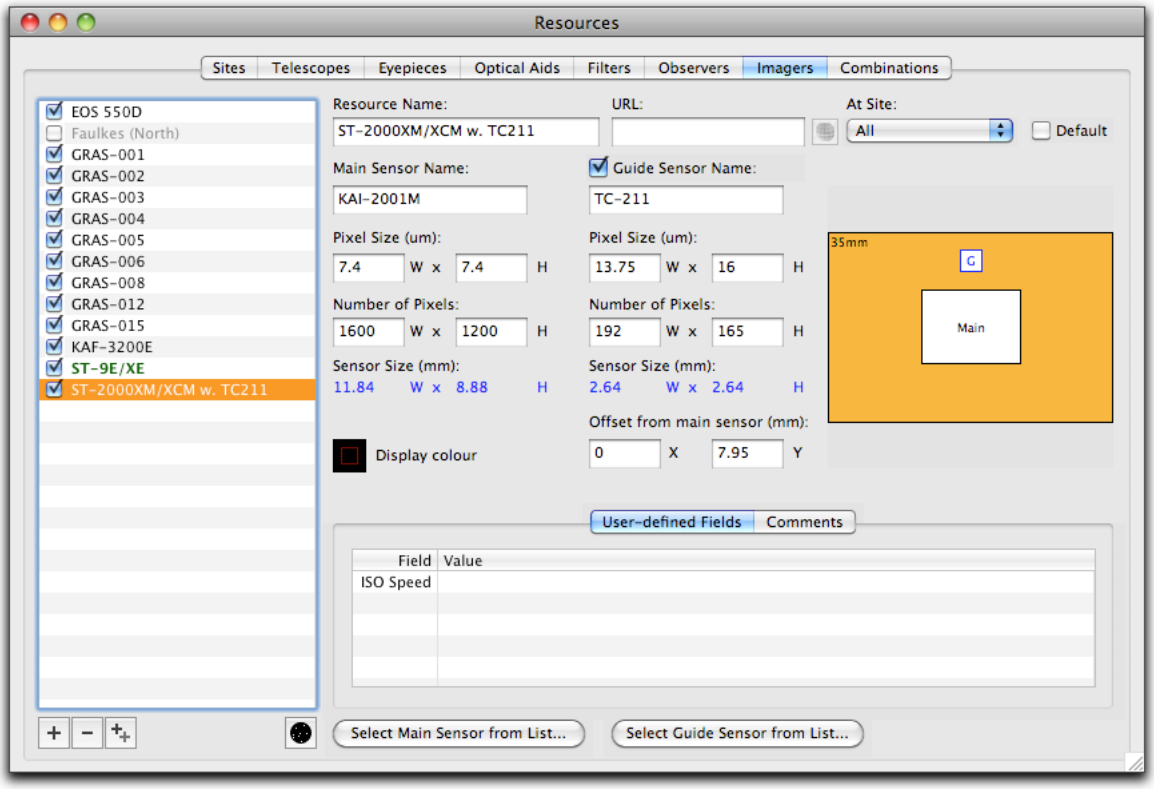


Figure 94: Imager resources

Main Sensor Name
The name of the imager's main sensor chip.

Main Sensor Pixel Size
The main sensor's pixel size (in µm).

Main Sensor Number of Pixels
The number of pixels in the X and Y directions of the main sensor.

Guide Sensor Name
The name of the imager's guide sensor chip. If the imager has a built-in guide sensor then check the checkbox next to this field.

Guide Sensor Pixel Size
The guide sensor's pixel size (in µm).

Guide Sensor Number of Pixels
The number of pixels in the X and Y directions of the guide sensor.

Guide Sensor Offset
The offset of the centre of the guide sensor from the centre of the main sensor (in mm)

35mm comparison
The diagram on the right shows the relative size of the main (and guide sensor if applicable) compared to a 35mm film frame.

Display Colour
Select the default colour used to display the imager outline in the field of view and other charts.

Select Main Sensor from List...
You can create a new Imager resource by selecting from a list of common (and not-so-common) manufacturer's models using this button. The list includes imagers first, followed by sensors used by those imagers at the end (in green). Imager models with separate built-in guide sensors are displayed in red.

The dialog lists as many known imager and sensor models as possible. Obviously keeping these lists up-to-date is time-consuming. Use the ***Update*** button to check on-line and see if there have been any updates to the lists. If you still don't see your commercial eyepiece on the list, feel free to send an e-mail message to support@ilanga.com and complain. We'll try and get the list updated as quickly as possible.

You can select one or more entries manually, or use the **Find** field to specify a search term.

Once you have selected one or more entries, click the ***OK*** button to create a new resource for each of them.

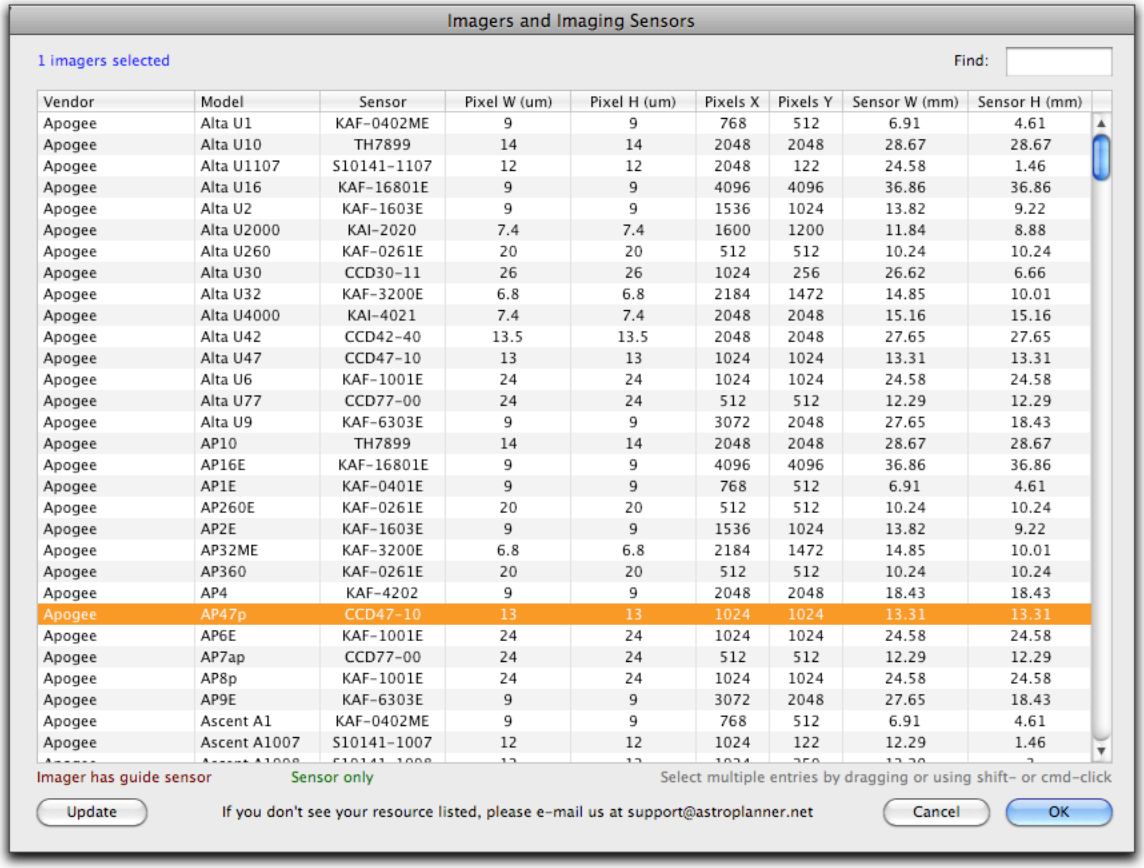
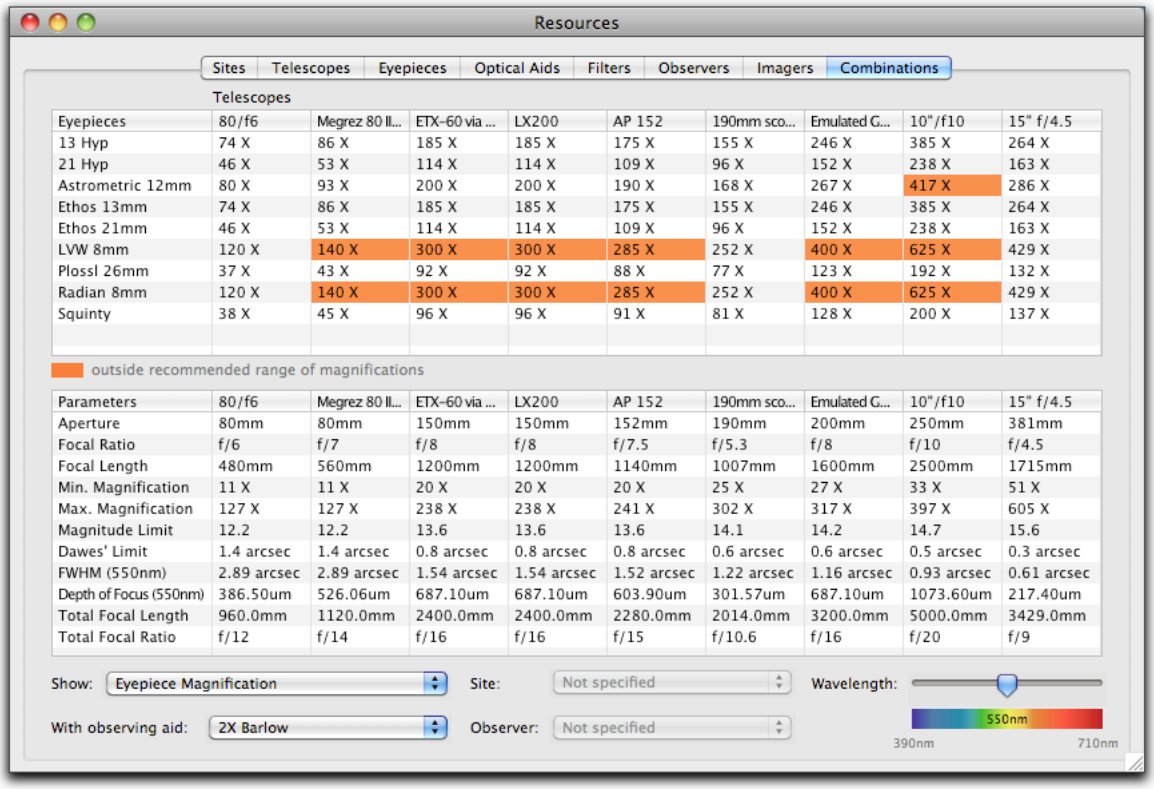


Figure 95: Imager listing dialog

Select Guide Sensor from List...
Does the same thing as the above, but only replaces the guide sensor data. The Guide Sensor checkbox need to be checked to enable this button.

9.2.9 Resource combinations

This tab allows you to show a tabular display showing combinations of telescopes with eyepieces, imagers and optical aids. In Figure 96 the top table shows all telescope resources paired with eyepieces and a 2X Barlow lens, showing the magnification achieved in each case. The lower table shows various computed parameters for each telescope



Eyepieces	80/f6	Megrez 80 II...	ETX-60 via ...	LX200	AP 152	190mm sco...	Emulated G...	10"/f10	15" f/4.5
13 Hyp	74 X	86 X	185 X	185 X	175 X	155 X	246 X	385 X	264 X
21 Hyp	46 X	53 X	114 X	114 X	109 X	96 X	152 X	238 X	163 X
Astrometric 12mm	80 X	93 X	200 X	200 X	190 X	168 X	267 X	417 X	286 X
Ethos 13mm	74 X	86 X	185 X	185 X	175 X	155 X	246 X	385 X	264 X
Ethos 21mm	46 X	53 X	114 X	114 X	109 X	96 X	152 X	238 X	163 X
LVW 8mm	120 X	140 X	300 X	300 X	285 X	252 X	400 X	625 X	429 X
Plossl 26mm	37 X	43 X	92 X	92 X	88 X	77 X	123 X	192 X	132 X
Radian 8mm	120 X	140 X	300 X	300 X	285 X	252 X	400 X	625 X	429 X
Squinty	38 X	45 X	96 X	96 X	91 X	81 X	128 X	200 X	137 X

Parameters	80/f6	Megrez 80 II...	ETX-60 via ...	LX200	AP 152	190mm sco...	Emulated G...	10"/f10	15" f/4.5
Aperture	80mm	80mm	150mm	150mm	152mm	190mm	200mm	250mm	381mm
Focal Ratio	f/6	f/7	f/8	f/8	f/7.5	f/5.3	f/8	f/10	f/4.5
Focal Length	480mm	560mm	1200mm	1200mm	1140mm	1007mm	1600mm	2500mm	1715mm
Min. Magnification	11 X	11 X	20 X	20 X	20 X	25 X	27 X	33 X	51 X
Max. Magnification	127 X	127 X	238 X	238 X	241 X	302 X	317 X	397 X	605 X
Magnitude Limit	12.2	12.2	13.6	13.6	13.6	14.1	14.2	14.7	15.6
Dawes' Limit	1.4 arcsec	1.4 arcsec	0.8 arcsec	0.8 arcsec	0.8 arcsec	0.6 arcsec	0.6 arcsec	0.5 arcsec	0.3 arcsec
FWHM (550nm)	2.89 arcsec	2.89 arcsec	1.54 arcsec	1.54 arcsec	1.52 arcsec	1.22 arcsec	1.16 arcsec	0.93 arcsec	0.61 arcsec
Depth of Focus (550nm)	386.50um	526.06um	687.10um	687.10um	603.90um	301.57um	687.10um	1073.60um	217.40um
Total Focal Length	960.0mm	1120.0mm	2400.0mm	2400.0mm	2280.0mm	2014.0mm	3200.0mm	5000.0mm	3429.0mm
Total Focal Ratio	f/12	f/14	f/16	f/16	f/15	f/10.6	f/16	f/20	f/9

Figure 96: Resource combinations

You can show:

- **Eyepiece magnification**.
- **Eyepiece Apparent FoV**.
- **Eyepiece Actual FoV**.
- **Eyepiece exit pupil**.
- **Telescope limiting magnitude**.
- **Advanced Limiting magnitude (zenith)**. In this case you specify a Site and an Observer.
- **Imager Actual FoV**.
- **Imager pixel scale**.

Wavelength

This is used in the computation of some of the computed parameters (e.g. depth of focus).

10 Constructing an observing plan

This chapter discusses how to go about constructing an observing plan (i.e. choosing a selection of objects to observe). There are various ways to do this, covered below.

10.1 Manual construction

The simplest way to construct a plan, while not necessarily being the fastest, is to do so manually. If you have a list of objects you wish to observe, possibly from a book or magazine, then this is the way to go (unless someone else has already done the work - in which case, see Section 10.2 on page 84).

Create a new plan by using ***File > New***.

10.1.1 Adding a new object

For each object on your list, click the **+** button under the object list, or use ***Object > New Object...***. This will invoke the new object dialog.

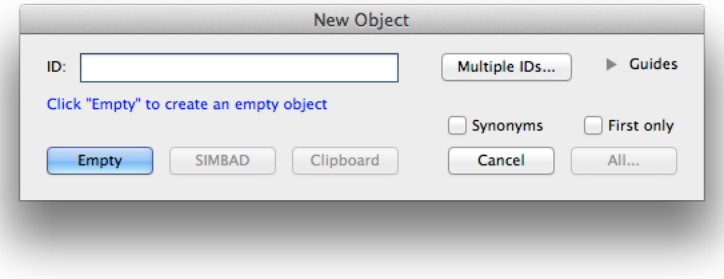


Figure 97: New Object dialog

You then have various options to create objects in your plan:

***Empty* button**. Clicking this will create an "empty" object in the plan, with no ID or coordinates. You can edit that object later (see Section 10.4 on page 88).

Type in a known ID. Type an ID into the **ID** field (or click the ***Clipboard*** button if the ID was previously copied there). If the ID prefix (e.g. "NGC") is found in one or more of your installed catalogues, then the dialog announces how many catalogues it appears in and enables a ***Best*** button. Clicking the ***Best*** button will search the catalogue most likely to contain the object and if found, the object will be inserted into your plan. If not found, you'll be informed.

Type the abbreviation or name of a constellation in order to add a constellation object. The constellation object is created with the ID equal to the abbreviation, the Name equal to the full constellation name, the RA/Dec coordinates of the centre of the constellation, and the Size equal to the largest dimension of the constellation.

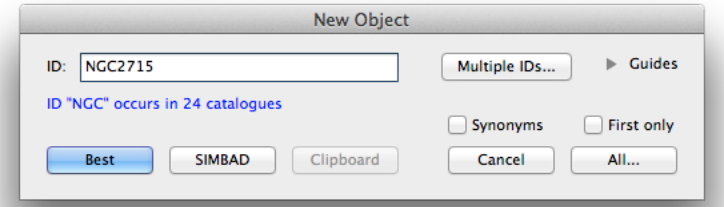


Figure 98: New object based on known ID

SIMBAD search. If you type in an ID, and it doesn't appear in any of your installed catalogues, and you have Internet access, you can request a search of the on-line professional SIMBAD database by using the ***SIMBAD*** button. This creates an object with a lot of information. You can always edit out what you don't need afterwards.

Search all catalogues. If you want to find all entries in your catalogue collection that match the ID, use the **All...** button. This will search all installed catalogues and create a list of all objects that match the ID. If none is found, you'll be given the chance to repeat the search looking in the catalogue object notes fields for occurrences of the ID (**Warning**: this can take a while). The search results are presented in a window. You can select one or more objects and click the ***Add Selected*** (or ***Add All***) button to add the object/s to your plan. If you are feeling lucky, you can check the **First only** checkbox, in which case the search will stop after finding the first match.

You can also set the **Synonyms** checkbox, in which case the search will also find any synonym objects with the same coordinates.

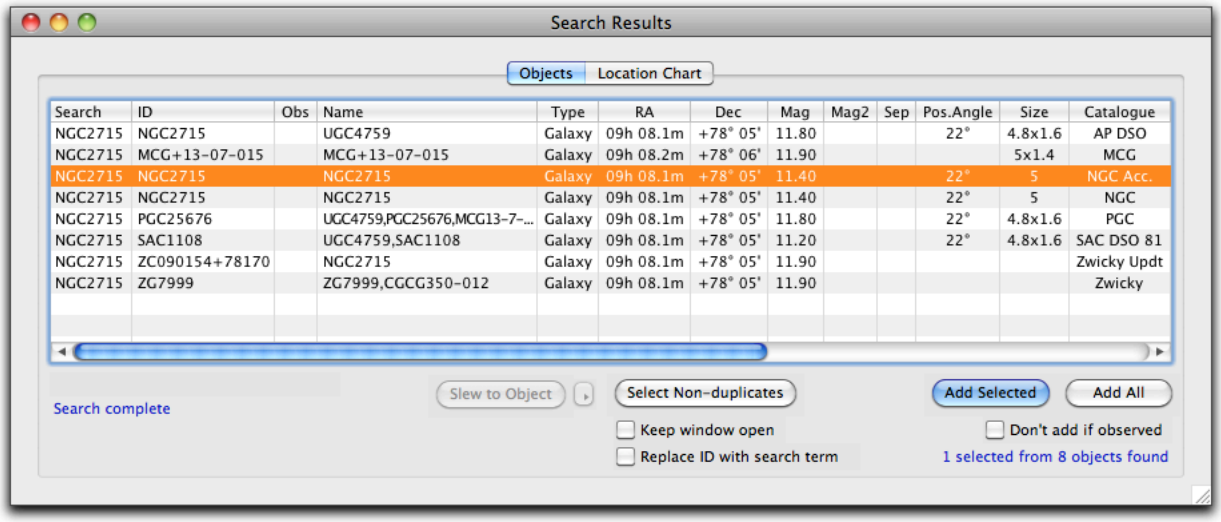


Figure 99: Search results window

If you want to add several objects at once, you can use the **Multiple IDs...** button. This will allow you to enter several IDs, in various forms, and search for all of them at once. The results are presented in the Search Results window as shown above.

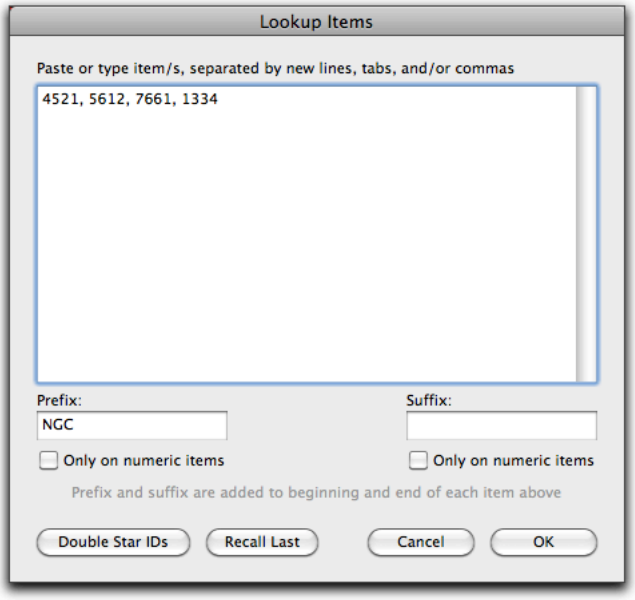


Figure 100: Lookup multiple IDs

The Multiple ID lookup also lets you select the catalogues to search. You can choose to search all the catalogues (the default), manually selected catalogues, only catalogues containing certain types of objects, only catalogues containing the ID/s you are searching for, or only catalogues where the ID you are searching for is the primary ID.

You can also lookup the IDs using the on-line SIMBAD catalogue if you wish (***SIMBAD*** button). You can also use the **Cross-index ID fields** checkbox to do an exhaustive search (which will pretty much find every ID and its synonyms in the catalogues, but might also find some false positives too).

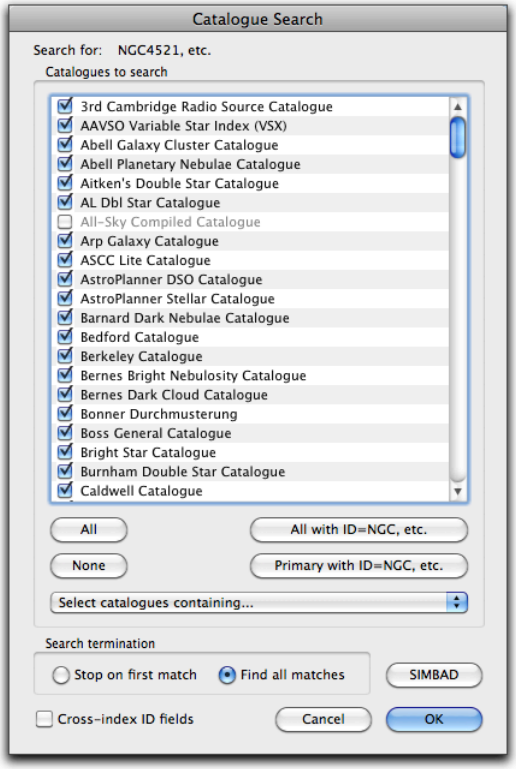


Figure 101: Catalogue select dialog

Finally, when you are entering the ID of your object, the dialog can be expanded (using the **Guides** widget at the top right) to display some useful aids to entering ID data. The left hand table contains the symbols of the Greek alphabet. Clicking on a symbol enters the 2- or 3-character abbreviation for that symbol. The centre table lists some common double-star discoverer IDs. Clicking an ID will enter the correct alphabetic prefix as used in the WDS catalogue name field.

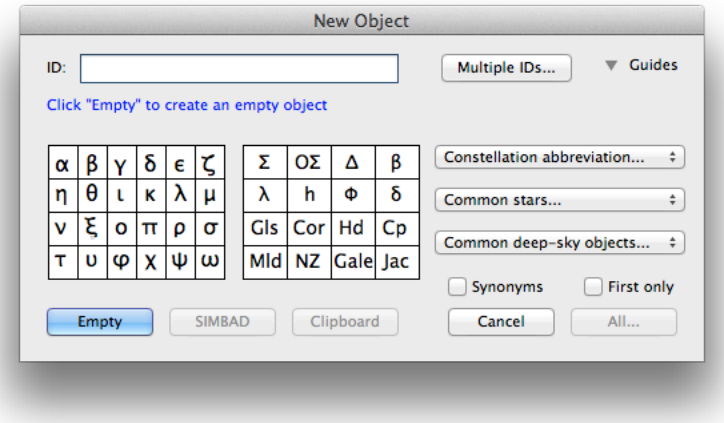


Figure 102: New object dialog showing guides

The **Constellation abbreviation** popup inserts the three-character abbreviation for the selected constellation. **Common stars** lists common names of stars, and when selected will insert the Bayer

ID or SAO ID into the ID field. **Common deep-sky objects** lists common names of deep-sky objects and asterisms, and when selected will insert a suitable ID for searching into the ID field.

10.1.2 Adding from a catalogue

You can add objects to your plan directly from an installed catalogue. Open the catalogue display window (usually via the ***Show Catalogue*** popup under the object list in the plan document window, or via ***Object > Open catalogue/s***).

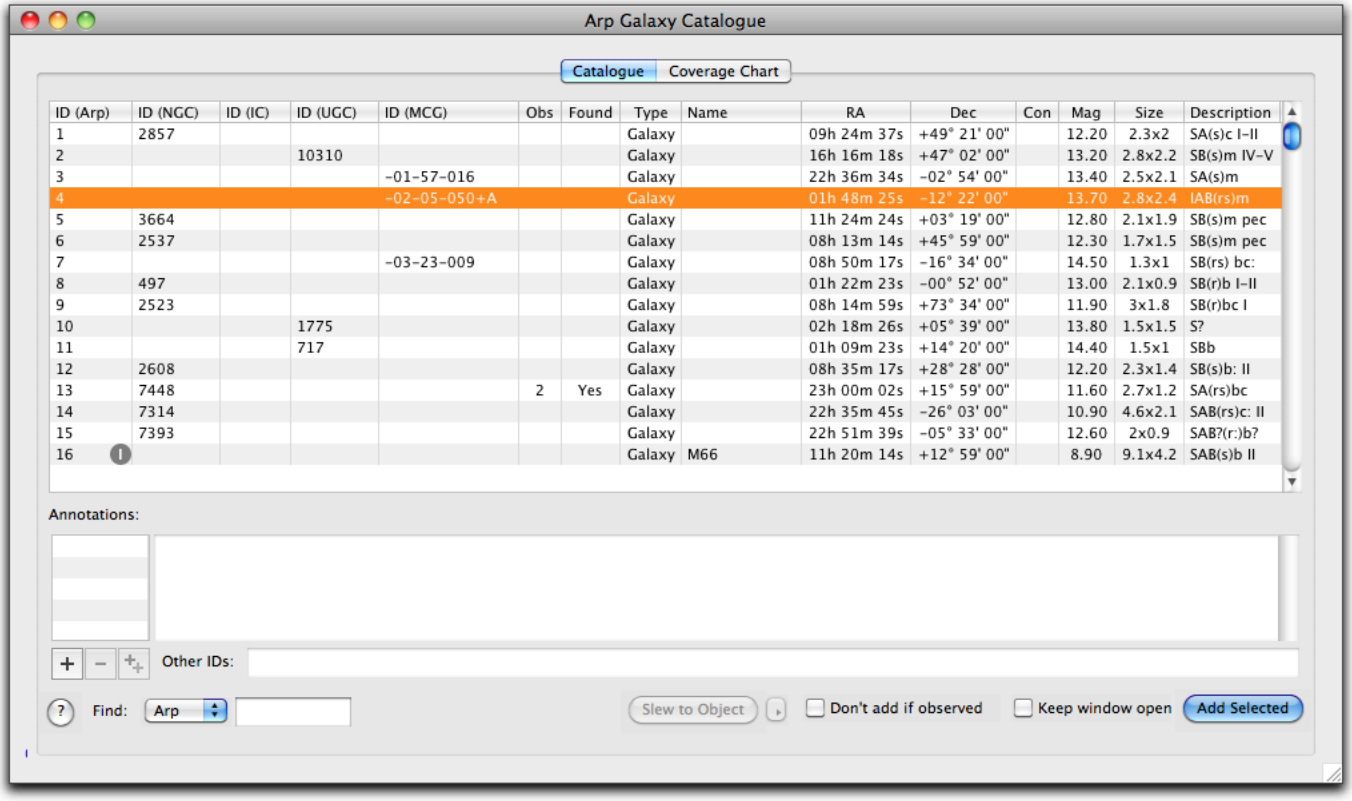


Figure 103: Catalogue display window

Select one or more objects and either drag the rows across to the plan window's object list, or click the ***Add Selected*** button.

10.1.3 Searching the catalogues

You can also perform a targeted search of one or all catalogues, based on criteria you define. This is done via the **Search Catalogue/s** popup under the object list in the plan document window, or via ***Object > Search > Search Catalogue/s***).

If you use the menu command, or if you select the **Choose catalogue/s from list...** entry from the popup, then you will be presented with a dialog that lets you choose one or more catalogues to be searched. The radio buttons at the top of the dialog window display your installed catalogues in various ways (as a single alphabetised list by **catalogue name**, as a hierarchical list by **object types** contained within the catalogues (e.g. nebulae, double stars, etc.), or as a hierarchical list by the **object IDs** supported by the catalogues (e.g. M, NGC, IC, etc.)).

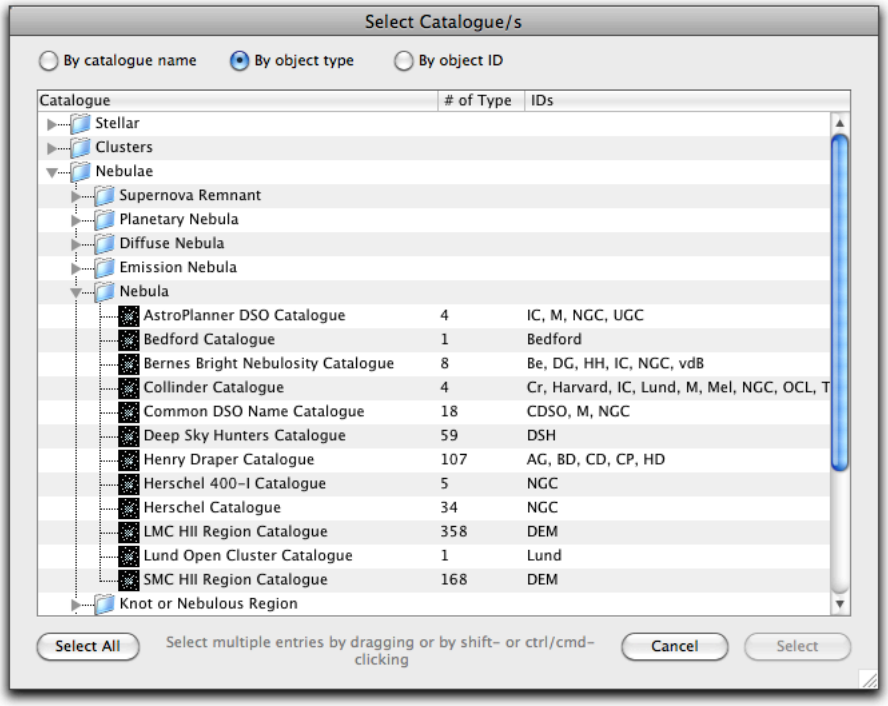


Figure 104: Select catalogue dialog

Once you have identified the catalogue/s to search, the Search dialog is presented. This dialog allows you to specify various search parameters to use to determine which objects are selected from the catalogue/s.

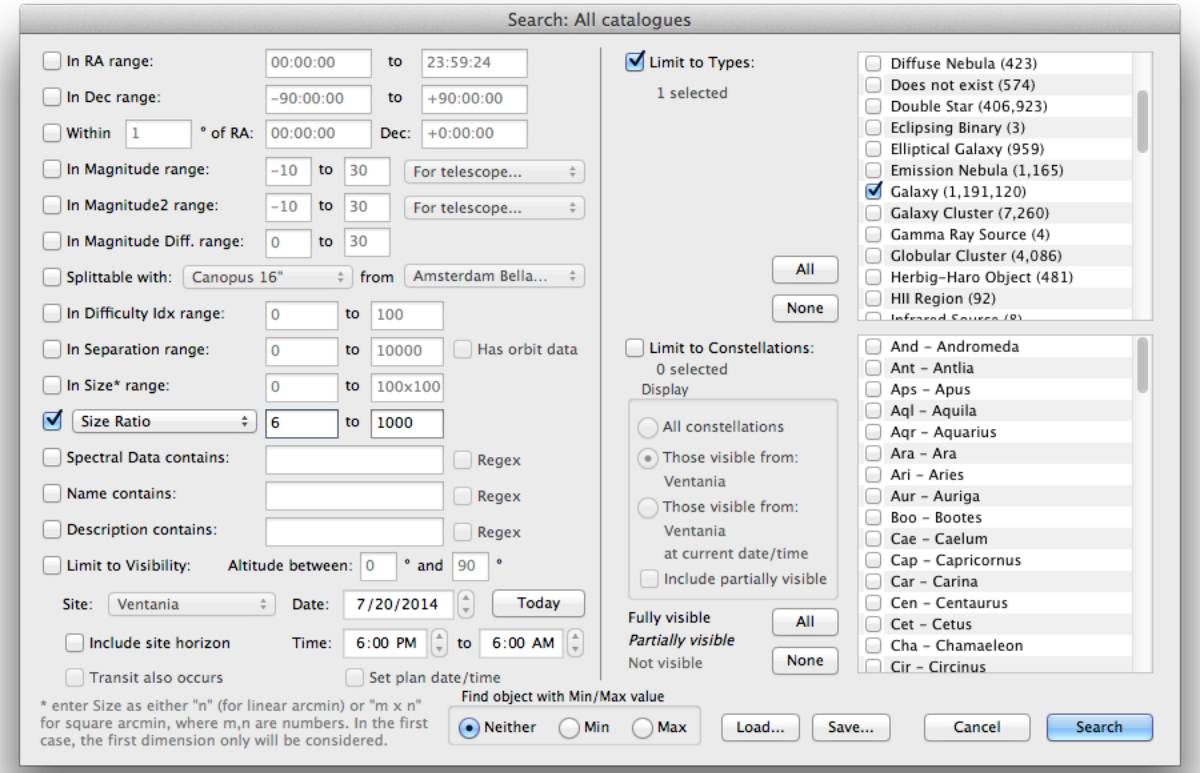


Figure 105: Catalogue search dialog

The general approach is to check the checkbox for the catalogue object parameter you wish to search on. If you choose more than one, then *all* the checked restrictions must be true for a catalogue object to be considered. Most of the parameters specified either define a range of values, or a character string to look for. The notes below describe those that don't follow this pattern, or have additional features.

Searches will typically find *all* matching objects in the catalogue/s. However, if your selected parameters include a single *numeric* parameter, then the **Find object with Minimum/Maximum value** item appears at the bottom of the dialog. If you select Minimum or Maximum then (for each processed catalogue) only a single object will be returned having the minimum or maximum value of the selected numeric parameter.

Notes

- **Within x° of RA/Dec**. This option only returns objects that are closer than x° from the specified RA/Dec coordinates.
- **In Magnitude/2 range**. You can use the **For telescope...** popup to select the visual magnitude limit for that telescope resource.
- **In Magnitude Diff. range**. Specifies a magnitude difference between Magnitude and Magnitude2 for an object. This can be used for double or variable stars only, where the Magnitude2 value is available.

- **In Size range**. As the footnote specifies, you can either specify ***m*** or a string of the form ***m x n***, where ***m*** and ***n*** are numbers. In the former case, only the longest (first) size linear dimension in arc minutes will be compared. In the second case the angular area in square arc minutes will be compared.
- **Size ratio**. This is one of the options in the parameter with the popup menu. The size ratio is valid for any object that has a specified size. If that size is a single number, then the size ratio is 1.0. The size is ***m x n***, where ***m ≥ n***, then the size ratio is ***m ÷ n***. In the example shown in Figure 105, the search is for galaxies with a size ratio ≥ 10, i.e. "flat" galaxies.
- **Spectral Data/Name/Description contains**. Returns any object that has the specified parameter containing the character string. However, if you use the **Regex** checkbox, then the field is considered to contain a regular expression, and the object will be returned if the regular expression is true for the specified object parameter.
- **Limit to Visibility**. An object is returned only if it falls between the given altitude values at the specified site, on the specified date, somewhere between the specified times. If the **Include site horizon** option is checked, then an object will not be returned if it is behind the user-specified horizon for the specified site. If the **Transit also occurs** option is checked, then an object is returned only if it transits (reaches its highest altitude in the sky) during the specified time period. Use the **Set plan date/time** option if you want to set the current plan's date and time to the beginning of the specified period when the search is done (regardless of the search results). **WARNING:** *This search option is very compute intensive, and should probably only be used on smaller catalogues.*
- **Limit to Types**. The list contains only those object types available in the search catalogue/s, together with the total number of such objects available.
- **Limit to Constellations**. The constellations displayed in the list can be limited to: All (88) constellations, only those constellations visible from the site, or only those constellations visible from the site at the current date/time. You can also elect to show partially visible constellations.
- **Save...** and **Load...** buttons allow you to save the contents of the search and reload it at a later stage. This is convenient if you have several complex search strategies you'd like to use more than once.

10.1.4 Adding "special" objects

Underneath the object list there is an ***Add Special*** popup menu. This is a convenient way of adding common objects to your plan. The planets, the moon, the Messier objects, comets, and minor planets can be inserted from here.

Figure 106: Add Special popup menu

If you choose **Comet...** or **Minor Planet...** then you get the choice to choose from any cached data that was previously downloaded (see Chapter 24 on page 338). Alternatively, you can create a default comet/minor planet and edit the elements manually.

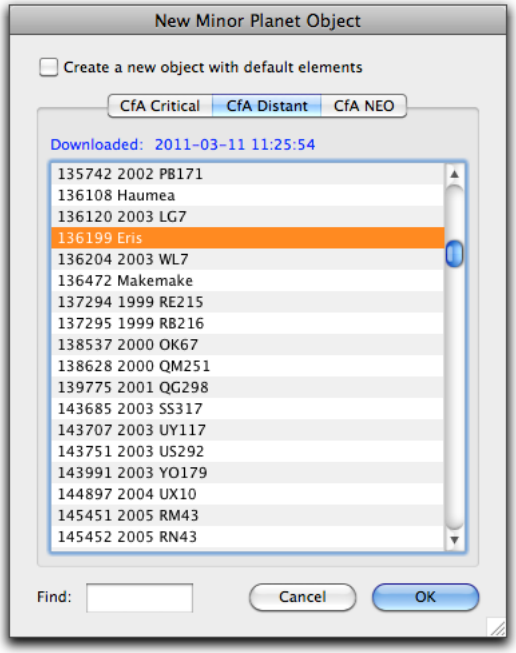


Figure 107: Add minor planet dialog

The **Constellation/s...** entry lets you add one or more constellation objects to the object list.

Figure 108: Adding constellation/s

10.2 User-contributed plans

A more convenient way to create a plan is to use one that another user has created and uploaded to the user-contributed plan repository. This is described in more detail in Section 22.1 on page 322.

10.3 Plan Creation Wizard

Another convenient way of creating an observing plan is to use the Plan Creation Wizard (PCW). The PCW maintains a database of observable objects that it collects from whatever catalogues you have installed[1]. Using rules (that you can change if you wish), the PCW rates the objects into five levels, from easy to hard. You can then get the PCW to create a plan for you, based on your desired level of difficulty, the telescope you plan to use, the place and time you will be observing, etc.

Objects are selected at random from the database, and wherever possible do not include any objects you've already selected in any previous use of the PCW feature.

To invoke the PCW, use ***File > Plan Creation Wizard...***. The PCW dialog is presented.

1. Whenever you add, delete or update a catalogue, the PCW database is updated accordingly in the background. You might see the occasional message about this, especially the first time you use AstroPlanner, or if you install a number of new catalogues.

Figure 109: Plan Creation Wizard dialog - page 1

You then navigate through several "pages" using the ***Next*** (and ***Previous***) buttons, and finishing with the ***Finish*** button.

On the second page you specify who you are and what level of difficulty you need. The plan will contain only objects considered to be of the difficulty rating you specify. You can use the **Include lower levels** checkbox to include objects from *all* levels up to and including the one you specify.

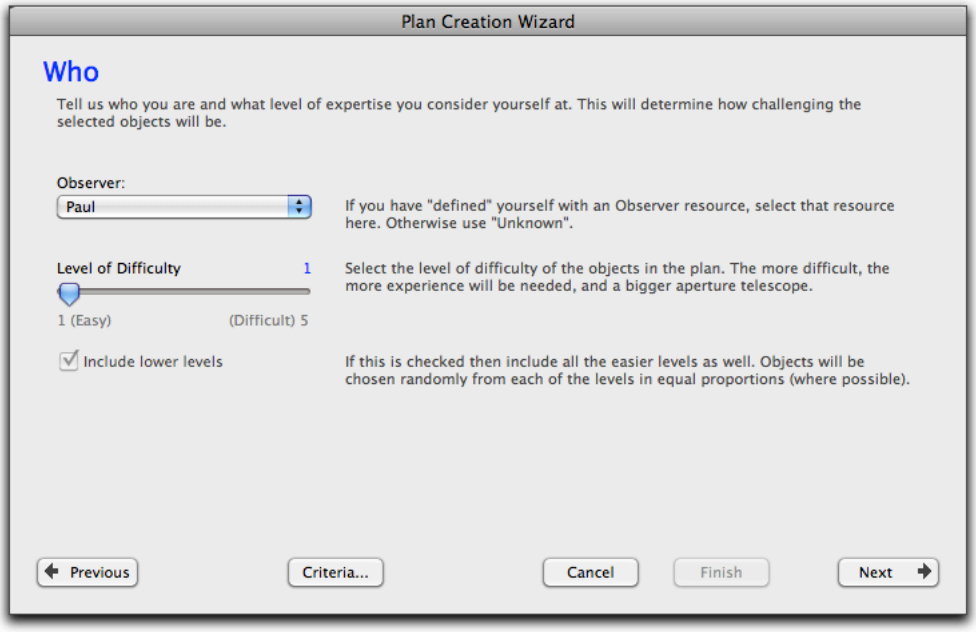


Figure 110: Plan Creation Wizard dialog - page 2

The third "page" specifies where (your site) and when (date, time, season, etc.) you will be observing. You can specify a specific date, a specific month, or the season (summer, etc.). Alternatively you can select constellations that you are interested in observing.

Figure 111: Plan Creation Wizard dialog - page 3 (select by date/time)

Figure 112: Plan Creation Wizard dialog - page 3 (select by constellation/s)

The fourth page lets you select what telescopes or binoculars you will be using to do your observing (you don't want to select objects that are outside the limits of your equipment).

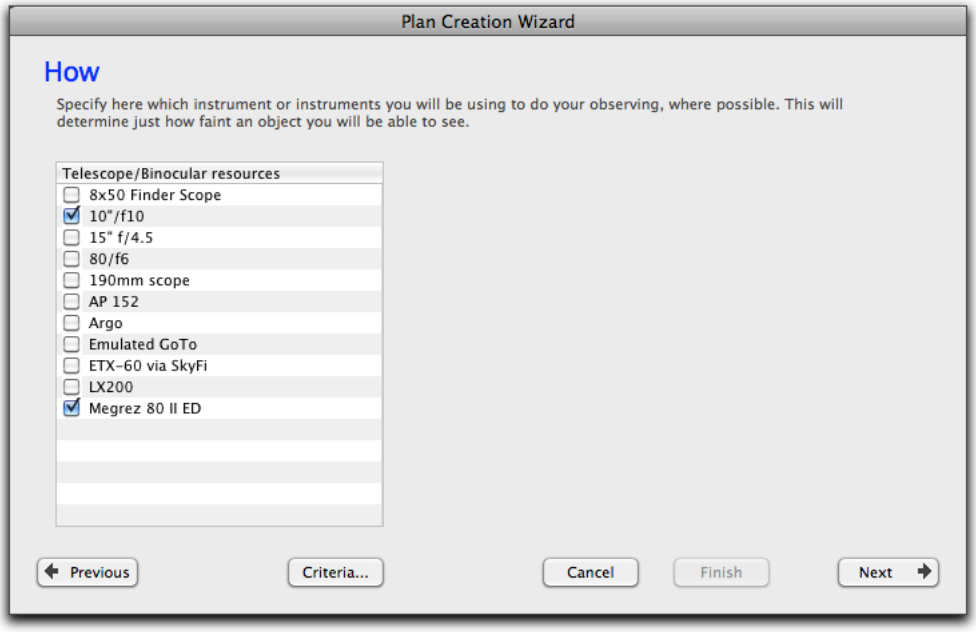


Figure 113: Plan Creation Wizard dialog - page 4

The fifth page is where you specify what kinds of objects you want to observe, how many objects to generate, and which catalogues to use (or not to use). The PCW will attempt to generate as many objects as you specify in the **Maximum objects in plan** field. You can uncheck any catalogues you don't want to consider. There's also a **Reject objects** option that will ignore any catalogue objects if they were previously observed (have at least one observation in the observation database).

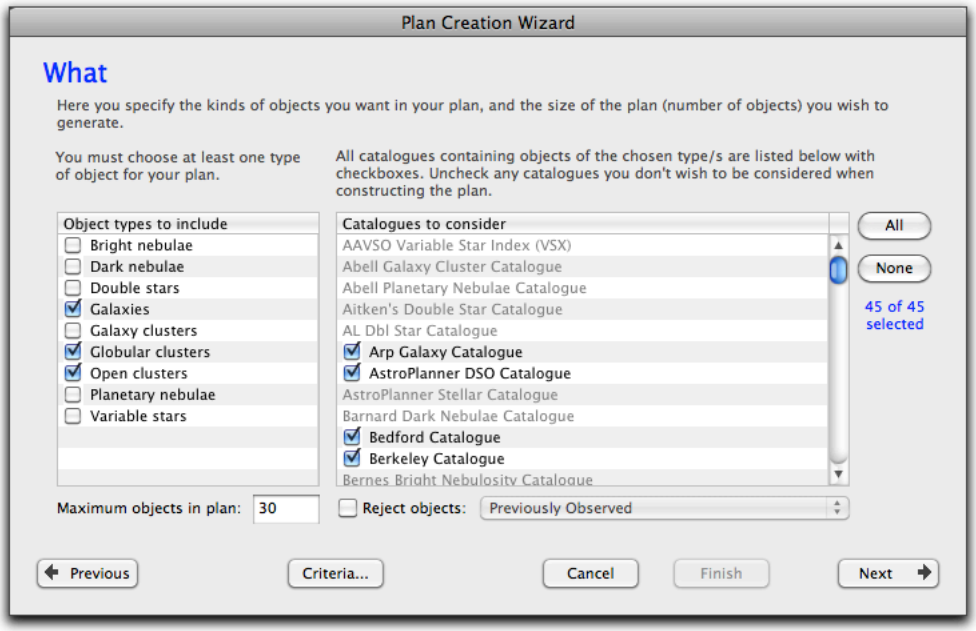


Figure 114: Plan Creation Wizard dialog - page 5

The final page lets you choose whether the new objects will be placed in a new plan, or placed in the open plan document. Clicking the ***Finish*** button will create the new plan objects.

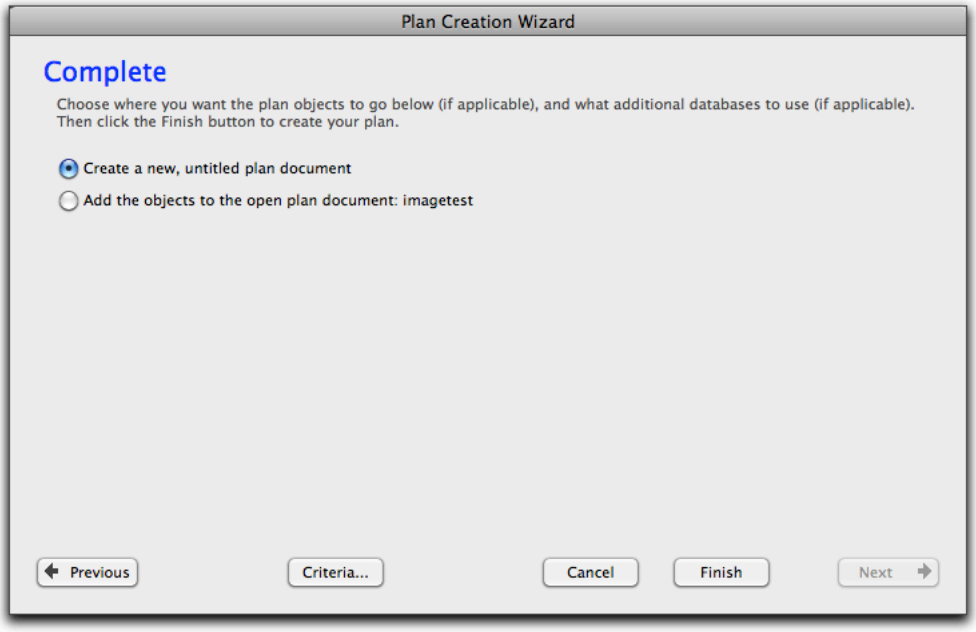


Figure 115: Plan Creation Wizard dialog - final page

10.4 Editing objects

Once you have added objects to your plan document, you might want to edit them. There are two ways to do this.

10.4.1 Editing fields

If the edit fields are not being displayed underneath the object list, you need to toggle the display button (circled in Figure 116).

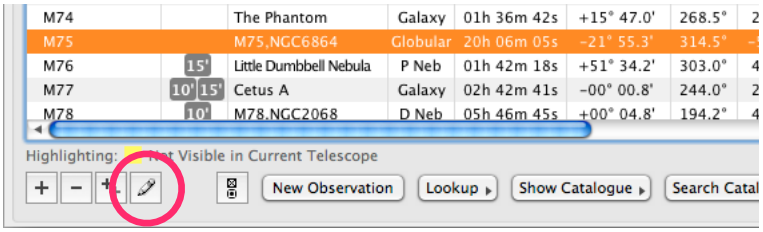


Figure 116: Object editing button

The editing fields are populated and enabled when a single object is selected in the object list. Any changes you make in these fields will be accepted and displayed immediately.

The search buttons to the right of the ID and Name fields will search the catalogues for the entries in those fields. If the ID or Name field is empty, then you'll be asked to enter one or more IDs to search for.

The annotations widget (select the Annotations tab in Notes/Annotations) displays any catalogue annotations for the selected object. See Section 23.7 on page 334 for details.

The ODM/Eyepiece tab displays the ODM information and the best eyepiece and/or eyepiece/visual aid combination to use with the current telescope in order to detect the object (where applicable). See Figure 118.

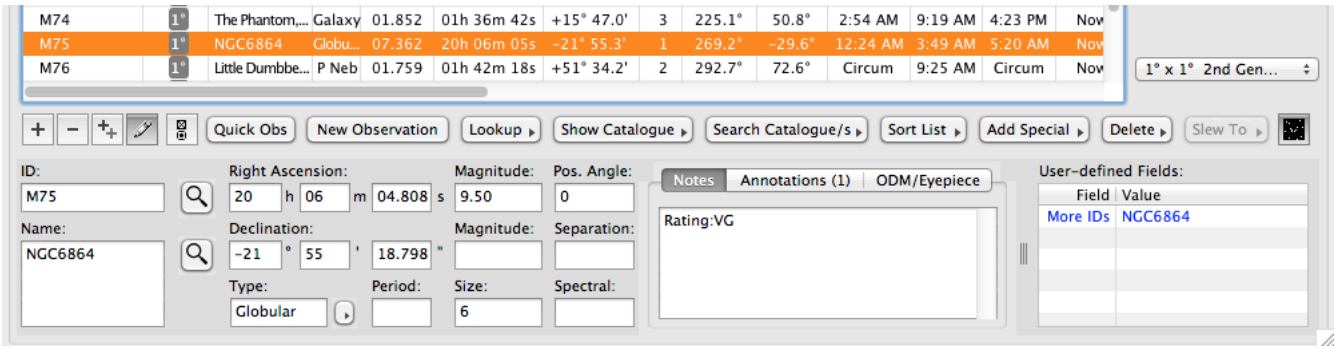


Figure 117: Object editing fields

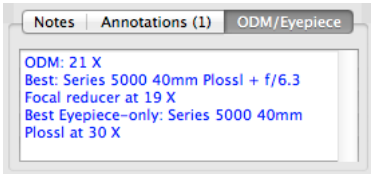


Figure 118: ODM/Eyepiece information

10.4.2 In-line editing

If you have in-line editing switched on (***Object > Object List Preferences > Navigation and editing > In-line editing of object fields***) then you also have the option of editing object data directly in the object list. **WARNING**: after changing the preference option you might have to close and reopen any open plan document windows before this feature functions correctly.

Any field in the selected object that is editable will be displayed with a small triangle on the left and right, as shown below. Fields without the triangles are not editable.

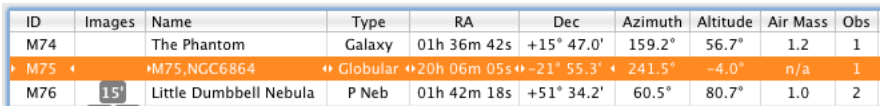


Figure 119: In-line object list editing

Clicking on an editable field will allow you to edit its value directly.

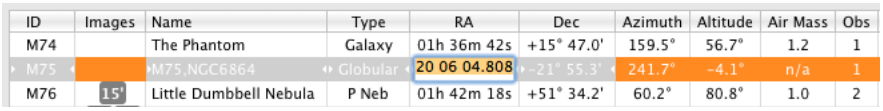


Figure 120: In-line editing in action

10.5 Importing objects from other sources

You can import objects from files created by other applications. See Section 26.1 on page 349 for more details.

User-contributed scripts might also exist that allow for import from other non-supported formats. See Section 27.2 on page 371 for more details.

You might be able to import and create objects directly from an external application. See Section 21.2 on page 321 for more details.

11 Plan document window

The plan document window is the fundamental place from which you will operate the application. The window is split into two parts: common information and settings at the top of the window and a set of four tabs below that. This chapter documents all items on the window.

11.1 Common information and settings

The common information and settings are located directly below the window title bar.

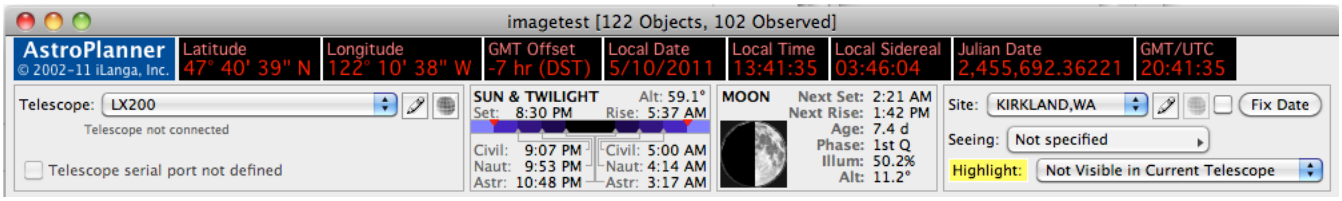


Figure 121: Common information & settings

Depending on the window width, the date/time settings panel might be hidden (as shown above) with a simple ***Fix Date*** button and checkbox. If the widow is resized wide enough, the Date/Time settings are revealed on the right (as shown below).

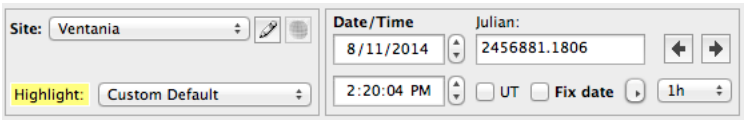


Figure 122: Date/time panel revealed

11.1.1 Time and other information

Along the top of the window are a number of displayed items. These include date, time, location and telescope information. As many items as will fit across the window are displayed. Any others are dropped until the window is resized wider.

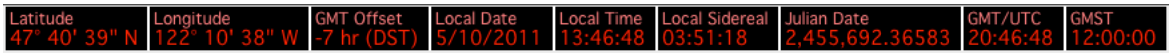


Figure 123: Time and other information

Items that can be displayed:

- **Latitude**. Latitude of the current site.
- **Longitude**. Longitude of the current site.
- **GMT Offset**. Offset (in hours) of the current site, with respect to GMT.
- **Local Date**. The local date at the site. Typically this is your computer's clock date, unless your site has defined a clock offset (i.e. a remote site), or you have "fixed" the date/time.
- **Local Time**. The local time at the site. Typically this is your computer's clock time, unless your site has defined a clock offset (i.e. a remote site), or you have "fixed" the date/time.
- **Local Sidereal**. The local sidereal time (LST) for the site.
- **Julian Date**. The Julian date.

- **GMT/UTC**. Greenwich mean time/Universal time. This is (effectively) the time at Greenwich (0° longitude), without taking into account any daylight saving time.
- **GMST**. Greenwich Mean Sidereal Time. The Local sidereal time at Greenwich (0° longitude).
- **Telescope RA**. The current pointing RA of the telescope mount. This will not be displayed unless a telescope is connected.
- **Telescope Dec**. The current pointing declination of the telescope mount. This will not be displayed unless a telescope is connected.
- **Telescope Az**. The current pointing azimuth of the telescope mount. This will not be displayed unless a telescope is connected.
- **Telescope Alt**. The current pointing altitude of the telescope mount. This will not be displayed unless a telescope is connected.
- **Telescope HJD**. The current Heliocentric Julian Date of the telescope mount's pointing coordinates. This will not be displayed unless a telescope is connected.
- **Computer Date**. The date set on your computer. This will typically be the same as your Local Date, unless your current site has a clock offset (if it's a remote site), in which case the Local Date might be different if the remote site is in a different time zone.
- **Computer Time**. The time set on your computer. This will typically be the same as your Local Time, unless your current site has a clock offset (if it's a remote site), in which case the Local Time might be different if the remote site is in a different time zone.
- **Local - Computer**. The difference in time between the Local Date/Time and the Computer Date/Time. This will typically be 0 hours, unless your current site has a clock offset (if it's a remote site), in which case the difference will be the number of hours between your time zone and the remote site's time zone..

You can enable/disable any of the above items by right-clicking and toggling items on and off in the menu. You can also change the font colour.

Figure 124: Right-click menu

11.1.2 Telescope control

The Telescope panel at the top left is where you select the telescope you are using for observing. A popup list of active telescope resources lets you choose. This choice affects some of the columns in the object list that might depend on telescope aperture (e.g. ODM).

If the telescope has a computerised mount (see Chapter 13 on page 195 for more details), then you will connect the application to that mount using the **Connect to telescope** checkbox. Unchecking the checkbox disconnects the application from the mount.

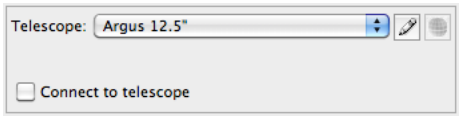


Figure 125: Telescope control - not connected

If you are connected to a Go-to computerised telescope mount then, once you are connected, the ***Slew to Object*** and ***Sync to Object*** buttons are revealed. See Section 13.5 on page 203 for more info.

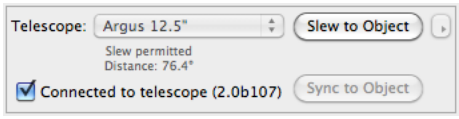


Figure 126: Telescope control - connected to a Go-to telescope mount

If you are connected to digital setting circles (DSC) then a small graphic is shown that indicates how far from the target object you are pointing.

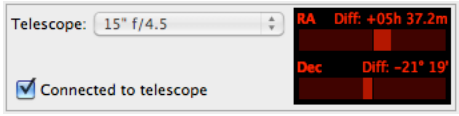


Figure 127: Telescope control - connected to a digital setting circle (DSC) telescope mount

11.1.3 Sun and moon information

The sun and moon information panels show information about the current status of the sun and moon at your specified site.

The sun panel shows the current altitude of the sun above or below the horizon, the times of sunset and sunrise, and the times at which twilight transitions between civil, nautical, and astronomical twilight, and complete darkness.

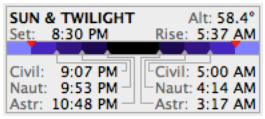


Figure 128: Sun & twilight information

The moon information panel shows time of moonset and moonrise, the age of the moon in days, the phase of the moon and percentage of the surface that's illuminated, and the current altitude of the moon above or below the horizon.

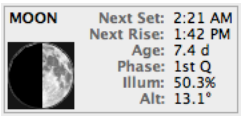


Figure 129: Moon information

Hover the cursor over the widgets to see additional information in a tool tip.

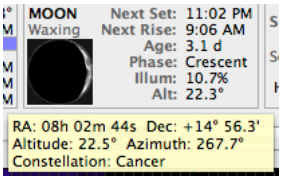


Figure 130: Additional information

11.1.4 Site & highlighting

The site and highlighting panel contains controls pertaining to the current observing site and highlighting features.

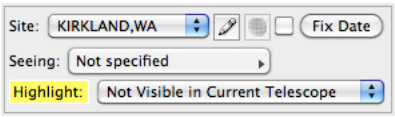


Figure 131: Site & highlighting

The **Site** popup defines the current observing site. This determines many aspects of the objects' visibility, since the site location and GMT offset determine the current positions of objects in the local sky.

The **Seeing** popup should be set to the current seeing conditions. This is only used for the Lord's Rating column for double stars. If you're not using this column or don't observe double stars, you can largely ignore this setting.

The **Highlight** popup determines how the object list is highlighted. See Section 18.1 on page 271 for more information.

If the plan document's window width is smaller than a minimum size (roughly 1200 pixels) then the Date/Time panel is hidden and a ***Fix Date*** button and checkbox displayed. Clicking the button displays a floating date/time window that allows you to select a date/time, stop the clock and set the date/time to the selected value (using the ***Apply*** button). The **Set time to...** popup contains a number of preset times of interest (see below) that can be applied.

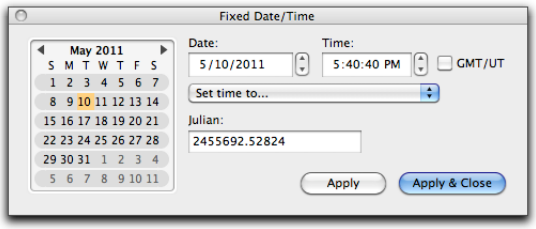


Figure 132: Date/time floating window

11.1.5 Date/time selection

If the plan document's window width is larger than a minimum size (roughly 1200 pixels) then the Date/Time panel is shown. The date and time fields automatically update with the computer clock. If you change any of the fields then the clock is effectively fixed at that point, and the **Fix date** checkbox is checked. Unchecking the checkbox will start the time running again.

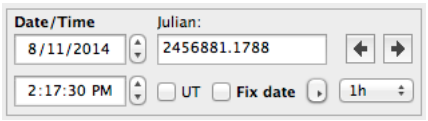


Figure 133: Date/time settings

The **UT** checkbox will change the fields so that they display the current date/time at Greenwich (0° longitude). The popup widget to the right of the Fix date checkbox contains a number of preset times of interest that can be applied

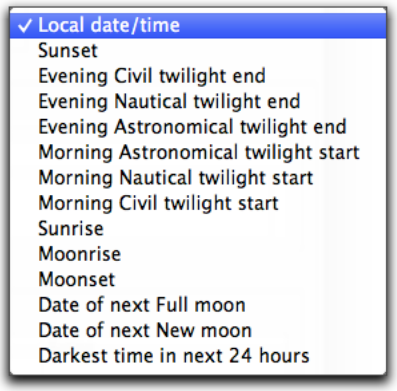


Figure 134: Preset time popup

You can use the arrow buttons on the right to step the time backwards or forwards by the amount specified in the popup below the arrow buttons.

11.2 Objects tab

The Objects tab contains the list of objects to be observed, a means to create and edit them, and various (optional) graphical widgets to help with visualisation.

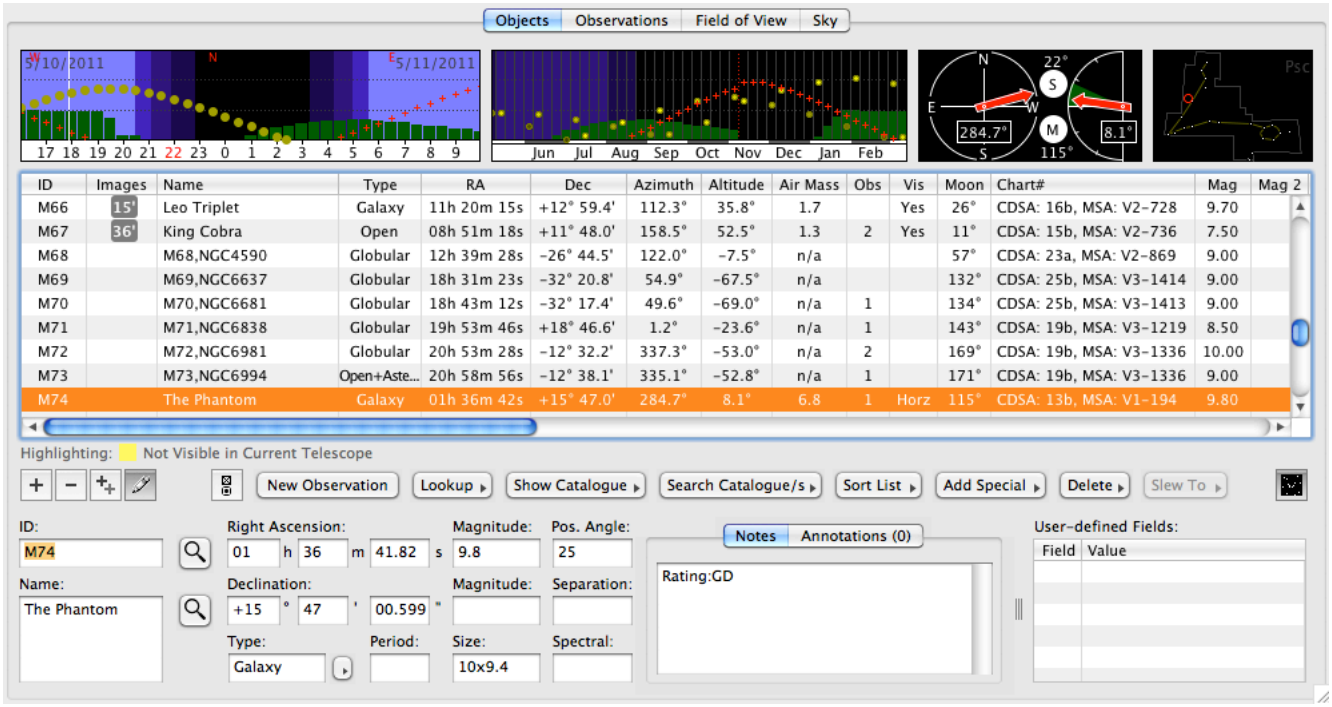


Figure 135: Objects tab

11.2.1 Object list

The object list is a table with one row per object in the plan. Each column represents a particular attribute of the object which can be one of three types:

- An attribute that is fixed for that object (e.g. ID, RA, Dec, Magnitude, etc.)
- An attribute that is computed from the fixed attributes (e.g. Surface Brightness, etc.)
- An attribute that is computed from the fixed attributes and external conditions such as date/time and site (e.g. Visibility, Altitude, Azimuth, Air Mass, etc.)

A description of the particular column attribute can be displayed by hovering the cursor over the heading for a column (or just below the heading).

You can select one or more rows of the object list by clicking on the first row and then shift-clicking the last row to select all rows in between, or Ctrl-clicking (Cmd-clicking on Macintosh) to select individual rows.

You can sort the object list by clicking on a column heading cell. Click again to reverse the order. You can also sort on multiple columns using the Sort Objects feature. See Section 11.2.13 on page 110 for details.

Note: The **Obs** column (if visible) displays the number of observations of that object (e.g. M51 in Figure 137). If it is blank, it implies that no observations have been made (e.g. M52 in Figure 137). Also, if at least one observation was made from this plan document, then the number is circled (e.g. M55 in Figure 137). Also if one or more of those observations were made in the past 12 hours, the circled number is inverted (e.g. M53 in Figure 137). This is a way to track which observations you have made in the current observing session. If the date/time is fixed, the the inversion is done if any observations were made since the fixed date/time.

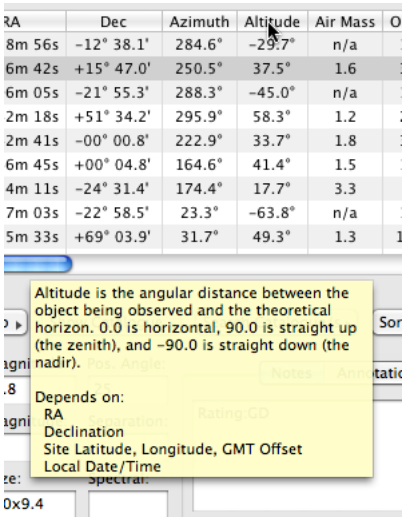


Figure 136: Hovering cursor over object list heading

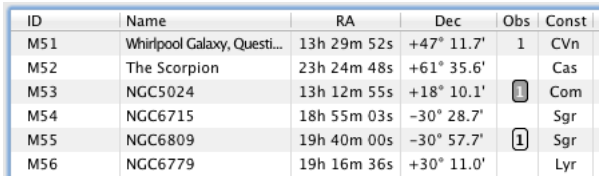


Figure 137: Obs column

11.2.2 Object list columns

Heading	Name	Description	Dependent on
Air Mass	Air Mass	The Air Mass of an object is the relative thickness of atmosphere between the observer and the object being observed, with 1.0 being the minimum (i.e. looking straight up). This will increase with decreasing Altitude.	Altitude
Altitude	Altitude	Altitude is the angular distance between the object being observed and the theoretical horizon. 0.0 is horizontal, 90.0 is straight up (the zenith), and -90.0 is straight down (the nadir).	RA, Declination; Site Latitude, Longitude, GMT Offset; Local Date/Time
App Mag	Apparent Magnitude	Apparent Magnitude is the Magnitude (brightness) of the object, but taking into account the effects of atmospheric extinction, especially near the horizon. It is directly dependent on object Altitude. It is also dependent of site altitude above sea level and season of the year.	Magnitude; Extinction
Azimuth	Azimuth	Azimuth is the angular distance between the object being observed and True North. 0.0 is due North, 90.0 is due East, 180.0 is due South, and 270.0 is due West.	RA, Declination; Site Latitude, Longitude, GMT Offset; Local Date/Time
Best AMag	Apparent Magnitude at Best Time	The Apparent Magnitude (see above) of the object at the Best Time (see below).	RA, Declination, Magnitude, Extinction; Site Latitude, Longitude, GMTOffset; Local Date/Time
Best EP	Best Eyepiece	The best eyepiece required to detect the object using the given telescope at the given site.	Magnitude; Separation; Size; Site; Telescope
Best Mag	Best Magnification	The best magnification required to detect the object using the given telescope at the given site.	Magnitude; Separation; Size; Site; Telescope
Best Time	Best Time	The local time in the next 24 hours (to the nearest 15 minutes) that the object is best observed (based on its maximum Observability value during that period). If the Best Time is less than the current local time, then it refers to the next evening.	RA, Declination; Site Latitude, Longitude, GMTOffset; Local Date/Time

Catalogue	Catalogue	The Catalogue from which this object was originally extracted.	
Catalogue Notes	Catalogue Notes	Notes derived from the catalogue entry for this object (where applicable)	
Chart#	Chart Number	The Chart number or atlas page number that contains this object. The charts/atlases in use are defined in the object list preferences.	RA, Declination
Comp	Components	Components of a double/multiple star entry (e.g. "AB")	
Const	Constellation	The Constellation that this object resides in. This is fixed for deep sky and stellar objects, but will change for solar system objects which move in the sky over time.	RA, Declination
Dec	Declination	The Declination of the object (similar to Latitude on earth maps). This is fixed for stellar and deep-sky objects, but will change over time for solar system objects. Has values from -90° at the south celestial pole to +90° at the north celestial pole.	
Diff Idx	Difficulty Index	The Difficulty Index for double stars. This is a number between 0 (easy) and 100 (extremely difficult) that gives an indication of how difficult a double star will be to split.	Magnitude; Magnitude2; Separation
Dk Start	Dark Time Start	The start time of the next time the object is in complete astronomical darkness, and is above the elevation specified in the object list preferences (and is also above the user-defined horizon if one has been specified for the given site). This will be the current time if the object is currently in this condition. If the object is not in this condition in the next 24 hours, the column will be blank.	Site; RA, Declination; Date/Time
Dk End	Dark Time End	The end time of the next time the object is in complete astronomical darkness, and is above the elevation specified in the object list preferences (and is also above the user-defined horizon if one has been specified for the given site). If the object is not in this condition in the next 24 hours, the column will be blank.	Site; RA, Declination; Date/Time

Dk Dur	Dark Time Duration	The duration (in hours) of the next time the object is in complete astronomical darkness, and is above the elevation specified in the object list preferences (and is also above the user-defined horizon if one has been specified for the given site).	Site; RA, Declination; Date/Time
E.Lat	Ecliptic Latitude	The ecliptic latitude of the object. This varies between -90 and +90 degrees, with 0 being on the ecliptic (passing through the plane of the solar system). +ve north of the ecliptic, -ve south.	RA, Declination
E.Long	Ecliptic Longitude	The ecliptic longitude of the object. This varies between 0 and 360 degrees along the ecliptic (passing through the plane of the solar system). Measured from the vernal equinox.	RA, Declination
Extinct	Extinction	Atmospheric Extinction. This is the effect the atmosphere has, at the given altitude, on the object in terms of magnitude. It will be 0 if the object is at the zenith, and increases as the object gets closer to the horizon. e.g. the value 1.5 means that the object will appear 1.5 magnitudes dimmer than the given Magnitude.	Altitude; Site; Date
Found	Object Found	True if at least one observation for this object has its Found status set to true. False if there are no observations of the object, or if all observations have a Found value of false.	ID
G.Lat	Galactic Latitude	The galactic latitude of the object. This varies between -90 and +90 degrees, with 0 being on the galactic equator (passing through the plane of the Milky Way).	RA, Declination
G.Long	Galactic Longitude	The galactic longitude of the object. This varies between 0 and 360 degrees along the galactic equator (passing through the plane of the Milky Way).	RA, Declination
Hr Angle	Hour Angle	The Hour Angle is the difference between the object's current right ascension (RA) and the right ascension of the meridian. It varies between -12 hours and +12 hours and will be zero when the object transits. It also represents the time since the object passed the meridian (e.g. -2.5 hours means the object will reach the meridian in 2.5 hours), assuming the object is a DSO or a slow-moving solar system object.	RA; Local Sidereal Time

HJD	Heliocentric Julian Date	The Heliocentric Julian Date is the Julian Date taking into account light travel time from the Sun. This date is used when measuring photometric magnitudes of variable stars in order to make sure all readings are standardized to the same time scale, regardless of time of year.	RA, Declination; Julian Date
ID	Object ID	The primary ID for the object.	
Images	Images	If the object has associated Images in the image database, this column will contain an entry.	
Level	Plan Creation Wizard Difficulty Level	The Plan Creation Wizard difficulty level, 1 (easy) through 5 (difficult), that the object would be if it was in the Plan Creation Wizard database, where applicable.	Type; Magnitude/s; Size; Period; Separation; Plan Creation Wizard criteria.
LOC	Log Object Contrast	Log Object Contrast (LOC) is a measure of the contrast of the (deep-sky) object against the background sky. It depends on the brightness and size of the object, and the brightness of the sky.	Magnitude; Size; Sky Brightness
L Rating	Lord's Rating	Lord's Rating is applicable only to double star objects (in particular double stars with unequal magnitudes). It requires the Performance index to be computed, which means the Current Telescope and Current Seeing popup menus must be used. The value is based on telescope aperture, central obstruction (if any) and seeing conditions.	Magnitude; Magnitude2; Separation; Telescope; Current Seeing
Mag	Magnitude	The Magnitude of the object. This is fixed for stellar and deep-sky objects, but typically varies for solar system objects. For variable stars this represents the maximum brightness of the star. For double stars, it's the magnitude of the primary star.	
Mag 2	Secondary Magnitude	The Magnitude of the secondary star, for double star objects. For variable stars this represents the minimum brightness of the star.	
Moon	Angular Distance to Moon	The current angular distance between this object and the position of the Moon. Values from 0 (the object is at the same coordinates as the Moon) to 180 (the object is on the far side of the sky from the Moon).	RA, Declination; Site Latitude, Longitude, GMT Offset; Local Date/Time
Name	Name/s	Additional Name or names for the object.	

Obs	Number of Observations	The number of observations of this object resident in the observation database. This includes any synonyms of the object.	ID
Obsvbty	Observability	The Observability value for the object at the current local date/time. This value varies between 0 (not observable) and 100 (perfect time to observe) and depends on the object's altitude, distance from moon and sun, moon phase and sky position, position w.r.t. the meridian, etc.	RA, Declination; Site Latitude, Longitude, GMTOffset; Local Date/Time
ODM	Optimum Detection Magnification	The Optimum Detection Magnification of the (deep-sky) object for the currently selected telescope. It will be displayed for any object that has both magnitude and size (i.e. has a computable surface brightness). The value represents the best magnification to use with the selected telescope in order to detect the object.	Magnitude; Size; Sky Brightness; Telescope
Opposition	Date of Opposition	The date at which the object will be at opposition (closest to the meridian at local midnight).	RA, Declination; Site
Par Angle	Parallactic Angle	The Parallactic Angle of the object at the current local (sidereal) time. This is the angle between the great circle passing through the object and the zenith point, and the great circle passing through the object and the celestial poles. The angle is zero when the object crosses the meridian. Often used by field rotators.	RA, Declination; Local Sidereal Time; Site Latitude
Period	Period	The Period of the object. This is generally understood to be the light curve period (in days) for a variable star.	
PosAngle	Position Angle	Position Angle of the object with respect to north. This refers to the secondary component of a double star with respect to the primary component, or the angle of the longer (major) axis for a galaxy. It has a value of 0 through 360 degrees, with 90 being due East.	
Prob	Probability of Detection	Probability of visual detection of a star of given Magnitude in the currently selected telescope. e.g. if the probability is 60% then the star will be detectable 60% of the time under ideal conditions.	Magnitude; Telescope

Prob 2	Probability of Detection	Probability of visual detection of a star of given Magnitude 2 in the currently selected telescope. e.g. if the probability is 60% then the star will be detectable 60% of the time under ideal conditions.	Magnitude2; Telescope
RA	Right Ascension	The Right Ascension of the object (similar to Longitude on earth maps, but runs from 0 to 24 hours). This is fixed for stellar and deep-sky objects, but will change over time for solar system objects.	
Rating	Rating	The average Rating for this object. The rating is computed from rating values in observations of the object. Defined in the object list preferences.	ID
Rise	Time of Object Rising	Rise time of the object. This is the time of the current day when the object rises above the (theoretical) horizon.	RA, Declination; Site Latitude, Longitude, GMT Offset; Local Date/Time
TDist	Telescope Distance	When a telescope is connected and supplying its current pointing coordinates, this is the angular distance of the object from those coordinates in degrees. Values from 0 (the telescope is pointing at the object) to 180 (the telescope is pointing directly away from the object).	RA, Declination; Telescope RA/ Dec coordinates
SB	Surface Brightness	Surface Brightness of the (deep-sky) object, in magnitudes per square arcsecond.	Magnitude; Size
Sep	Separation	The object Separation. This is for double star objects. The value is expressed in arcseconds (3600 arcsec = 1 degree).	
Set	Time of Object Setting	Set time of the object. This is the time of the current day when the object sets below the (theoretical) horizon.	RA, Declination; Site Latitude, Longitude, GMT Offset; Local Date/Time
Size	Angular Size	The angular Size of a deep-sky object. Unless otherwise shown the size is expressed in minutes of arc (60 minutes = 1 degree). If the object is non-circular then the size is given as AxB where A is the angular size of the longer axis, and B is the angular size of the shorter axis.	
Spect	Spectral Information	Spectral information pertaining to the object.	

Split	Splitability	The "splitability" of a double star when viewed through the currently-selected telescope under ideal conditions. "Yes"=splittable, "???"=possible but difficult, "No"=not splittable.	Magnitude; Magnitude2; Separation; Telescope Aperture; Telescope Obstruction; Site Sky Brightness
Split mm	Splitability Aperture	The telescope aperture required to split a double star with a 50% chance of success, when viewed through the currently-selected telescope under ideal conditions.	Magnitude; Magnitude2; Separation; Telescope Aperture; Telescope Obstruction; Site Sky Brightness
Sun	Angular Distance to Sun	The current angular distance between this object and the position of the Moon. Values from 0 (the object is at the same coordinates as the Moon) to 180 (the object is on the far side of the sky from the Moon).	RA, Declination; Site Latitude, Longitude, GMT Offset; Local Date/Time
Transit	Time of Object Transit	The time of the current day when the object transits (reaches its highest altitude; crosses the meridian).	RA, Declination; Site Latitude, Longitude, GMT Offset; Local Date/Time
Transit Alt	Transit Altitude	The altitude of the object when it transits (reaches its highest altitude; crosses the meridian).	Declination; Site Latitude
Transit Date		The date of the year when the object transits (reaches its highest altitude; crosses the meridian) with the greatest altitude.	RA, Declination
Type	Object Type	The Type of the object (e.g. Star, Galaxy, etc.). If the object falls into more than one category then the types will be separated by "+".	
User Notes	User Notes	User Notes for the object.	

Vis	Visibility	The Visibility of the object at the given site and date/time. This takes on the following possible values: blank - the object is currently not visible. **Yes** - the object is visible. **Horz** - the object is behind the user-defined horizon for the site. **Light** - the object is in the user-defined light dome for the site. **Limit** - the object is outside the slewing limits of the telescope.	RA, Declination; Site Latitude, Longitude, GMT Offset, Horizon; Local Date/Time

11.2.3 Object image and constellation map

If you select a single object in the object list, and that object has images associated with it (See Chapter 17 on page 254), then those images are displayed to the right of the object list (the object list being resized to fit the image). A popup menu below the image shows a description of the currently-displayed image and allows to select other images where applicable.

For DSS images, moving the cursor over the image displays the cursor's RA/Dec coordinates.

The image display feature can be toggled on and off by clicking the image button below the image (circled in Figure 138).

Further features are described in Section 17.2 on page 259.

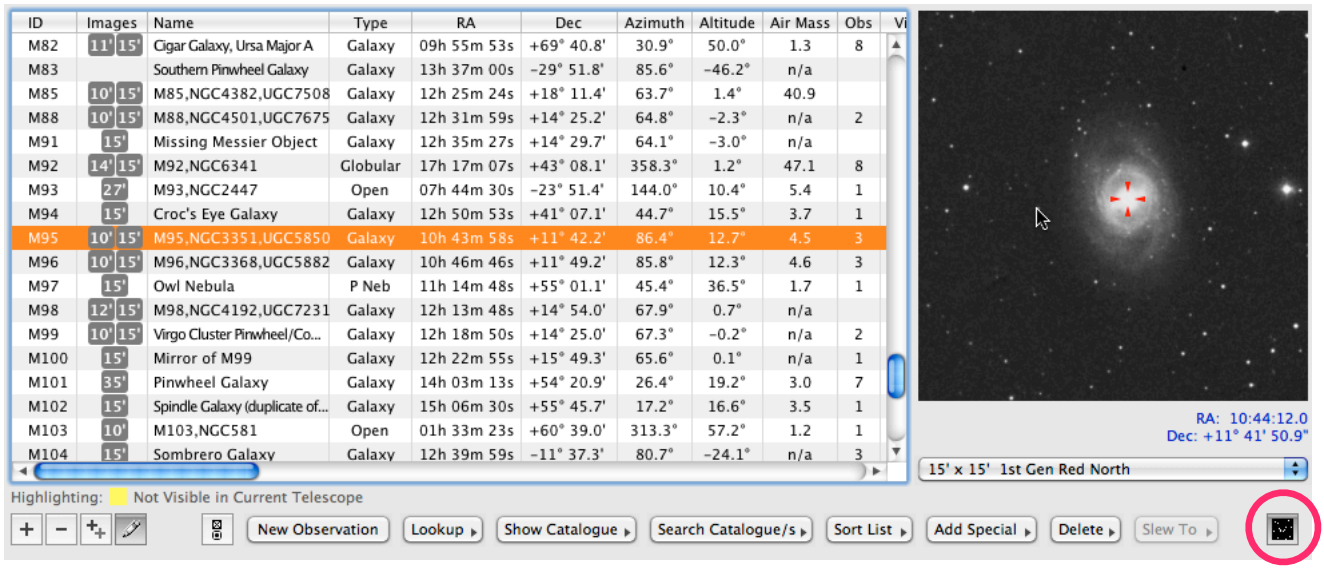


Figure 138: Object list image

Also (if you have the option turned on, which it is by default - Section 20.5.4 on page 295) you will see a constellation map of the constellation containing the object. The object's location within the constellation will be shown with a red circle. Any other objects in the plan that are in that constellation will be shown with grey circles. See Figure 139.

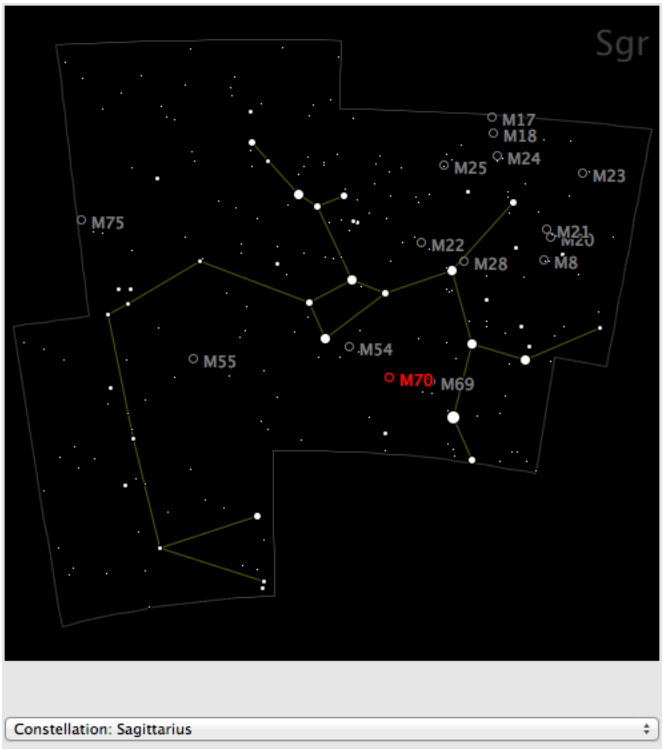


Figure 139: Constellation map for M70 (in Sagittarius)

For Jupiter and Saturn, a diagram showing the current positions of the planet's satellites is displayed.

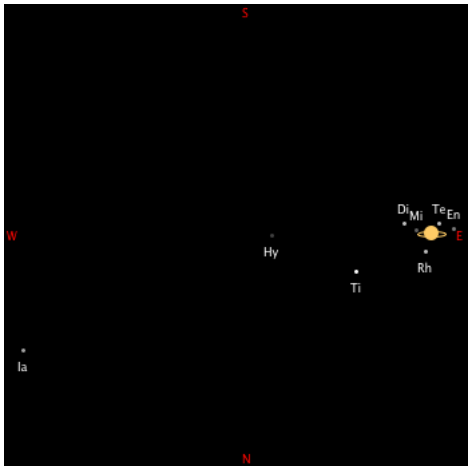


Figure 140: Saturn satellites

For a constellation object, a chart of the constellation is shown. Any plan objects that are in that constellation will be shown with their associated ID.

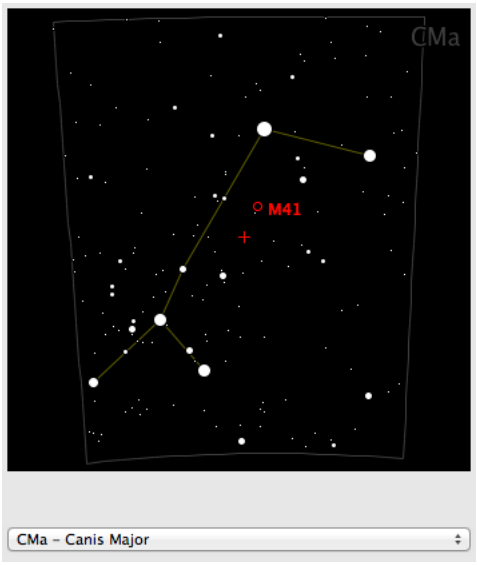


Figure 141: Constellation chart for a constellation object

11.2.4 Object editing fields

(See Section 10.4.1 on page 88 for more details) If revealed, these fields allow the attributes of the selected object to be edited (e.g. ID, RA, Dec, Notes, etc.). The fields appear below the object list.

11.2.5 Short-term visibility indicator

The Short-term visibility indicator (optionally) appears above the object list.

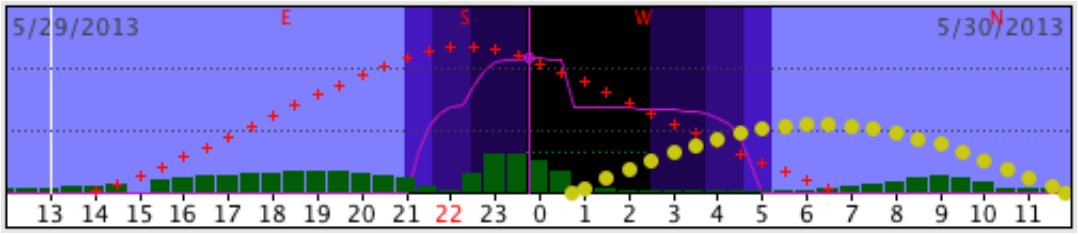


Figure 142: Short-term visibility indicator

This indicator represents a chart of the selected object in the sky over a (configurable) period of up to 24 hours. The horizontal axis represents local time. The vertical axis represents altitude (0° to 90°). The current local time is shown by a vertical white line (13:00 in the above example). The background colour represents sky darkness, with daylight being in light blue, twilight in dark shades of blue, and complete darkness in black.

If an object is selected in the object list, its altitude is shown as a succession of red crosses (in the above example the object rises c. 14:00 and reaches its zenith at at about 22:30. Similarly, the moon's altitude is shown by small yellow circles.

If the site has a user-defined horizon, then it is shown at each time interval as a green bar that shows the blocking altitude in the direction of the object.

Also shown are the cardinal points where the object is due north (N), etc. In the above example the object will be at its maximum altitude (72°) at about 22:30 and is due south.

This indicator gives you a visual indication of when the best time to observe the object might be. In the above example, 00:00 to 02:00 would seem the best time, with the object above the horizon and complete darkness.

The Observability value is shown as a purple line, with a vertical purple line where the observability is at a maximum (just before midnight in this case). You'll see the value growing from zero after sunset, and declining rapidly when the moon rises.

The dark time elevation (where applicable) is shown as a horizontal dotted green line extending over the period of astronomical darkness. An object's Dark Time is defined to be the period during astronomical darkness when the object's altitude is above this elevation.

The right-click menu allows you to select the start time for the time axis, and the period (up to 24 hours). Visual astronomers might just want to see the dark hours between 18:00 and 06:00, but others (e.g. radio astronomers) would want to see daylight hours. You can also toggle on/off the display of observability and/or the dark time elevation setting.

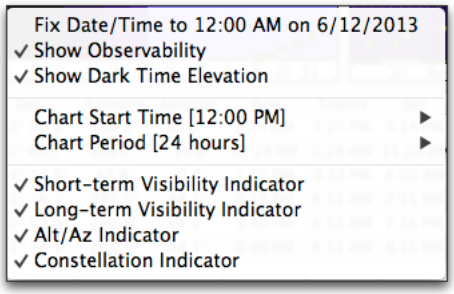


Figure 143: Short-term visibility indicator right-click menu

By right-clicking a particular spot on the chart and choosing the **Fix Date/Time** item, the date/time will be fixed at that point.

You can toggle the chart on or off using the **Short-term Visibility Indicator** item. This, and other settings can also be found in the Object List Preferences (see Section 20.5.1 on page 293).

11.2.6 Long-term visibility indicator

The Long-term visibility indicator (optionally) appears above the object list.

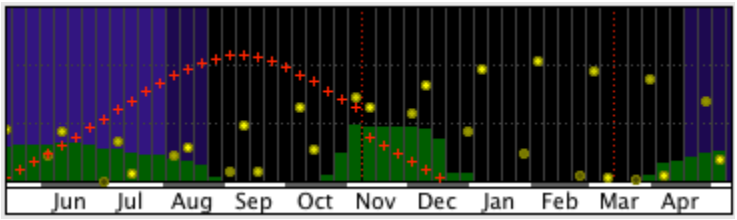


Figure 144: Long-term visibility indicator (Altitude mode)

This indicator represents a chart of the selected object in the sky over a (configurable) period of up to one year. The horizontal axis represents local date, with the leftmost being the current local date. It is divided up into intervals of 1 week (or less for other time periods). Each interval represents to situation at a particular day of the week and a particular time of the night (22:00 on Saturdays in the above example).

The vertical axis (in Altitude mode) represents altitude (0° to 90°). The background colour represents sky darkness, with daylight being in light blue, twilight in dark shades of blue, and complete darkness in black.

If an object is selected in the object list, its altitude is shown as a succession of red crosses (in the above example, on the next Saturday at 22:00 the object has just risen. The best time to observe the object would be on Saturday nights in September, where the sky is dark at 22:00 and the object is at its maximum altitude. Similarly, the moon's altitude is shown by small yellow circles. If there is no moon for a particular interval, it means that it has not risen at 22:00 on that Saturday.

If the site has a user-defined horizon, then it is shown at each time interval as a green bar that shows the blocking altitude in the direction of the object. In the above example, The object will not be visible until June, and after the beginning of November it will be below the user horizon again.

The vertical dotted red lines indicate transitions to and from daylight saving time, if applicable.

This indicator gives you a visual indication of when the best time to observe the object during the year might be. In the above example, September through October would seem the best time, with the object well above the horizon and in darkness.

There is another mode for this indicator. In this mode the vertical axis represents time of night from 16:00 at the bottom through 08:00 at the top. The time interval is the same as for the Altitude mode described above. The vertical axis is, effectively, a squashed version of the short-term indicator turned through 90°. The red line represents the object above the horizon. The yellow line represents the moon above the horizon.

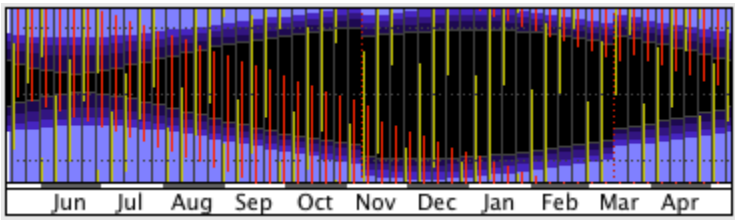


Figure 145: Long-term visibility indicator (Time-of-night mode)

In the above example, one can see that the object starts out as a morning object. By July it's transiting in the middle of the night. In October/November it's an evening object. It's pretty much not visible between January and March.

The right-click menu allows you to select the Chart type (Altitude or Time-of-night mode), the period (from 30 days to a year).

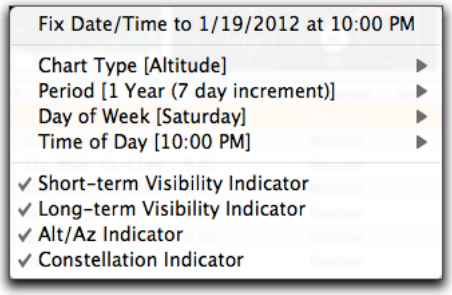


Figure 146: Long-term visibility indicator right-click menu

By right-clicking a particular spot on the chart and choosing the **Fix Date/Time** item, the date/time will be fixed at that point.

You can toggle the chart on or off using the **Long-term Visibility Indicator** item. This, and other settings can also be found in the Object List Preferences (see Section 20.5.1 on page 293).

11.2.7 Alt/Az indicator

The Alt/Az indicator (optionally) appears above the object list.

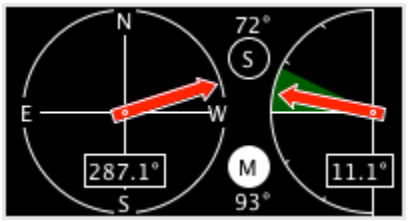


Figure 147: Alt/Az indicator

The indicator shows the current azimuth of the selected object on the left, and the altitude on the right. If the arrows are grey, it means the object is currently visible. If the arrows are red it means the object is below the true horizon, or hidden behind the user-defined site horizon. The numeric values of azimuth and altitude are also shown.

The circle with an S represents the sun. If it filled with black, then the sun has set. If it is white the the sun is above the horizon. The number associated with it represents the angular distance from the selected object to the sun.

Similarly the circle with an M represents the moon.

The right click menu allows you to flip the azimuth cardinal points vertically and or horizontally if you wish. You can toggle the chart on or off using the **Alt/Az Indicator** item. This, and other settings can also be found in the Object List Preferences (see Section 20.5.1 on page 293).

11.2.8 Constellation indicator

The Constellation indicator (optionally) appears above the object list.

Figure 148: Constellation indicator

The indicator shows a small rendering of the constellation containing the selected object, with the main stars, constellation figure lines, and boundary shown. The position of the selected object is shown by a small red circle.

Positioning the cursor over a star will show that star's Bayer ID, Flamsteed ID, and common name, where applicable.

The right click menu allows you to flip the chart vertically and or horizontally if you wish. You can toggle the chart on or off using the **Constellation Indicator** item. This, and other settings can also be found in the Object List Preferences (see Section 20.5.1 on page 293).

Double-clicking the indicator causes the application to switch to the Field of View tab and draw the entire constellation in the Field of View chart.

11.2.9 New Observation

Clicking the ***New Observation*** button is a shortcut to create a new observation for the selected object (rather than switching manually to the observation tab and clicking the ***+*** button under the list of observations). Note that you can't make observations on an untitled plan document - it must be saved first.

11.2.10 Lookup

The ***Lookup*** popup button allows you to do a catalogue search on either the selected object's ID or Name field. If no object is selected, you can enter text for the search. Note that this command will deselect any selected object/s before beginning the search.

11.2.11 Show Catalogue

The ***Show Catalogue*** popup button lets you open a window, for a selected catalogue, that shows all the objects in that catalogue, allows you to add catalogues objects to your plan, etc.

See Section 23.6 on page 332 for more details.

11.2.12 Search Catalogue/s

The Search Catalogue/s popup button lets you search one or more catalogues based on various criteria that you specify.

See Section 10.1.3 on page 79 for more details.

11.2.13 Sort List

The ***Sort List*** popup button allows you to sort the object list by multiple columns, and save those "sorts" for future use.

Sort List > Sort By... (the same as ***Object > Sort Objects...***) sets up a multiple column sort. You can sort by up to three columns in ascending or descending order.

If a column is time-related (e.g. rise time) then you can also specify an offset to use as the lowest time for sorting purposes.

Once set up, you can add this sort to the Sort List popup menu as a "pre-defined" sort by checking the **Add to Sort List popup** checkbox.

You can also specify that this sort order be used as the default sort order whenever you open a plan document, using the **Use as default** checkbox. You can subsequently remove this default sort order by using the ***Clear*** button.

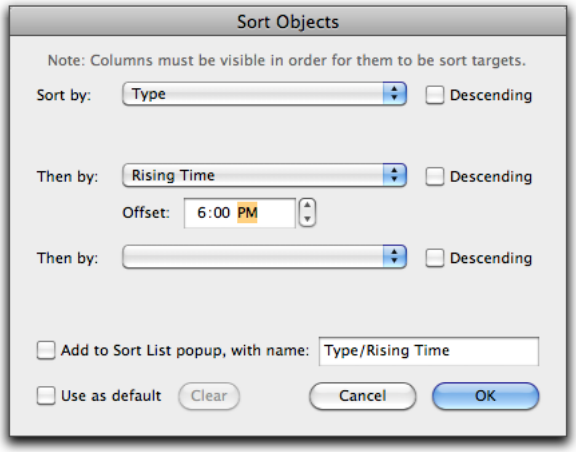


Figure 149: Sort Objects dialog

You can edit any predefined sorts added to the Sort List menu by using ***Sort List > Edit...***

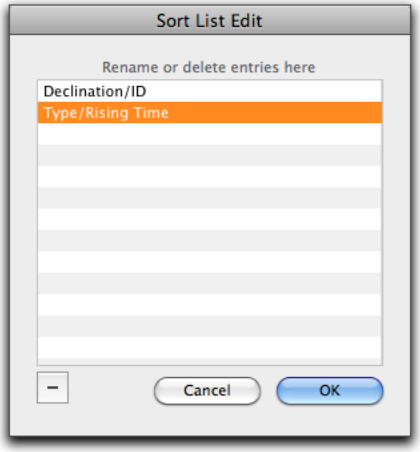


Figure 150: Sort List Edit dialog

You can delete or rename any entries.

11.2.14 Add Special

The ***Add Special*** popup button allows you to add various "special" objects to your plan. See Section 10.1.4 on page 82 for details.

11.2.15 Delete

The ***Delete*** popup button gives you various ways of deleting multiple objects from the object list.

The **Delete CONDITIONALLY** entry allows you to specify criteria for deleting objects from the object list. You can specify up to three columns/attributes to match on, and you can choose to match on all attributes (AND) or on any of the attributes (OR).

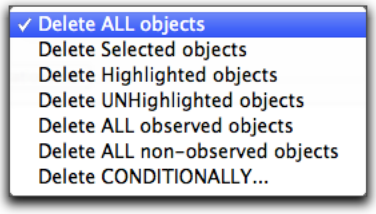


Figure 151: Delete popup menu

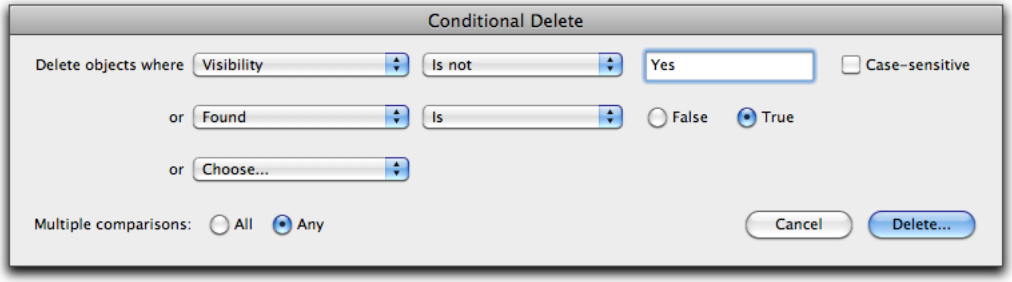


Figure 152: Conditional delete dialog

11.2.16 Slew To

If a telescope with Go-to capabilities is connected, then the ***Slew To*** popup button is enabled and allows a quick slew to common objects. You can also slew to specified coordinates using the **RA/Dec...** item, or to the centre of a specified constellation using the **Centre of Constellation...** item.

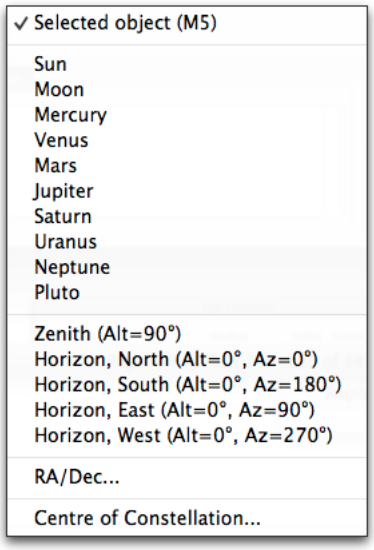


Figure 153: Slew To popup menu

11.2.17 Customising object list columns

To customise the object list columns (ordering, formatting, visibility, etc.), use the ***Edit > List Columns...*** menu command.

The editing dialog consists of a list with one row per column in the list. You can rearrange the ordering of the list columns by dragging the rows in the dialog.

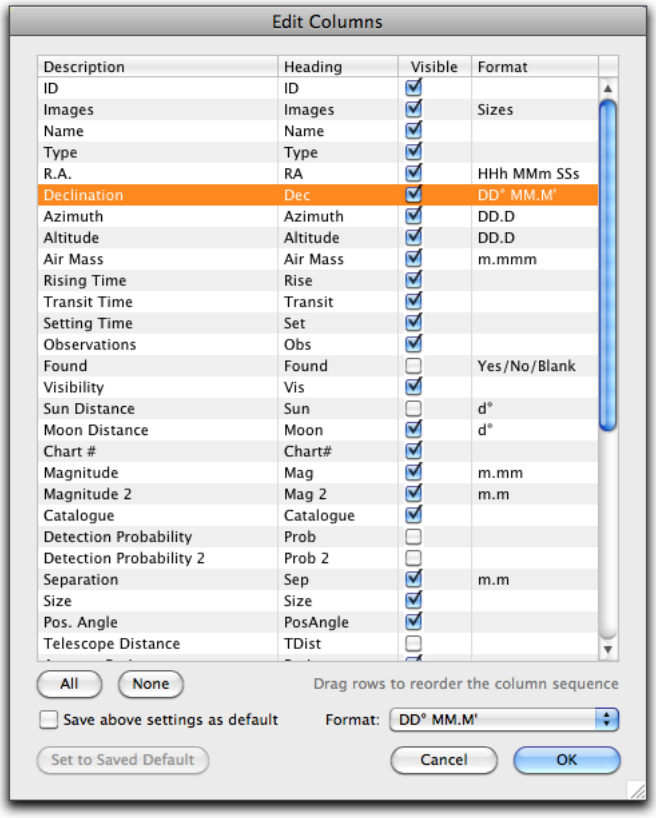


Figure 154: Editing object list columns

The checkbox in the Visible column determines whether or not the column is visible in the object list.

If a column contains values that can have different formats, then the current format is shown in the Format column, and the Format popup under the list is enabled to allow changes if such a row is selected.

If you check the **Save above settings as default** checkbox, then when you click ***OK*** the settings are saved as the default for any new plan windows that are opened. If you edit the columns of an object list after doing that, you can use the ***Set to Saved Default*** button to revert the settings to the previously-saved default.

The ***Edit > Adjust List Columns to Fit Text*** menu command will attempt to adjust each column's width to fit the text (and heading) in that column.

11.3 Observations tab

The Observations tab is where you can examine and/or make observations for objects in the object list.

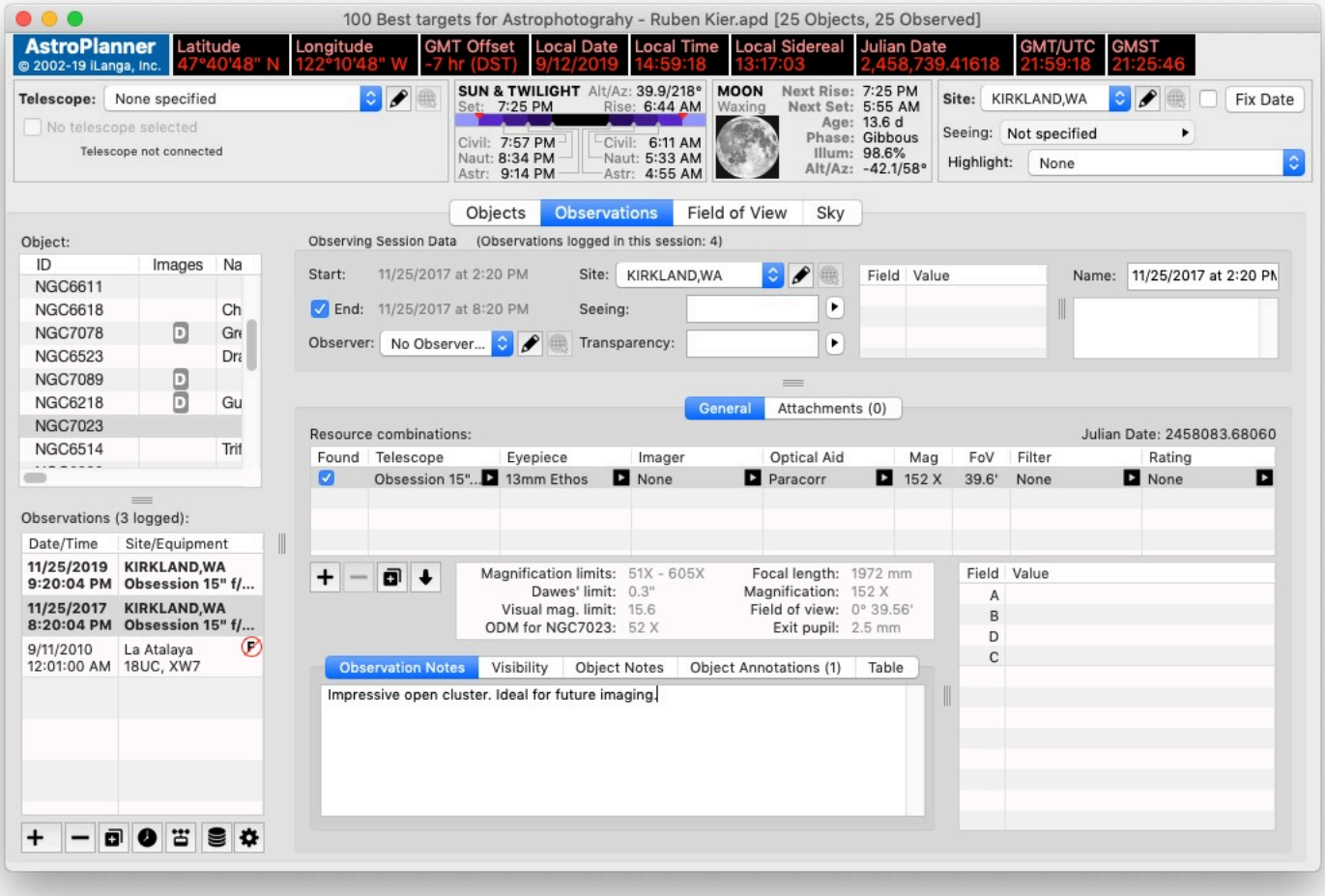


Figure 155: Observations tab

11.3.1 Object list

The object list also appears on the left side of the window in this tab, mainly so that you can select the relevant object to see its observations, or to make a new observation. The window splitting controls below the list and to the right of the list allow you to resize the list (at the expense of other items on the tab).

11.3.2 Observations list

The Observations list below the object list shows all observations of the currently-selected object. They are typically in descending order of date/time. Unless appended by "UT", the dates and times represent local time at the observing site.

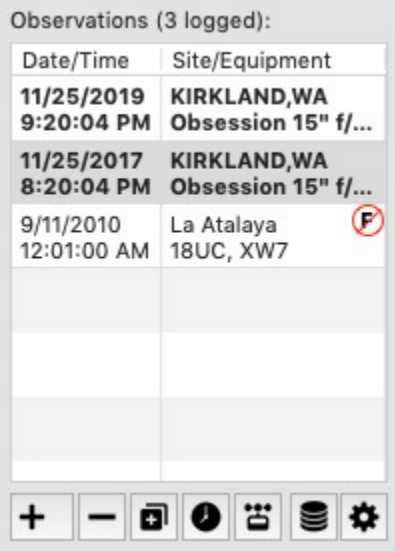


Figure 156: Observation list

If the entry is **bold** then that observation was made from the currently open plan document (e.g. the 11/25/2019 observation in Figure 155).

If the observation was not "found" (i.e. the observer was not able to detect the object and did not check the Found checkbox in any of the resource combinations for the observation), then a "not found" icon is appended at the right (e.g. the observation for 9/11/2010 in Figure 155).

Under the Observations list are seven buttons. The function of these buttons, from left to right are:

- **Add new observation**. Create a new observation and add it to the list. The contents of the new observation are shown on the right side of the window and can be edited there. Depending on observation preference settings, the date/time of the observation will either be the current date/time, or you will be asked for the observation's date/time via a dialog. See Section 12.1 on page 179 for more details.
- **Delete selected observation**. The selected observation is deleted from the database. If that observation is the last observation in the observing session, you'll be given the choice to retain or delete the session record.
- **Duplicate selected observation**. Make a copy of the selected observation. You will be asked via a dialog for that duplicate observation's date/time.
- **Edit the date/time of the selected observation**. Uses the same dialog as above to change the date/time of the selected observation.
- **Set conditions for the selected observation**. Sets the Site, Date, Time, etc. to replicate the observing conditions when the observation was made. This can be useful to see the Sky chart for the event, and to examine other attributes, such as Altitude, etc.
- **Show the observation database**. Display the observation database window. See Section 12.2 on page 180 for more details.
- **Show the observation preferences**. Show the Observation preferences window. See Section 20.9 on page 309 for more details.

11.3.3 Observing session data

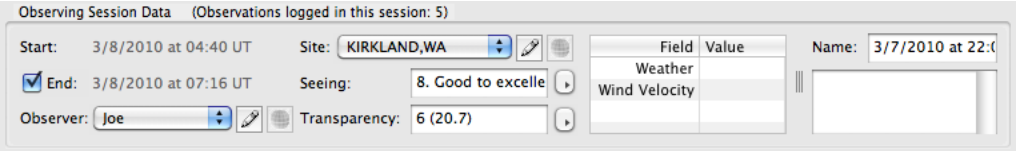


Figure 157: Observing session data

The Observing session data contains information pertaining to the current observing session, namely:

- **Start/End**. The Start date and time is computed from the time of the first observation made in the session (minus a suitable "set-up" time specified in the Observation preferences). The End date and time is computed from the time of the last observation made in the session (plus a suitable "break-down" time specified in the Observation preferences). The checkbox is checked when the session is over (this is largely automatic).
- **Observer**. The observer (resource) for the observer making the observations.
- **Site**. The site (resource) where the session occurred.
- **Seeing**. An arbitrary string describing the Seeing for the session. The popup menu on the right of the field allows you to choose predefined strings from the Pickering, Antoniadi, or Danjon standard scales, or you can define your own custom scale (Figure 158).
- **Transparency**. An arbitrary string describing the atmospheric Transparency for the session. The popup menu on the right of the field allows you to choose predefined strings, which can be set up as you wish.
- **User-defined fields**. User-defined fields common to all sessions. User-defined fields are described in detail in Chapter 19 on page 276.
- **Name**. A name field for the session. The default name is the start date and time, but can be changed to something more meaningful if required.
- **Notes**. Arbitrary notes about the observing session.

Figure 158: Seeing popup

11.3.4 General observation fields

Resource combinations

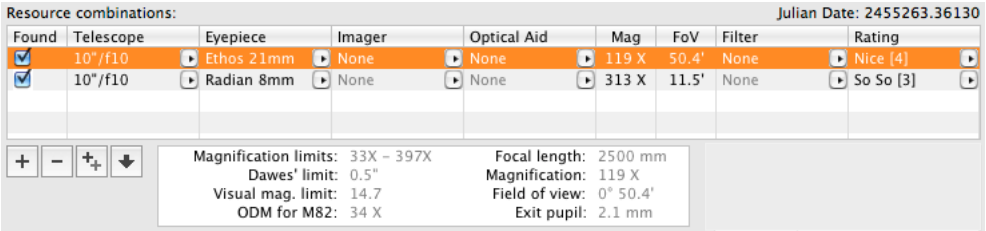


Figure 159: Resource combination list

This is a list of combinations of observing resources and the results of using them. Each observation has at least one combination, defining what telescope and eyepiece or imager was used, whether the object was found, and a rating of the observation.

The columns have popup menus to the right of each entry allowing you to choose from your resource database. Where relevant, the magnification and the actual FoV are computed and displayed. Also, some computed parameters are displayed below the list for the currently-selected combination.

The buttons below the list on the left allow you to add a new entry, delete an entry, or duplicate an entry. The fourth button copies the relevant details into the insertion point in the Observation Notes field (see below).

Observation notes

These are arbitrary notes that can be logged for the observation.

Visibility

A graphic is displayed that shows the altitude and azimuth of the object at the time of the observation (as well as the distance from the sun and moon).

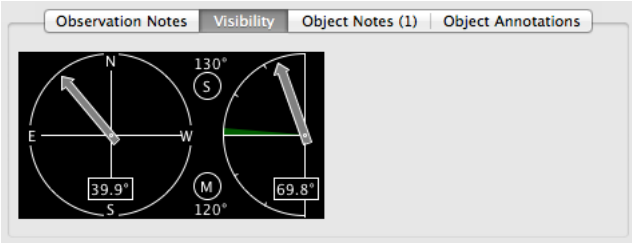


Figure 160: Observation visibility

Object notes

A copy of the notes associated with the object, as well as ODM info where applicable. This is read-only (i.e. you can't change this field, although you can in the Objects tab).

Object annotations

Displays any catalogue annotations associated with the object. See Section 23.7 on page 334 for details.

11.3.5 Observation attachments

You can attach files of various kinds to an observation. With the relevant observation selected in the observation list, select the Attachments tab (the number in parentheses is the number of attachments for that observation).

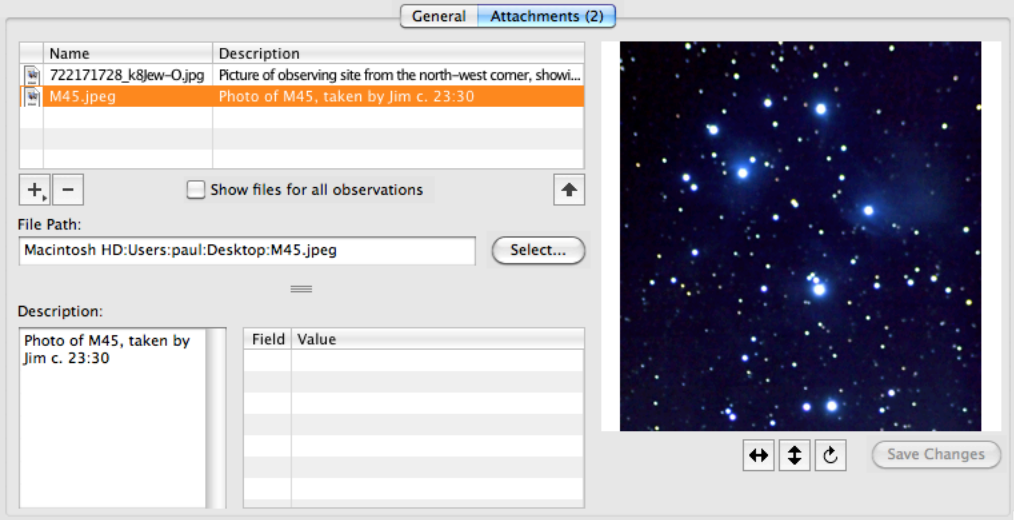


Figure 161: Observation attachments tab

At the top left is a list of attached files, showing the file name and the first part of an arbitrary description assigned to the attached file.

If you select an entry, the file contents (where possible) is displayed on the right, and the file path, optional description, and optional user-defined values displayed below the list.

To add a new file as an attachment, use one the following techniques:

- Drag the file from the Finder (Mac) or Windows Explorer (Windows) to the drop area on the right (where file contents are also displayed). You will be asked via a dialog whether you want to link to the existing file (which will save space, but will no longer be valid if the original file is deleted or moved), or copy the file to the database (in which case a copy is made into a special folder, and the original file can be subsequently moved or deleted without issue).

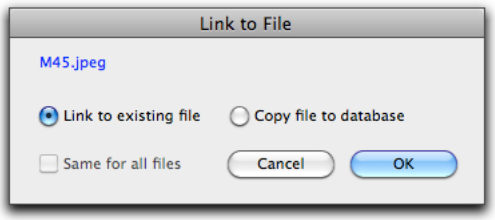


Figure 162: Link to file dialog

- Use the **+** button under the list. The menu gives you three options: link to an existing file (which will save space, but will no longer be valid if the original file is deleted or moved), copy an existing file to the attachment database (in which case a copy is made into a special folder, and the original file can be subsequently moved or deleted without issue), or copy an existing object image (if one exists) to the attachment database.

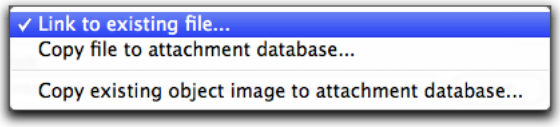


Figure 163: + button menu

If you use the third option, you'll be given a list of object images for the current object.

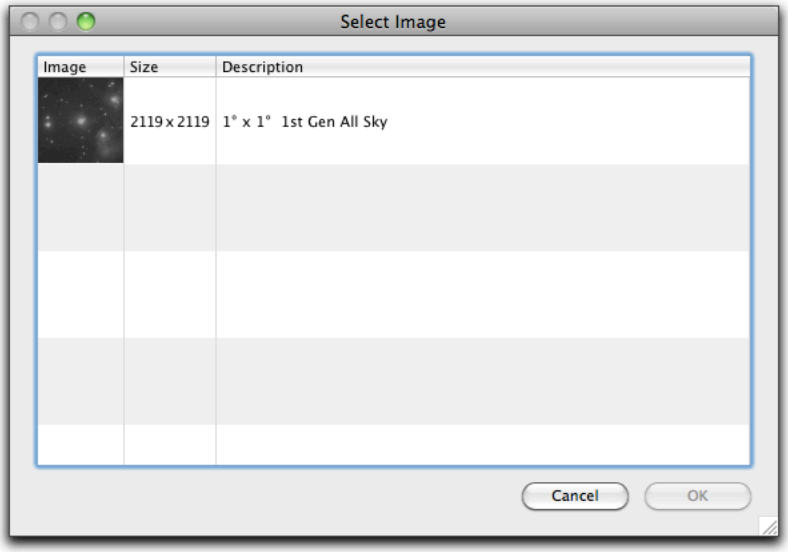


Figure 164: Select image dialog

The **Show files for all observations** checkbox, when checked, will list all attached files for all observations of the current object.

The button at the bottom right of the list of attachments will open the selected file attachment with an appropriate third-party application (where possible). e.g. if the attached file is an HTML file, then it will be opened in your browser, etc.

If you have an image file selected, the image will be displayed on the right, and the buttons underneath the image can be used to flip and/or rotate the image. You can also right-click the image and elect to open it with an external application, open it in a separate document window, or reveal it in the Finder (Mac) or Windows Explorer (Windows).

11.3.6 Observation functions

Clear-Sky chart

Observation > Forecasts > Clear-Sky Chart provides a chart from the Clear-Sky Chart site. The latitude and longitude of your currently-selected site is used to find the closest Clear-Sky site to that site, and displays its data (the distance to the site is shown in the title bar of the window). Clicking on the chart will take you to the website in your browser (if you have an Internet connection). This is only available for North American sites.

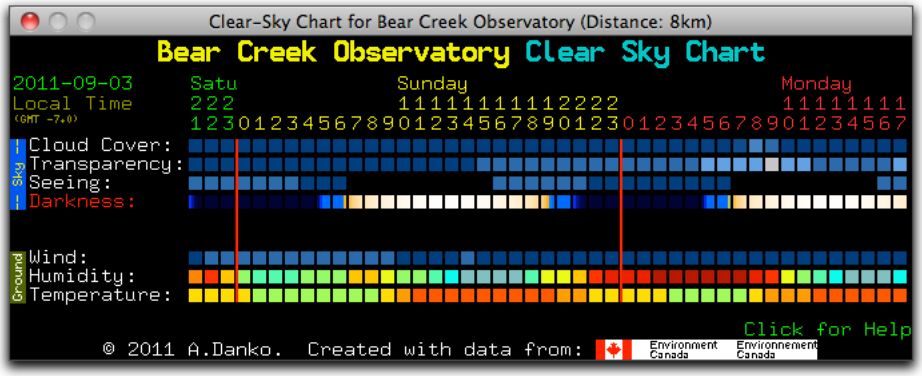


Figure 165: Clear-sky chart

7Timer chart

Observation > Forecasts > 7Timer Chart provides a chart from the 7Timer.com site. The latitude and longitude of your currently-selected site is used to find the observing conditions. Clicking on the chart will take you to the website in your browser (if you have an Internet connection).

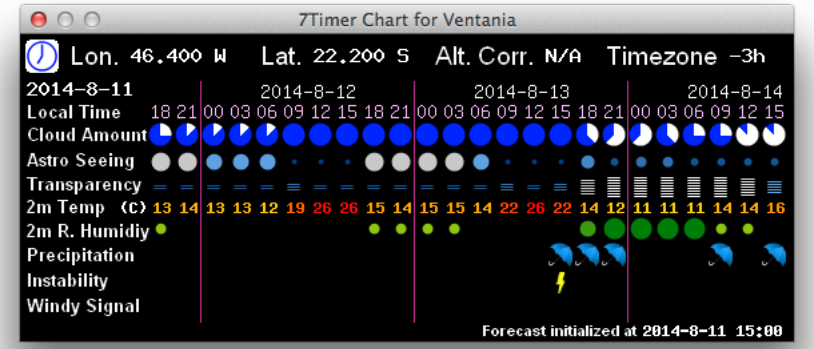


Figure 166: 7Timer chart

Site status

The Site status feature (***Observation > Site Status***) shows you a list of all your defined sites with their current status with respect to your local site (chosen via the popup menu at the upper left). Additionally, clicking the "Site:" label next to the current site popup on the plan document window will open the Site Status window.

The columns are:

- **Site**. The name of the site. If the site resource defines an URL, then it will be displayed in blue with underlining. The local site is is shown with bold text.
- **Local Date/Time**. The local time at that site.
- **Offset**. The offset in hours of the site from the local site.
- **Darkness**. The current state of darkness or twilight at the site. Can be "Dark", "Astronomical", "Nautical", "Civil", or "Daylight".

- **Next**. The time of the next "darkness" transition (e.g. Daylight to Sunset, Dark to Astronomical) and how long it will be.
- **Moonrise**. Time of moonrise.
- **Moonset**. Time of moonset.

The world map at the bottom left shows the positions of your local site and the selected site (where applicable). If the selected site defines an URL, that URL will be displayed at the bottom right.

You can use your computer clock as the current local date/time, or use an arbitrary date/time using the settings at the top right.

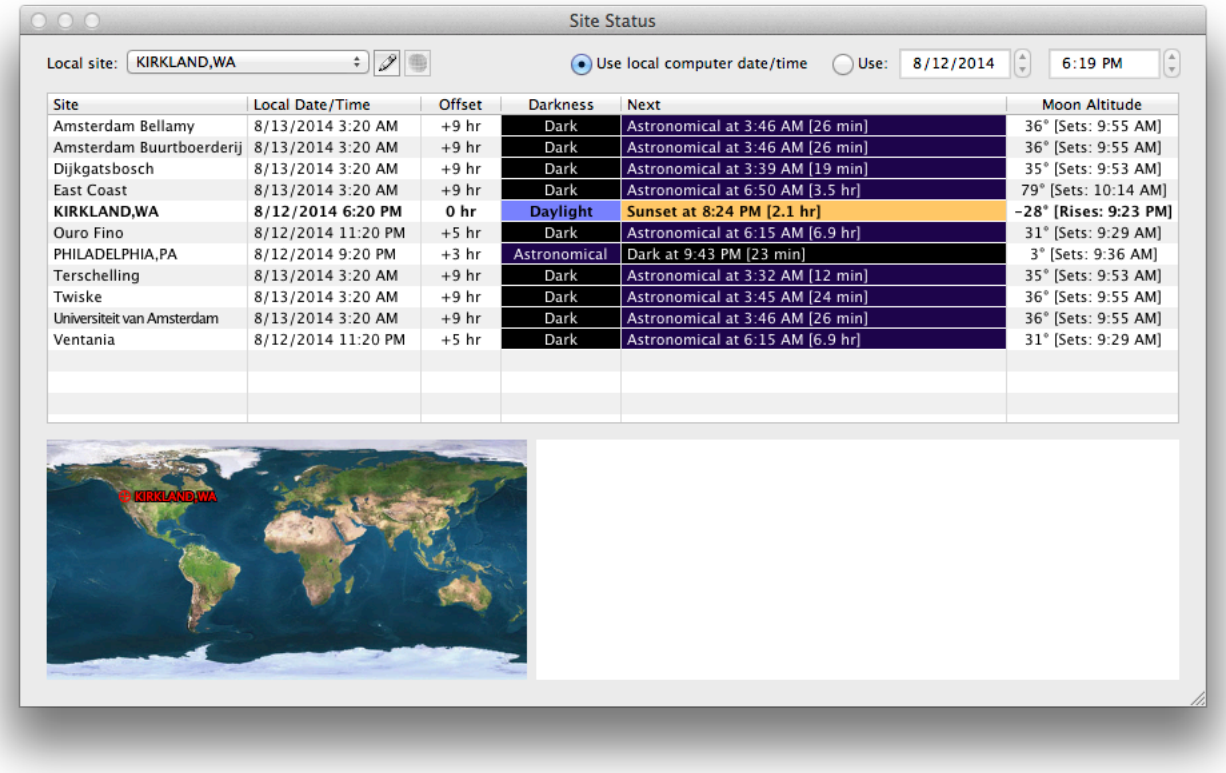


Figure 167: Site status window

Night Vision Mode

Observation > Night Vision Mode toggles this mode on and off. This causes the entire screen to be rendered in red (or green or grey) tones to help when you are using the computer in the field. This works pretty well on Mac computers. Unfortunately this is not the case on Windows.

On Windows the application attempts to colour as much of the interface as it can, but does not do a good job on some widgets. The work-around is to select the Windows Classic theme from the Display control panel. The UI is not quite as fancy as the standard themes, but night vision mode works a lot better.

In general, you are probably a lot better off using a physical screen cover (made of red plexiglass, etc.)

You have quite a lot of control over the colours and darkness of the screen via the Night Vision preferences (see Section 20.1.2 on page 286).

11.4 Field of View tab

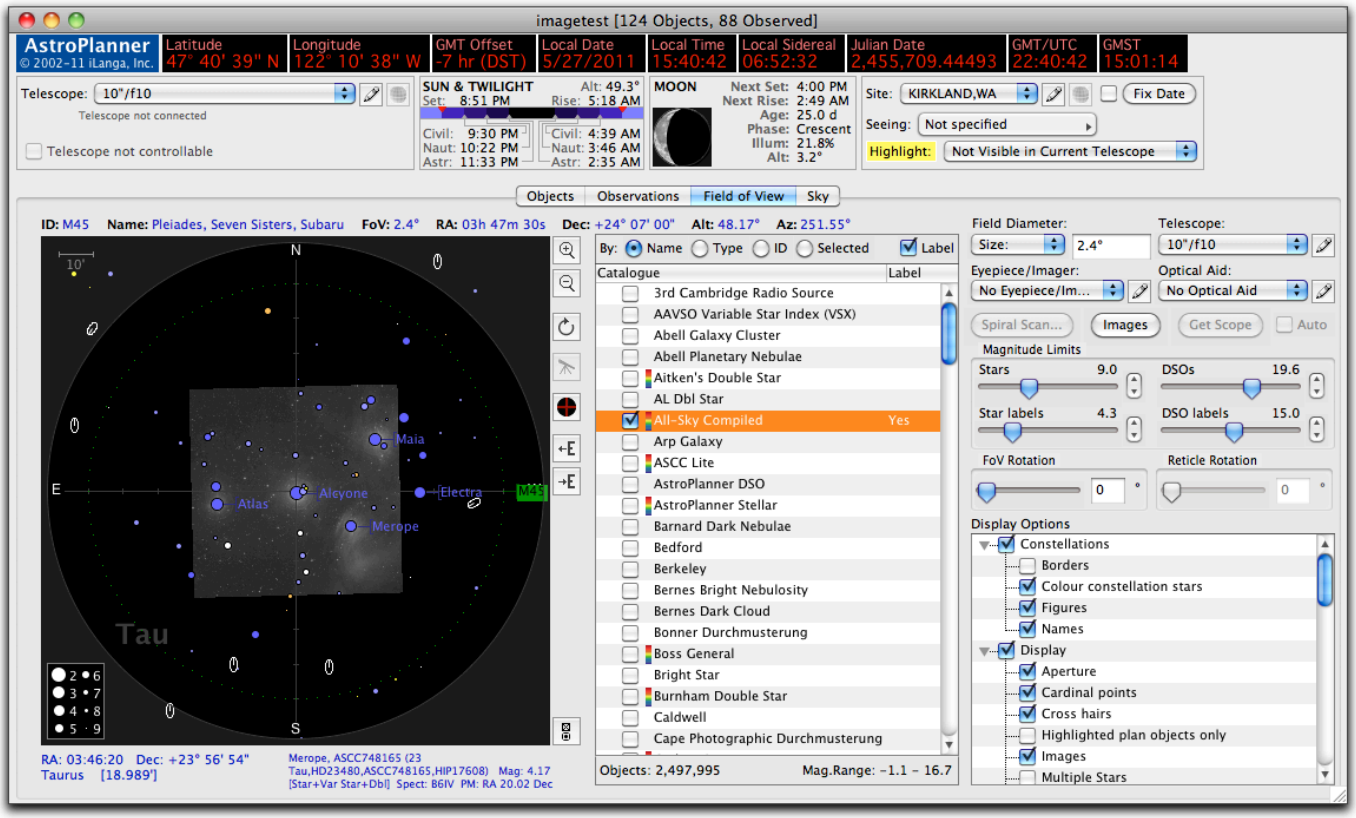


Figure 168: Field of View tab

The Field of View tab is designed to show a chart that represents a visualisation of what you are going to see through your telescope.

11.4.1 Field of View chart

The chart is displayed on the left of the tab (with all the controls and options on the right). The default chart shows a round "aperture" that represents the actual field of view of the telescope/eyepiece/optical aid combination.

It will display objects from the catalogues you select on the right, together with images, constellations, objects in your plan document object list, etc. Moving the cursor around on the chart will show (below the chart) the coordinates of the mouse cursor, and information on objects you are pointing at where applicable.

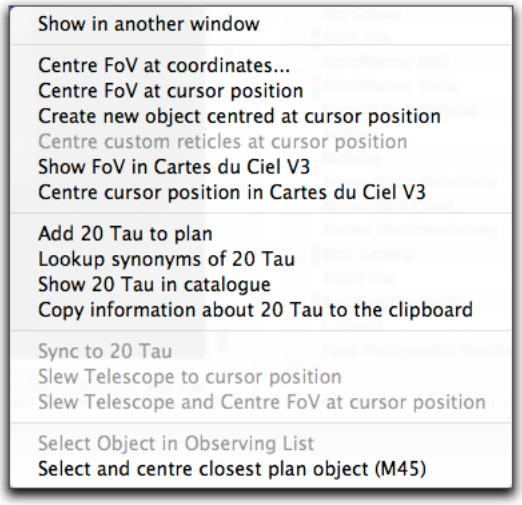


Figure 169: Field of view chart right-click menu

Right-clicking the mouse on the chart allows several operations:

- **Show in another window**. Creates a new window containing a copy of the current chart. That chart will remain static and will not change when the actual field of view chart is modified.
- **Centre FoV at coordinates**. Re-centre the field of view chart at given coordinates. A dialog is presented to enter the RA/Dec coordinates.

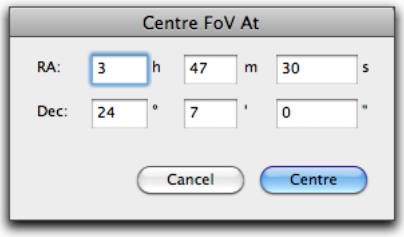


Figure 170: Re-centre at coordinates dialog

- **Centre FoV at cursor position**. Re-centre the field of view chart at the mouse cursor coordinates (where the right-click took place).
- **Centre custom reticles at cursor position**. Centre the custom reticle/s at the mouse cursor coordinates (where the right-click took place).
- **Show FoV in {External Application}**. Show the current field of view in the specified external planetarium application. i.e. the external application should centre itself to the same coordinates as the centre of the chart.
- **Centre cursor position in {External Application}**. Centre the specified external planetarium chart at the coordinates of the mouse cursor (where the right-click took place).
- **Add {catalogue object} to plan**. Enabled if the mouse cursor (where the right-click took place) is over or close to a displayed catalogue object. This will add that catalogue object to the plan as a plan object.

- **Lookup synonyms of {catalogue object}**. Enabled if the mouse cursor (where the right-click took place) is over or close to a displayed catalogue object. This will search for all synonyms of the catalogue object and display them in a results window.
- **Show {catalogue object} in catalogue**. Enabled if the mouse cursor (where the right-click took place) is over or close to a displayed catalogue object. This will open a window displaying the object in its originating catalogue.
- **Copy information about {catalogue object} to the clipboard**. Enabled if the mouse cursor (where the right-click took place) is over or close to a displayed catalogue object. This will copy text information about that catalogue object onto the clipboard (name, ID/s, coordinates, etc.).
- **Sync to {catalogue object}**. Enabled if the mouse cursor (where the right-click took place) is over or close to a displayed catalogue object, and if a go-to telescope mount is connected and has the capability of syncing. The telescope mount will be synced to the coordinates of the object.
- **Slew telescope to cursor position**. Enabled if a go-to telescope mount is connected. Slews the telescope to the coordinates of the mouse cursor (where the right-click took place).
- **Slew telescope and Centre FoV at cursor position**. Enabled if a go-to telescope mount is connected. Slews the telescope to the coordinates of the mouse cursor (where the right-click took place), and re-centres the chart at that position.
- **Select Object in observing list**. Enabled if the mouse cursor (where the right-click took place) is over or close to a displayed plan object. If so, that object will be selected in the object list.
- **Select and centre closest plan object**. Find the plan object closest to the mouse coordinates (where the right-click took place) and centre the chart there.

11.4.2 Catalogue selection

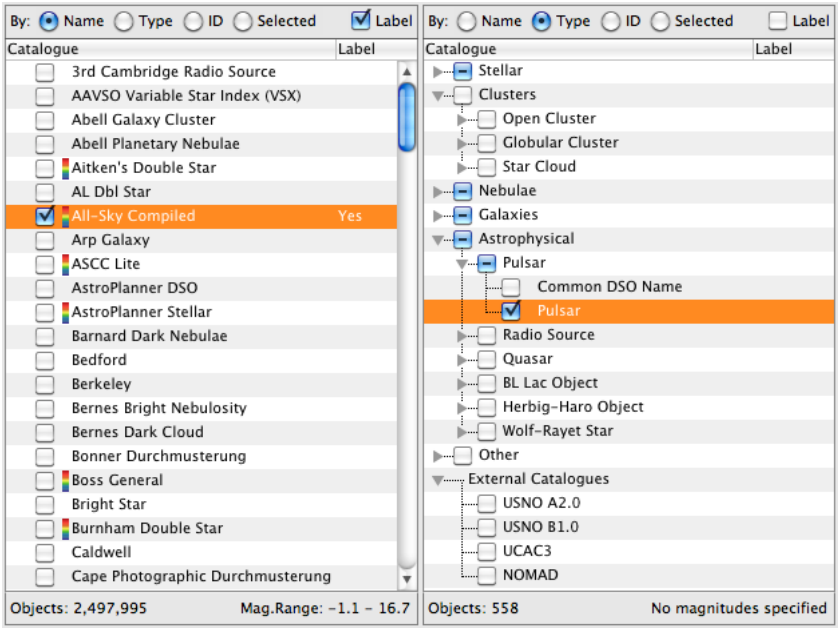


Figure 171: Catalogue selection by Name and by Type

The catalogue selector is a list of installed catalogues and external catalogues that can be displayed in the field of view chart. Each catalogue has a checkbox that determines if it will be included in the

chart. The list of catalogues can be displayed in any of four modes, determined by the radio buttons along the top (illustrated in Figure 171 and Figure 172):

- By **Name**. An alphabetical list of installed catalogues, by name.
- By **Type**. A hierarchical list of installed catalogues, ordered by the types of objects in the catalogues. e.g. ***Clusters > Globular Cluster*** will list all catalogues containing at least one globular cluster object. Note that this means that a catalogue might appear at several places in the hierarchy, depending on what kinds of objects it contains.
- By **ID**. An alphabetic list of IDs. Each ID category contains a list of installed catalogues containing objects with that ID.
- By **Selected**. Shows a list of the currently-selected installed catalogues.

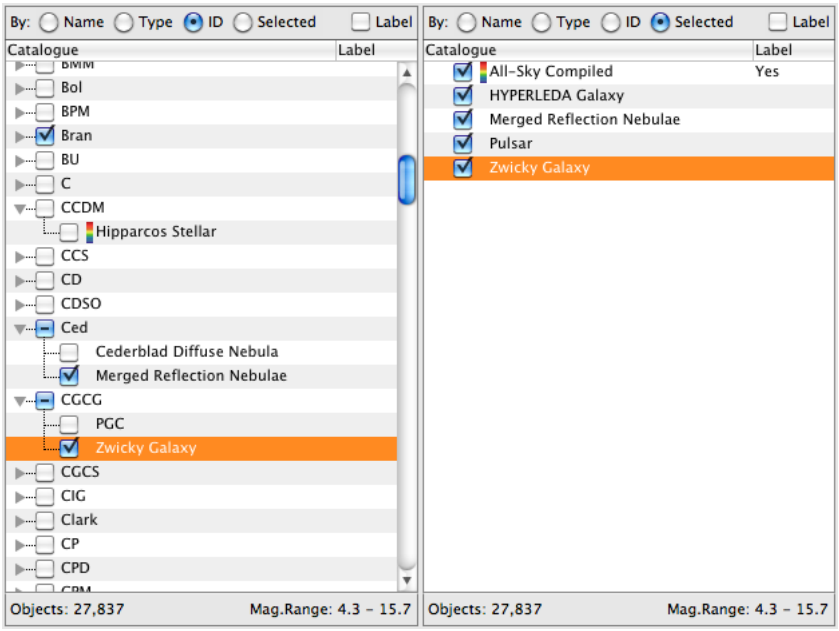


Figure 172: Catalogue selection by ID and by Selected

If you have any external catalogues defined and enabled (see Section 20.6.15 on page 303 for more details), then these will be listed after the installed catalogues, in a separate **External Catalogues** section.

When you select a catalogue (by clicking on its entry) you can toggle the **Label** column by either double-clicking that column for the catalogue, or by using the **Label** checkbox at the top right. If the Label is enabled for a catalogue then objects from that catalogue will be labelled if the object's magnitude is brighter than the label magnitude settings (see Section 11.4.9 on page 138).

Basic information for a selected catalogue also appears at the bottom of the list.

11.4.3 Display Options

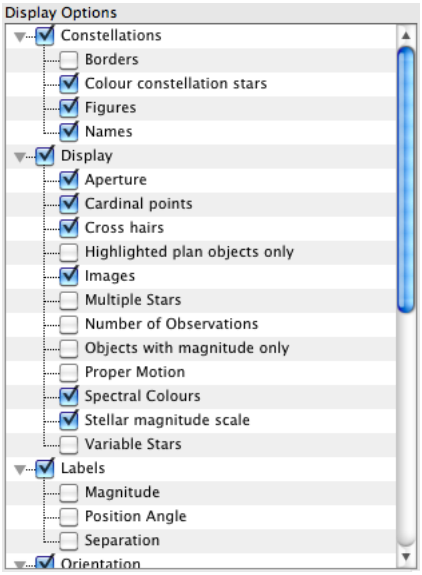


Figure 173: FoV display options

The Display Options are a list of options for displaying the chart. Switch them on/off via the check-box. They are defined as follows:

Constellations

These options define if and how constellations are displayed in the field of view chart.

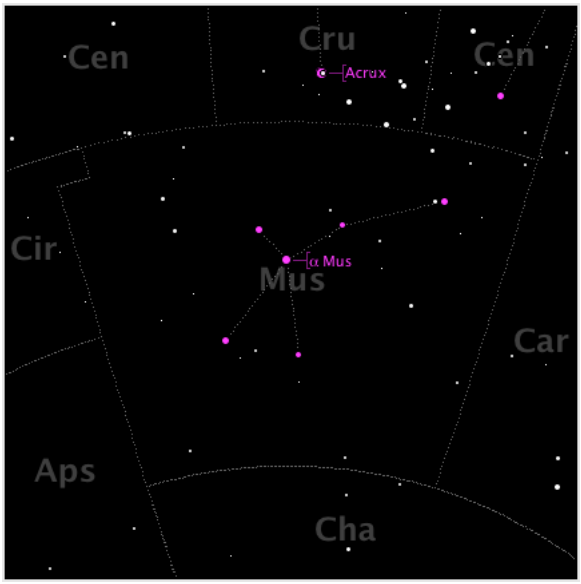


Figure 174: Constellation display options at work

- **Borders**. Draw the borders of each constellation present in the chart, using a grey dotted line.
- **Colour constellation stars**. Give the stars that define the constellation "figure" a distinctive colour (default: magenta, can be changed via the Field of View preferences. See Section 20.6 on page 299).

- **Figures**. Draw the figure of each constellation present in the chart, using a grey dotted line. The figure is a collection of lines joining the main stars that represent the constellation.
- **Names**. Draw the 3-character abbreviated constellation names, in grey.

Display

Change various visual aspects of the chart.

- **Aperture**. Draws a circular aperture on the chart showing the extent of the field of view.

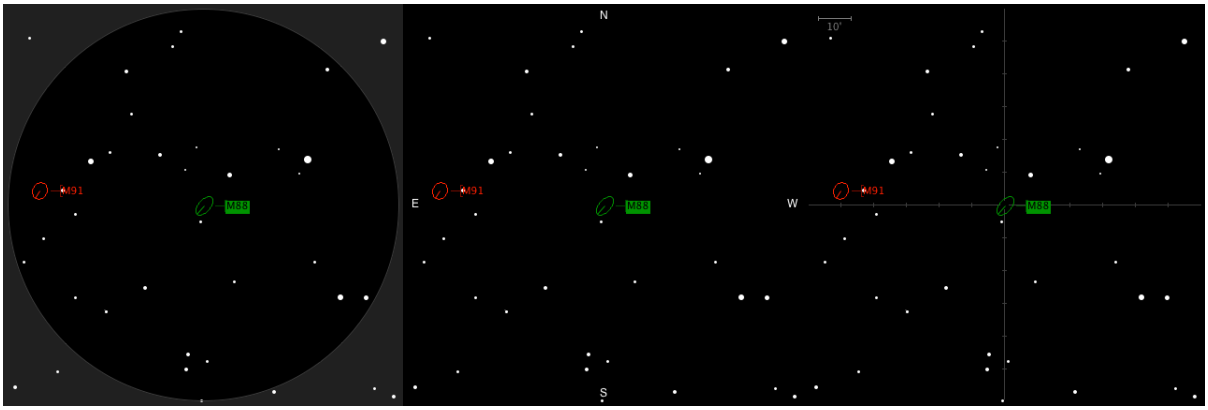


Figure 175: Aperture (*left*), Cardinal points (*centre*), Crosshairs (*right*)

- **Cardinal points**. Draws the cardinal points (NSEW) on the chart.
- **Cross hairs**. Draws crosshairs centred on the field of view, with tick marks at regular intervals. The tick mark interval is given at the top left.
- **Current telescope position**. Turns on/off the ability to display the current pointing coordinates of the connected telescope (where applicable).
- **Highlighted plan objects only**. Only show plan objects that are currently highlighted.
- **Images**. Show any DSS/SDSS images that overlap the field of view.

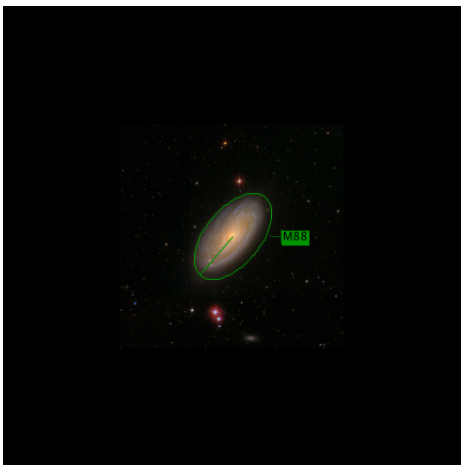


Figure 176: Images in the field of view chart

- **Multiple stars**. Show stars with multiple components with a horizontal bar.

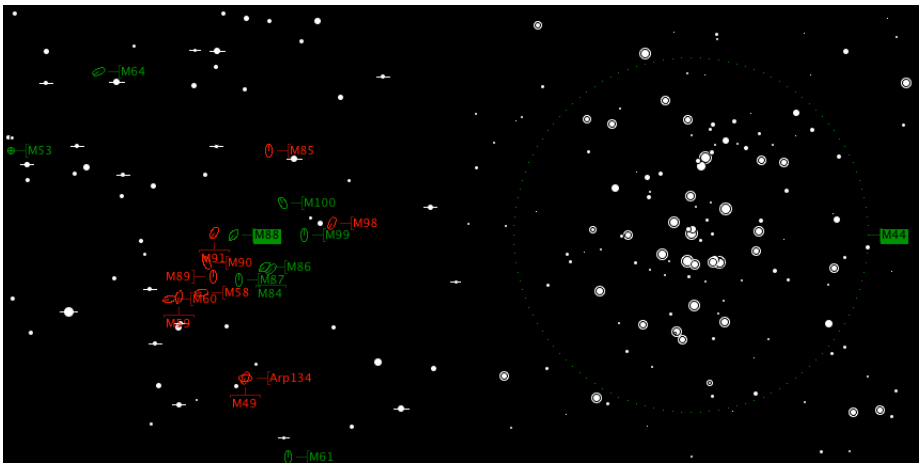


Figure 177: Multiple stars (*left*), Variable stars (*right*)

- **Number of observations**. For plan objects, show number of observations made, where applicable.

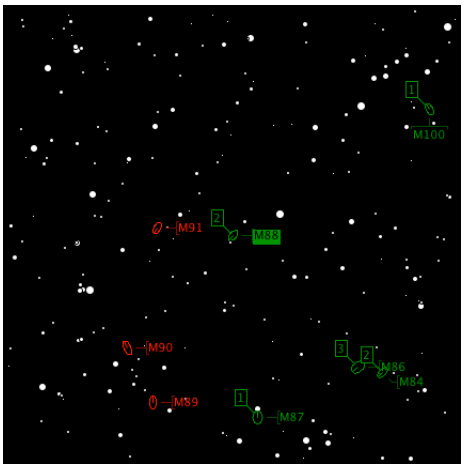


Figure 178: Number of observations

- **Objects with magnitude only**. Show only catalogue objects that have an associated magnitude.
- **Obey catalogue min/max magnitudes**. If any displayed catalogues have a minimum and/or maximum magnitude restriction (See File > Catalogue Manager > Coverage and Settings), then those restrictions will be obeyed and any catalogue objects that have a magnitude outside the restricted range will not appear in the chart.
- **Plan object at chart centre only**. If this option is on then any plan objects that are in the field of view, but not at the centre coordinates of the field of view, will not be displayed.
- **Show constellation sub-chart**. Superimpose a small constellation chart at the bottom right of the main chart, showing the constellation at the centre of the main chart. The main chart centre is shown as a small red ring. See Figure 180.
- **Show Date/Time if date fixed**. If the date/time is currently fixed and this option is enabled, the current date/time will be displayed at the bottom of the chart as a warning. See Figure 179.

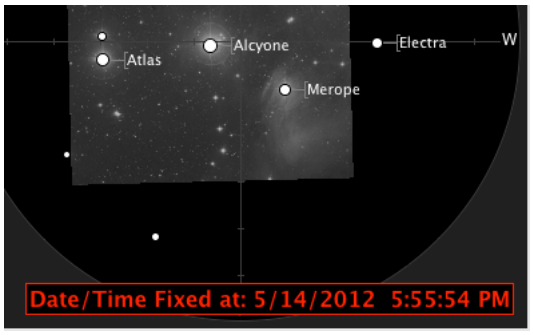


Figure 179: Show Date/Time if date fixed

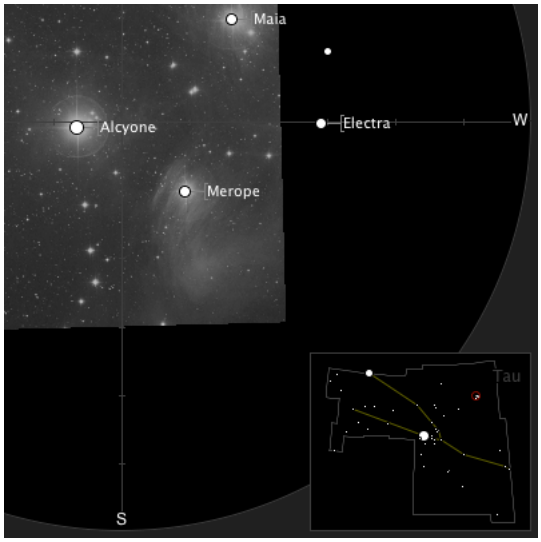


Figure 180: Constellation sub-chart

- **Proper motion**. Show the proper motion direction of stars by adding a short grey line pointing in the direction of the proper motion, with its length proportional to the magnitude of that motion. Useful for looking for associated cluster stars, for example. Note that this is only applicable to stellar catalogues that include proper motion. Note that when this option is on, appropriate catalogues (those containing proper motion data) in the catalogue list are marked with a small double-headed arrow icon.
- **Spectral colours**. Show the stellar spectral class by colouring stars in an appropriate colour. This only applies to catalogue stars that have an associated spectral class. Note that when this option is on, appropriate catalogues (those containing spectral data) in the catalogue list are marked with a small "spectrum" icon.

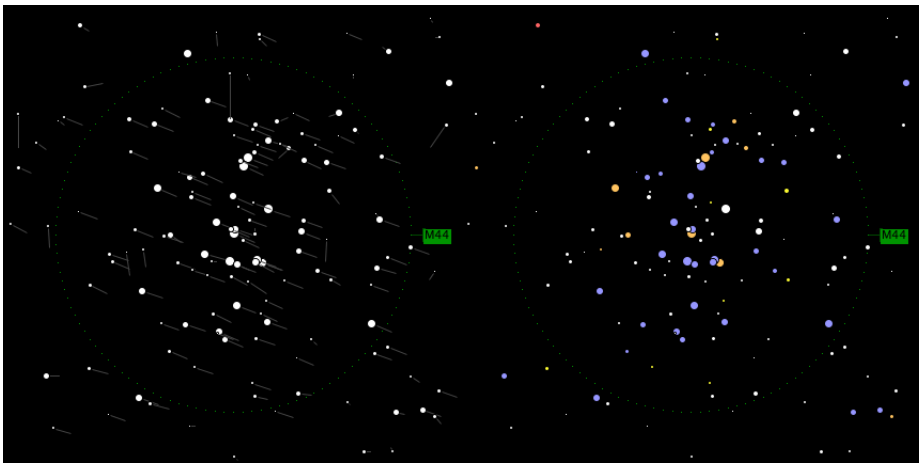


Figure 181: Proper motion (left), Spectral colours (right)

- **Stellar magnitude scale**. Show the stellar magnitude scale at the bottom left of the chart.

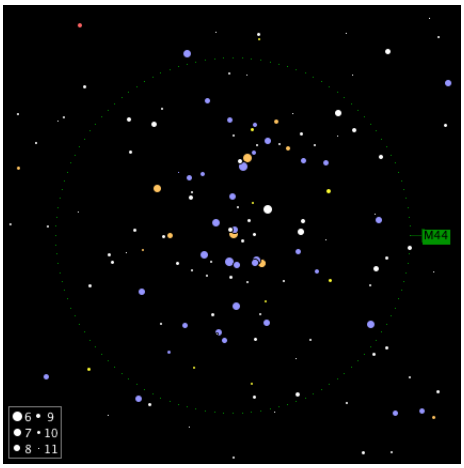


Figure 182: Stellar magnitude scale

- **Variable stars**. Show any variable stars with a circle around them.

Labels

These are labels on any plan or catalogue objects, where applicable.

- **Magnitude**. Show the magnitude of objects in the chart, assuming that they have an associated magnitude and that magnitude is within the magnitude limits for labels.
- **Position angle**. Show the position angle for objects in the chart (double stars, galaxies, etc.), assuming that they have an associated position angle and the object magnitude is within the magnitude limits for labels.
- **Separation**. Show the separation for objects in the chart (double stars, etc.), assuming that they have an associated separation and the object magnitude is within the magnitude limits for labels.

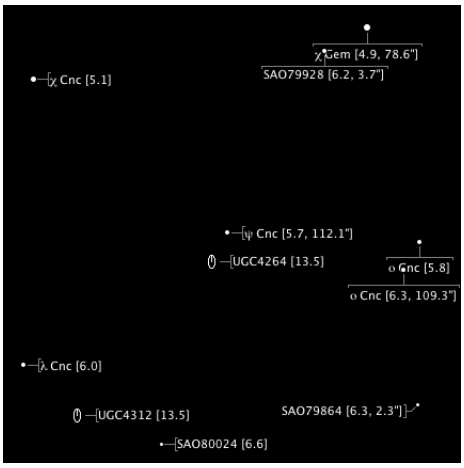


Figure 183: Labels, showing magnitude, position angle, separation

Orientation

- **Alt/Az rotation**. The field of view is rotated to show the field as would be seen by an alt/az-mounted telescope, or a binocular, pointed at the field at the current date/time from the current site.

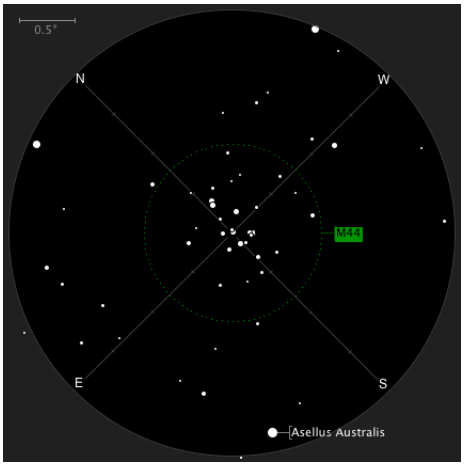


Figure 184: Alt-Az rotation

- **Flip horizontal**. Flip the field horizontally.
- **Flip vertical**. Flip the field vertically.

Other

- **Ignore imager guide sensor**. If you are sizing the field of view chart to fit an imager, and the imager has a integral off-axis guide sensor, then the field of view is sized to fit the track of the guide sensor. If this option is checked, the guide sensor is ignored and the field of view is sized to fit the main sensor only.

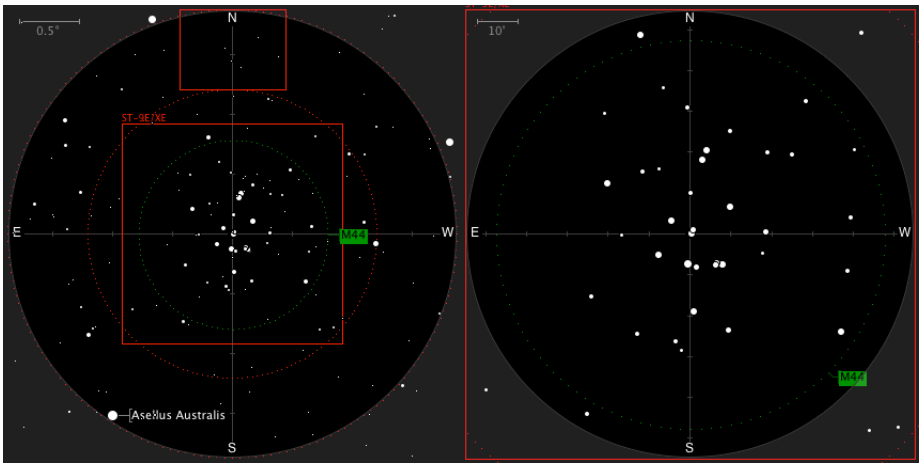


Figure 185: Ignore imager guide sensor option off (*left*) and on (*right*)

- **Legend**. Displays a floating window with a legend for star magnitudes and DSOs. If spectral star colours are being displayed, a spectral colour legend is included.

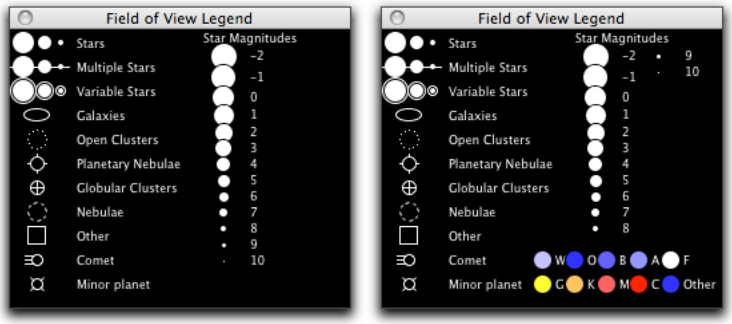


Figure 186: Field of view floating legend

- **Show object notes**. Show the object notes, for the object being pointed at by the mouse cursor, in a floating window.

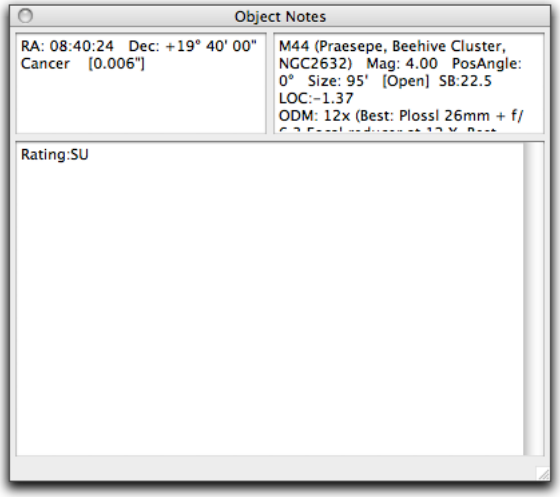


Figure 187: Object notes floating window

Reticles/FoVs

Controls the display of reticles and field-of-view outlines for eyepieces, etc.

- **All binocular FoVs**. Display circular reticles for all active "binocular" telescope resources in your resource database.

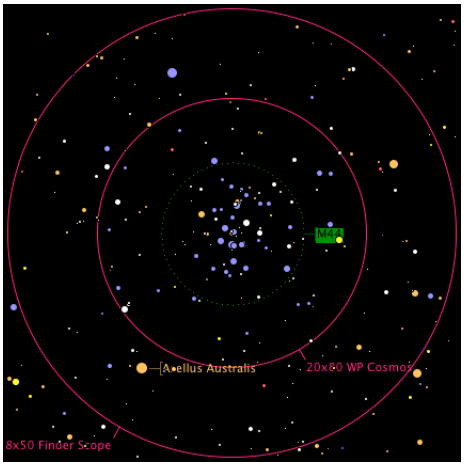


Figure 188: All binocular FoVs

- **All eyepiece FoVs**. Display circular reticles for all active eyepieces resources in your resource database. The diameter of the FoV reticles will depend upon the selected telescope resource.

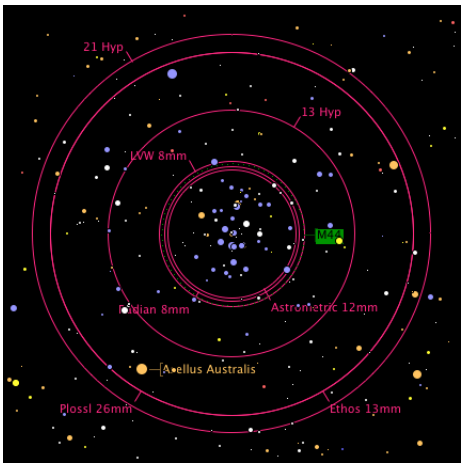


Figure 189: All eyepiece FoVs

- **Binocular FoV**. Display the binocular FoV extent, if the currently selected telescope resource is a binocular.

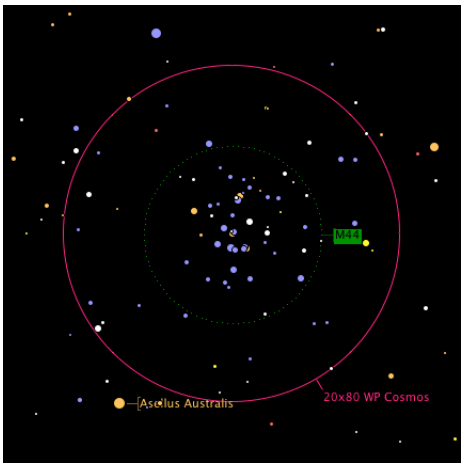


Figure 190: Binocular FoV

- **Custom reticles**. Display any active custom reticles (see Section 11.4.13 on page 140).

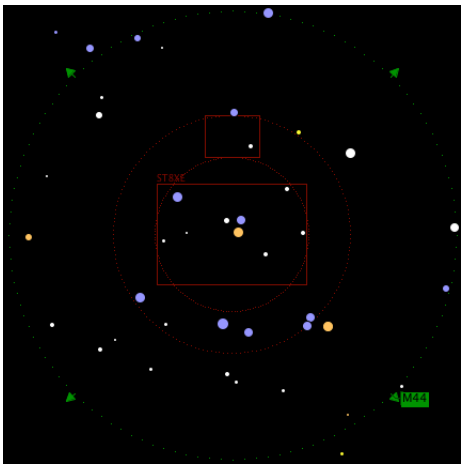


Figure 191: Custom reticles

- **Eyepiece FoV**. Display the eyepiece FoV extent, if an eyepiece resource and telescope resource are currently selected.

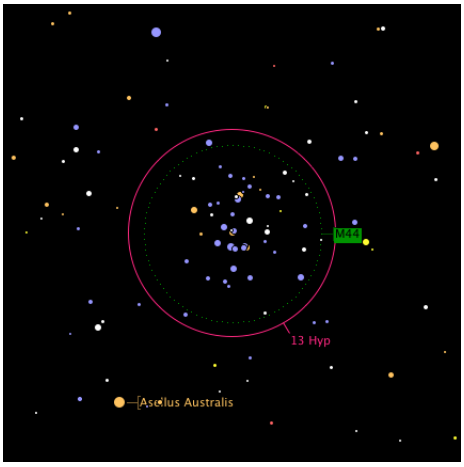


Figure 192: Eyepiece FoV

- **Fit imager to FoV aperture**. When sizing the field of view to fit an imager, then this option will size the chart so that the imager fits inside the circular aperture.

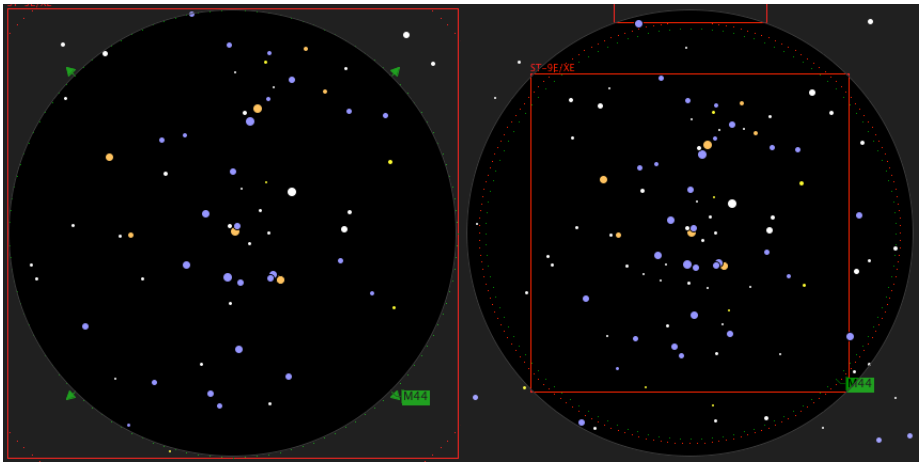


Figure 193: Fit imager to FoV aperture: off (*left*) and on (*right*)

- **Hide eyepiece reticle**. If the currently-selected eyepiece resource has a reticle, then this option will hide that reticle.

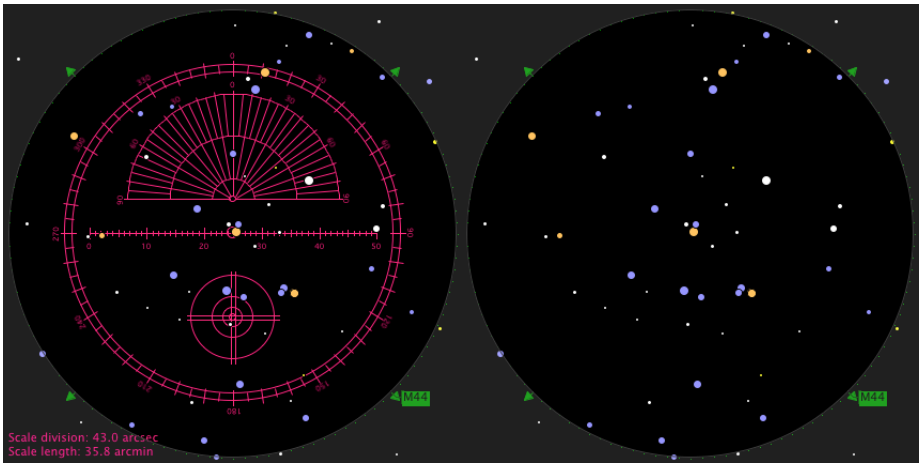


Figure 194: Hide eyepiece reticle: off (*left*) and on (*right*)

- **Imager FoV**. If this option is on, and an imager is selected, then display that imager's FoV.
- **Rigel QuickFinder**. Display a reticle for the Rigel QuickFinder, which projects circles of diameter 0.5° and 2° onto the sky.
- **Telrad**. Display a reticle for the Telrad, which projects circles of diameter 0.5°, 2° and 4° onto the sky.

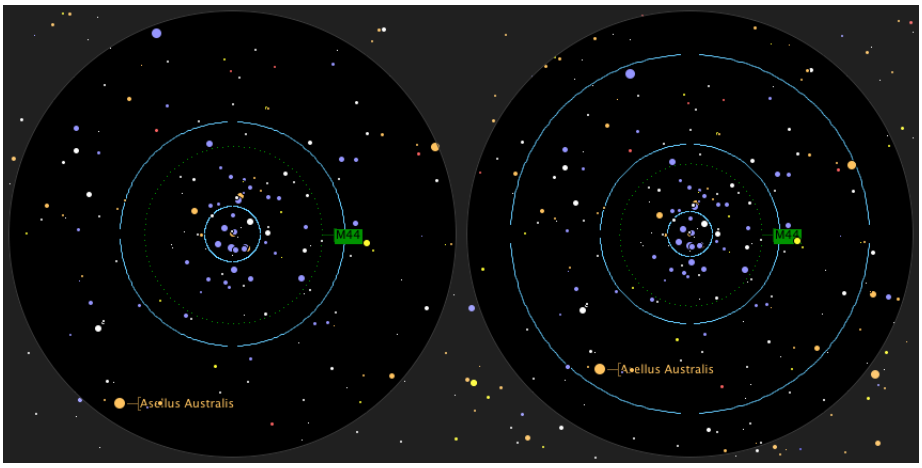


Figure 195: Rigel QuickFinder reticle (*left*) and Telrad reticle (*right*)

- **Crosshairs/Grid...** Display either crosshairs or a grid on the chart. The grid or crosshairs can be rotated using the Reticle Rotation slider. Double-clicking the display option entry allow changing of the parameters (Figure 198).

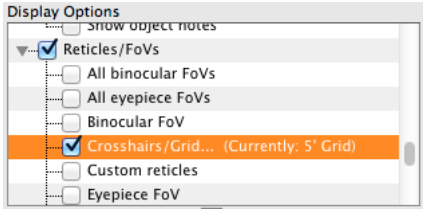


Figure 196: Crosshairs/Grid

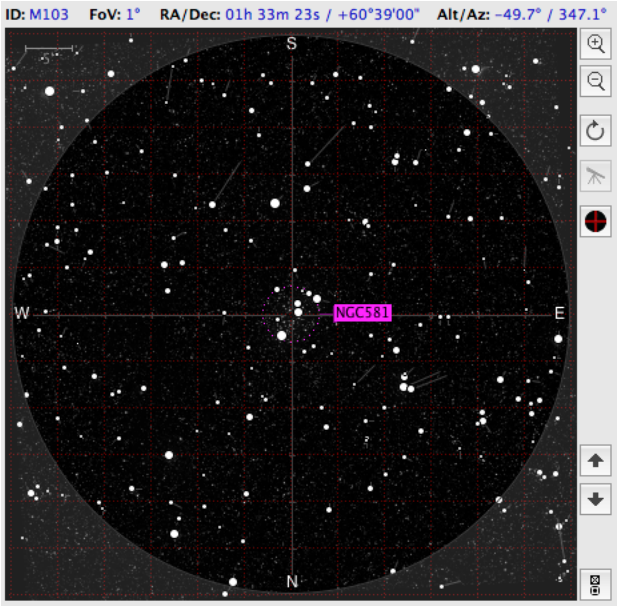


Figure 197: FoV showing 5' grid

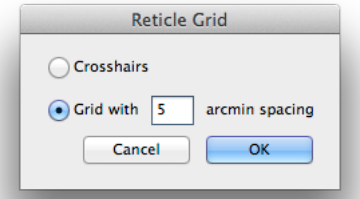


Figure 198: Changing grid parameters

Solar System

Turn on/off the display of various solar system objects.

- **Show Comets.** Show/hide any comets that appear in the plan document object list.
- **Show Minor Planets.** Show/hide any minor planets that appear in the plan document object list.
- **Show Moon.** Show/hide the moon (whether or not it's a plan object).
- **Show Planets.** Show/hide the planets (whether or not they are plan objects).
- **Show Sun.** Show/hide the sun (whether or not it's a plan object).

11.4.4 Field diameter

The **Field Diameter** specifies the angular size of the field of view chart.

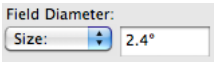


Figure 199: Field diameter

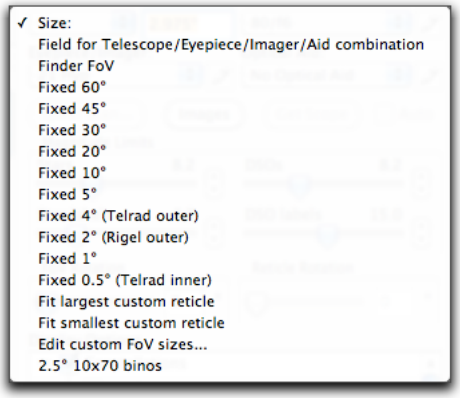


Figure 200: Field diameter popup menu

The popup menu determines how this is calculated:

- **Size**. Specify the field of view diameter (in degrees) by manually entering the diameter in the text field. Note that you can enter the size in arcminutes by appending ' to number, or arcseconds by appending ".
- **Field for Telescope/Eyepiece/Imager/Aid combination**. Computes the FoV diameter by taking into account the telescope and eyepiece/imager selection (and optical aid if specified).

- **Finder FoV**. If a telescope is specified, and that telescope resource has a Finder scope specified, then the field of view diameter is set to the finder scope's FoV.
- **Fixed 60°, etc**. Various fixed angular diameters.
- **Fit largest custom reticle**. Change the diameter to fit the largest active custom reticle.
- **Fit smallest custom reticle**. Change the diameter to fit the smallest active custom reticle.
- **Edit custom FoV sizes...** Allows adding and removing additional fixed diameter entries to the popup list. The dialog allows you to select and remove an entry, or adding a new entry to the end of the list.

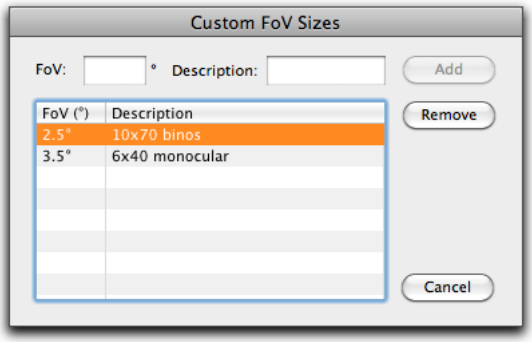


Figure 201: Custom FoV Sizes dialog

11.4.5 Telescope/Eyepiece/Imager/Optical Aid

These specify the resources to be used to compute the diameter of the field of view chart (unless the **Field Diameter** is set to a choice other than ***Size:***).

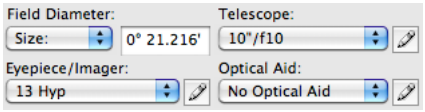


Figure 202: FoV resource selectors

11.4.6 Spiral Scan

Starts or continues a telescope spiral scan, assuming a go-to-controllable telescope mount is connected. See Section 13.10 on page 210 for more details.

11.4.7 Images

Opens the Images window, showing images for the current field of view chart where applicable.

11.4.8 Get Scope

If a computerised telescope is connected, then the **Get Scope** button is enabled. Clicking the button will get the telescope's current pointing coordinates and centre the field of view chart there. If the **Auto** checkbox is checked, then this will be done automatically at regular intervals and the chart updated is the coordinates have changed.

11.4.9 Magnitude limits

These slider controls specify the magnitude limits for stars and DSOs (non-stellar deep-sky objects) in the field of view chart. e.g. in Figure 203, stars down to magnitude 9.1 will be plotted, with labels shown for those stars of magnitude 4.3 or brighter (if the catalogue containing the star has its Label

flag enabled). Similarly, DSOs of magnitude 9.1 or brighter will be plotted, with labels on any with magnitude 15.0 or brighter.

Figure 203: Field of view magnitude limits

Note that the Star/DSO magnitude sliders will be automatically set to the selected telescope's visible magnitude limit whenever that telescope is changed (assuming that the Default Limiting Magnitude option in the Field of View preferences is set. See Section 20.6.10 on page 302).

11.4.10 FoV rotation

Rotate the field of view chart by the selected angle (either use the slider or enter the angle manually). This option will be disabled if you are using the Alt/Az Rotation display option.

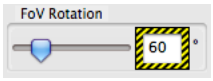


Figure 204: FoV Rotation slider

The numerical angle field is surrounded by a "warning" frame if the angle is non-zero to remind you that the field is rotated.

11.4.11 Reticle rotation

Rotate the imager reticle or custom reticle/s by the selected angle independently of the field of view (either use the slider or enter the angle manually). This option will be disabled if you are not displaying an imager or custom reticle.

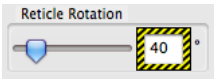


Figure 205: Reticle Rotation slider

The numerical angle field is surrounded by a "warning" frame if the angle is non-zero to remind you that the reticle/s is/are rotated.

11.4.12 Field of View chart buttons

These small buttons appear along the right side of the field of view chart.

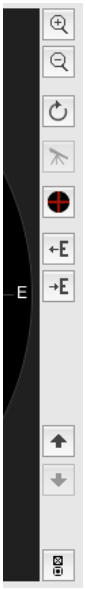


Figure 206: Field of view chart buttons

From top to bottom, these buttons are:

- **Zoom In**. Zoom in by a factor of 2 (i.e. halve the diameter of the chart), where possible.
- **Zoom Out**. Zoom out by a factor of 2 (i.e. double the diameter of the chart), where possible.
- **Refresh**. Force a refresh of the chart. This is rarely necessary.
- **Slew telescope**. If a telescope with a go-to mount is currently connected, slew the telescope to the coordinates of the centre of the chart.
- **Edit custom reticles**. Edit the custom reticles (see Section 11.4.13 on page 140).
- **Make the chart field the same as the external application's field**. If an external application has been specified, request the size and central coordinates of the application's chart field and, if successful, set the field of view chart to the same coordinates and size.
- **Make the external application's field the same as the chart field**. If an external application has been specified, request that the application set the size and central coordinates of its chart field to the same coordinates and size as the field of view chart.
- **Move UP the object list**. Select the previous object in the object list. If no object is currently selected, or the first object in the list is selected, then this button will be disabled. Clicking the button will select the previous object and redraw the chart.
- **Move DOWN the object list**. Select the next object in the object list. If no object is currently selected, or the last object in the list is selected, then this button will be disabled. Clicking the button will select the next object and redraw the chart.
- **Show the field of view preferences**. Show the field of view preferences (see Section 20.6 on page 299).

11.4.13 Custom reticles

Custom reticles are user-defined reticles that can be superimposed on the field of view chart, using the **Custom reticles** display option (see Reticles/FoVs on page 133). All editing of the custom reti-

cles is done via the Custom Reticles dialog. This is displayed via the **Edit custom reticles** button to the right of the field of view chart (see above).

The Custom Reticles dialog contains a list of defined reticles, each of which can be active or inactive via the associated checkbox (only active reticles will be displayed). Buttons underneath the list allow you to create new reticles, and delete or duplicate existing reticles.

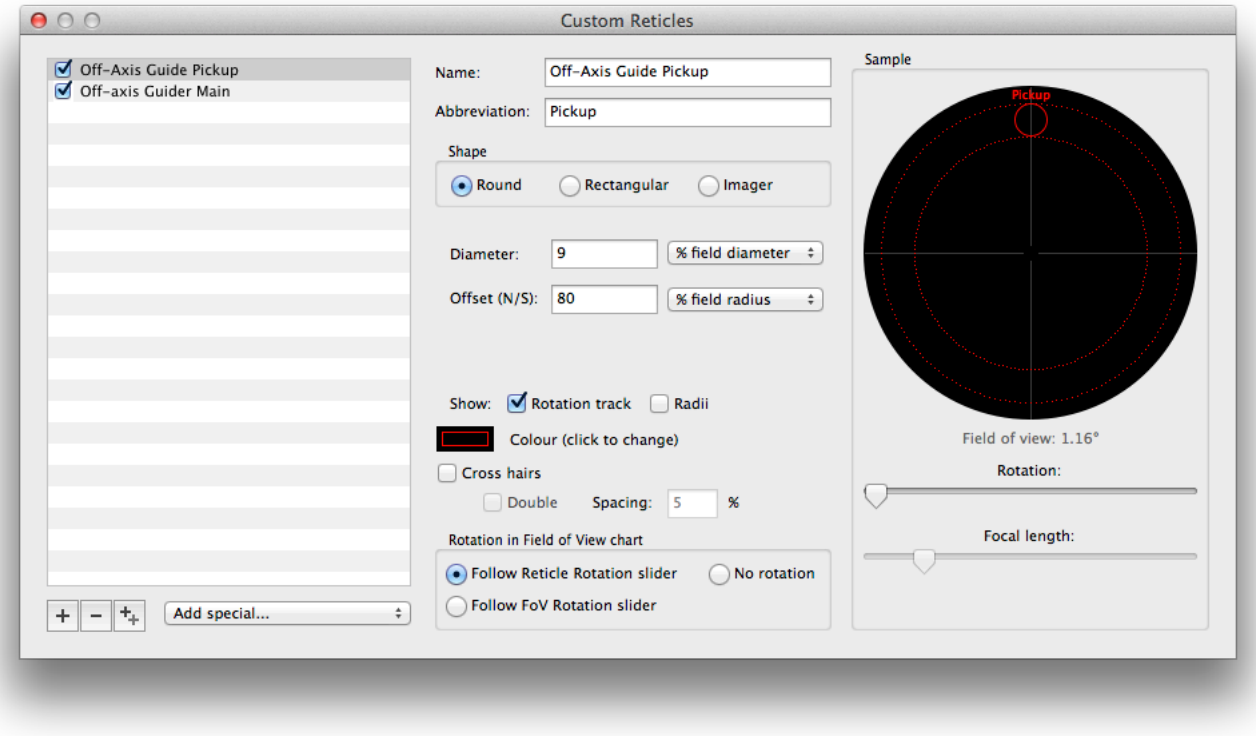


Figure 207: Edit a Round custom reticle

Custom reticles can be one of three types: Round, Rectangular, and Imager.

A **Round** reticle is defined by its angular diameter, or as a percentage of the field diameter or radius (Figure 207). It also has an optional offset from the centre of the field. These can be put to use as simple circular reticles, or as offset reticles (such as off-axis guider fields).

A **Rectangular** reticle is defined by its angular width and height (Figure 208). It also has an optional offset from the field of view centre.

An **Imager** reticle is defined by the physical width and height of the imager's sensor (in mm) (Figure 209). It also has an optional offset from the field of view centre. If an offset is specified it is assumed that the sensor is an off-axis star tracker and you can elect to show the track of the off-axis tracker when it is rotated, and the radii of the limits of the track (Figure 210). You can specify a telescope to determine the actual size of the reticle when drawn (it will be sized as if the imager sensor was placed at prime focus of that telescope). If you specify FoV Default then the reticle will be resized to match whatever telescope is currently selected for the field of view chart.

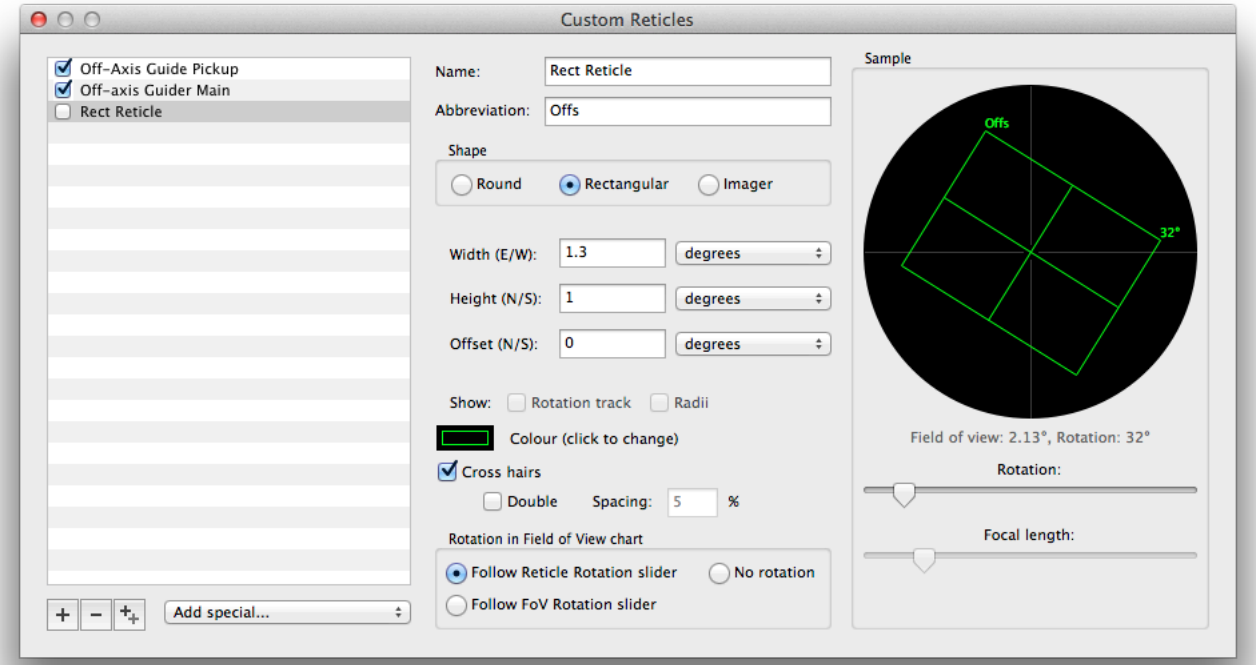


Figure 208: Edit a Rectangular custom reticle

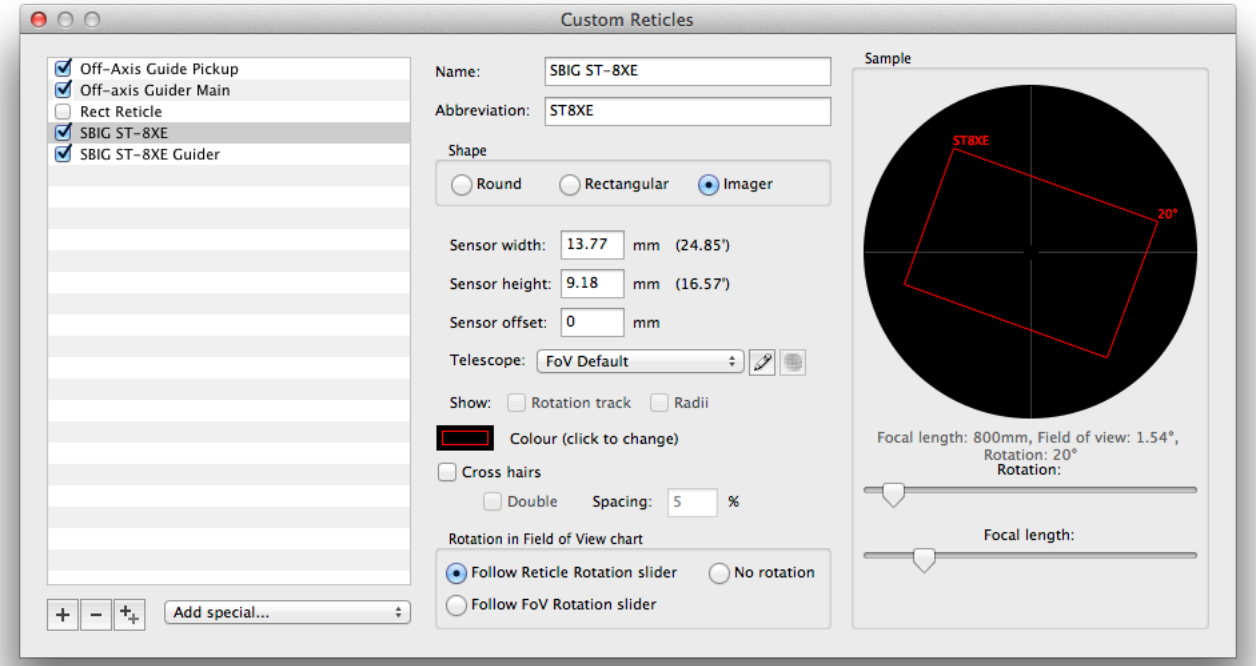


Figure 209: Edit an Imager custom reticle

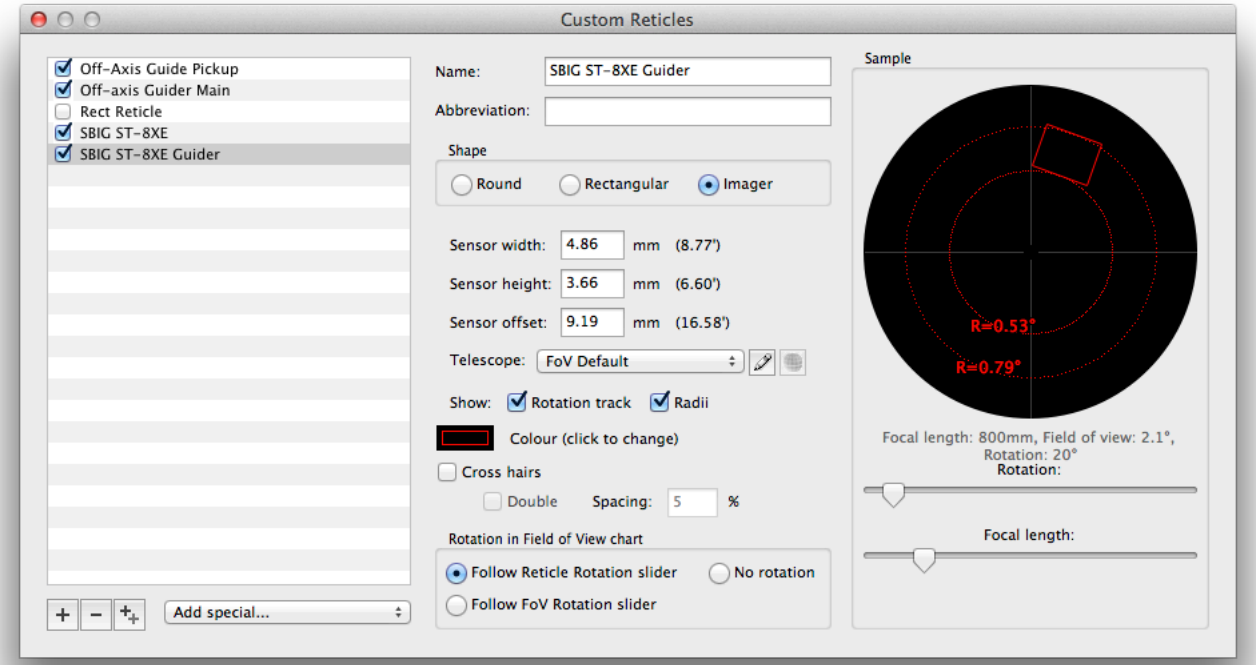


Figure 210: Offset image sensor example

Common items for all reticle types are:

- **Name**. Reticle name to be displayed in the list.
- **Abbreviation**. Abbreviated name to be displayed next to the reticle on the field of view chart.
- **Show: Rotation track**. Show the track an offset reticle will make when rotated around the centre of the field (Figure 210).
- **Show: Radii**. If a rotation track is shown, annotate it with the angular radii of the inside and outside of the track.
- **Colour**. The colour to be used to display the reticle in the field of view chart.
- **Cross hairs**. Check this if the reticle has cross hairs. If the cross hairs are double, then check the **Double** checkbox and enter the spacing of the hairs as a percentage of the reticle size.
- **Rotation in Field of View chart**. Custom reticles have three choices for rotation: Rotate with the Reticle Rotation slider, rotate with the FoV Angle slider, or no rotation. This is useful for, say, off-axis guiders where the pickoff mirror rotates separately from the main sensor/reticle. If you make your main imager reticle have "No rotation" and the pickoff mirror reticle have "Reticle rotation" then the pickoff mirror will be adjusted w.r.t. the imager using the Reticle Rotation slider. The FoV Rotation slider can be used to rotate the FoV under the main imager reticle for framing.
- **Add special**. A popup menu that allows you to add a new custom reticle based on any Imager resources, or a list of common Imager types (Figure 211).

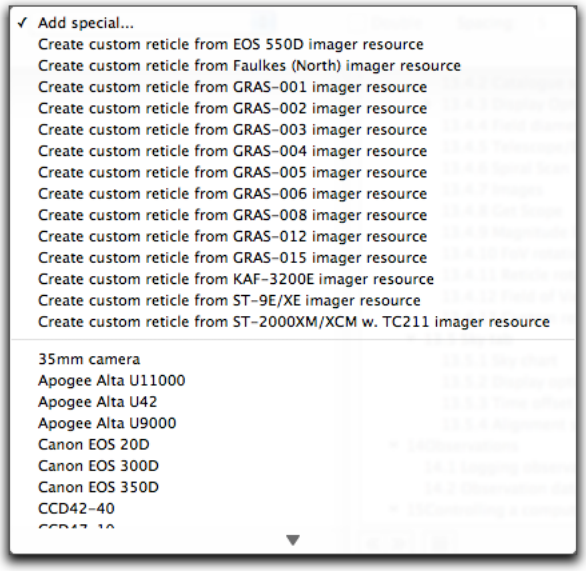


Figure 211: Pre-defined reticle list

11.5 Sky tab

The Sky tab displays an all-sky chart for the current local date/time at the current site.

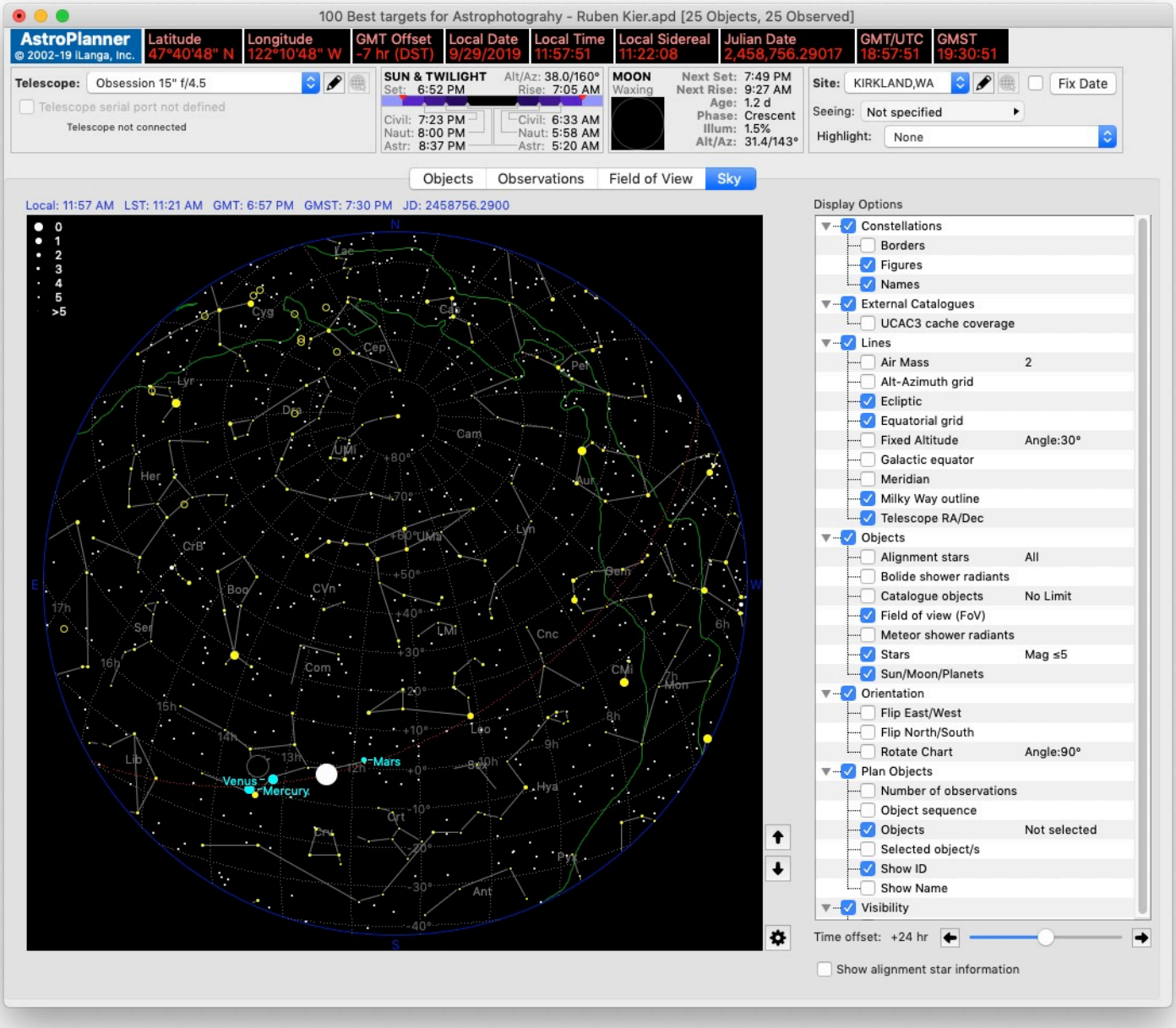


Figure 212: Sky tab

11.5.1 Sky chart

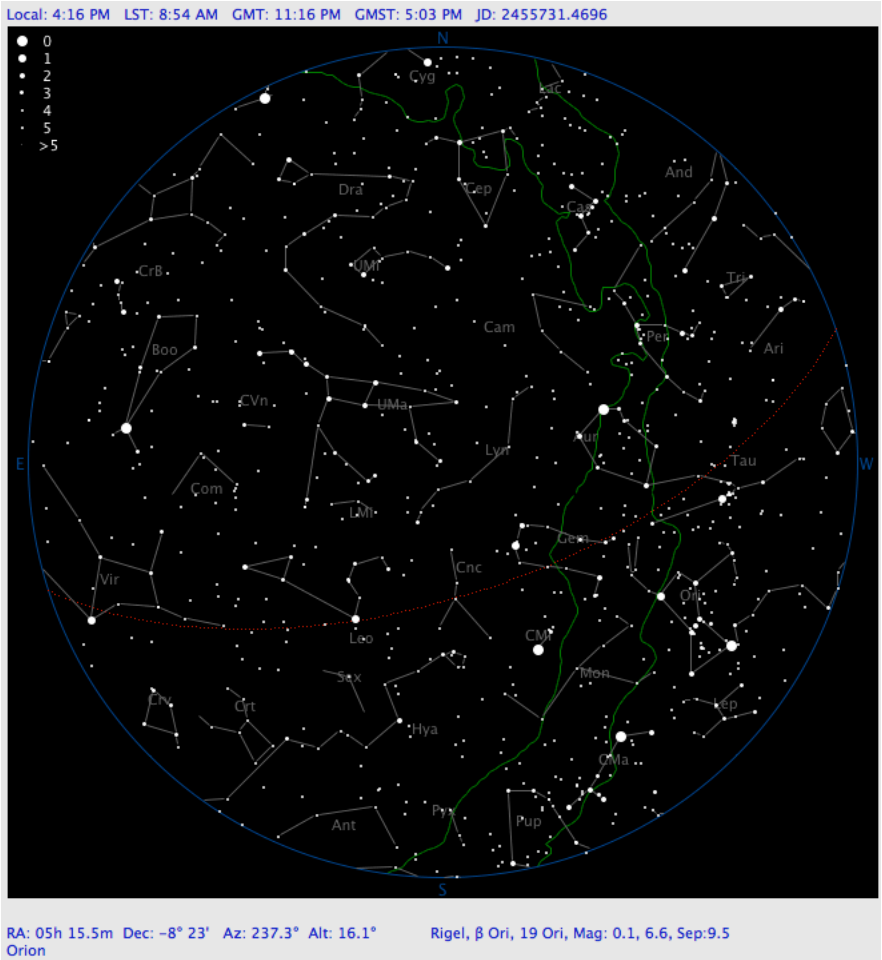


Figure 213: Sky chart

11.5.2 Display options

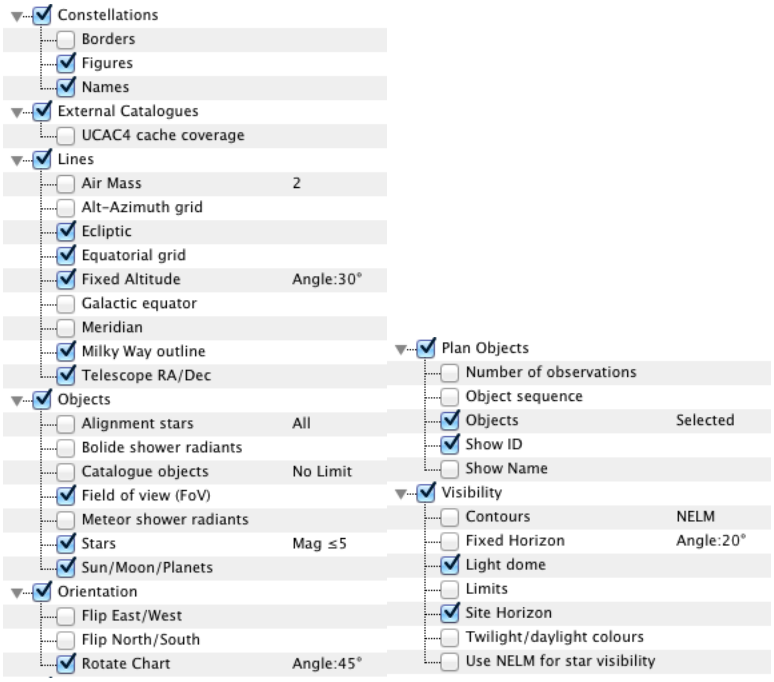


Figure 214: Display options

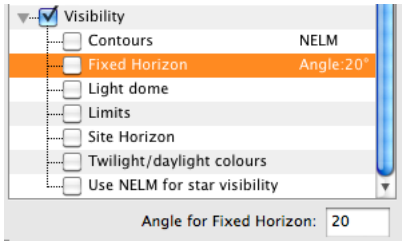


Figure 215: Select display option with associated value

Constellations

- **Borders**. Show the official constellation borders with grey dotted lines.
- **Figures**. Show the constellation figures (lines joining principal stars) using solid grey lines.
- **Names**. Show the constellation name 3-letter abbreviations.

External Catalogues

- **xxx cache coverage**. If you have one or more external catalogues with caching enabled (see Section 20.6.15 on page 303) then there will be an entry for each of those catalogues, with "xxx" replaced by the catalogue name. Using this option will show what parts of the sky are covered by cached data.

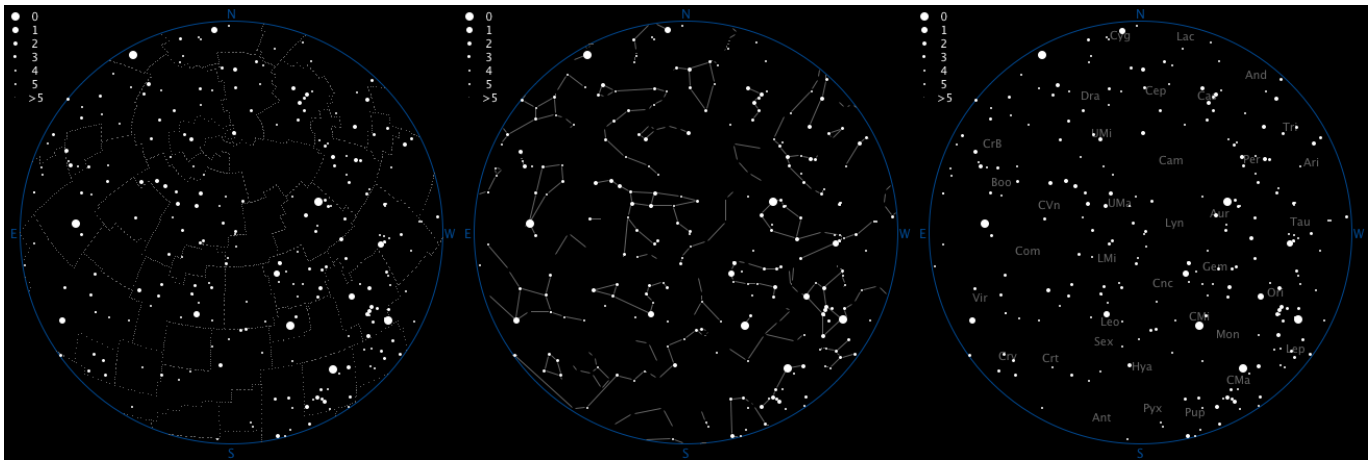


Figure 216: Constellations: Borders (left), Figures (middle), Names (right)

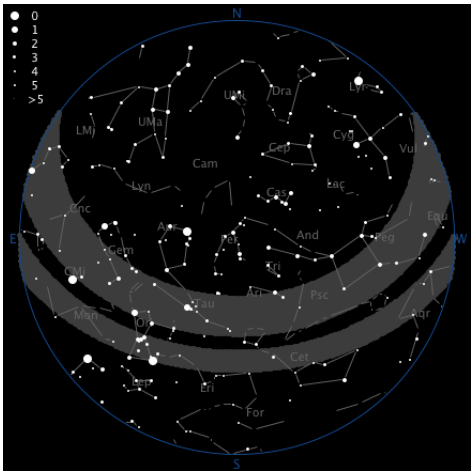


Figure 217: External catalogue cache coverage

Lines

- **Air Mass**. This option draws a dotted line at the altitude representing the given Air Mass. Select the entry and you can change the value just below the Display Options.
- **Alt-Azimuth grid**. Draws an alt-azimuth grid (i.e. grid of horizon coordinates)
- **Ecliptic**. This option draws a dotted line along the ecliptic (the plane of the Earth's orbit).

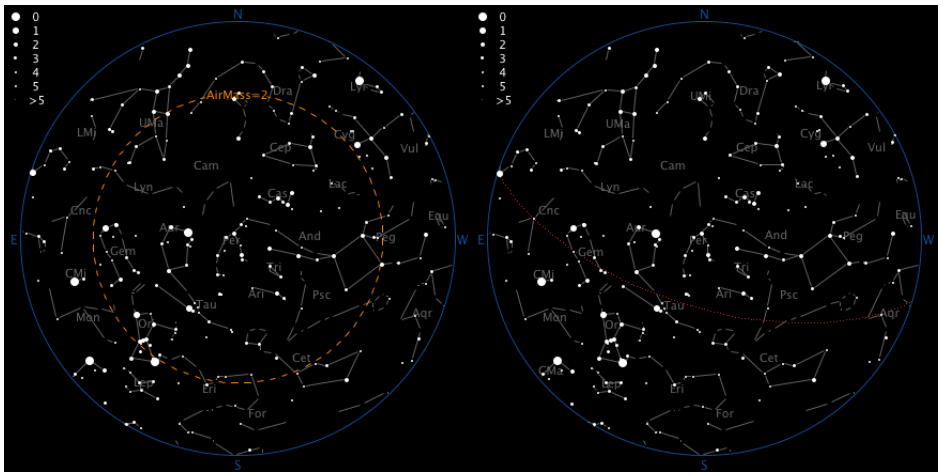


Figure 218: Air Mass line (left), and Ecliptic (right)

- **Equatorial grid**. Draws an equatorial grid (i.e. grid of equatorial coordinates: R.A. and Declination).

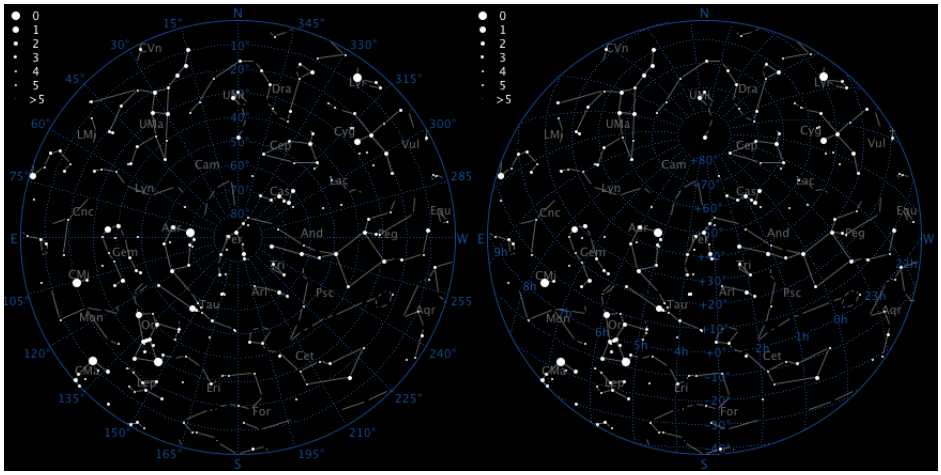


Figure 219: Alt-Azimuth grid (left), equatorial grid (right)

- **Fixed Altitude**. Draw a line at a given fixed altitude. Select the entry and you can change the value just below the Display Options.
- **Galactic equator**. Draw a dotted line showing the Milky Way galactic equator.
- **Meridian**. Draw a dashed line on the meridian (the great circle passing through both celestial poles).
- **Milky Way outline**. Draw solid lines showing the extent of the Milky Way.
- **Telescope RA/Dec**. Draw a small "gun sight" icon at the current pointing coordinates of your computerised telescope (assuming one is connected). If such a telescope is not connected, or is pointing below the horizon, then the icon is not displayed.

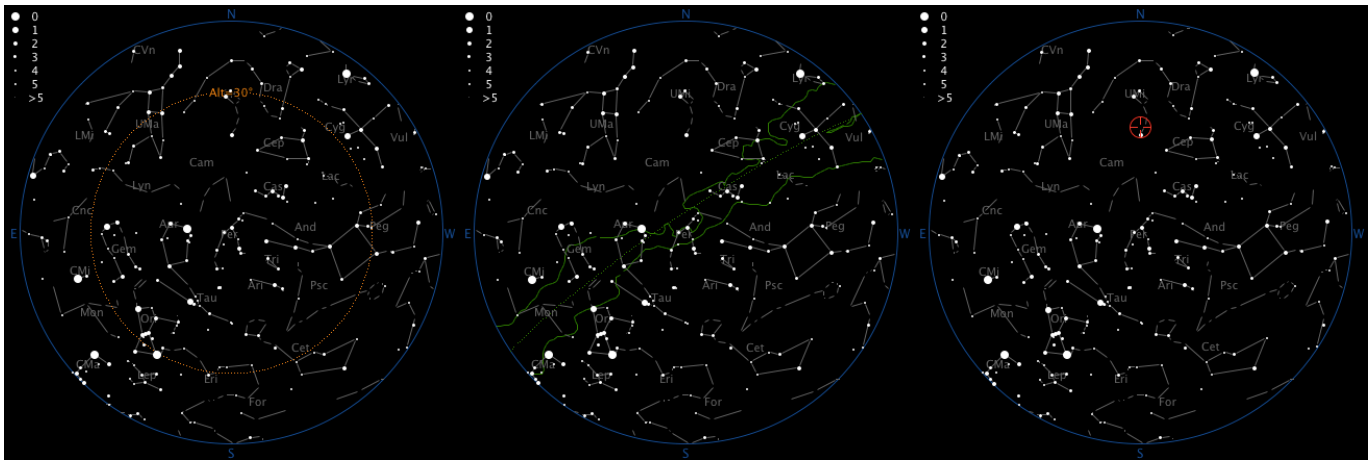


Figure 220: Fixed altitude (*left*), Milky Way outline and galactic equator (*centre*), Telescope RA/Dec (*right*)

Objects

- **Alignment stars**. Shows the alignment stars for the currently selected computerised telescope (where applicable). See Section 11.5.4 on page 154 for more information.
- **Bolide shower radiants**. Show the location of possible bolide showers using random lines emanating from the radiant coordinates.
- **Catalogue objects**. Show the position of selected catalogue objects on the chart (as small squares). All catalogues that have been marked as being displayable in the sky chart will be shown (see Section 23.3 on page 328 for details). The option has a magnitude limit value associated with it, and only catalogue objects brighter than that value will be selected for display. Select the entry and you can change the value just below the Display Options. **WARNING**: selecting catalogues with lots of objects might make this option take a *long* time to redraw.
- **Field of view (FoV)**. Draw a circle showing the size and location of the Field of View chart if it is above the horizon. This might be virtually invisible if the Field of View is small.
- **Meteor shower radiants**. Show the location of possible meteor showers using random lines emanating from the radiant coordinates.

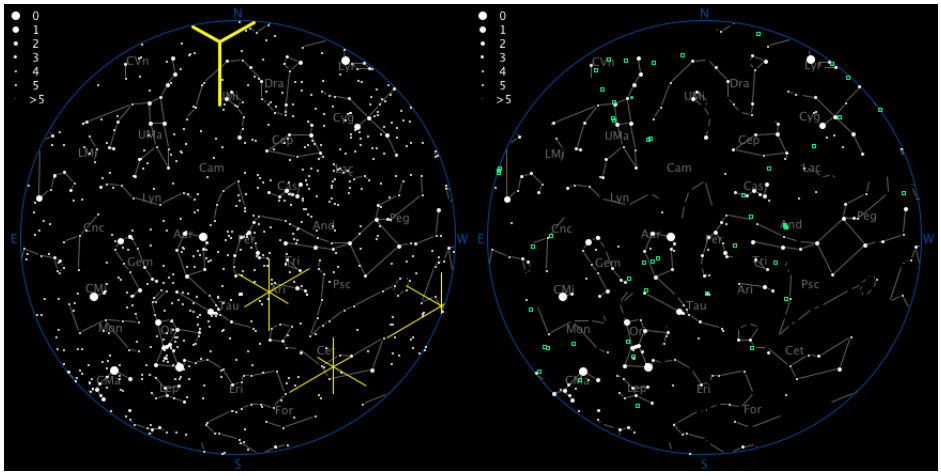


Figure 221: Bolide and meteor shower radiants (*left*), and Catalogue objects (Messier) (*right*)

- **Stars**. Switches on the display of stars (typically this will always be on). The catalogue used is the Bright Star catalogue, which includes stars down to about magnitude 6.5. The option includes a magnitude limit parameter. Only stars brighter than that value will be displayed. Select the entry and you can change the value just below the Display Options.
- **Sun/Moon/Planets**. Display the positions of the Sun, the Moon, and any visible planets.

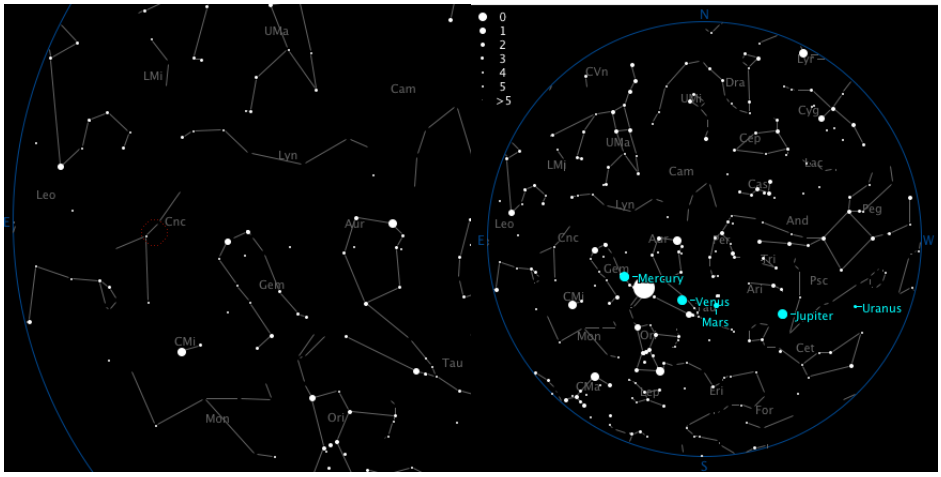


Figure 222: Field of view (5° around M44 in CnC here) (*left*), Sun/Moon/Planets (*right*)

Orientation

- **Flip East/West**. Flip the chart horizontally.
- **Flip North/South**. Flip the chart vertically.
- **Rotate Chart**. Rotate the chart by an arbitrary amount. Useful if you, say, visualise the sky at 90° to the meridian (looking east or west) while observing.

Plan Objects

These options control the display of objects in the current plan.

- **Number of observations**. If an object has associated observations then show the number of observations next to the object.
- **Object sequence**. Show the sequence of objects in the Object List by drawing a dotted line between each object in succession. This is mainly useful if you have sorted the objects using, say, a minimum slew sort, giving an idea of where you will be slewing the telescope.
- **Objects**. Show the plan objects as small open circles. If one or more objects are selected in the Object List, then they are shown as a filled circle with another circle surrounding each one. There is also a parameter allowing you to restrict the objects only to those that are selected, highlighted, observed, or not observed. Select the entry and you can change the value just below the Display Options.
- **Show ID**. Show the object ID next to the object.
- **Show Name**. Show the object Name next to the object.

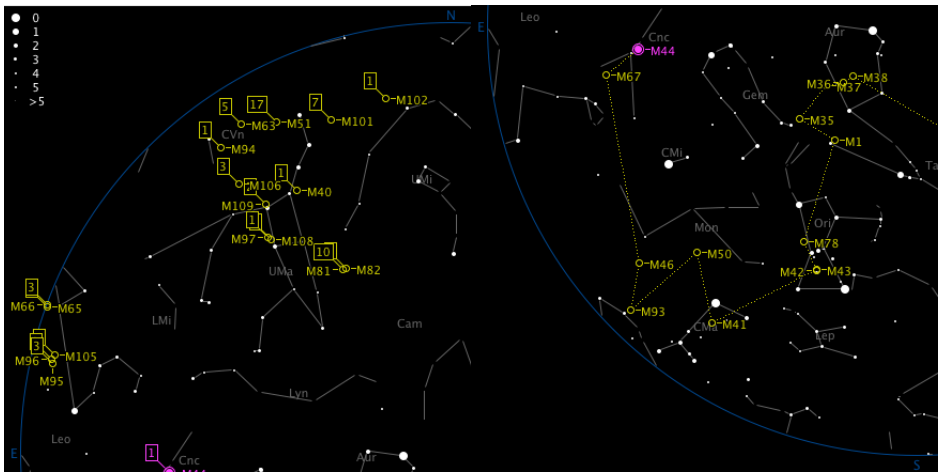


Figure 223: Plan objects with IDs and # of observations (*left*), object sequence (*right*)

Visibility

Visibility-related options for the Sky chart.

- **Contours**. Overlay contours on the sky chart showing current sky brightness conditions over the sky. The parameter allows displaying the brightness in terms of NELM (naked-eye limiting magnitude) or SB (sky brightness in nL or magnitudes/square arcsec). Select the entry and you can change the value just below the Display Options.

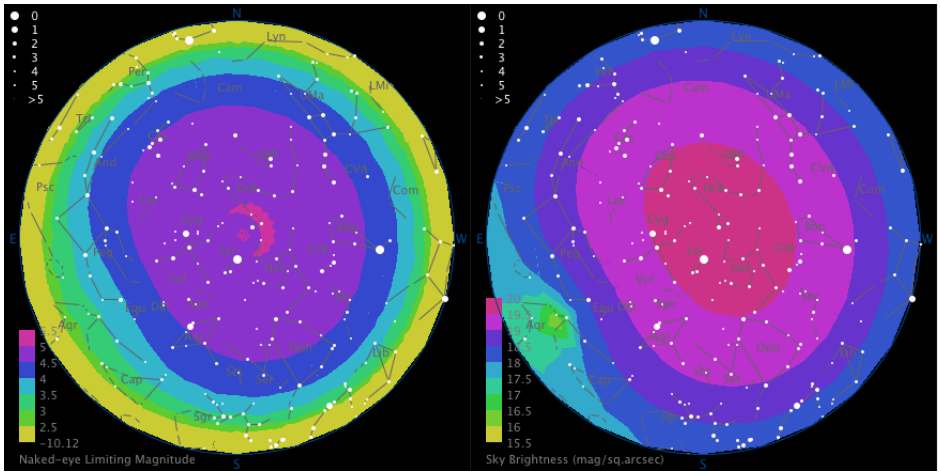


Figure 224: NELM contours (*left*), Sky Brightness contours (*right*)

- **Fixed horizon**. Draw a fixed horizon (i.e. an area coloured up to the specified altitude). Select the entry and you can change the value just below the Display Options.
- **Light dome**. Show the current site's defined light dome/s (where applicable).
- **Limits**. If the currently-selected telescope has a computerised mount with defined slewing limits, colour the out-of-limit areas.
- **Site horizon**. Show the current site's defined upper and lower horizons (where applicable).

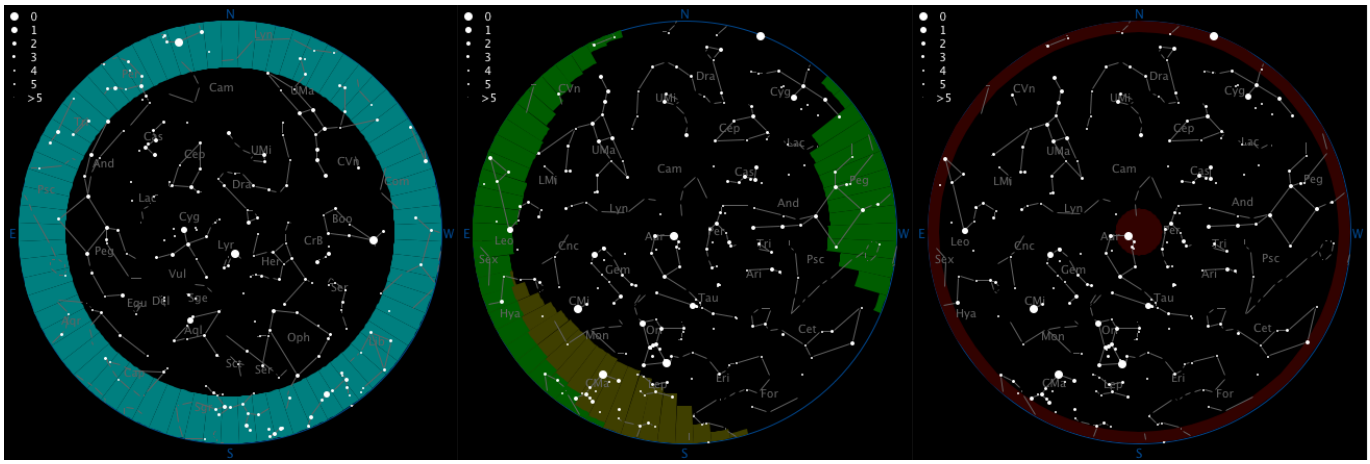


Figure 225: Fixed altitude (20°) (*left*), site horizon and light dome (*centre*), slewing limits (between 5° and 80° altitude) (*right*)

- **Twilight/daylight colours**. Colour the chart background with a colour representing the current time of day (i.e. day time, civil/nautical/astronomical twilight, and complete darkness).

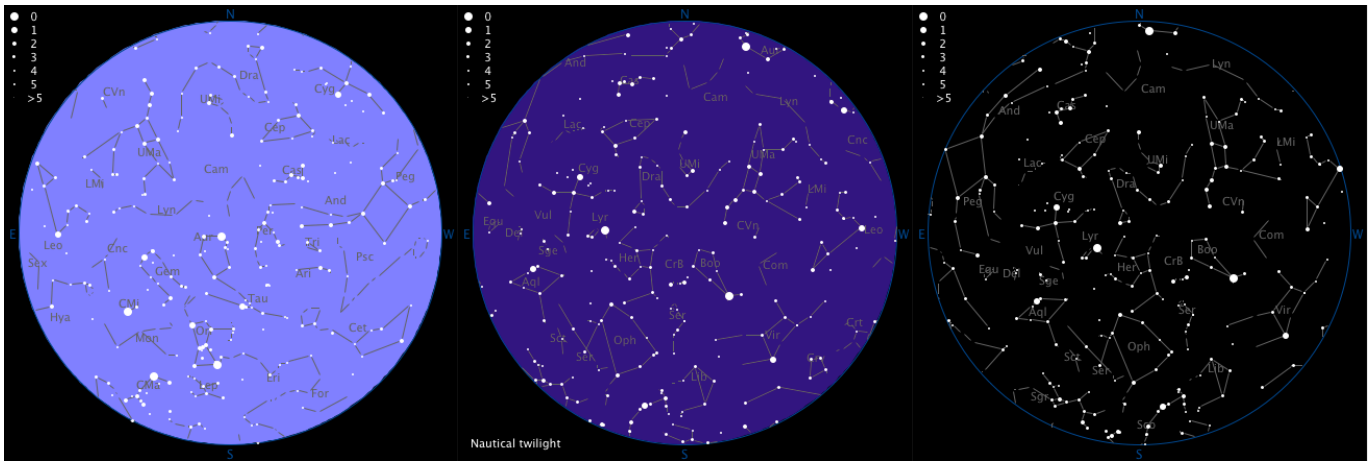


Figure 226: Using twilight/daylight colours: daytime (*left*), nautical twilight (*centre*), total darkness (*right*)

- **Use NELM for star visibility**. Use the NELM (naked-eye limiting magnitude) algorithm to determine which stars will be visible to the naked eye. i.e. none during daylight, some during twilight, most during complete darkness. Takes into effect horizon and moon conditions.

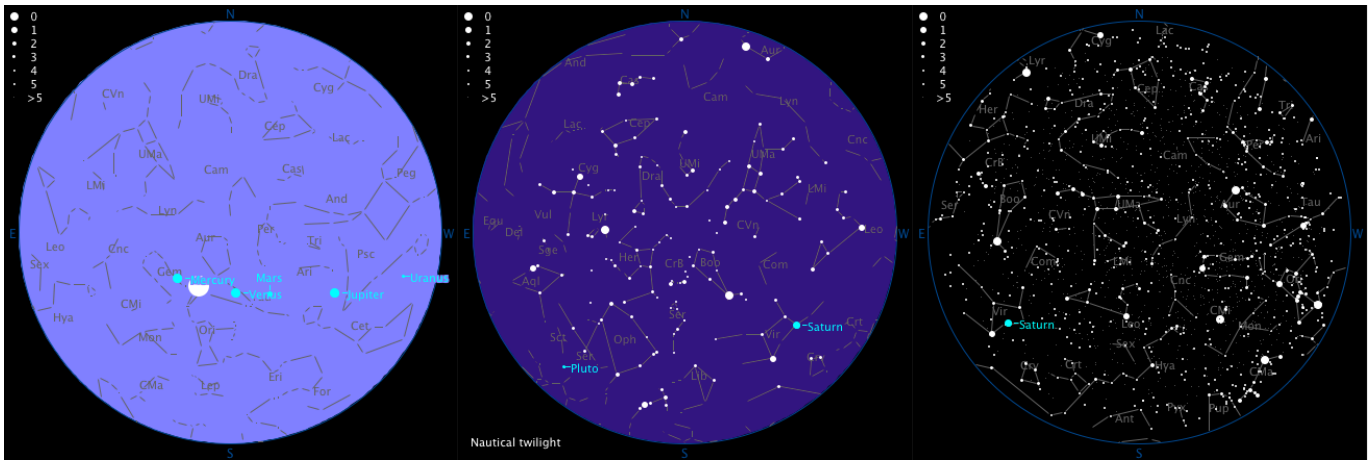


Figure 227: Using NELM for star visibility: daytime (*left*), nautical twilight (*centre*), total darkness with no moon (*right*)

11.5.3 Time offset

The time offset slider allows you to select a time offset from the current local time (by up to 24 hours in either direction). This allows you to, for example, see the effects as the sun sets, moon rises, etc. without having to use the Fix Date feature.

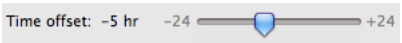


Figure 228: Time offset slider

11.5.4 Alignment stars

If you have selected a telescope, and that telescope has a computerised mount that defines a set of alignment stars ("standard" stars used by the telescope to perform initial alignment), then you can show those stars in the Sky tab, in both tabular form and on the chart if required.

If the selected telescope does not have a mount with defined alignment stars, a warning message is shown (Figure 229).

Alignment star list

Use the **Show alignment star information** checkbox to display a table of the alignment stars for the telescope mount. This includes columns:

- **Name**. The common name of the alignment star.
- **Magnitude**. The magnitude of the alignment star.
- **Visible**. "Yes" if the star is currently above the horizon.
- **Reject**. Status of the star for inclusion as a candidate for use to perform an alignment. *Blank* if the star is not visible (and hence automatically rejected), "**Alt**" if the star is rejected because its altitude is too low or too high (as defined in the Sky preferences), "**Lim**" if the star is rejected because the telescope cannot slew to that position, "**Mag**" if the star is rejected because it is too dim (as defined in the Sky preferences), or "**Hor**" if the star is hidden by the site horizon. Otherwise a checkbox is included, and the star is not rejected unless that checkbox is checked.
- **Always**. Contains a checkbox that, if checked, will always reject that particular star.

Stars that are not visible, or are rejected are shown in a grey colour.

The ***Show FoV*** button is enabled if a row is selected. If clicked it will change to the Field of View tab and move the centre of the chart to the coordinates of the selected star.

The ***Slew to Star*** button is enabled if a row is selected, the selected star is visible, and a telescope with a Go-to mount is currently connected. If clicked it will slew the telescope to the coordinates of the selected star.

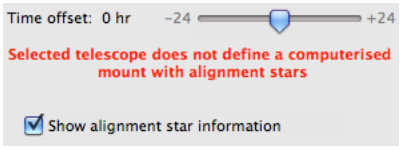


Figure 229: Warning message if selected telescope does not define alignment stars

If you right-click the list, you can select **Add alignment stars to plan...** This lets you create a plan consisting of alignment star objects. You can specify what is placed in the ID and Name fields of the plan objects so created.

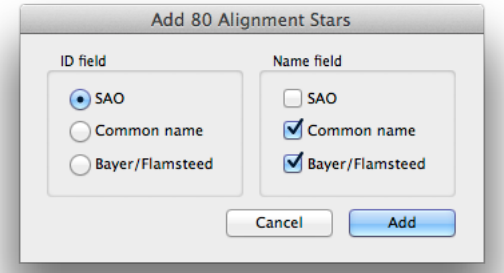


Figure 230: Add alignment stars to plan

Sky chart option

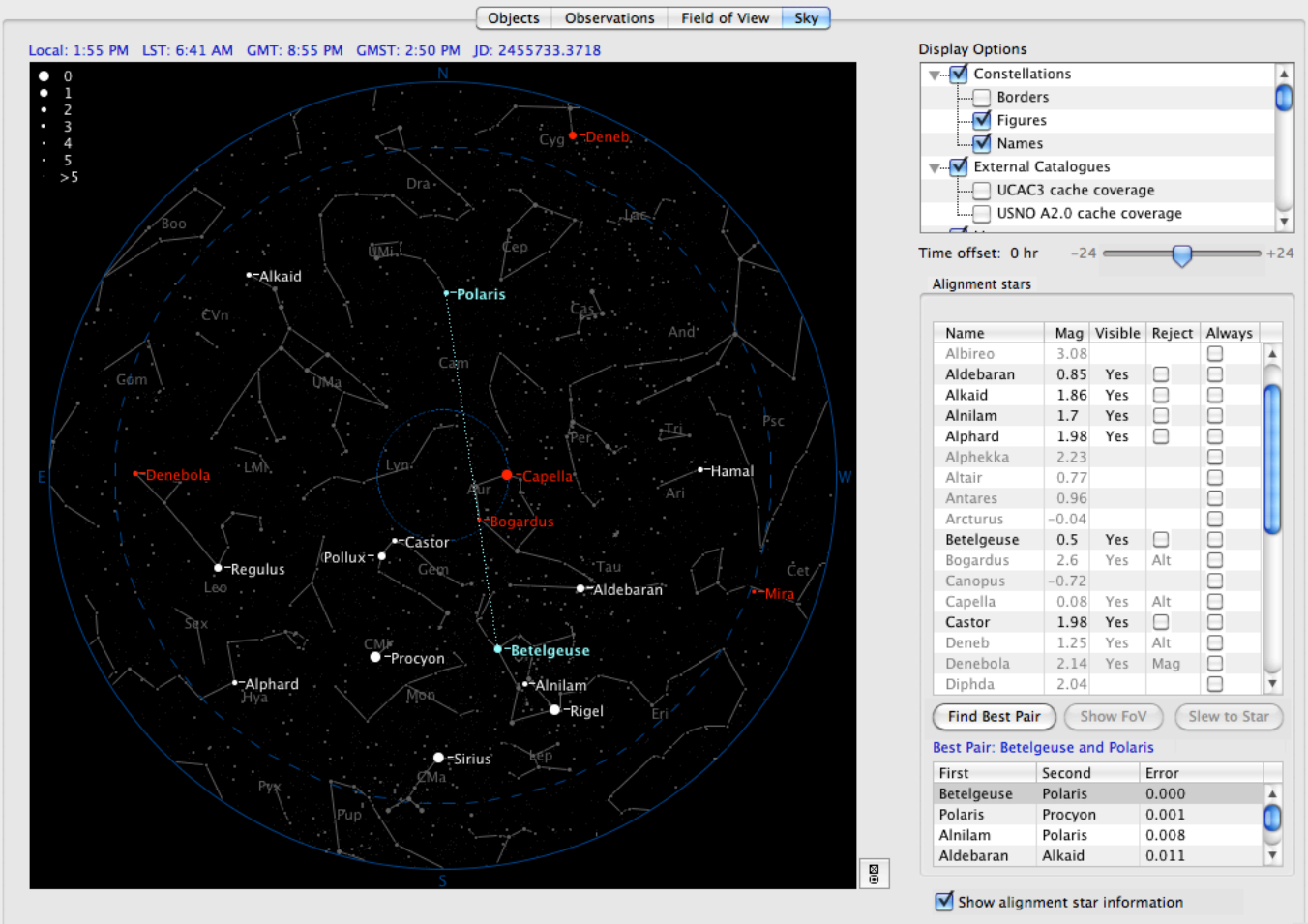


Figure 231: Alignment stars

If the **Display Options > Objects > Alignment stars** option is checked then:

- All stars except for the known alignment stars are dimmed.
- Lower and upper altitude limits (where applicable) for alignment stars are drawn.
- Any rejected alignment stars are displayed in red.
- If the alignment star selection algorithm has been used then the two stars selected in the best pair list are joined by a dotted line.

Alignment star selection

The button below the alignment star list to perform alignment star selection is labelled as ***Find Best Pair***, ***Find Pairs***, or ***Find Triples***, depending on the type of algorithm selected in the Sky preferences. Clicking that button will run an algorithm to determine the best pairs or triples of alignment stars to use.

Once the algorithm has finished running, the results are displayed in the lower list, typically in descending order of "bestness".

Why not trust your telescope controller to make the choice?

In the case of the Meade LX200 (Classic) Alt-Az-mounted telescope (for which the Best Pair algorithm was specifically developed) the answer to this question is two-fold.

Firstly, the LX200 Classic controller makes you choose two stars from a list, and does not make any suggestions as to which pair will be the best candidates.

Secondly, the Meade engineers "forgot" to take into account atmospheric refraction for low-altitude stars, so it is best to avoid these.

For other telescope types, the need is not so clear. The controllers typically will make a choice of stars for you, and in most cases they are pretty good. However, empirical evidence seems to show that the Best Pair algorithm works even better at choosing optimum pairs of stars. The author has found that the following precautions are just as important to a good alignment than choosing the optimal pair of stars:

- Make sure the telescope mount is initially level (i.e. the top of the tripod is level) and the RA axis of the mount is pointing directly at the zenith. A bubble level will help.
- Make sure the scope optical tube is exactly level and pointing north (or south in the case of the LX200 Classic) before switching on.
- While aligning, make sure the alignment stars are exactly in the centre of the eyepiece field-of-view. Using a reticle eyepiece or defocussing the stars might help here.
- Choose alignment stars that are more than 90° apart wherever possible.

Rejecting potential star candidates

Each telescope controller has a list of preselected alignment stars it can use for alignments. These are typically (a) bright and (b) evenly spaced over the sky. However, some of these stars are better than others for various reasons. For the Best Pair algorithm to work to your best advantage you should arrange for some stars to be "rejected". Such stars fall into six categories:

1. **Non-visible stars.** These are rejected automatically by the algorithm since there is no way you can align on a star below the horizon.
2. **Low altitude stars.** Low altitude stars are typically non-optimal because of atmospheric refraction effects. These stars can be rejected automatically by setting the "Reject stars with altitude less than" check box in the Sky chart preferences. The default value of 15° will reject all stars with current altitudes less than that angle. This is optional.
3. **High altitude stars.** High altitude stars may not be reachable owing to mount limitations, etc. These stars can be rejected automatically by setting the "Reject stars with altitude greater than" check box in the Sky chart preferences. The default value of 75° will reject all stars with current altitudes greater than that angle. This is optional.
4. **Dim stars.** Dim alignment stars, especially at a light-polluted site, can be problematical. These stars can be rejected automatically by setting the "Reject stars with magnitude greater than" check box in the Sky chart preferences. This is optional.
5. **Slewing limitations.** Any stars that fall outside the slewing limits defined for the telescope mount will automatically be rejected.
6. **Non-optimally placed stars.** Some stars are not optimally placed. For example, Polaris can cause cord-wrapping problems if you slew to it from the wrong side in the case of the LX200 (Classic) telescope. Other stars might be temporarily hidden by a cloud or tree. These can be rejected by using the checkboxes in the alignment star list.

2- and 3-Star Polar Alignment

The algorithm used for two-star selection[1] is:

- *Choose two stars that are on the same side of the meridian, and at least 3 hours apart in RA and between 3° and 60° apart in Declination.*

For three-star selection:

- *For the first two alignment stars, follow the same guideline as choosing for the two- star alignment.*
- *For the third star, choose a star that is on the opposite side of the meridian from the first two stars. Both first alignment star and third alignment star should have an absolute value of 30° to 70° in Declination. If the first chosen star has a small Declination (< 30°), the Declination of the third star should be at least 50°.*

The algorithm does not find optimal pairs or triples, but merely those that fit the criteria above.

11.5.5 Sky chart buttons

These small buttons appear along the right side of the sky chart.

Figure 232: Sky chart buttons

From top to bottom, these buttons are:

- **Move UP the object list**. Select the previous object in the object list. If no object is currently selected, or the first object in the list is selected, then this button will be disabled. Clicking the button will select the previous object and redraw the chart.
- **Move DOWN the object list**. Select the next object in the object list. If no object is currently selected, or the last object in the list is selected, then this button will be disabled. Clicking the button will select the next object and redraw the chart.
- **Sky chart preferences**. Show the sky chart preferences (see Section 20.7 on page 305).

11.6 Object list functions

Most of the functions that act on the object list, or on objects in that list, exist in the ***Object*** menu.

1. Taken from the SynScan handbook

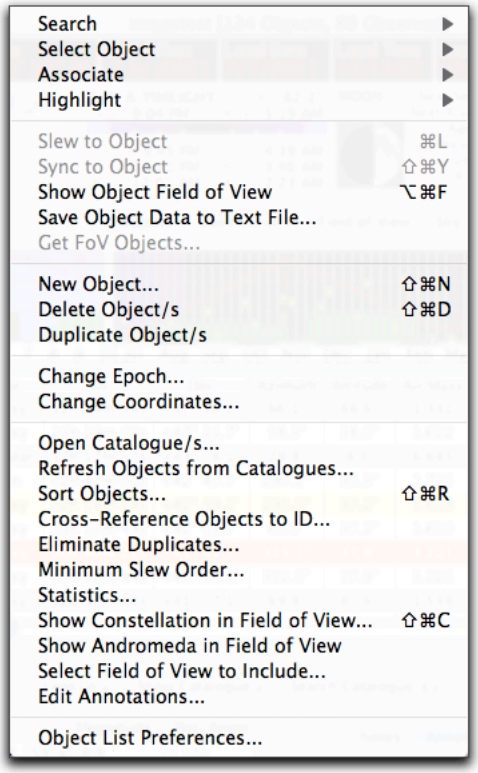


Figure 233: Object menu

11.6.1 Search

The ***Search*** submenu includes commands that search for object information.

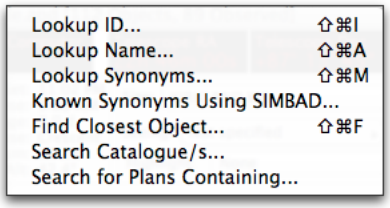


Figure 234: Object > Search menu

Lookup ID
Lookup Name

Lookup the ID/Name of the selected object (in the object list) in the installed catalogues.

Firstly you are asked to select which catalogues to search (see Figure 235). The initial selection is all installed catalogues (apart from those that are marked as not searchable in the Catalogue Manager - see Section 23.3 on page 328). The buttons and popup menu underneath the list of catalogues allow you to select specific catalogues.

You can also specify to stop the search when the first match is found, or to continue looking for all matches.

If you are connected to the Internet, you can also elect to lookup the object using the SIMBAD astronomical database, by clicking the ***SIMBAD*** button. In this case, the installed catalogues will be ignored.

The **Cross-index ID fields** option, if checked, will recursively check all synonym IDs found during the initial search, all synonyms found during the subsequent search, etc., until all synonyms have been found. This is an exhaustive search, but you need to be aware that it can (a) take time to complete, and (b) produce "false positives".

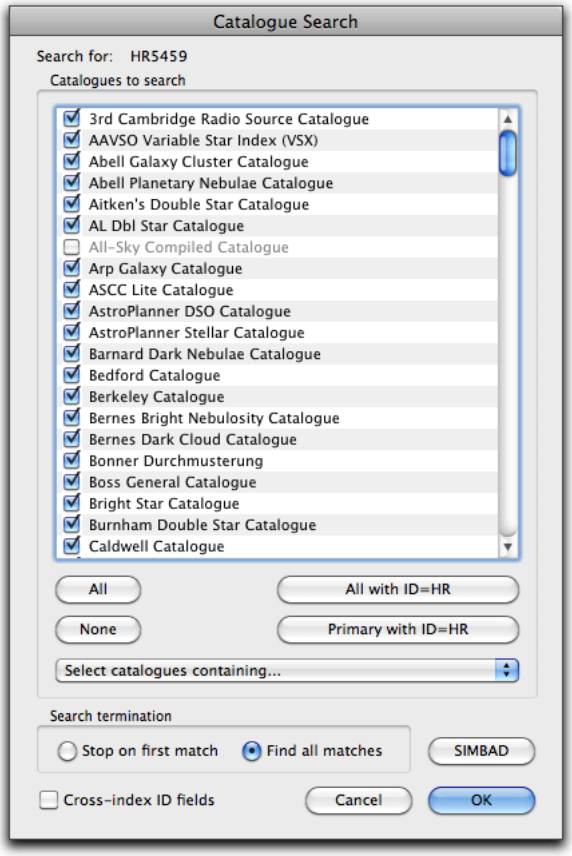


Figure 235: Catalogue selection for Lookup

If no object was selected, or if the ID field of the selected object is empty, you are prompted to enter text for the search (Figure 236). You can type one or more search terms, separated by commas on the same line, or using multiple lines. Ranges of IDs can be specified using "...", e.g. the term "M56...71" will search for M56, M57, M58,..., M70, M71.

If you define a Prefix, then that will be prefixed to each search item (e.g. if you are searching for a lot of NGC objects, just enter the object numbers and make the prefix "NGC"). Similarly for the Suffix.

The ***Recall Last*** button will set the text to the last lookup you performed, if applicable.

The ***Double Star IDs*** button displays a list of well-known and historical double star observer IDs, and also shows the availability of double star observations in the Washington Double Star (WDS) catalogue for each observer.

The results of any search is displayed in the search results window

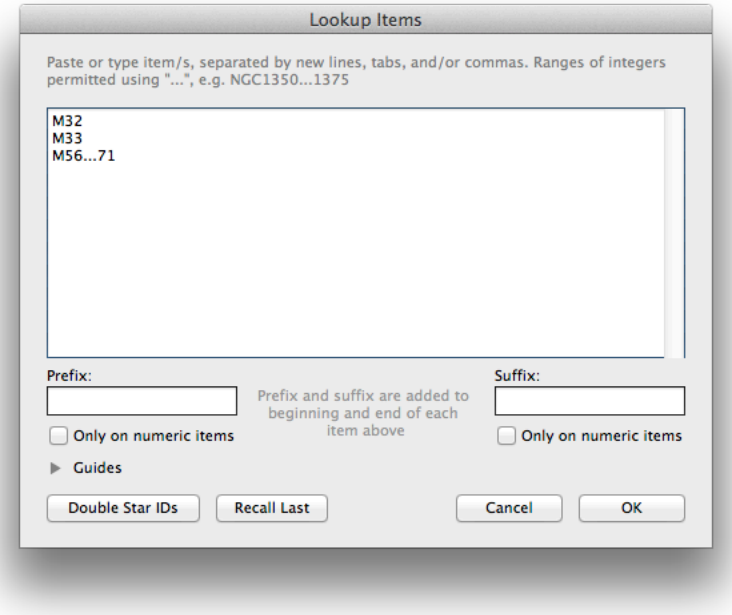


Figure 236: Item selection for blank/unselected Lookup

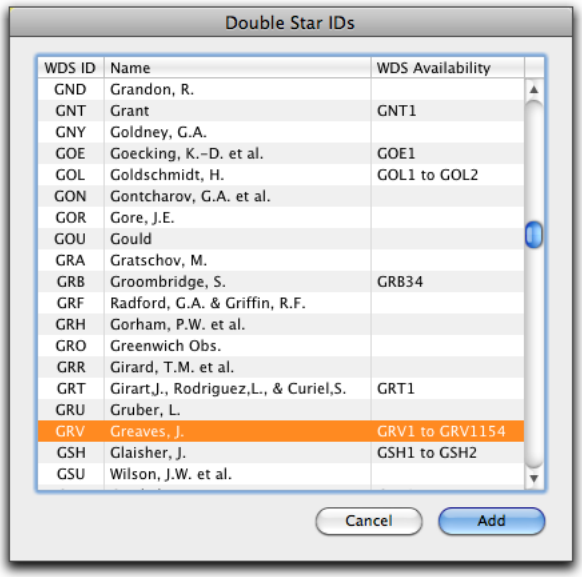


Figure 237: Double Star IDs

The **Guides** widget can be toggled to display some useful aids to entering ID data (Figure 238). The left hand table contains the symbols of the Greek alphabet. Clicking on a symbol enters the 2- or 3-character abbreviation for that symbol. The centre table lists some common double-star discoverer IDs. Clicking an ID will enter the correct alphabetic prefix as used in the WDS catalogue name field.

The **Constellation abbreviation** popup inserts the three-character abbreviation for the selected constellation. **Common stars** lists common names of stars, and when selected will insert the Bayer ID or SAO ID into the ID field. **Common deep-sky objects** lists common names of deep-sky objects and asterisms, and when selected will insert a suitable ID for searching into the ID field.

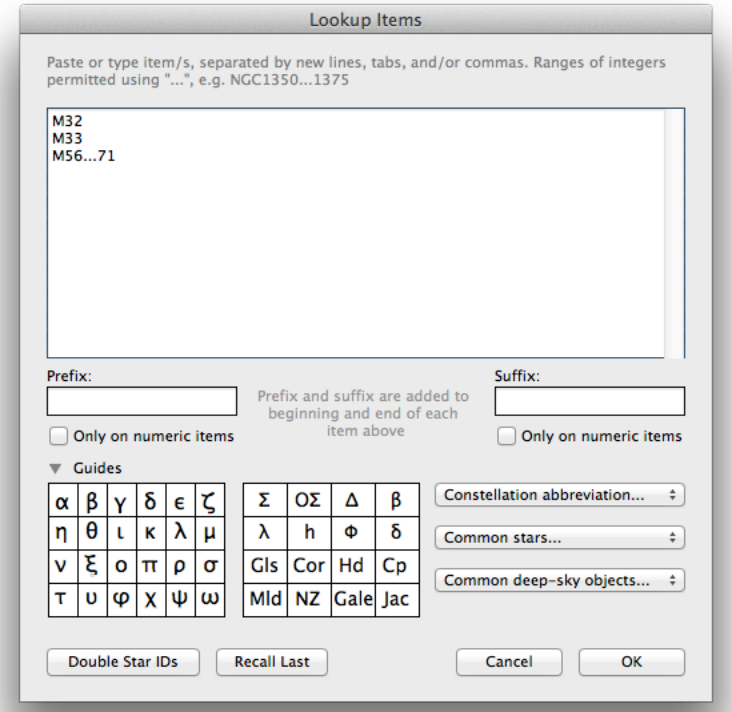


Figure 238: Dialog with Guides revealed

Lookup Synonyms

This feature searches all installed catalogues to find all objects at, or very close to, the RA/Dec coordinates of the selected object. Section 20.1.9 on page 288 describes the preference to determine how close an object must be to the RA/Dec coordinates for it to be considered synonymous.

Note that this feature ignores the ID or Type of the object.

This is a convenient way to find a catalogue object if you don't know the ID.

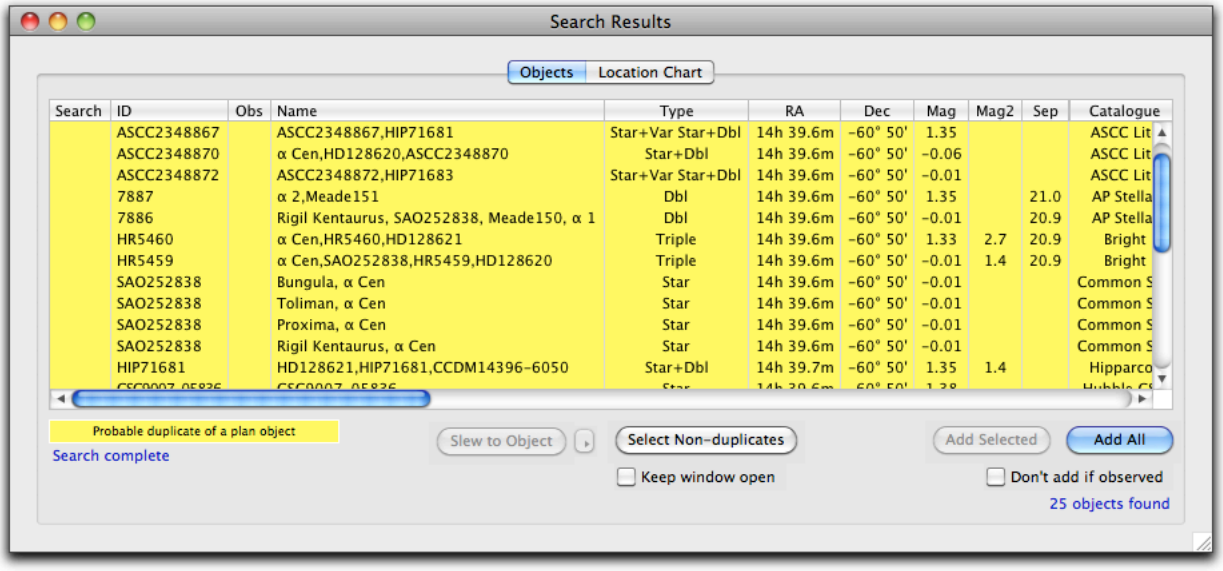


Figure 239: Lookup Synonyms results

Known synonyms using SIMBAD

A dialog will appear showing the known synonyms for the selected object. This feature looks up the ID in the on-line SIMBAD database. It requires on-line Internet access.

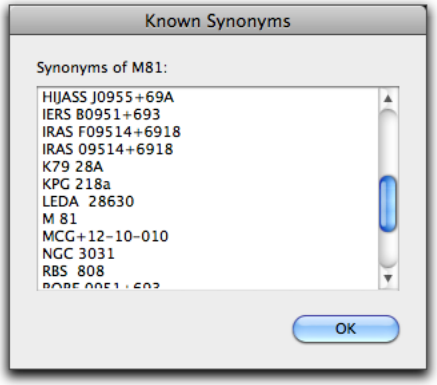


Figure 240: Known synonyms using SIMBAD

Find Closest Object

Find the closest object to the selected object in the object list, in a selected catalogue. To be considered, any found object must be within a search radius of 0.5° (default) from the selected object. The search radius can be increased or decreased via an option in the Object List preferences.

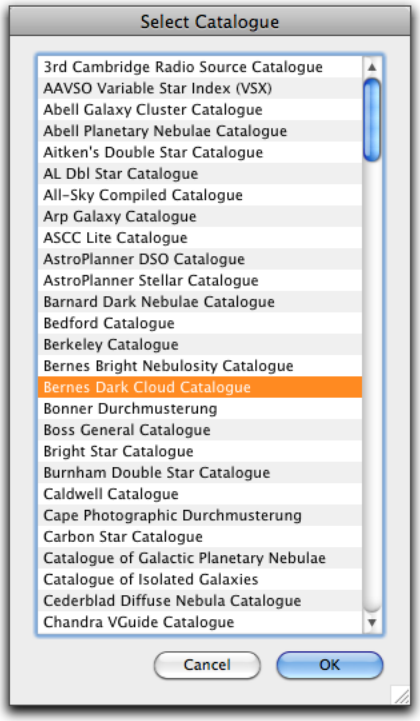


Figure 241: Select catalogue for Find Closest Object

Search Catalogue/s

This performs the same catalogue search described in Section 10.1.3 on page 79.

Search for Plans Containing

This searches a given folder hierarchy for all plan documents that contain a given search term.

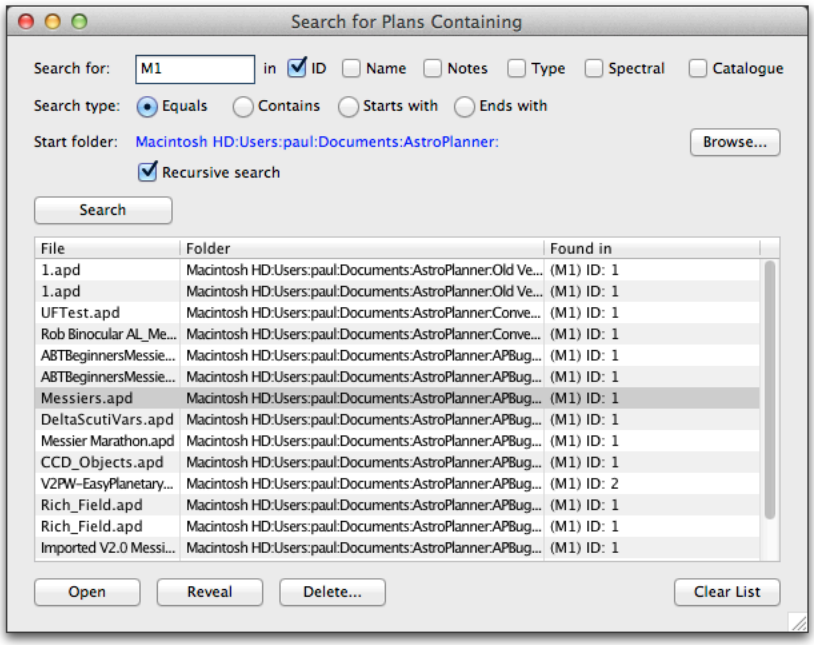


Figure 242: Search for plans containing M1

You specify the search term to look for in a plan document (in the example here it is "M1")

You can specify which plan document fields to search (in the example here just the ID field is considered).

You can specify whether the search term has to match the field exactly (as is the case in the example), is contained in the field, etc.

You specify the root folder to start the search in. If you check the **Recursive search** checkbox then the folder and all of its sub-folders will be searched.

Click the **Search** button to start the search. While the search proceeds, any plan documents found that meet the search criteria will be added to the list.

Once the search is complete, you can select a plan and open it (**Open** button), reveal it in the Finder (Mac) or Windows Explorer (Windows) using the **Reveal** button, or delete the document from disk using the **Delete...** button.

Find Objects within Radius

Searches selected catalogues for all objects within a given angular radius of the selected object.

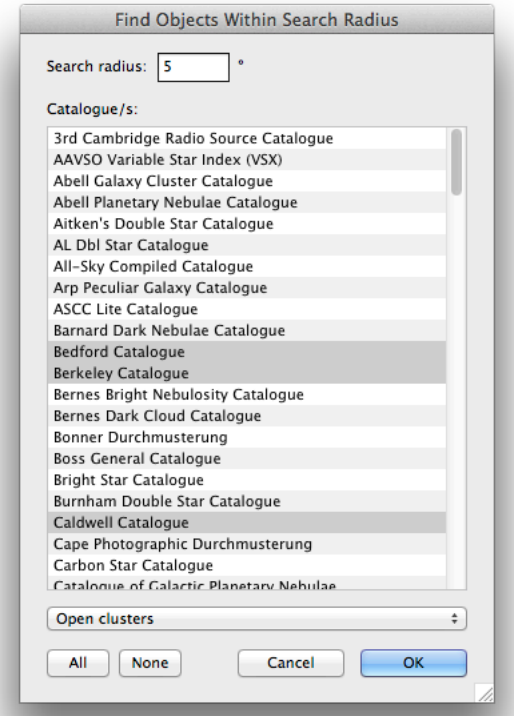


Figure 243: Find objects within radius

11.6.2 Select Object

These are menu items to navigate through the object list. You'll probably never use them (since clicking with a mouse or using the arrow keys is easier), but they are there with their corresponding keyboard shortcuts which might prove useful.

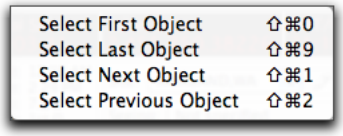


Figure 244: Object > Select Object menu

Select First Object
Select the first object in the object list.

Select Last Object
Select the last object in the object list.

Select Next Object
Select the next object in the object list, unless you are at the last object.

Select Previous Object
Select the previous object in the object list, unless you are at the first object.

11.6.3 Associate

This submenu deals with object associations. This process is explained in detail in Section 18.2 on page 275.

Figure 245: Object > Associate menu

Associate Selected Objects
If more than one object is selected, then associate those objects together.

Disassociate Selected Object/s
If one or more objects are selected and one or more of them is part of an association, then remove those objects from any associations.

11.6.4 Highlight

This submenu deals with object highlighting. This process is explained in detail in Section 18.1 on page 271.

Figure 246: Object > Highlight menu

Toggle Forced Highlighting/Unhighlighting
If the selected object is not highlighted, then it will be Force Highlighted. If it is Force Highlighted then that will be removed.

If the selected object is highlighted, then it will be Force Unhighlighted. If it is Force Unhighlighted then that will be removed (and it will revert to being highlighted).

Remove Any Forced Highlighting/Unhighlighting
Any selected objects that are either Force Highlighted or Force Unhighlighted will have that status removed.

Edit Custom Highlighting
Allows you to edit the custom highlighting rules. See Section 18.1.3 on page 272 for more details.

11.6.5 Slew to Object
If the selected object is visible (i.e. not below the horizon), a go-to telescope is connected, and the object coordinates are within the mount's set limits (where applicable), then this will slew the telescope to the object's coordinates. Performs the same action as the ***Slew to Object*** button.

11.6.6 Sync to Object
If the selected object was slewed to, this will sync the mount to the object's coordinates. Performs the same action as the ***Sync to Object*** button.

11.6.7 Show Object Field of View
Switches to the Field of View tab, and redraws the chart with the selected object centred. Performs the same action as clicking to select the Field of View tab using the mouse.

11.6.8 Save Object Data to Text File
Saves the text from the the selected object to a text file. The file consists of one line per column, with the column heading and the value separated by a comma. e.g.

```
ID, M6
Name, Butterfly Cluster
Type, Open
RA, 17h 40m 20s
Dec, -32° 15.2'
Azimuth, 277.6°
Altitude, -52.7°
Rise, 9:04 PM
Transit, 11:42 PM
Set, 2:50 AM
ODM, 28x
Mag, 4.50
Size, 15
Const, Sco
Catalogue, Messier.apcat
HJD, +0.00532
Hr Angle, 08.978
Chart#, CDSA: 24a, MSA: V3-1416
SB, 19.0
PosAngle, 0
LOC, 0.0
Transit Date, 8/3/2011
Moon, 51°
Sun, 157°
Transit Alt, 10°
Notes, Rating:SU
Prob, > 98%
```

11.6.9 New Object
Creates a new object in the object list. Operates the same as clicking the button under the object list. See Section 10.1.1 on page 75 for details.

11.6.10 Delete Object/s
Deletes the selected objects from the object list.

11.6.11 Duplicate Object/s
Makes duplicates of the selected object or objects. You can then edit those duplicate entries manually.

11.6.12 Change Epoch
All AstroPlanner objects are assumed to be in Epoch J2000.0 RA/Dec coordinates. i.e. the coordinates that they would have had on 1/1/2000. This is a common epoch and you'll find that the coordinates of most object data that you'll find on-line or in books are from this epoch. However, occasionally you'll find older data that are in the coordinate system from another epoch (B1950 is relatively common) or the current epoch (JNow). In order to match up the coordinates, they need to be precessed to the J2000.0 epoch. This command will allow you to do that.

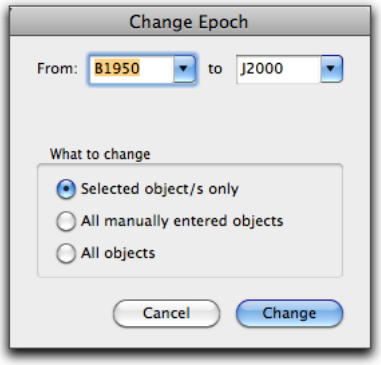


Figure 247: Change Epoch dialog

You can choose to change the epoch for the selected objects or all objects. You can also specify to change the epoch for manually entered objects only (all objects in AstroPlanner catalogues are J2000.0, and so should never need precessing to J2000.0).

11.6.13 Change Coordinates
If you want to change the RA/Dec (Equatorial) coordinates of an object, you just edit in the new ones. However, if you have coordinates for the object in Ecliptic or Galactic coordinates, you can use this convenient feature to convert the coordinates to equatorial.

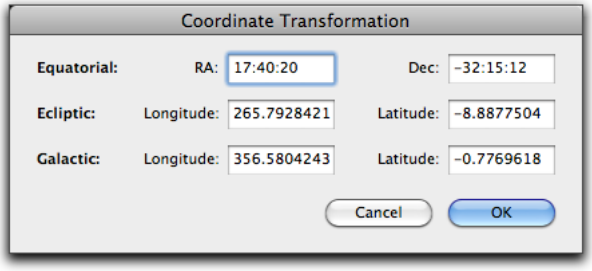


Figure 248: Change coordinates dialog

11.6.14 Refresh Objects from Catalogues

If you create plan objects and modify them, you might at a later stage wish to restore one or more of the modified fields from the original catalogue entries. If you have comet or minor planet objects in your plan, you might wish to update their orbital elements from the latest catalogues.

Object > Refresh Objects from Catalogues... allows you to select which objects you want to update in the plan document and which fields are to be updated/restored to the catalogue values.

In the event that the original catalogue is no longer available, or the object was originally added manually, you can also specify what to do: ignore the object, find a catalogue containing the ID of the object and use that, or use a specific catalogue to lookup the ID.

You can also specify if you want to update any comet or minor planet objects found in the plan.

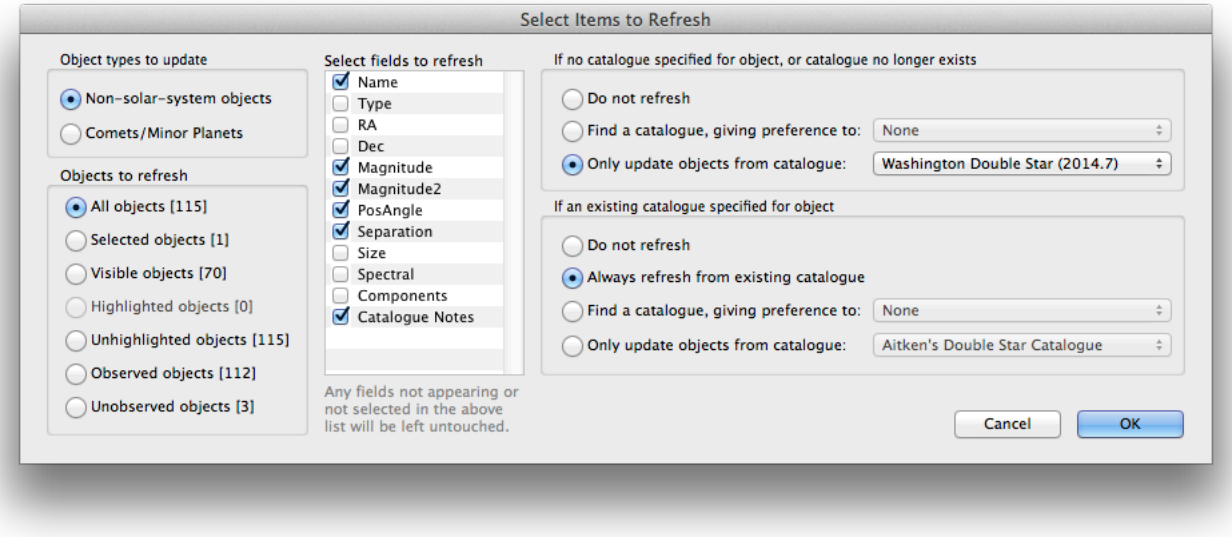


Figure 249: Refresh objects from catalogues

11.6.15 Sort Objects

This has the same function as the **Sort List** popup (see Section 11.2.13 on page 110).

11.6.16 Cross-Reference Objects to ID

The ***Object > Cross-Reference Objects to ID*** feature allows you to match plan objects to objects in a specified catalogue, and to replace or modify one or more fields of the plan object if a match is found. This feature is useful if you have input a number of objects where you only know the ID or the RA/Dec coordinates, and would like to replace these objects with "official" ones from an installed catalogue. The dialog (Figure 250) allows control over this process using the following options:

- **Objects to process**. Select the objects in the plan to which you would like to apply this process.
- **ID to cross-reference**. Select the object ID that you would like to cross-reference against. The popup menu contains all know IDs in the installed catalogues. Then select the particular catalogue you would like to compare against (containing the ID).
- **Where to add matched ID**. When a match is found, this identifies the object field where the catalogue object ID should be placed.

- **Method of adding matched ID to existing entry**. This is how to treat that catalogue object ID. You can replace the existing field, or prepend/append the ID to it.
- **Assume same object if**. How to match the plan objects with the catalogue objects. This is either by position (coordinate matching), or by comparing the IDs.
- **Also replace these fields**. You can additionally elect to replace these fields of the plan object with the same fields from the matched catalogue object.

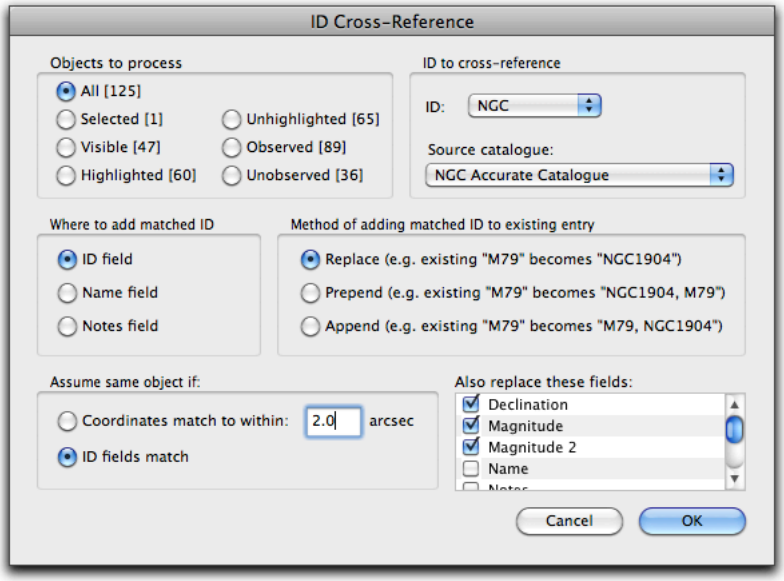


Figure 250: Cross-reference Objects to ID dialog

11.6.17 Eliminate Duplicates

The **Object > Eliminate Duplicates** feature looks for potential duplicate pairs of plan objects and allows you to choose which ones to delete. The dialog specifies a minimum separation value. Any pair of plan objects whose coordinates are within this separation distance are considered as candidates and are listed in the dialog, together with their actual separation distance.

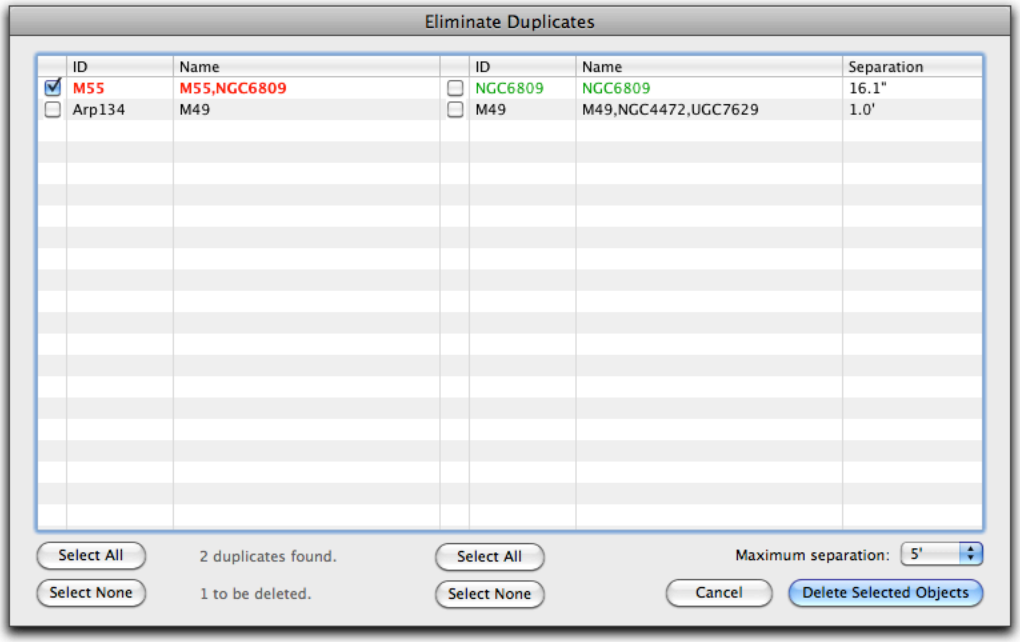


Figure 251: Eliminate duplicates dialog

Each object (listed by its ID and Name) has a checkbox next to it. Checking that checkbox flags the object for deletion (and its text colour is set to red). Clicking the ***Delete Selected Objects*** button will delete any checked objects.

Note that if you have three or more duplicate objects, you might have to use this feature more than once to eliminate all of the duplicates.

11.6.18 Minimum Slew Order

Sort the object list in such an order as to minimise the total slewing distance to visit each object in turn. If an object is selected in the list, it will be considered to be the first in the sequence. This algorithm is an approximation of the optimum algorithm (known as the Travelling Salesman Problem), and is guaranteed to produce a sequence that is 2X the optimum slewing distance or less.

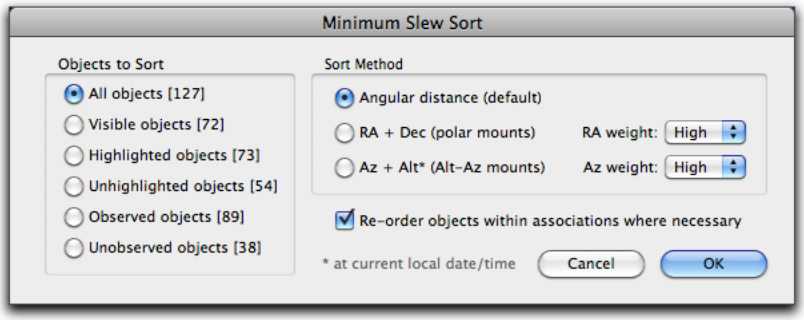


Figure 252: Minimum slew order

The dialog allows you to select the objects to include in the sorted sequence, the sort method (which differs for different mount types), and whether or not to reorder objects within any associations (see Section 18.2 on page 275) if necessary.

11.6.19 Statistics

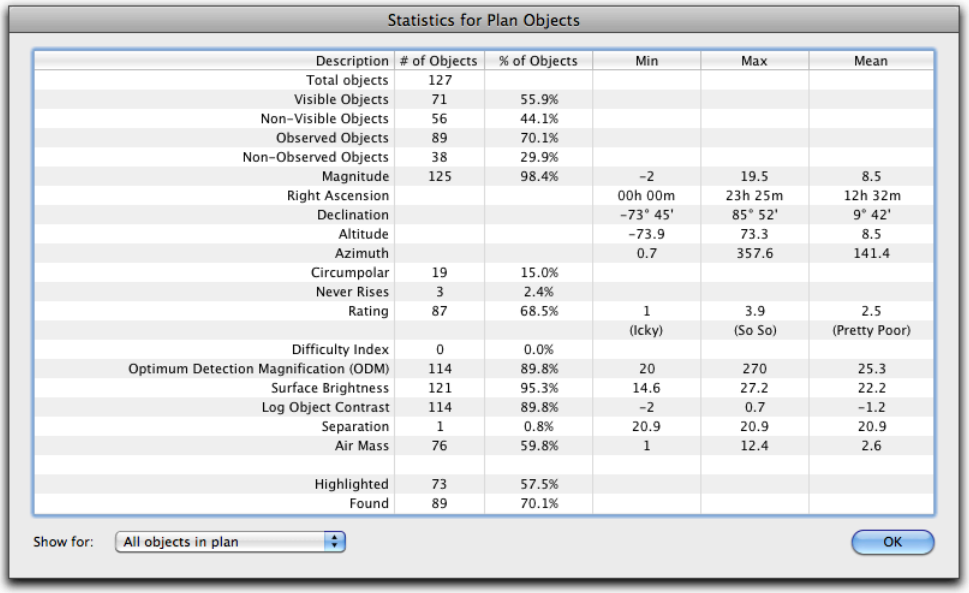


Figure 253: Statistics

Display statistical and tabular information regarding the objects in your plan document.

11.6.20 Object Properties vs. Time

This feature lets you examine various dynamic properties of an object over a period of time, in both chart and tabular form.

To get these charts/data, select one or more objects in the object list, and choose **Object > Object Properties vs. Time** (also available in the object list right-click menu). This opens a window and allows you to chart and tabulate data for the selected object/s.

The properties are all "dynamic" and change with time. You can choose one or more of these properties using the check list at the top left of the window. Currently, these properties include:

- Air Mass
- Altitude
- Apparent Magnitude
- Azimuth
- Extinction
- Heliocentric Julian Date
- Hour Angle
- Moon Distance
- Observability
- Parallactic Angle
- Sun Distance

- Visibility

Additionally, if any of the objects are solar system objects (e.g. planets, comets, etc.) then the following properties are also available:

- Right Ascension
- Declination
- Magnitude
- Ecliptic Latitude
- Ecliptic Longitude

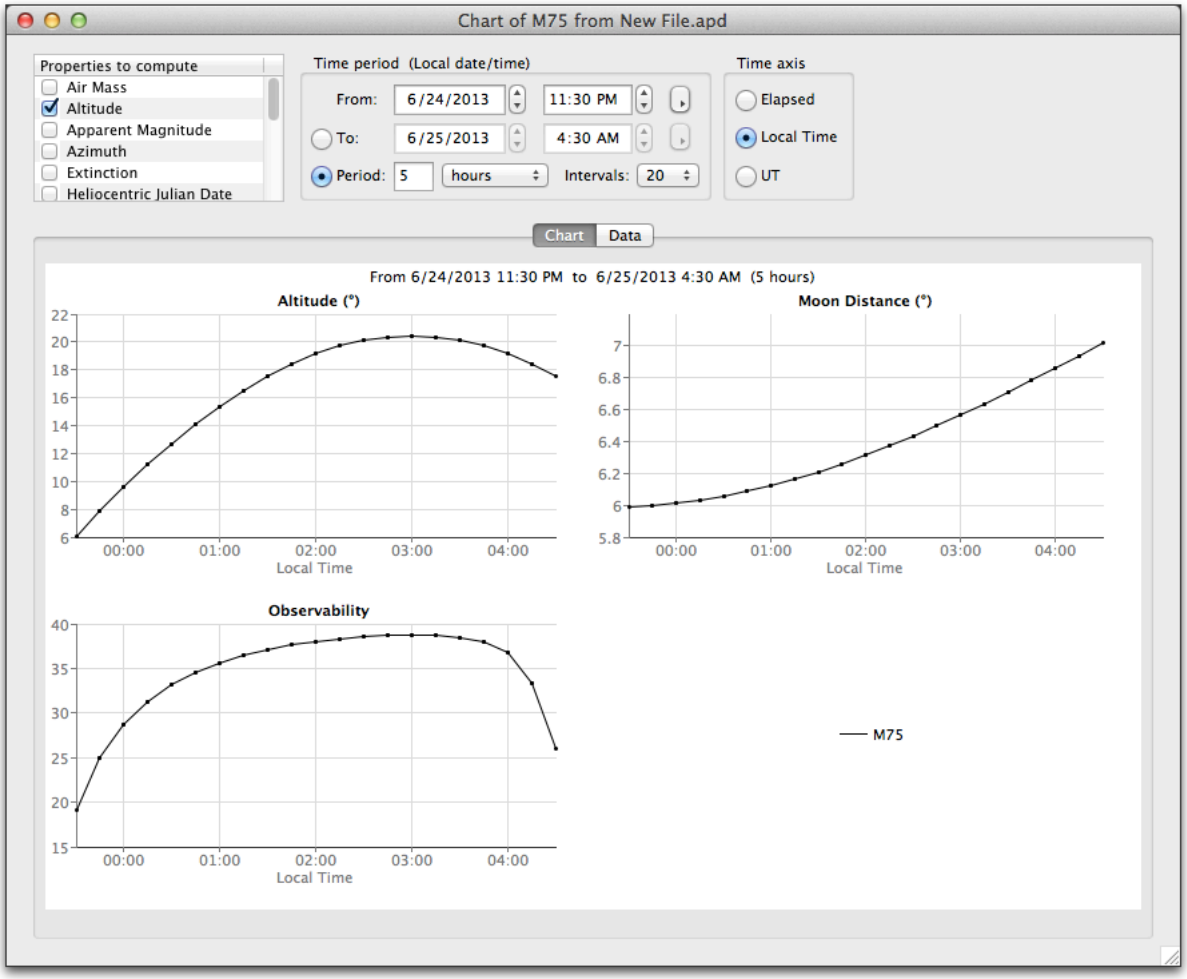


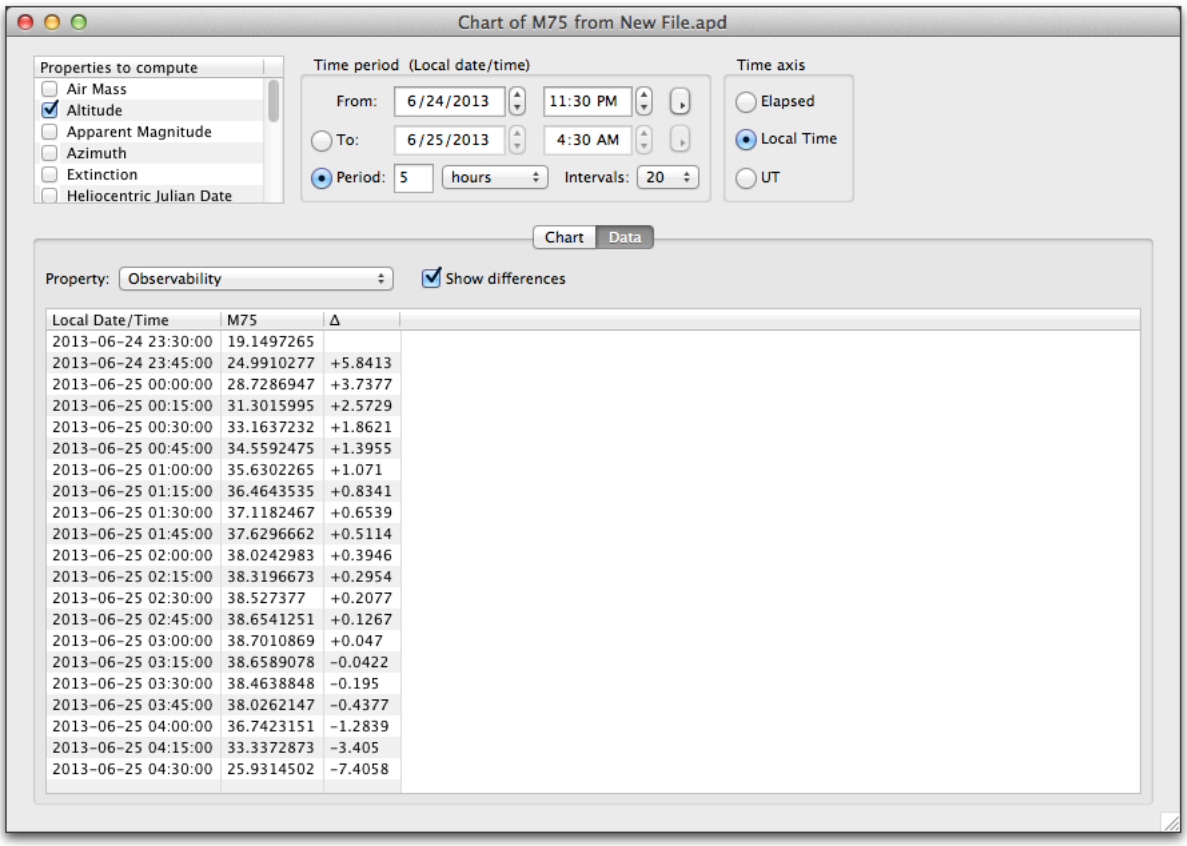
Figure 254: Object properties vs. time charts, for a single object

You can specify a time period from a start local date/time to an end local date/time, or from a start local date/time for a given period in seconds, minutes, hours, or days. Specify the number of intervals you desire and they will be uniformly spread over the specified time period. You can also specify the units in the time (horizontal) axis.

For each checked property, a small chart of that property over time will be displayed (Figure 254). Moving the cursor over a chart will display the value of the property at the pointed-to time, at the bottom of the window.

These charts can be printed (**File > Print...**).

The tabular data can be displayed in the Data tab (Figure 255). Select the property you want to tabulate using the **Property** popup. You can also show a differences (Δ) column using the **Show differences** checkbox. This shows the difference in values between each row and row before it.



Local Date/Time	M75	Δ
2013-06-24 23:30:00	19.1497265	
2013-06-24 23:45:00	24.9910277	+5.8413
2013-06-25 00:00:00	28.7286947	+3.7377
2013-06-25 00:15:00	31.3015995	+2.5729
2013-06-25 00:30:00	33.1637232	+1.8621
2013-06-25 00:45:00	34.5592475	+1.3955
2013-06-25 01:00:00	35.6302265	+1.071
2013-06-25 01:15:00	36.4643535	+0.8341
2013-06-25 01:30:00	37.1182467	+0.6539
2013-06-25 01:45:00	37.6296662	+0.5114
2013-06-25 02:00:00	38.0242983	+0.3946
2013-06-25 02:15:00	38.3196673	+0.2954
2013-06-25 02:30:00	38.527377	+0.2077
2013-06-25 02:45:00	38.6541251	+0.1267
2013-06-25 03:00:00	38.7010869	+0.047
2013-06-25 03:15:00	38.6589078	-0.0422
2013-06-25 03:30:00	38.4638848	-0.195
2013-06-25 03:45:00	38.0262147	-0.4377
2013-06-25 04:00:00	36.7423151	-1.2839
2013-06-25 04:15:00	33.3372873	-3.405
2013-06-25 04:30:00	25.9314502	-7.4058

Figure 255: Object properties vs. time data, for a single object

If more than one object is selected, there will be multiple lines on each chart, one for each object, together with a suitable legend. Similarly, the tabular data will have one column for each object. See figures below.

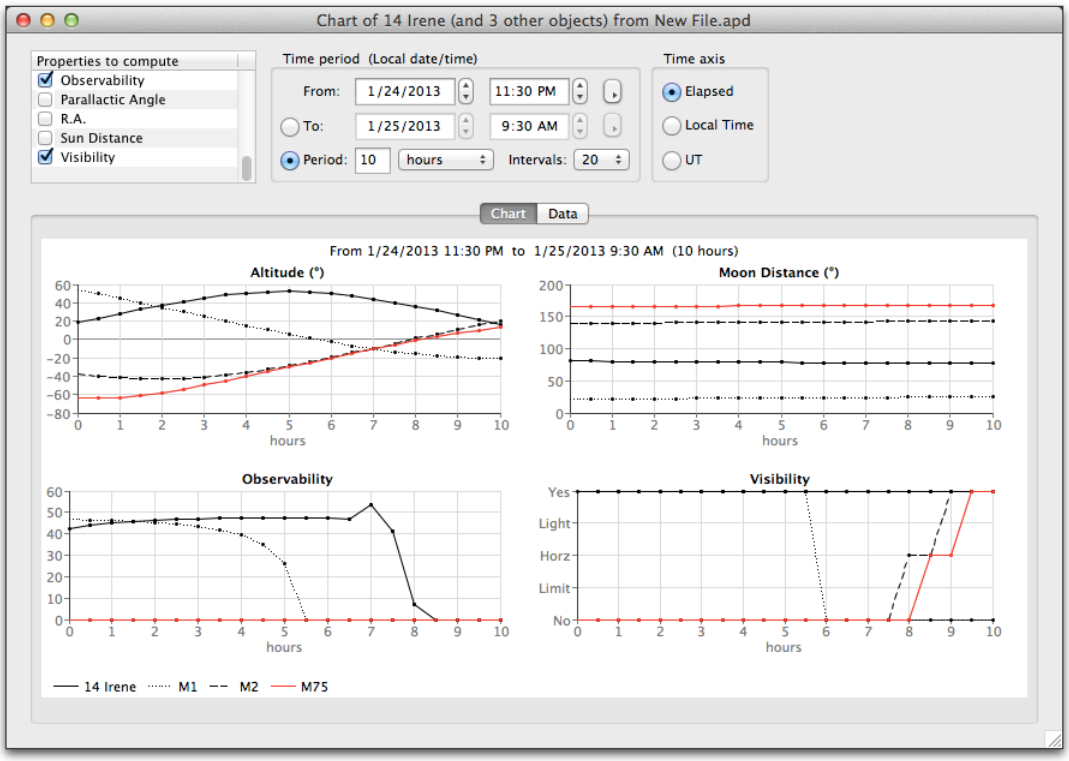
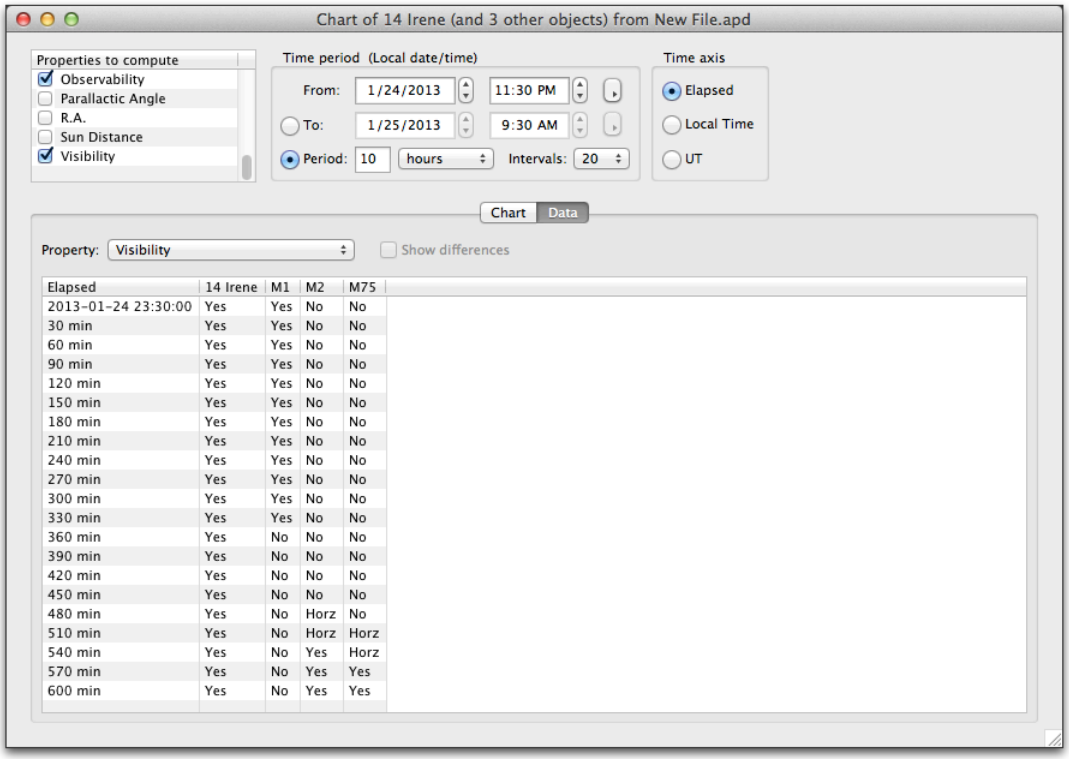


Figure 256: Object properties vs. time charts, for multiple objects



Elapsed	14 Irene	M1	M2	M75
2013-01-24 23:30:00	Yes	Yes	No	No
30 min	Yes	Yes	No	No
60 min	Yes	Yes	No	No
90 min	Yes	Yes	No	No
120 min	Yes	Yes	No	No
150 min	Yes	Yes	No	No
180 min	Yes	Yes	No	No
210 min	Yes	Yes	No	No
240 min	Yes	Yes	No	No
270 min	Yes	Yes	No	No
300 min	Yes	Yes	No	No
330 min	Yes	Yes	No	No
360 min	Yes	No	No	No
390 min	Yes	No	No	No
420 min	Yes	No	No	No
450 min	Yes	No	No	No
480 min	Yes	No	Horz	No
510 min	Yes	No	Horz	Horz
540 min	Yes	No	Yes	Horz
570 min	Yes	No	Yes	Yes
600 min	Yes	No	Yes	Yes

Figure 257: Object properties vs. time data, for multiple objects

11.6.21 Copy IDs

Edit > Copy IDs copies the ID column of the object list to the clipboard. You can then paste it into a text file of your own choosing.

11.6.22 Add User Image

You can use the ***Image > Add User Image...*** command to associate an arbitrary image with the selected object in the object list. If you know the image centre coordinates, orientation, and the scale of the image, then entering those values will allow the image to be displayed in the field of view chart.

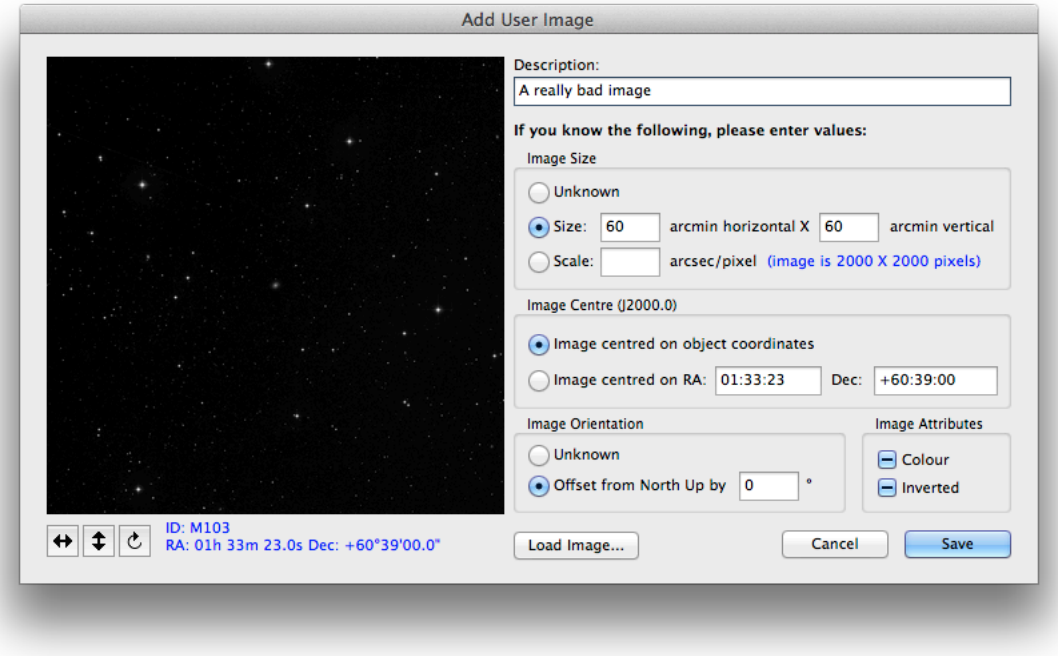


Figure 258: Add User Image

11.7 Field of View functions

These are functions that act on the Field of View chart

11.7.1 Select Field of View to Include

Object > Select Field of View to Include selects a field of view size and centre coordinates to include the selected objects. If the required field of view required is greater than 60° then this feature will not work.

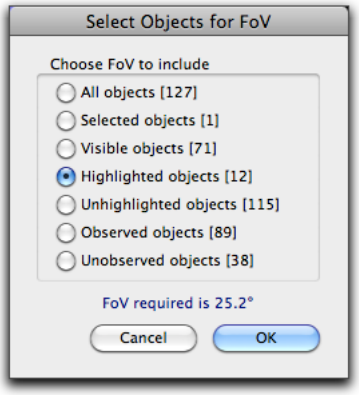


Figure 259: Select field of view to include

11.7.2 Get Field of View Objects

Object > Get Field of View Objects shows the plan and catalogue objects displayed in the Field of View chart as a table of objects in the Search Results window.

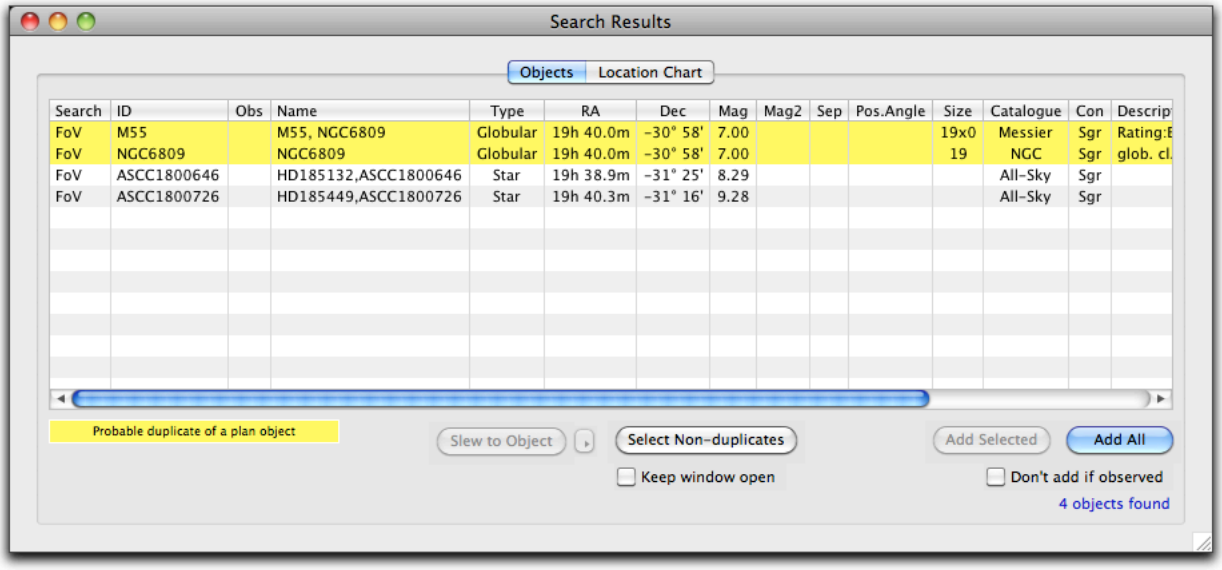


Figure 260: Field of View objects

11.7.3 Show Constellation in Field of View

Set the Field of View chart to show the selected constellation in its entirety. Also sets the stellar magnitude to a suitable "naked eye" limit to avoid showing too many stars.

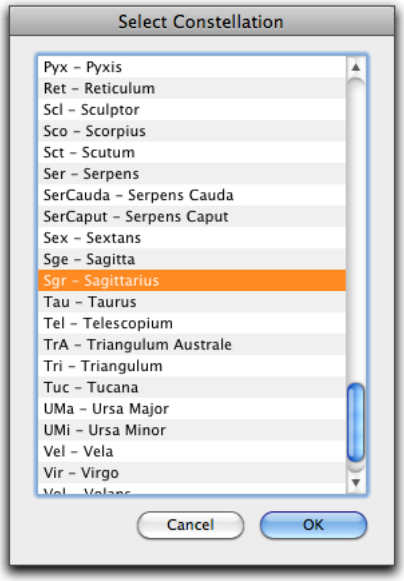


Figure 261: Show Constellation in Field of View

12 Observations

12.1 Logging observations

Observations are logged from the Observations tab on the plan document window. This is described in Section 11.3 on page 113.

In order to create a new observation, you must have an object selected in the object list (on the Objects or Observations tab). That selected object will be the one for which the observation will be logged. To create a new observation, use one of the following methods:

- Click the ***New Observation*** button under the object list on the Objects tab. This switches you to the Observations tab and creates a new observation.
- Click the ***+*** button under the Observations list at the bottom left of the Observations tab.
- Right-click the object in the object list and select ***New Observation***.
- Use the ***Observation > New Observation*** menu command.

What happens next depends on the **New observation date/time source** setting in Observation preferences (Section 20.9.1 on page 309).

If the setting is **Computer** (or **Telescope**), then the logged date/time of the observation is set to the computer's clock (or the telescope - if one is connected and the date/time can be retrieved from it). This is only really useful if you are logging observations in "real time" while you are actually observing.

If the setting is **Ask User**, then you are asked to enter the date/time of the observation via a dialog.

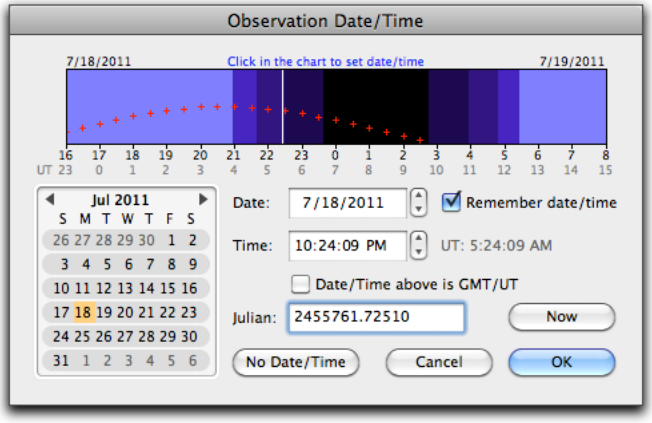


Figure 262: Observation date/time dialog

You can enter the local date/time, GMT/UT (using the checkbox), or Julian date. You can also click the mouse on the chart at the top of the dialog to enter an approximate time.

If you don't have a date/time for the observation (e.g. it's an old observation from the days before you logged that information), you can click the ***No Date/Time*** button to mark the observation as such.

The observation is logged, added to the Observations list, and you can now add the details in the fields on the right side of the Observations tab, or change them there at any time in the future.

If you need to change the date and/or time of the observation in the future, you can do it by:

- Select the observation in the Observations list and use the ***Observation > Change Observation Date/Time...*** menu command.
- Right-click the observation in the Observations list and use the ***Edit date/time of selected observation*** menu command.

The dialog shown above is presented and you can change the observation's date and/or time.

12.1.1 Quick observations

Sometimes you just want to log that an observation was made on an object, without worrying about making notes, selecting the date/time, noting what telescope you used, etc. This is a "quick observation", and consists of a normal observation, using the current local time, and with no other input. You can edit the other stuff in later if you wish.

To make a quick observation, select an object (or more than one) in the object list and click the **Quick Obs** button under the object list. Alternatively you can use the **Observation > New Quick Observation** menu command, or right-click the object list and use **Make Quick Observation**.

Once you have made a quick observation, the **Quick Obs** button changes its caption to **Delete Obs**, which offers a convenient way to delete the last quick observation. However, after two minutes it reverts back to **Quick Obs**. You can also use **Observation > Delete Last Quick Observation** to delete the last quick observation you made on the selected object (this menu command does not have a 2 minute time window).

12.2 Observation database

All observations and observing session data are kept in a central observation database. You can view and manipulate this data from the Observation Database window. This is accessed by one of the following methods:

- Use the ***Observation > Show Observation Database*** menu command.
- Click the ***Show Observation Database*** button under the Observations list on the Observations tab of a plan document window (the second button from the right).

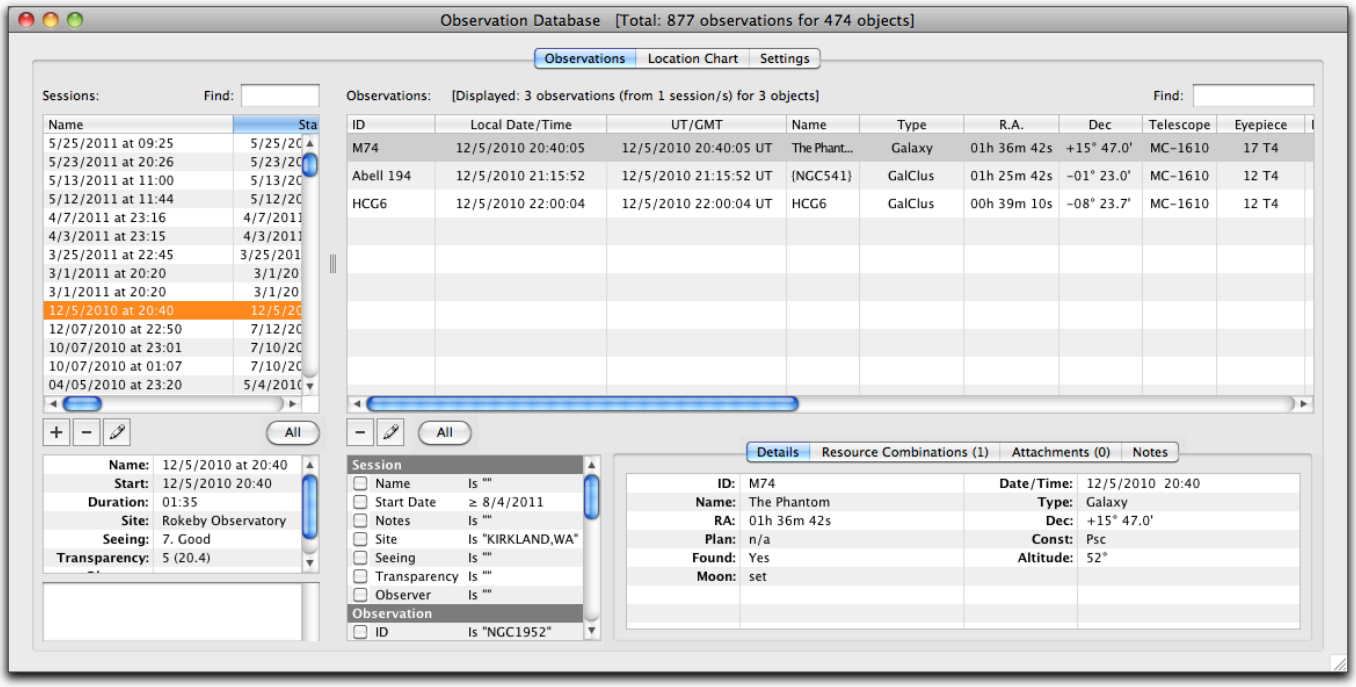


Figure 263: Observation database window

The following sections describe the functionality of this window.

12.2.1 Sessions list

The left side of the database window contains the Session data. At the top left is the Sessions list, which contains a list of observing sessions in the database. The columns in this list can include[1]:

- **Name**. The name given to the session. The default name given to a newly-created session is "ddddd at ttttt" where ddddd is the date and ttttt is the time of the start of the session. You can, however, name your sessions manually as you please (e.g. "Vacaville, Aug 23, 2012").
- **Start**. The start date/time of the session.
- **Duration**. The duration of the session in hours and minutes.
- **Obs**. The number of observations made in the session.
- **Site**. The observing site name.
- **User**. User-defined field values, where applicable.
- **Observer**. The observer name.
- **Transparency**. The Transparency value for the session.
- **Seeing**. The Seeing value for the session.
- **Plan/s**. The plan document/s used to make the observations.
- **Notes**. The observing notes for the session.

1. See Section 12.2.18 on page 193 for details on how to select and order these columns.

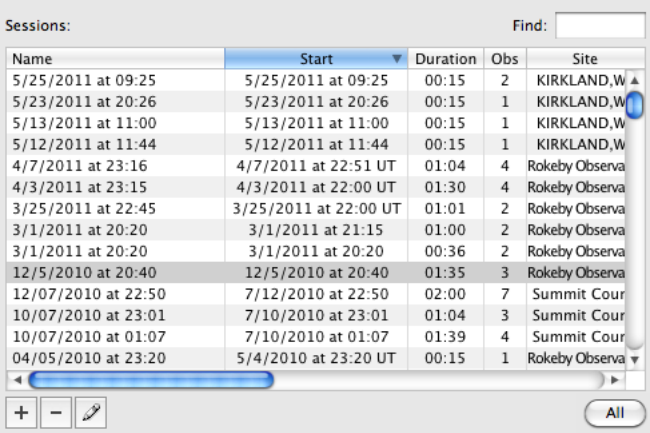


Figure 264: Sessions list

The **+** button under the list creates a new session manually (normally this is done for you automatically when you create a new observation that isn't in an existing session).

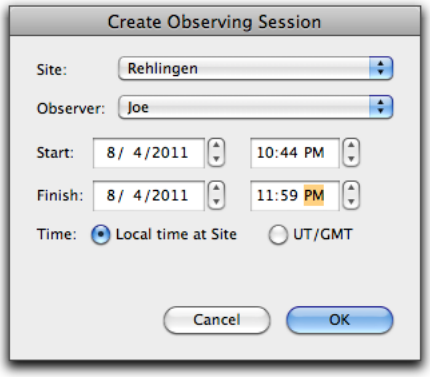


Figure 265: Create observing session dialog

A new session is created with no associated observations.

The **–** button deletes the selected session/s, and all associated observations. You might want to think twice before clicking ***Yes*** in the subsequent alert dialog.

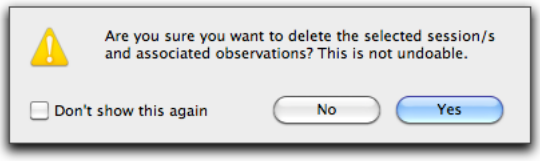


Figure 266: Session deletion

The third button under the list edits the selected session. See Section 12.2.3 on page 183 for more information.

The ***All*** button selects all of the sessions in the list.

The **Find** field above the list limits the visible sessions only to those containing the given search string in one of the fields.

Note that sessions list may not contain *all* sessions in the database if there are session restrictions in effect (see Section 12.2.15 on page 189).

12.2.2 Session data

When a single session is selected in the list, its data are summarised in the fields below the list. Note that you are not able to edit these values directly - see the section below on how to edit a session's data.

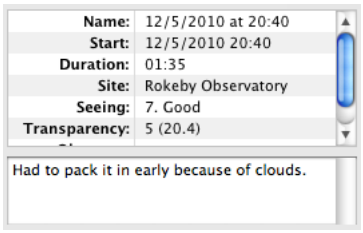


Figure 267: Session data

12.2.3 Editing session data

To edit an observation session's data, select the session in the sessions list, and either

- Right-click the session entry in the list and choose ***Edit selected session*** item, or
- Click the edit button under the list (third from the left).

The session edit dialog allows you to change various data for that session. Any changes are saved when the ***OK*** button is clicked. If the session is longer than it should be (i.e. has excess time before the first observation, or after the last observation, the ***Trim Session*** button is enabled, and using it will trim off that excess time.

If you choose an observation other than the first or last in the list of observations, you can use the ***Split Session*** button to split the session into two separate sessions at that observation time.

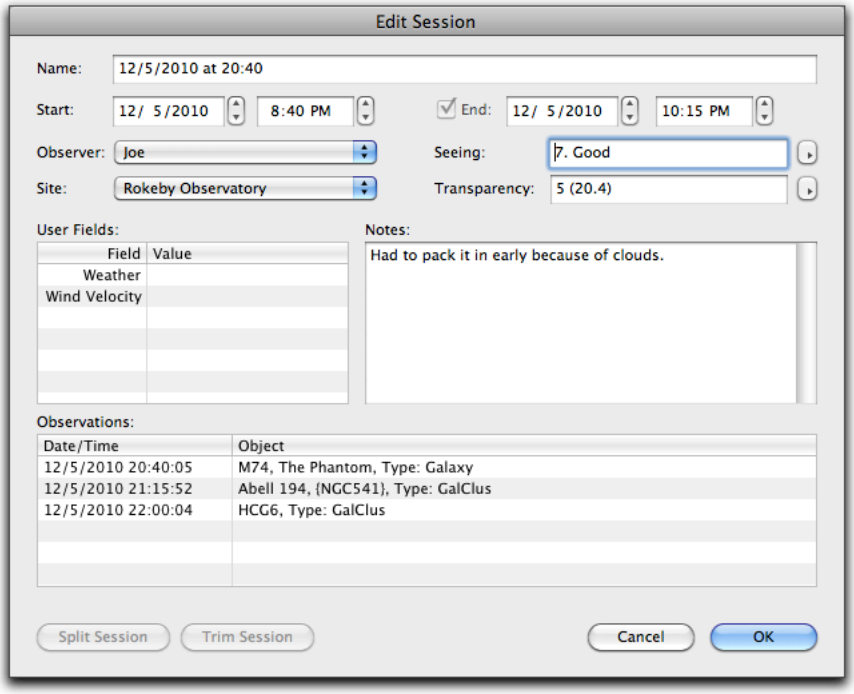


Figure 268: Session edit dialog

12.2.4 Merging sessions

If you select two adjacent[1] sessions in the sessions list, you can merge those two sessions together into a single session, by right-clicking and choosing the ***Merge Sessions*** menu item.

12.2.5 Session find-and-replace

Right-clicking the sessions list and choosing ***Find and Replace...*** allows you to find and replace a given string in all sessions currently displayed in the sessions list. This will only take place in the session fields that you specify.

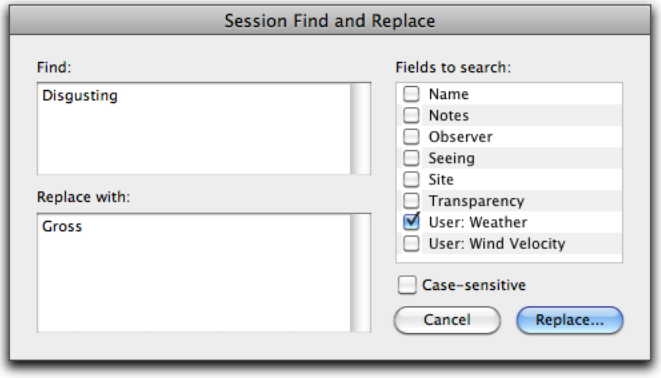


Figure 269: Session find-and-replace dialog

12.2.6 Observations list

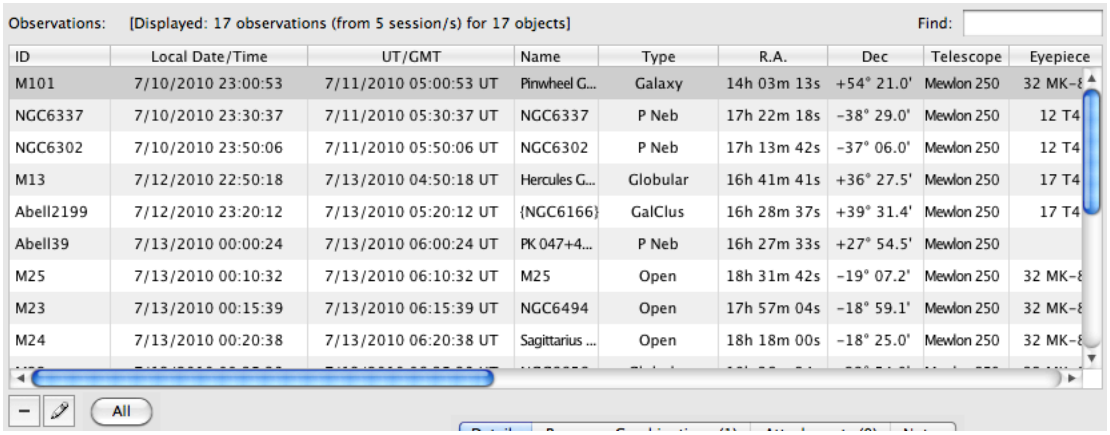


Figure 270: Observations list

The observations list displays observations contained in whatever sessions are currently selected in the sessions list.

Note that sessions list may not contain *all* sessions in the database if there are session restrictions in effect (see Section 12.2.15 on page 189).

The columns in this list can include[2]:

1. adjacent in so much as that no other session falls between them in time.

2. See Section 12.2.18 on page 193 for details on how to select and order these columns.

- **ID**. Object ID.
- **Local Date/Time**. Local date and time the observation was made.
- **UT/GMT**. The UT date and time the observation was made.
- **Name**. Object name.
- **Type**. Object type.
- **R.A**. Object right ascension.
- **Dec**. Object declination.
- **Telescope**. The first resource combination Telescope entry.
- **Eyepiece**. The first resource combination Eyepiece entry (if applicable).
- **Imager**. The first resource combination Imager entry (if applicable).
- **Filter**. The first resource combination Filter entry (if applicable).
- **Optical Aid**. The first resource combination Optical Aid entry (if applicable).
- **Rating**. The first resource combination Rating entry (if applicable).
- **Plan**. The originating plan document from whence this observation was made.
- **Const**. The constellation containing the object.
- **# Combos**. Number of resource combinations used in the observation.
- **Found**. Whether or not the object was found during the observation.
- **Notes**. Observation notes.
- **User**. Any user-defined field values.

12.2.7 Observation data

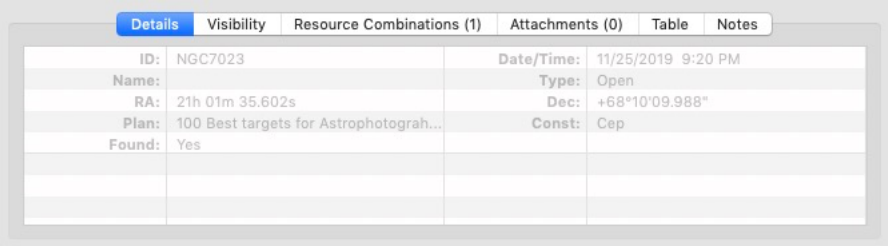


Figure 271: Observation data

The data for a selected observation are displayed under the observations list. The tabs display different aspects of the data. Note that it is not possible to edit the values in these fields, apart from the ***Table*** tab. To edit the data, see the next section.

12.2.8 Editing observation data

Edit an observation by selecting it in the observations list and either right-clicking and selecting ***Edit selected observation***, or clicking the edit button under the observations list (second from left).

The dialog lets you edit most aspects of the observation, including the date/time.

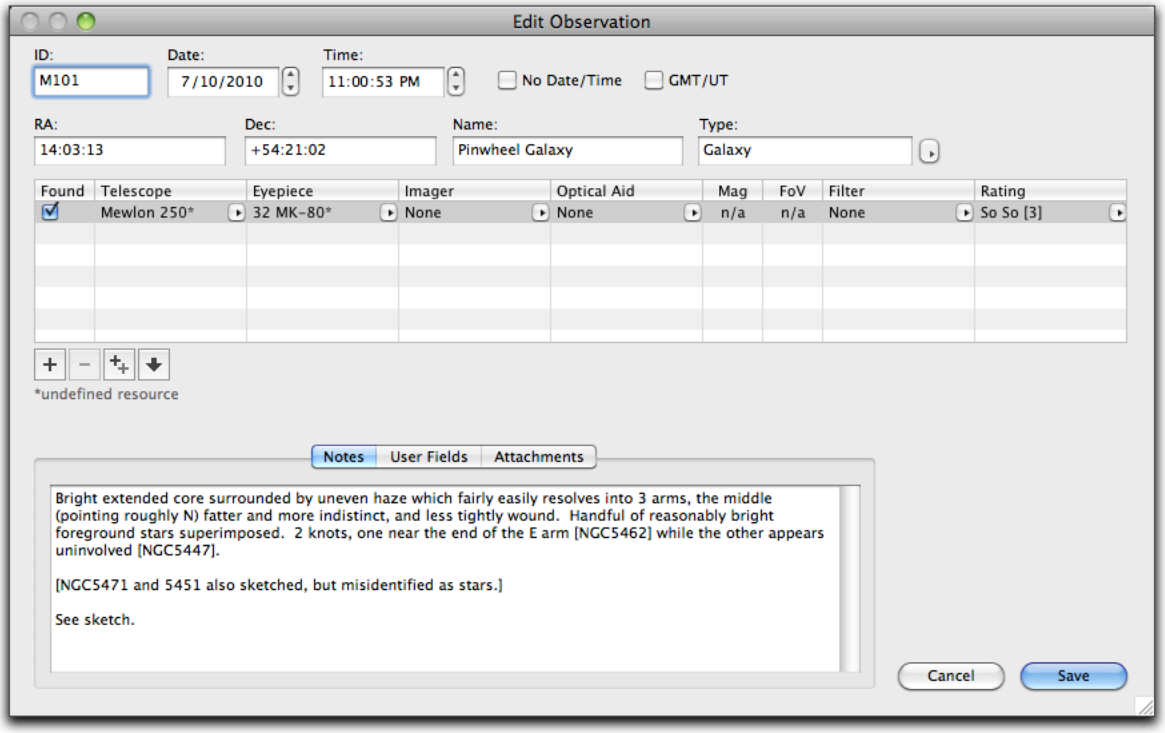


Figure 272: Observation editing dialog

12.2.9 Observation Tabular Data

A table of data can be attached to each observation. Such tables are viewed and edited in the Table tab below the observation list. The tables can have as many columns and rows as you like (within reason). This feature is designed for more advanced applications, and has full scripting support.

Initially the tables are undefined. You must define at least one table column. All observation tables share the same columns, but each observation's table row data is unique to that observation.

Figure 273: Empty observation table

Edit the column definitions by clicking on the edit button at the bottom right.

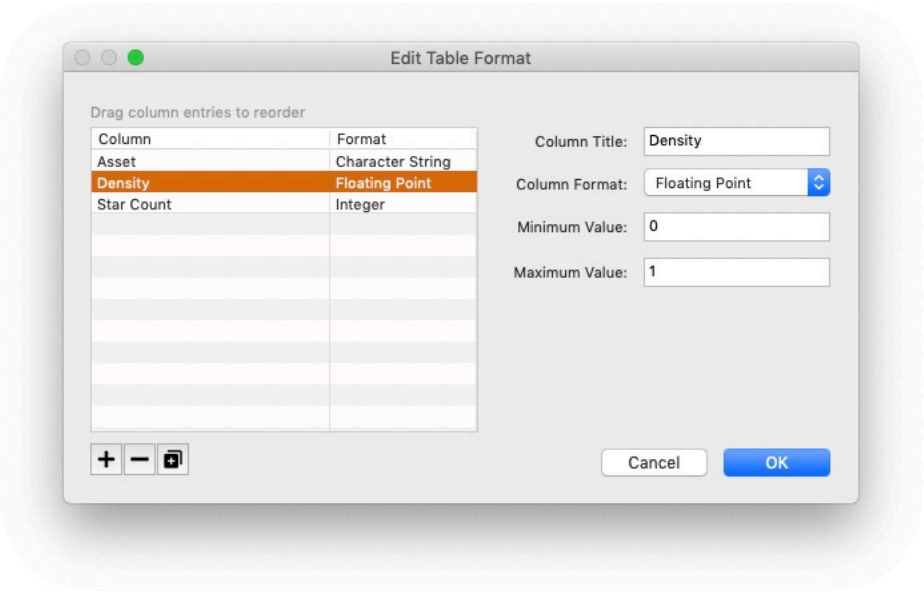


Figure 274: Edit table columns

You specify the column title, the type of data, and its range of values (if appropriate). Once you've set up the columns, you can use the + button to add rows to the table (or use scripting to do the job).

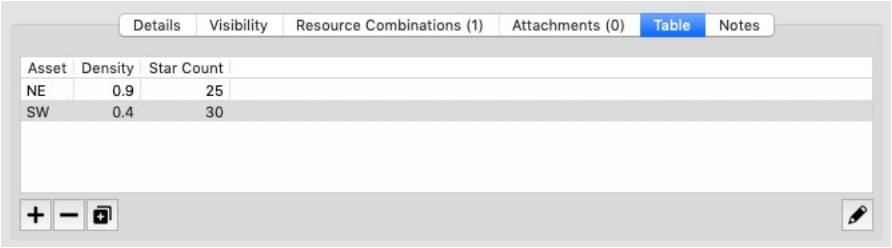


Figure 275: Adding data to an observation table

12.2.10 Select session

If you have multiple sessions selected, then the observations list will contain the observations associated with those selected sessions. If you select an observation, right-click, and select ***Select session for selected observation***, then only the session that contains that observation will be selected in the sessions list.

12.2.11 Known synonyms

The observation database keeps a list of synonyms for each observed object. If you select an observation, right-click and select ***Known synonyms...***, a dialog will appear showing the known[1] synonyms for that observed object.

1. The set of known synonyms is dependent on the installed set of catalogues. More installed catalogues will give a wider set of synonyms.

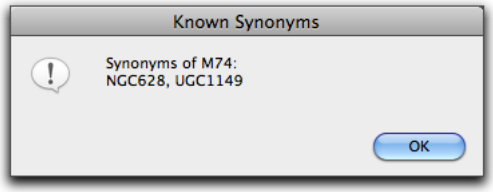


Figure 276: Known synonyms

12.2.12 Known synonyms using SIMBAD

If you select an observation, right-click and select ***Known synonyms using SIMBAD...***, a dialog will appear showing the known synonyms for that observed object. This feature looks up the ID in the on-line SIMBAD database, and hence gives a better coverage of synonyms than the above feature. It requires on-line Internet access.

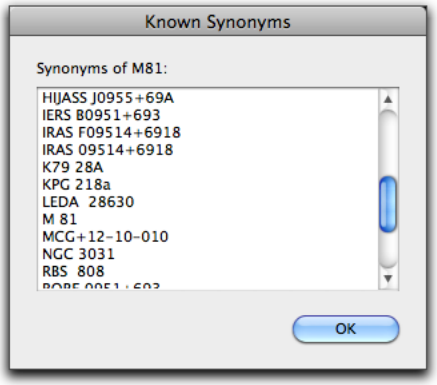


Figure 277: Known synonyms using SIMBAD

12.2.13 Merge selected observations of xxx

If more than one observation is selected in the observations list, and if in those selected observations, two or more observations of the same ID in the same session exist, then you will be given the opportunity of merging those observations into a single observation.

This can be useful for observations made using AstroPlanner V1, where the lack of multiple resource combinations meant multiple observations of an object were required if more than one eyepiece, telescope, etc. was used.

12.2.14 Observation find-and-replace

Right-clicking the observations list and choosing ***Find and Replace...*** allows you to find and replace a given string in all observations currently displayed in the observations list. This will only take place in the observation fields that you specify.

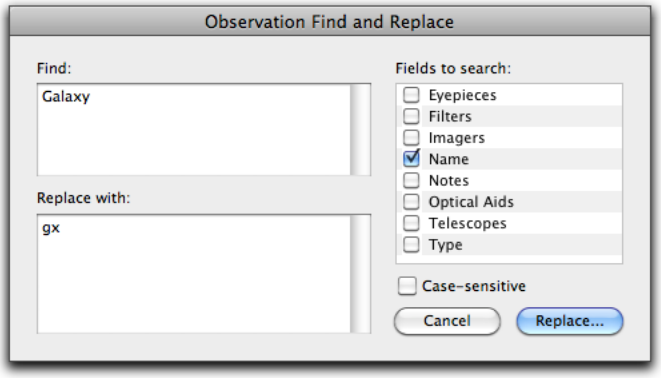


Figure 278: Observation find-and-replace dialog

12.2.15 List restrictions

Normally, the sessions list displays all the sessions present in the database, and the observations list displays all the observations associated with selected sessions. You can use the restrictions widget below the observations list to restrict what sessions and/or observations are shown.

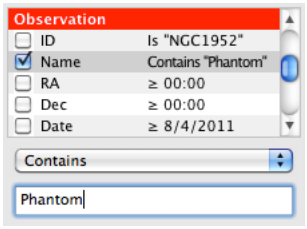


Figure 279: List restrictions

The widget is divided into two sections, one for Sessions and the other for Observations. If the checkbox next to any restriction is checked then displayed sessions/observations will be limited to those that pass the checked restrictions.

For example, in Figure 279, only observations that contain "Phantom" in their Name field will be displayed.

Note that the heading of each section is highlighted in red if any restrictions are checked as a warning (so that you don't think that observations have mysteriously gone missing when they are just not being displayed).

12.2.16 Location chart

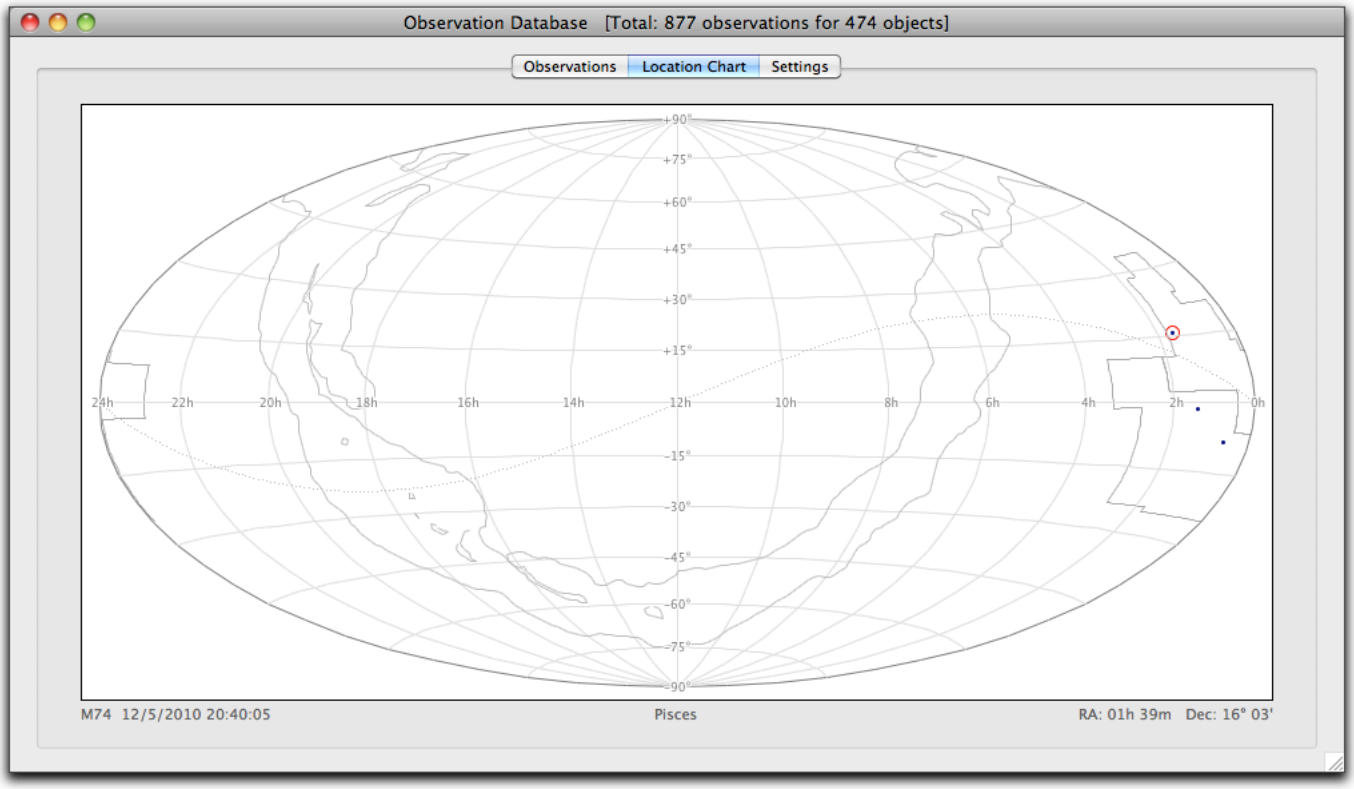


Figure 280: Observation database window Location Chart

The Location chart is located on a separate tab of the database window. It shows the location of the displayed observations on a whole-sky map. Additionally, any selected observations are circled in red. You can double-click an observed object on the chart and the associated record will be selected in the observations list.

12.2.17 Statistics

The Statistics tab shows one or more tables and pie charts of statistics related to the observations in your observation database. The window can have up to 3 x 3 independent table/charts, automatically determined by the size of the window (Figure 282).

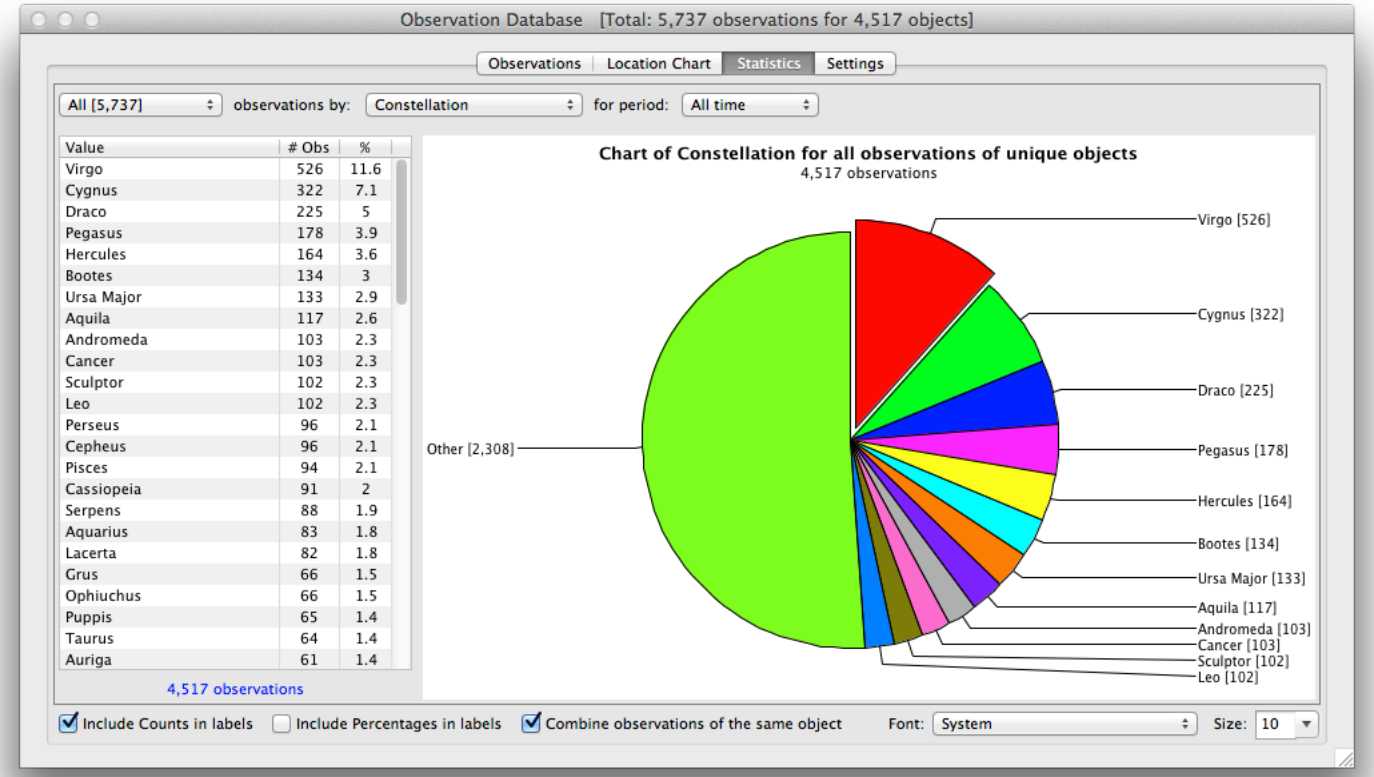


Figure 281: Statistics tab

Above each table/chart are three popup menus that control what is displayed. The first determines what observations are to be used:

- ***All***. All observations in the database.
- ***Displayed.*** Only the observations currently being displayed in the Observations tab.
- ***Selected.*** Only the observations currently selected in the list in the Observations tab.

The second popup determines the observation parameter to use to summarise the statistics values:

- Constellation.
- Day of Week.
- Eyepiece.
- Filter.
- Found.
- Hour of Day.
- ID.
- Imager.
- Month.

- Object Type.
- Observer.
- Optical Aid.
- Plan File.
- Rating.
- Seeing.
- Site.
- Telescope.
- Transparency.
- Year.

The third popup determines the period over which observations are to be included:

- All time.
- This year.
- Last year.
- This month.
- Last month.
- xxxx, where xxxx is each year for which observations were made. e.g. 2000, 2001, etc.

The tables represent the different values of the parameter, the number of observations, and the percentage of the total, in descending order.

The pie chart is a graphical depiction of the first 12 rows of the table, and a 13th "slice" representing the rest of the table's rows combined.

At the bottom of the tab are some settings that alter the table contents and/or the pie charts:

- **Include Counts in labels**. The contents of the ***# Obs*** column is included in the pie "slice" labels.
- **Include Percentages in labels**. The contents of the **%** column is included in the pie "slice" labels.
- **Combine observations of the same object**. Observations of the same object are counted as one.
- **Font**. Customise the font and size used in the pie charts.

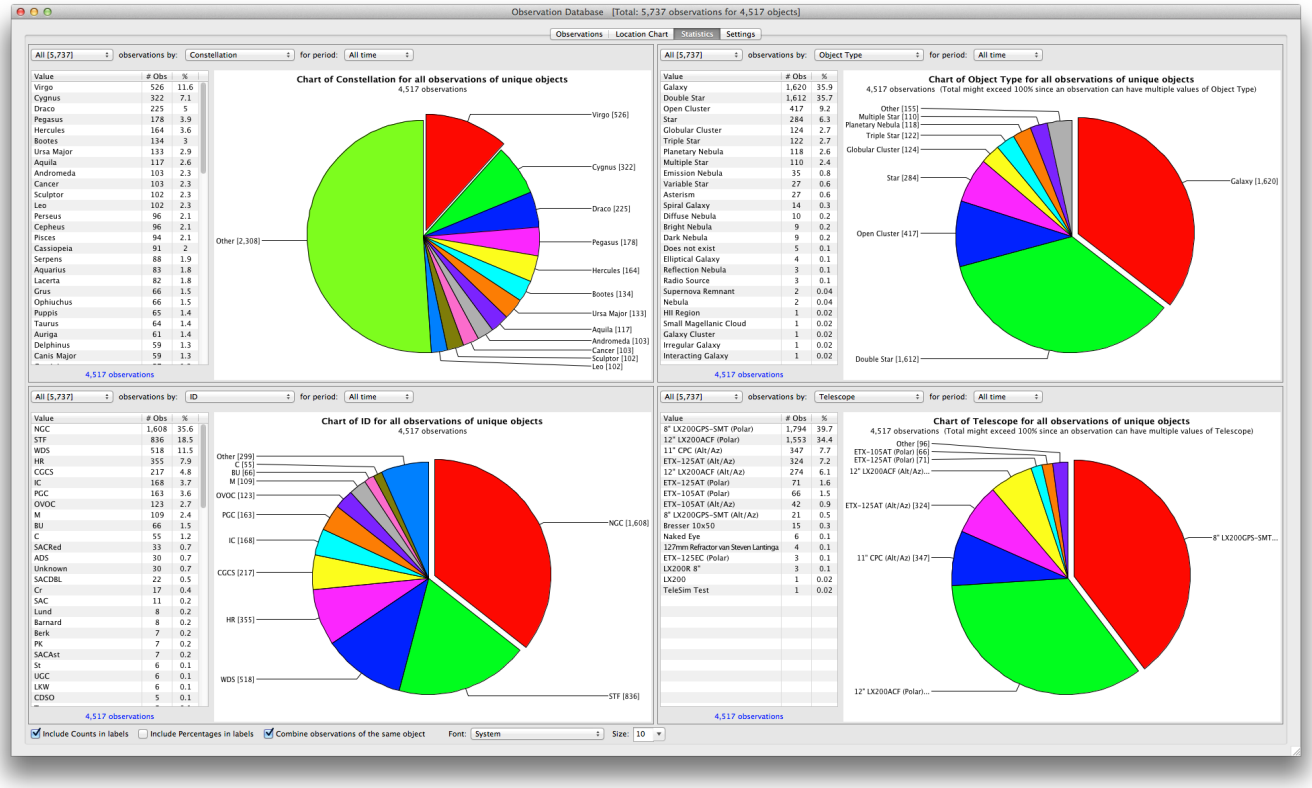


Figure 282: Statistics tab in a larger window, show 2 x 2 table/charts

12.2.18 Settings

The Settings tab allows you to set up some observation database options.

Sessions list columns

Choose what columns you want to see in the Sessions list (by checking or unchecking the checkboxes), and drag the entries to determine the order of the columns. Note that the "User" entry represents any user-defined session fields (and hence might consist or zero or more columns).

Observations list columns

Choose what columns you want to see in the Observations list (by checking or unchecking the checkboxes), and drag the entries to determine the order of the columns. Note that the "User" entry represents any user-defined observation fields (and hence might consist or zero or more columns).

Synonyms

Sometimes the application fails to realise that two IDs are in fact synonymous (i.e. they represent the same object in two different catalogues). You can "force" two IDs to be synonymous by listing then here as pairs of comma-separated IDs.

Non-synonyms

Sometimes the application believes that two IDs are synonymous (i.e. they represent the same object in two different catalogues), when they are not actual synonyms. This can happen if catalogues have errors, or IDs are duplicated. You can "force" two IDs to be non-synonymous by listing then here as pairs of comma-separated IDs.

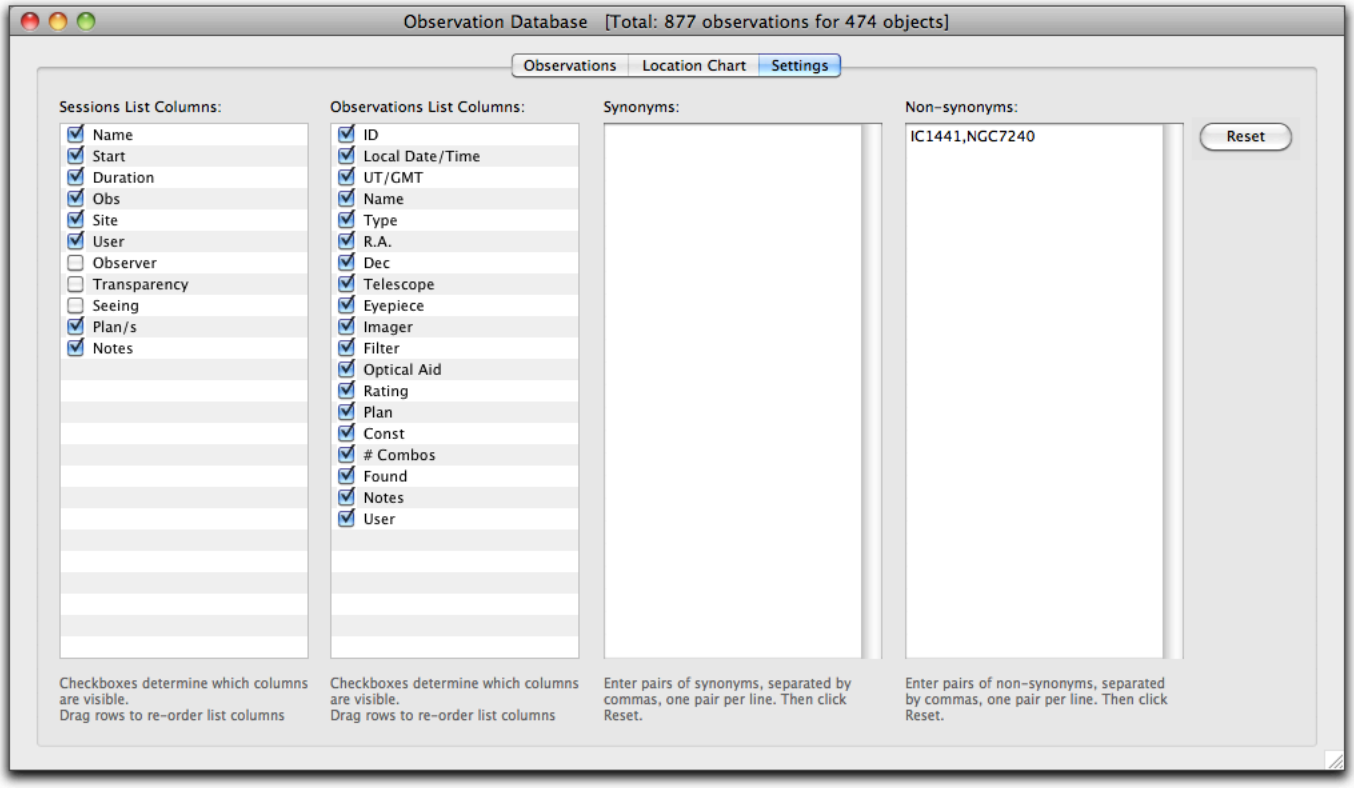


Figure 283: Observation database window Settings

12.2.19 Printing

You can print your object database (or subsets thereof) using the ***File > Print...*** menu command. This is covered in the Printing chapter (Section 15.6 on page 242).

13 Controlling a computerised telescope

AstroPlanner allows for the connection and control of many popular types of computerised telescope mounts. These can be digital setting circle (DSC) mount controllers (the computer can only read the current pointing coordinates of the telescope), or Go-to mounts (the computer can both read the current pointing coordinates of the telescope, and command the mount to slew the telescope to given coordinates).

Each Telescope resource (see Section 9.2.3 on page 58) can specify a computerised mount, which can be configured to suit.

13.1 Choosing a mount type

With your Resources window open (***Edit > Resources...***) and telescope selected in the Telescope tab, use the Computerised Mount popup menu to select the mount.

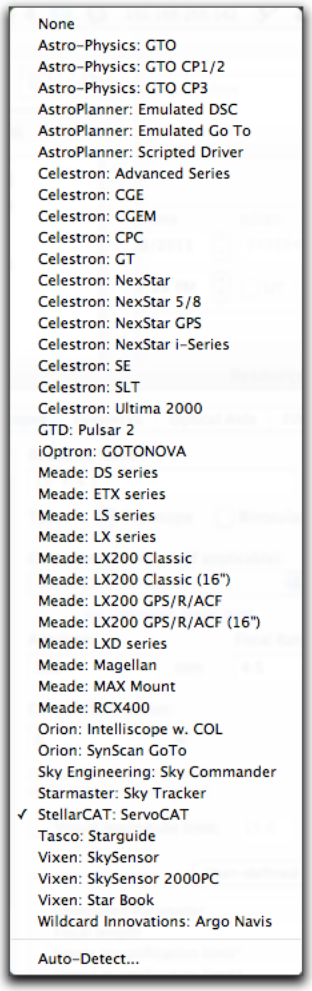


Figure 284: Computerised mount popup menu

All of the mounts listed are supported on both Mac and Windows (apart from ASCOM, which will only appear in Windows). Of special interest are the two AstroPlanner Emulated mounts, which control internally "simulated" telescopes, and which can be used for testing or practice purposes if a real mount is not available (see Section 13.11 on page 211). The AstroPlanner scripted mount uses a script to control the mount (see Section #.# on page #).

At the bottom of the menu is **Auto-Detect...**. This option can be used to find any connected telescopes and attempt to determine what kind of mount is connected. This is done by scanning each known serial port and attempting to get an expected response for each type of known telescope mount (not for ASCOM however).

The Auto-Detect dialog allows you to select the serial ports (and/or SkyFi/StarSeek adapter) to scan, and the expected type/s of telescope to check for. If you're not sure, check as many as you like, understanding that it might take a while to check for and find the correct one.

Note: If you plug in a USB-to-serial adapter then you might have to use the Refresh button (just to the right of the Serial ports checkbox) in order to find the serial port.

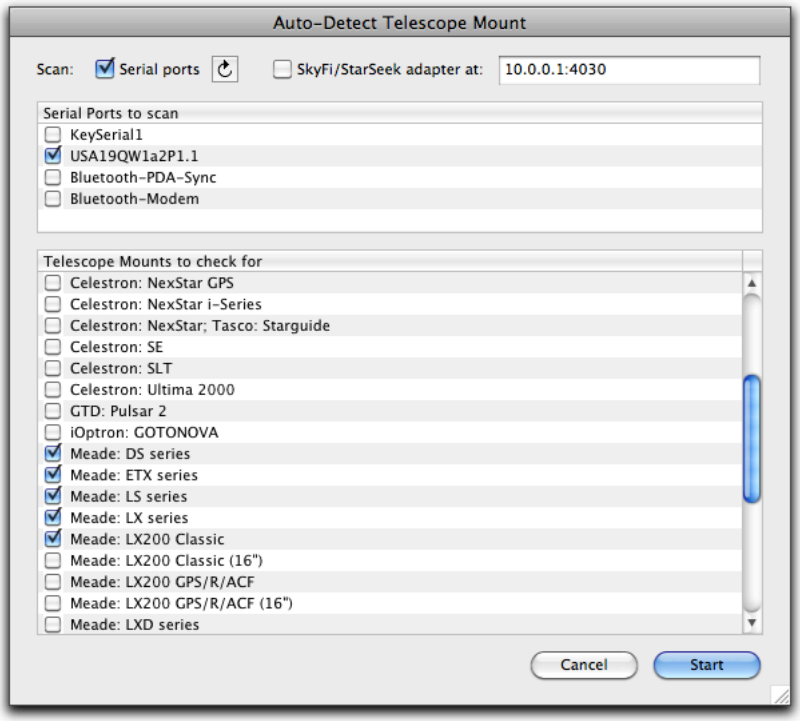


Figure 285: Auto-Detect dialog

The application scans the specified serial ports until a telescope mount responds correctly. The telescope mount type (or types if the algorithm cannot disambiguate more than one possible mount type) is displayed in a dialog (e.g. Figure 286), and lets you choose. If the chosen mount (or mounts) is incorrect, you can click the ***Ignore and Keep Looking*** button to continue scanning and checking for other mounts and/or other serial ports.

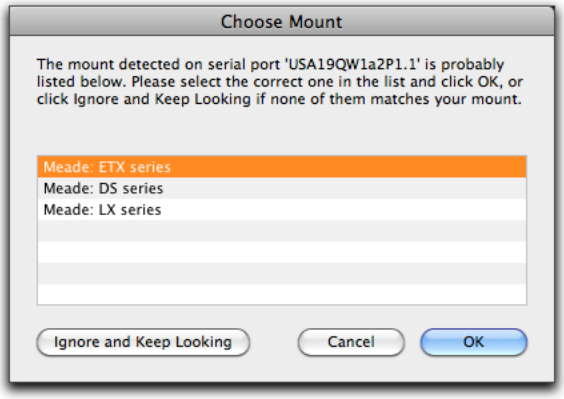


Figure 286: Choose mount dialog

13.2 Configuration

Once the mount type is selected, you will need to configure the software for your particular mount. This is done by clicking the ***Edit...*** button next to the Computerised Mount popup for the Telescope resource.

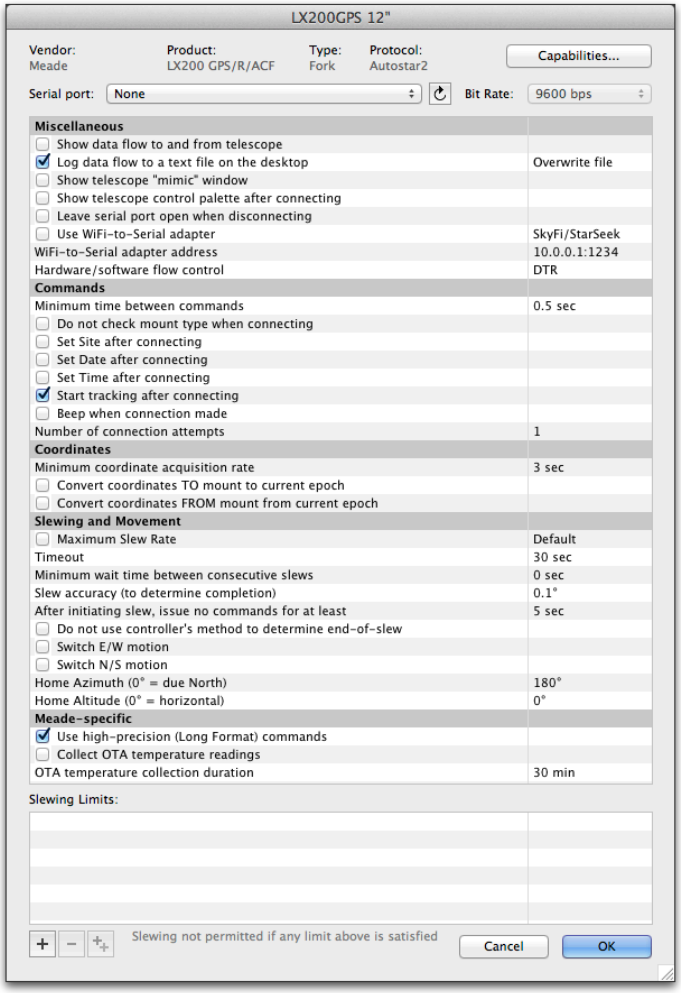


Figure 287: Mount parameters edit dialog

For most mounts, a serial port is required, and that is selected via the **Serial port** popup at the top left. If a choice of bit rates is allowed, the **Bit Rate** popup will be enabled.

The list below contains a number of configurable parameters. Some of those common to most mount types are listed below. Clicking/selecting a parameter allows you to edit its value, where applicable.

13.2.1 Miscellaneous

- **Show data flow to and from telescope**. When you connect a telescope, a window opens and shows all the data traffic to and from the mount. This is often useful for troubleshooting connections. The window is closed when you disconnect. The window has a checkbox which, when checked, will log the window's data and any subsequent data to a log file. The **Action** column is the action requested by the computer. The **To Telescope** column is the actual text command sent to the telescope mount. The **From Telescope** column is the actual response text received back from the mount (where applicable). The **Result** column is the interpreted value or meaning of the response from the mount (where applicable).

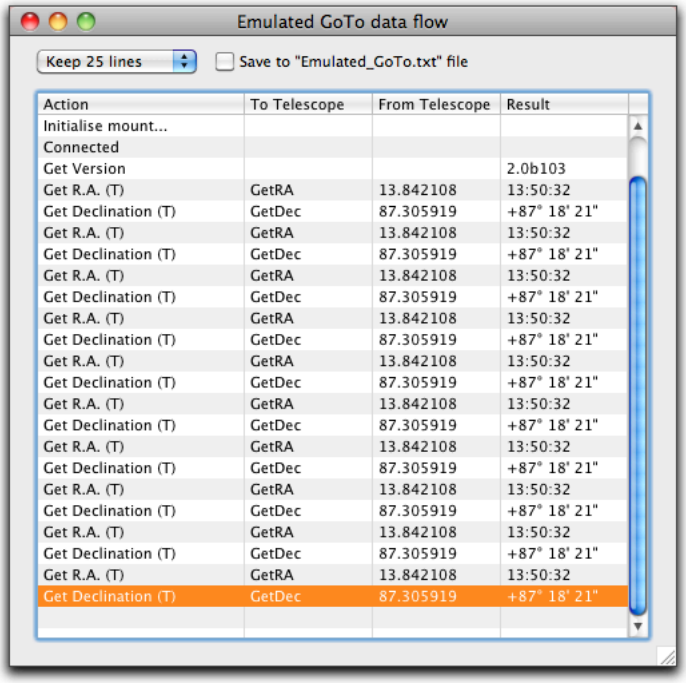


Figure 288: Data flow window

- **Log data flow to a text file on the desktop**. Similar to the above, but the traffic data is automatically logged to a text file on your desktop (with the same name as your telescope resource). You can choose to overwrite any existing log file, append to the existing log file, or create a new file each time you connect (in which case, the files will be numbered).
- **Show telescope "mimic" window**. Displays a small window (Figure 289) that shows the current pointing coordinates of the telescope. Useful if your telescope is remote from your computer. Emulated mounts also display this window. If your current Site has a user horizon defined, it will be displayed.

- **Show telescope control palette after connecting**. Shows the telescope control palette (see Section 13.8 on page 204) when you connect. Otherwise the control palette remains hidden until requested (***Telescope > Telescope Control Palette***).
- **Leave serial port open when disconnecting**. Normally, when the telescope is disconnected, the serial port is closed. This option allows the serial port to remain open when the telescope is disconnected, and re-used when the telescope is reconnected. This might avoid some delays with certain serial ports (e.g. Bluetooth) that take some time to connect and open each time.
- **Use WiFi-to-Serial adapter**. If you are using a SkyFi, StarSeek, Nexus, or other WiFi-to-Serial adapter, then select this option. If the IP#/port for the unit has been changed from the default, you can specify it here.
- **WiFi-to-Serial adapter address**. The IP number and port for the WiFi-to-Serial adapter.
- **Hardware/software flow control**. You can choose XON/XOFF and/or Data Terminal Ready (DTR) flow control if your telescope mount demands it (this will rarely be required).

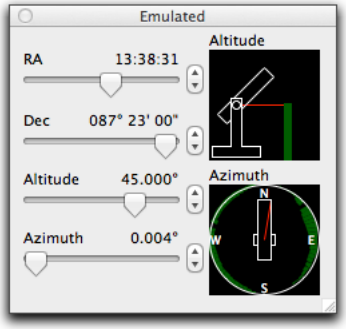


Figure 289: Telescope "mimic" window

13.2.2 Commands

- **Minimum time between commands**. The computer issues various commands to the mount. Some mounts cannot take more than a maximum number of commands per second. This setting allows you to specify a minimum time to wait between issuing commands.
- **Do not check mount type when connecting**. The computer typically checks to make sure that the correct type of mount is connected before continuing on and communicating with it. This option will avoid doing that check and assume that the mount is correct. This can be of use if you are, say, using the LX200 Classic mount protocol with a non-LX200 Classic mount, that might not support the commands that the LX200 mount driver uses for recognition.
- **Set Site after connecting**. After connecting the telescope, send the site information for the current site (latitude, longitude, GMT offset) to the telescope mount, if supported.
- **Set Date after connecting**. After connecting the telescope, send the local date to the telescope mount, if supported.
- **Set Time after connecting**. After connecting the telescope, send the local time to the telescope mount, if supported.
- **Start tracking after connecting**. If the mount allows tracking to be set on and off, this will force the mount to start tracking when you connect.
- **Beep when connection made**. Beep the computer when connection is made.

- **Number of connection attempts**. Sometimes it might require more than one attempt to connect to the telescope mount. This specifies the maximum number of attempts to make before giving up.

13.2.3 Coordinates

- **Minimum coordinate acquisition rate**. Minimum time between asking the mount for its current RA/Dec coordinates. The lower this value, the more often the mount is interrogated, which can slow down operation of the application.
- **Convert coordinates between J2000.0 and current epoch**. Normally the computer assumes the telescope uses epoch J2000.0 coordinates. If your telescope requires coordinates in the current epoch (JNow), then use this option. Very few telescopes have accurate enough pointing that this makes much difference in practice.
- **Use controller's internal database where possible**. Some mounts have an internal database of objects that can be accessed via the computer. If so, use this option. It is recommended that you *don't* use this option.

13.2.4 Slewing and Movement

- **Maximum Slew Rate**. If your mount allows, you can set the maximum slew rate (°/sec) for Go-to operations.
- **Timeout**. When slewing, if the mount does not report back that it has completed the slew within this time, it will report a timeout error. For mounts with slow slewing, you might need to bump this up.
- **Minimum wait time between consecutive slews**. Some mounts can get confused, or even damaged, if a slew is started before the current slew has completed, or for a short settling time afterwards. This option sets that required settling time.
- **Slew accuracy (to determine completion)**. Some mounts report when a slew is complete and some do not. In order to ascertain that the slew has completed, the computer asks the mount for its current pointing coordinates, and if they are within this angular distance of the target, the slew is assumed to have finished.
- **After initiating slew, issue no commands for at least *n* seconds**. Some mounts do not like any commands to be issued after a slew has started. This will make sure that no commands are issued before a specified time has passed.
- **Do not use controller's method to determine end-of-slew**. For mounts that have a special command to determine if the telescope is currently slewing, this will override that method (which can sometimes be unreliable), and use the comparison of pointing coordinates to determine slew completion instead.
- **Switch E/W motion**. When using the E/W movement buttons in the control palette, this option swaps the button actions around.
- **Switch N/S motion**. When using the N/S movement buttons in the control palette, this option swaps the button actions around.
- **Home Azimuth**. Specifies the azimuth of the Home position for the mount.
- **Home Altitude**. Specifies the altitude of the Home position for the mount.

13.2.5 Digital Setting Circles

- **Mount Type**. For digital setting circle (DSC) mount controllers, this specifies the type of mount in use.

13.2.6 Script

- **Driver Script**. If your mount is using a scripted driver (see Section 27.10 on page 377), then this option specifies the script to use.

13.3 ASCOM configuration

(*Windows only*) If you want to use an ASCOM driver to control your telescope mount, choose "ASCOM: ASCOM Driver" as your Computerised Mount type. Edit the mount (***Edit...*** button).

Click the ***ASCOM Configure...*** button to select the particular driver you want to use, and configure its properties (serial port, etc.).

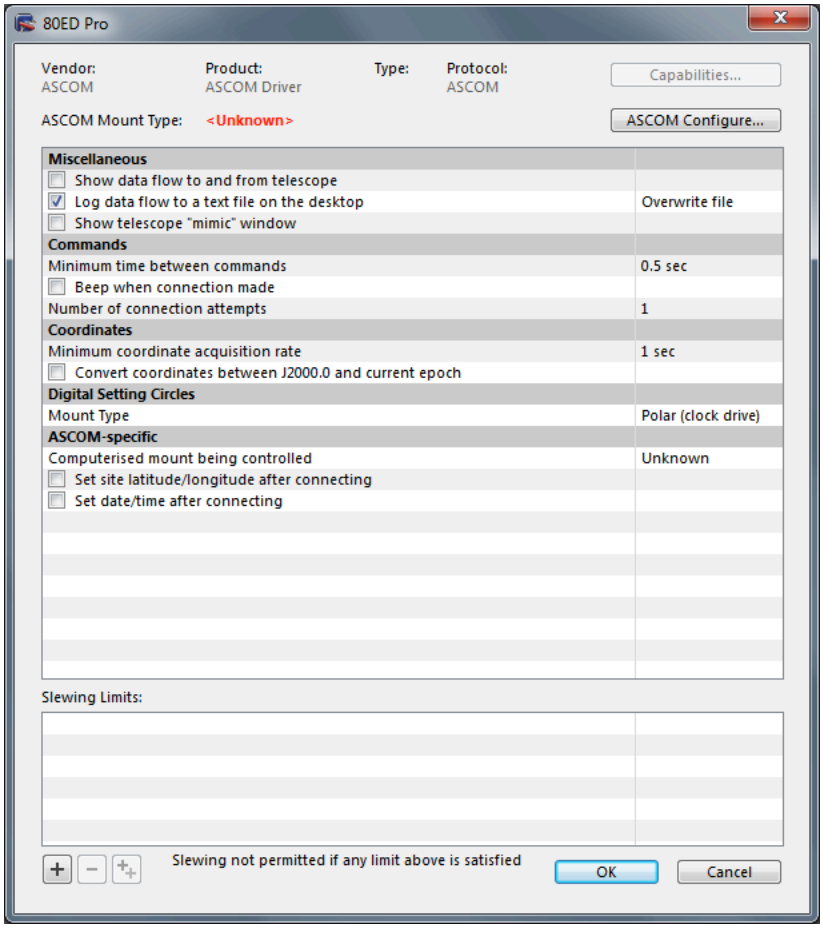


Figure 290: ASCOM mount - before selecting driver type

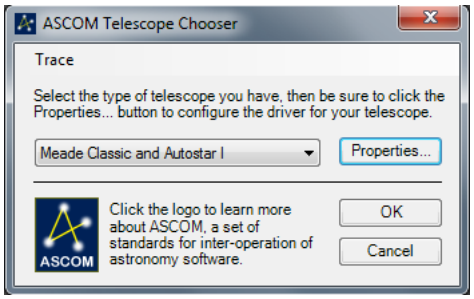


Figure 291: Selecting the ASCOM telescope type

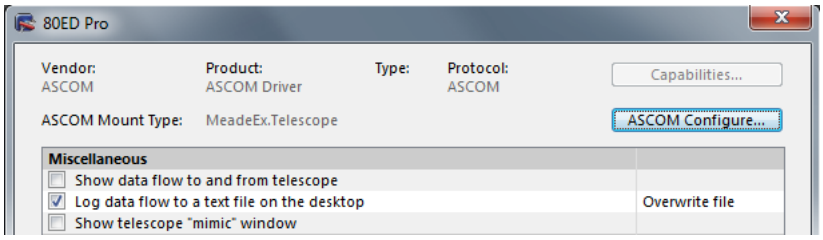


Figure 292: ASCOM Mount - after selecting driver type

You can also use the **Capabilities...** button to examine the capabilities available for that mount (not all of which might be available to you in AstroPlanner).

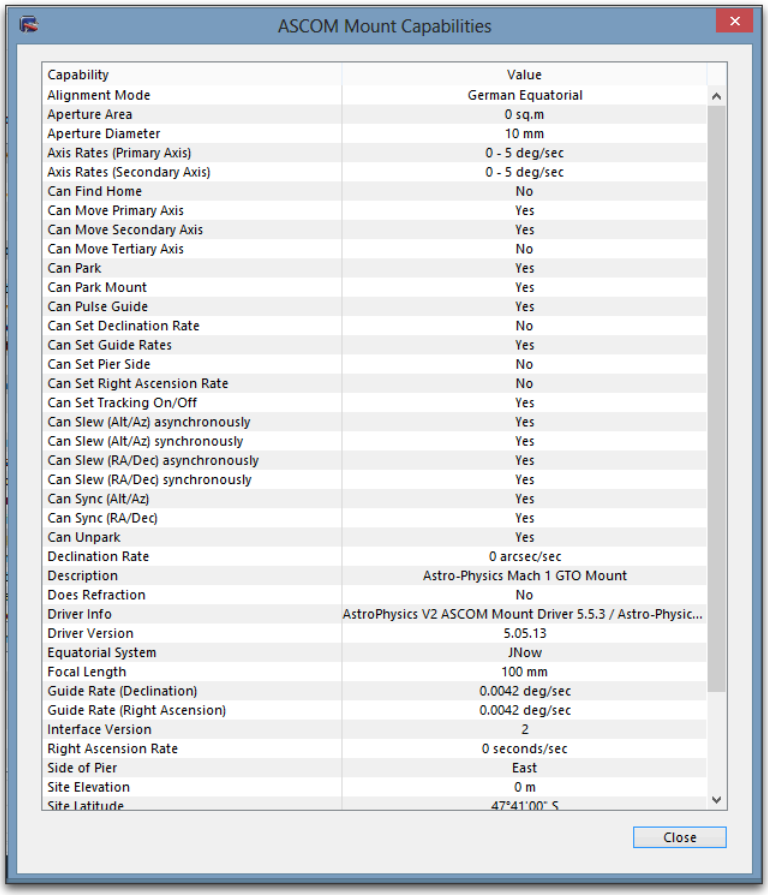


Figure 293: ASCOM Capabilities

***NOTE**: It would seem that in order to connect AstroPlanner to a shared ASCOM mount via the ASCOM POTH feature, AstroPlanner must be run in Administrator mode. To do this, right-click on the application icon, or a shortcut to the application, and choose **Run as administrator**. You may only have to do this once.*

13.4 Connecting & disconnecting

To connect to a telescope, use the **Connect to telescope** checkbox on a plan document window.

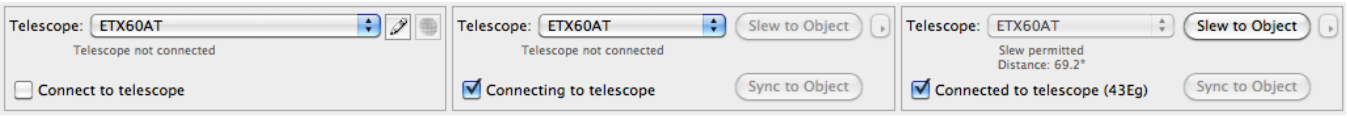


Figure 294: Telescope: disconnected (*left*), connecting (*middle*), connected (*right*)

If another plan window is connected to the same telescope, the two windows will share the connection.

Uncheck the **Connected to telescope** checkbox to disconnect.

13.5 Slewing

In order to slew the connected go-to telescope to a target, that target must be above the (theoretical) horizon (i.e. have an altitude > 0°), and must be within any set slewing limits for that telescope mount.

Slewing to a given target can be done from various places in the application:

- ***Slew to Object*** button on plan window.
- ***Object > Slew to Object*** menu command.
- Right-click object list and use ***Slew to Object***.
- Right-click field of view chart and use ***Slew to cursor position***.
- Right-click sky chart and use ***Slew to...***.
- Choose a visible alignment star in the list on the Sky tab and click ***Slew to Star***.
- Use the **Slew To** popup underneath the object list.
- ***Slew to Object*** button in a catalogue display window.
- ***Slew to Object*** button in a search results window.

Typically, there is a progress bar that shows you how far the slew has progressed, and the ***Slew To*** button typically changes to an ***Abort Slew*** button while the slew is taking place (if the telescope allows for the aborting of a slew operation).

After slewing, the ID of the object that was the target of the slew is reported just below the **Slew** button.

13.6 Syncing

Some telescope mounts allow you to "sync" the controller of a go-to telescope mount to the current position. i.e. you slew to a known position, but the mount needs to be moved slightly using arrow buttons to line up the known object position with the centre of the field of view. The sync operation

will tell the controller to adjust its alignment parameters to match the coordinates. This typically makes slewing more accurate, at least in the vicinity of the sync coordinates.

In AstroPlanner, there is a ***Sync to Object*** button in the telescope section of the plan document window. After slewing, and adjusting the pointing of the telescope with the hand controller, you can click the button to perform the sync operation.

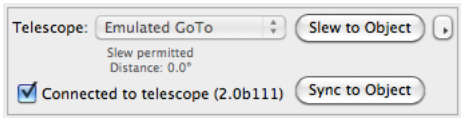


Figure 295: Sync to Object

Syncing is also used in other telescope-related features such as high-precision slewing (Section 13.9 on page 208), iterative polar alignment (Section 14.1 on page 219), and in the telescope control palette (Section 13.8.1 on page 204).

13.7 Tracking

If the telescope mount allows you to turn tracking on and off, then you can toggle this using **Telescope > Toggle Tracking**.

13.8 Control palette

The telescope control palette is a small floating window that allows direct control over several go-to telescope mount features (if they are implemented by the telescope mount and its associated protocol). The palette is available when the telescope is connected via the ***Telescope > Telescope Control Palette*** menu command. It can also be automatically opened via the appropriate mount option (see Section 13.2.1 on page 198). The palette closes automatically when the telescope is disconnected.

The palette window has multiple tabs, each one covering various features of the telescope.

13.8.1 Motion

This tab contains controls pertaining to telescope motion and slewing.

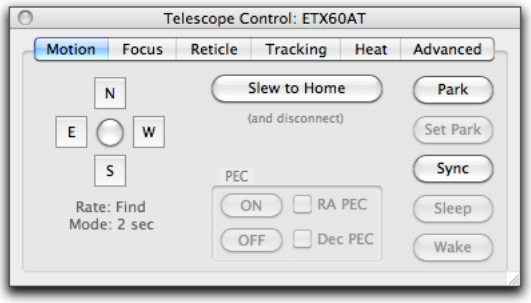


Figure 296: Telescope control palette: Motion

The N, E, W, S buttons allow the mount to be moved in the four directions. The round button in the centre reveals a popup menu when clicked. This menu allows you to select the rate of motion when the direction buttons are used (which is mount-dependent, but is typically guide speed (2x sidereal), centre speed, find speed, and slew speed). You can also set how the direction buttons operate:

- **Momentary**. The motion occurs as long as the button is held down.

- **Toggle on/off**. One click of the button starts the motion. A second click stops the motion.
- **Fixed duration**. Clicking a direction button starts motion in the given direction for a fixed amount of time, after which the motion stops. The **Option...** menu entry allows you to change the duration.

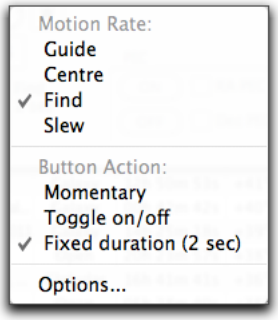


Figure 297: Motion popup menu

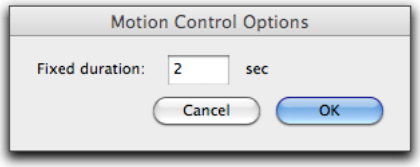


Figure 298: Motion control options

The ***Slew to Home*** button will slew the telescope to the home position (either specified as a mount option, or fixed for the mount type) and disconnects the telescope from AstroPlanner.

The ***Park*** button, if implemented, will park the telescope. The ***Set Park*** button will set the park position to the current Alt/Az position of the telescope.

The ***Sync*** button does a sync operation.

The ***Sleep*** button puts the scope to sleep (typically ththis puts the mount in a low- or no-power mode from which it can be woken without losing its alignment). The ***Wake*** button wakes up a previously-sleeping mount.

The **PEC** (Periodic Error Correction) controls allow you switch PEC on or off, and where applicable, to select whether RA PEC, Dec PEC, or both are enabled.

13.8.2 Focus

This tab contains controls pertaining to telescope focusing (some mounts allow you to plug in an electronic focuser, or have one built-in as part of the mount/OTA).

The ***In*** and ***Out*** buttons control the focuser, moving the focus either in or out. This motion is controlled by the popup to the right:

- **Momentary**. The focus motion occurs as long as the ***In*** or ***Out*** button is held down.
- **Toggle on/off**. One click of the ***In*** or ***Out*** button starts the motion. A second click stops the motion.

- **Fixed duration**. Clicking the ***In*** or ***Out*** button starts motion in the given direction for a specified fixed amount of time, after which the motion stops.

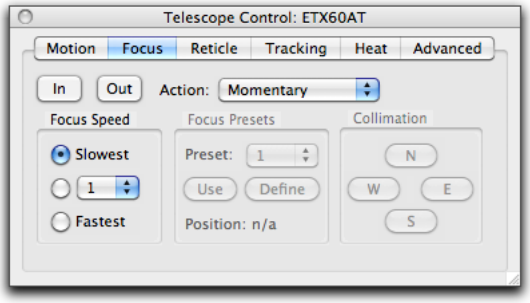


Figure 299: Telescope control palette: Focus

The **Focus Speed** (where applicable) allows you to select the speed of the focuser motor.

If your mount allows it, you can use the **Focus Presets** controls to set one or more preset focuser positions. You set a preset by selecting the preset number in the **Preset** popup and clicking the ***Define*** button. To move the focus to a preset position select the preset number in the **Preset** popup and click the ***Use*** button.

The **Collimation** buttons, where applicable will move the collimation motors for the specified sector.

13.8.3 Reticle

This tab contains controls pertaining to illuminated reticle eyepiece control (some mounts allow you to plug in an eyepiece with an externally-powered illuminated reticle).

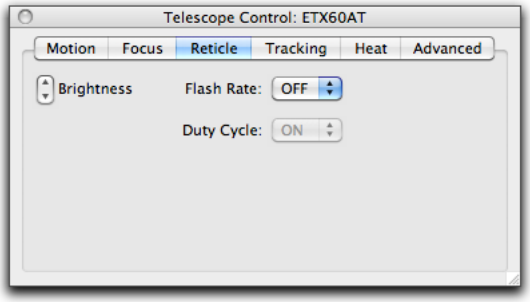


Figure 300: Telescope control palette: Reticle

The **Brightness** control adjusts the reticle illumination up or down. The **Flash Rate** allows you to specify the rate at which the illumination LEDs are turned on and off. The **Duty Cycle** adjusts the proportional on/off time of the illuminator.

13.8.4 Tracking

This tab contains controls pertaining to telescope mount tracking (the motion used to track the stars, etc. when the telescope is not slewing).

Where applicable, the tracking can be turned ***On*** or ***Off***. The **Tracking Rate** allows you to specify the rate at which the tracking motion occurs:

- **Sidereal**. The tracking rate to keep the stars stationary.

- **Solar**. The tracking rate to keep the sun stationary.
- **Lunar**. The tracking rate to keep the moon stationary.
- **Manually increment**. Increment/decrement the current rate.
- **Manual rate**. Set the current rate to a fixed value. The rate is measured in Hz. 60Hz will move the scope such that it makes one complete revolution of the sky in 24 hours. Sidereal rate is slightly fast (typically 60.1Hz).

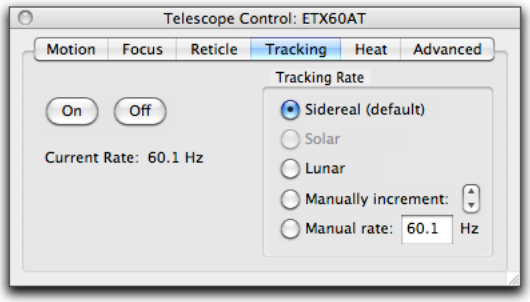


Figure 301: Telescope control palette: Tracking

13.8.5 Heat

This tab contains controls pertaining to controlling telescope heaters, where applicable.

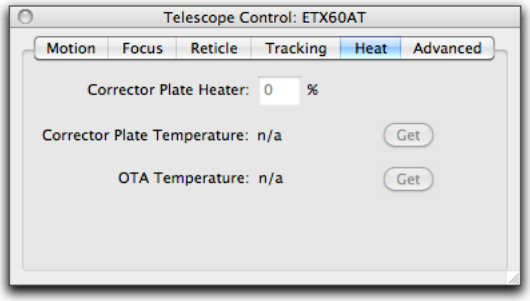


Figure 302: Telescope control palette: Heat

The **Corrector Plate Heater** setting specifies the amount of heating (as a percentage of full power) to apply to the corrector plate on Schmidt- or Maksutov-type telescopes.

The **Corrector Plate Temperature** and **OTA Temperature** can be measured and displayed by clicking the relevant ***Get*** button.

13.8.6 Advanced

This tab contains controls pertaining to controlling advanced telescope features, available on some mounts.

The telescope **Tube exhaust fan** can be turned ***On*** or ***Off***.

The **De-rotator** on some Alt/Az mounted telescopes can be turned **On** or **Off**.

Power Reset will (effectively) cycle the power to the mount, causing it to restart.

Start Alignment will start or restart the telescope alignment procedure.

The **Anti-backlash** settings can be changed for the two rotational axes.

12V Panel Power (for accessories) can be switched ***On*** or ***Off***.

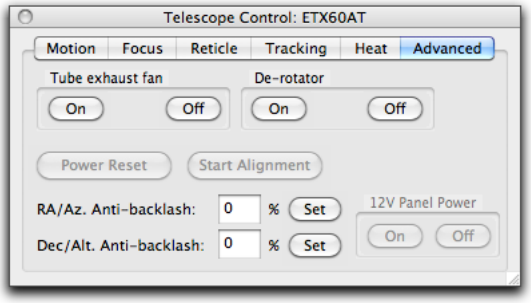


Figure 303: Telescope control palette: Advanced

13.9 High-precision slewing

When you slew a go-to telescope to given coordinates, the precision of that slew to the actual sky co-ordinates is dependent on how well the mount was aligned initially, the orthogonality of the mount axes, and several other parameters. Typically, the alignment algorithm is accurate only for small angular distances across the sky. If you make a large slew, the precision of the slew drops off.

This can be a problem if you are, for example, slewing to a dim object which might be difficult to find unless the slew is spot on. If you are slewing remotely, with an imager attached to the telescope, this can also be problematic.

However, some mounts allow a *sync* operation that corrects the local alignment (in and around the current pointing coordinates). This can be used to improve the precision of a slew by doing the following:

- Slew to a known bright object (a bright star) fairly close to the target object.
- Centre the bright object in the eyepiece (or imager) using movement commands.
- Do a sync operation to improve the slew precision in the vicinity of the bright object.
- Do a slew to the target object, which should then be pretty close to the centre of the eyepiece/imager.

This can also be improved for very long slews (from one side of the sky to the other), by repeating the first three steps with smaller slews (say 10° at a time) until you're close enough to the target, and then do the final step.

The high-precision slew feature of AstroPlanner allows you to automate this procedure whenever you do a slew.

The feature is toggled on and off via the ***Telescope > High-Precision Slewing*** menu command.

If the feature is on and you start a slew, then the High-Precision Slewing floating window is displayed.

At any time you can abandon this procedure and just slew straight to the target by clicking the ***Slew to target*** button, or cancel the slew altogether with the ***Cancel*** button.

At the top of the window is a list of bright stars close to the target, in decreasing order of their distance to the target. Pick one of these stars you know, and click the ***Slew to Star*** button.

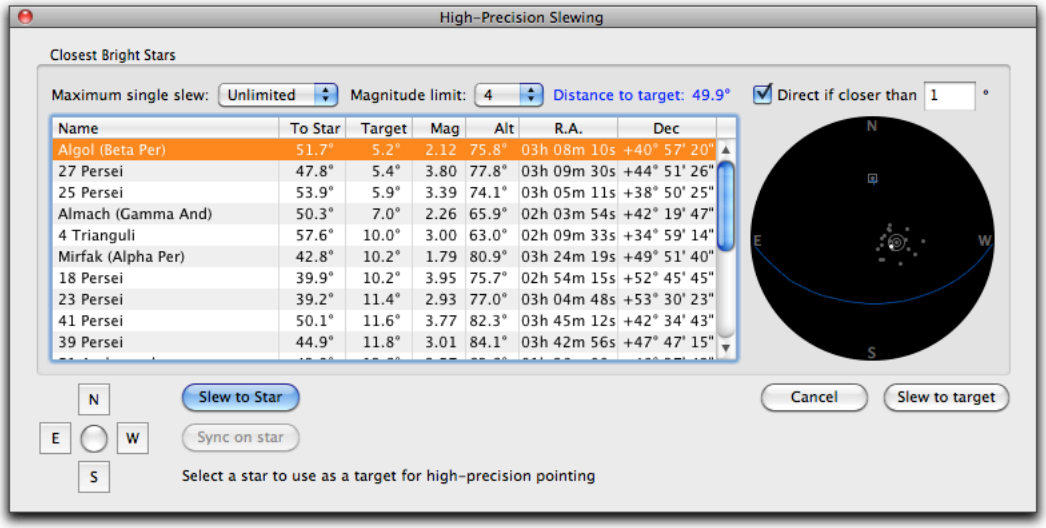


Figure 304: High-precision slewing window

The window shrinks down (since the star list is no longer required), and the slew to the bright star begins. You can abort the slew if necessary using the ***Abort Slew*** button.

Figure 305: Slewing to a bright star

Once the slew has completed, centre the bright star in the eyepiece/imager using the telescope hand controller or the direction motion buttons on the window, and the click the ***Sync on star*** button. Then click the **Slew to target** button to complete the slew.

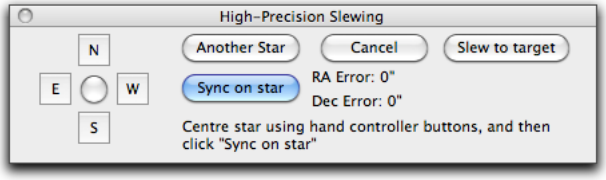


Figure 306: Ready to slew to target

There are some controls to customise this procedure:

- **Maximum single slew**. By default this is set to *Unlimited*, which means all slews will consist of a single slew to a bright star near the target, followed by a slew to the target. This could be problematic for long slews since the bright star might be outside of the eyepiece/imager field of view. You can also specify a maximum angular distance for a single slew. For example, if you set this to 20° and the target is 47° away, then the operation will hop to at least three bright stars en-route to the target, improving the chances that each bright star will be in the field of view after each sub-slew.
- **Magnitude limit**. Limits the list of stars to those brighter than this magnitude setting.

- **Direct if closer than x°**. If the target is less than x° away then just do a direct slew.

13.10 Spiral Scan

The spiral scan mechanism allows you to conduct a search starting at your telescope's current pointing coordinates, in an overlapping "spiral" path. This is useful if you are looking for an object but only have rough coordinates.

The spiral scan requires a go-to telescope to be connected. Start the scan using the ***Spiral Scan...*** button on the Field of View tab, or by using the ***Telescope > Start Spiral Scan...*** menu item. This displays the spiral scan dialog.

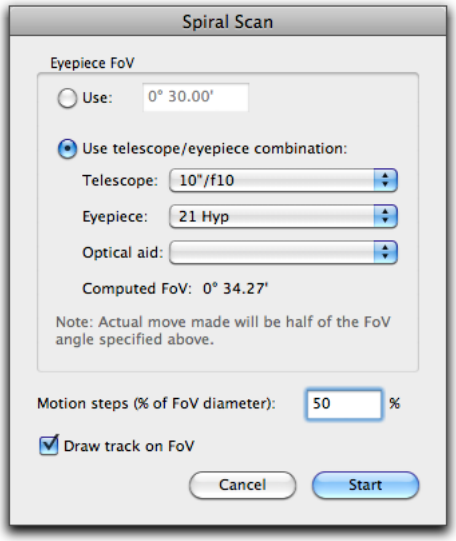


Figure 307: Spiral scan dialog

The dialog allows you to specify the field of view of the eyepiece (or imager) you are using. Either you can specify a fixed field of view, or you can specify the telescope/eyepiece/optical aid and let the application work it out.

You also specify the motion steps as a percentage of the field of view diameter. e.g. 50% implies a 50% overlap.

The **Draw track on FoV** option draws the track of the "spiral" path on the field of view chart, as shown in the figure below.

Clicking the ***Start*** button moves the telescope to the coordinates of the first step of the path.

To move to the next step of the path, click the ***Spiral Scan*** button on the Field of View tab, or use the ***Telescope > Continue Spiral Scan*** menu command.

To end the spiral scan process, *Shift*-click the ***Spiral Scan*** button on the Field of View tab, or use the ***Telescope > Stop Spiral Scan*** menu command.

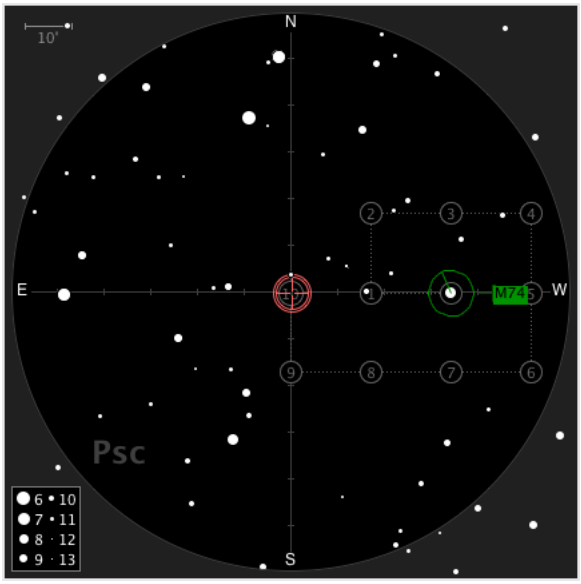


Figure 308: Spiral scan progress shown on field of view chart

13.11 Emulated mounts

For testing purposes, and to allow you to get a feel for how a telescope connects and is used without actual hardware connected, AstroPlanner defines two special computerised mounts:

- **AstroPlanner Emulated Go-to**. This emulates a go-to telescope that allows slewing, syncing, etc.
- **AstroPlanner Emulated DSC**. This emulates digital setting circles on a "push-to" telescope, that can only display the current pointing coordinates.

To emulate these mounts, a telescope "mimic" window is displayed, showing the current pointing coordinates (RA/Dec and Alt/Az).

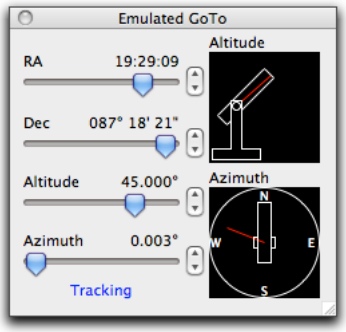


Figure 309: Emulated go-to telescope mimic window

13.12 Other features

13.12.1 Test telescope communication

This feature can be used to check your telescope mount communication manually, if you have an understanding of the serial commands used for communication. This can only be used if the telescope is currently disconnected from the application. It can also only be used for wired serial port communication, or communication that appears as a serial/COM port to the application. i.e. it won't work

for Ethernet (e.g. Vixen Star Book), direct USB connections, or SkyFi-type device communications. It also assumes 8-bit, no parity, 1 stop bit settings.

In the window you need to set up the serial port you will be using and the bit rate to use. You can also slow down communication (to the mount) by using the **Delay between characters** option, and also elect to add a carriage return character ($0D) at the end of each transmitted command.

Enter the text you wish to send into the Input command field and click ***Send*** to transmit it to the mount. If every command you send has an identical prefix and/or suffix, then you can set those fields up too. e.g. in the illustration below, clicking ***Send*** will transmit #:GZ# to the mount (this is the Meade command to return the current telescope azimuth).

The Telescope response field lists any characters returned from the telescope mount.

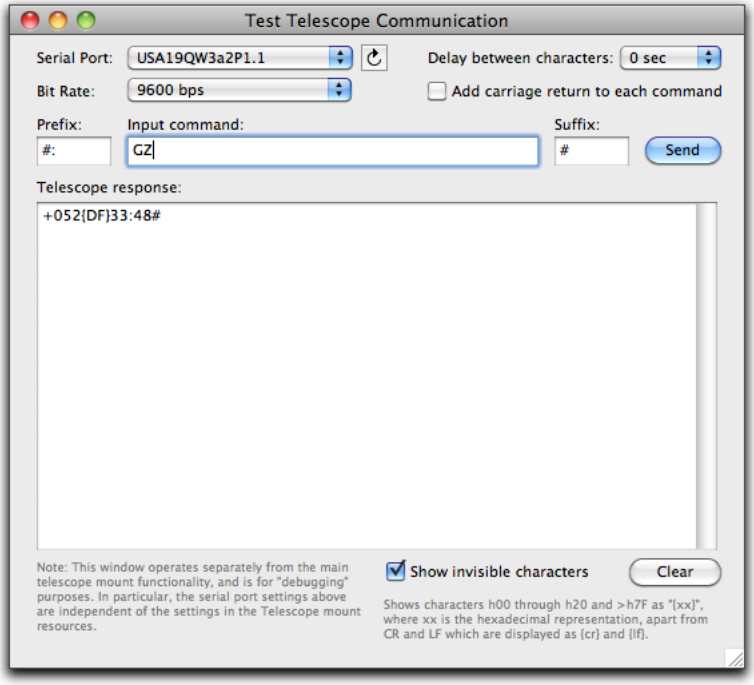


Figure 310: Test Telescope Communication window

13.12.2 Synchronise telescope to computer clock

If your telescope mount supports it, this command will send your computer's current date and/or time values to your telescope mount so that the telescope will be synchronised with the computer (to within a few seconds, since there might be a time lag).

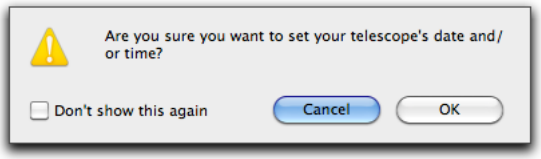
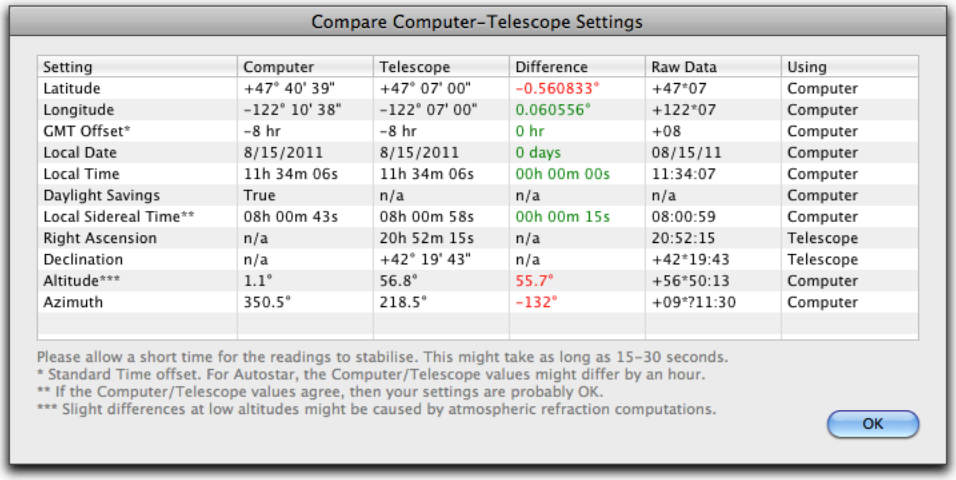


Figure 311: Synchronising telescope date/time

13.12.3 Compare computer-telescope settings

This feature will compare equivalent settings between what AstroPlanner knows or computes and what the telescope mount knows or computes. If the settings differ widely between the two, then it

could cause issues with slewing (the computer tries to slew to an object that the mount thinks is below the horizon, for example).



Setting	Computer	Telescope	Difference	Raw Data	Using
Latitude	+47° 40' 39"	+47° 07' 00"	-0.560833°	+47*07	Computer
Longitude	-122° 10' 38"	-122° 07' 00"	0.060556°	+122*07	Computer
GMT Offset*	-8 hr	-8 hr	0 hr	+08	Computer
Local Date	8/15/2011	8/15/2011	0 days	08/15/11	Computer
Local Time	11h 34m 06s	11h 34m 06s	00h 00m 00s	11:34:07	Computer
Daylight Savings	True	n/a	n/a	n/a	Computer
Local Sidereal Time**	08h 00m 43s	08h 00m 58s	00h 00m 15s	08:00:59	Computer
Right Ascension	n/a	20h 52m 15s	n/a	20:52:15	Telescope
Declination	n/a	+42° 19' 43"	n/a	+42*19:43	Telescope
Altitude***	1.1°	56.8°	55.7°	+56*50:13	Computer
Azimuth	350.5°	218.5°	-132°	+09*?11:30	Computer

Figure 312: Compare computer-telescope settings

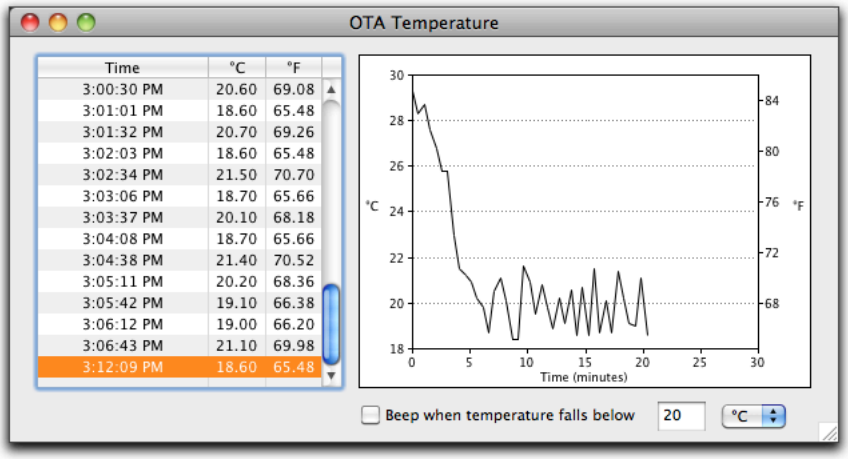
Note that not all mounts will be able to compare all settings.

The **Computer** and **Telescope** columns show the values being compared. The **Difference** column shows the difference between the two. If the value is coloured green it means that the values are within acceptable bounds. If the text is coloured red, it means that there is a substantial difference between the two that should be investigated.

13.12.4 Display OTA temperature

Some telescopes are capable of measuring the temperature of their OTA (optical tube assembly). This information can be collected and displayed. If the telescope mount can collect this information, and if the collection of temperature is switched on in the mount options, then the ongoing temperature can be displayed via the ***Telescope > Display OTA Temperature*** menu command.

The information is displayed in both tabular and graphical form.



Time	°C	°F
3:00:30 PM	20.60	69.08
3:01:01 PM	18.60	65.48
3:01:32 PM	20.70	69.26
3:02:03 PM	18.60	65.48
3:02:34 PM	21.50	70.70
3:03:06 PM	18.70	65.66
3:03:37 PM	20.10	68.18
3:04:08 PM	18.70	65.66
3:04:38 PM	21.40	70.52
3:05:11 PM	20.20	68.36
3:05:42 PM	19.10	66.38
3:06:12 PM	19.00	66.20
3:06:43 PM	21.10	69.98
3:12:09 PM	18.60	65.48

Figure 313: Display OTA temperature window

There is also an option to beep when the temperature falls below a given temperature.

13.12.5 Go to

The ***Telescope > Go To...*** menu command allows a slew to specified RA/Dec coordinates (assuming they are above the horizon).

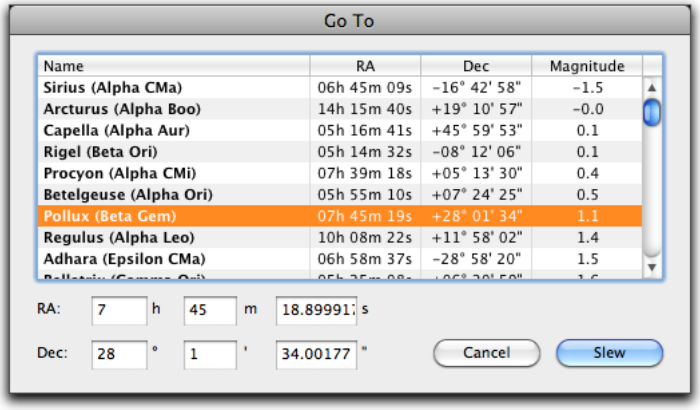


Figure 314: Go to dialog

The dialog includes a list of bright stars. Clicking on a star entry will insert its coordinates into the RA/Dec fields.

13.12.6 Sync to

The ***Telescope > Sync To...*** menu command allows a sync to specified RA/Dec coordinates. This might be useful to do a simple one-star alignment of a polar-mounted go-to telescope.

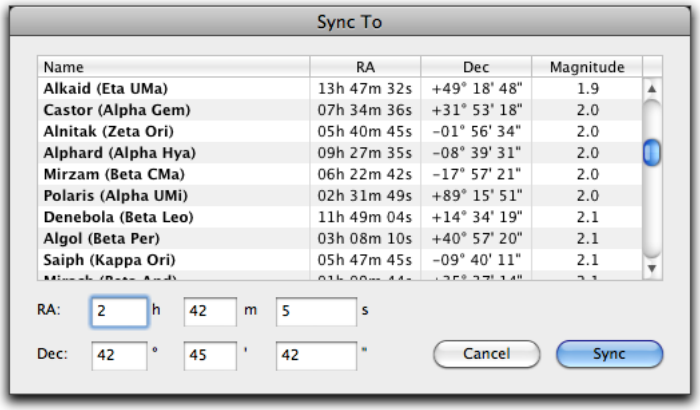


Figure 315: Sync to dialog

The dialog includes a list of bright stars. Clicking on a star entry will insert its coordinates into the RA/Dec fields.

13.12.7 Set telescope location/date/time

If it is possible to set your telescope mount's location (latitude, longitude, GMT offset) and its local date and time, then the ***Telescope > Set Telescope Location/Date/Time*** menu command will do just that.

13.12.8 Add alignment stars to plan

If your telescope mount includes a list of alignment stars, then the ***Telescope > Add Alignment Stars to Plan...*** menu command will add all of those stars to the current plan document as plan objects. The dialog allows you to specify what appears in the ID and Name fields for each object.

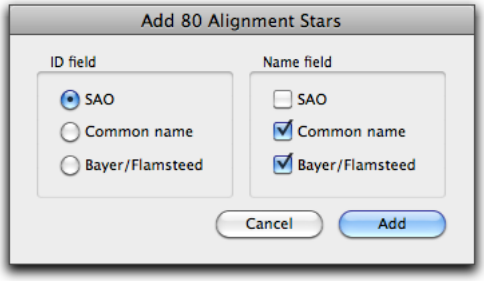


Figure 316: Add alignment stars dialog

13.12.9 Slew telescope to home

Use the ***Telescope > Slew Telescope to Home*** menu command to slew the telescope to the home position specified in the mount options.

13.12.10 Slew to Sky Flat Position...

When taking sky flats for astrophotography one needs to point the telescope towards the zenith, or close to the zenith (if, say, a dome slit or mount doesn't allow slewing to the zenith), with the azimuth opposite to the sun's azimuth.

This command slews the telescope to such a position, based on the sun's current position and an altitude specified by the user.

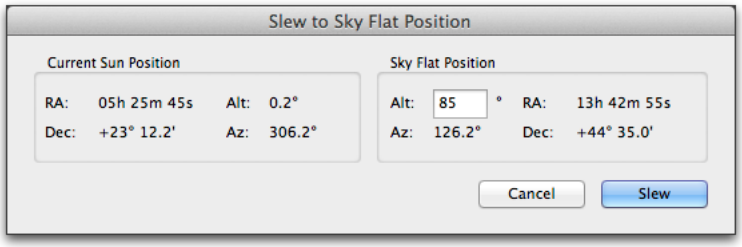


Figure 317: Slew to Sky Flat Position

13.13 Vendor-specific features

13.13.1 Argo Navis

The Argo Navis controller is a sophisticated digital setting circle device (i.e. not a go-to controller).

Download plan to Argo Navis

It is possible to download a list of target objects to the controller. Using the ***Telescope > Download Plan to Argo Navis...*** menu command, *when the mount is not connected*, displays the download dialog.

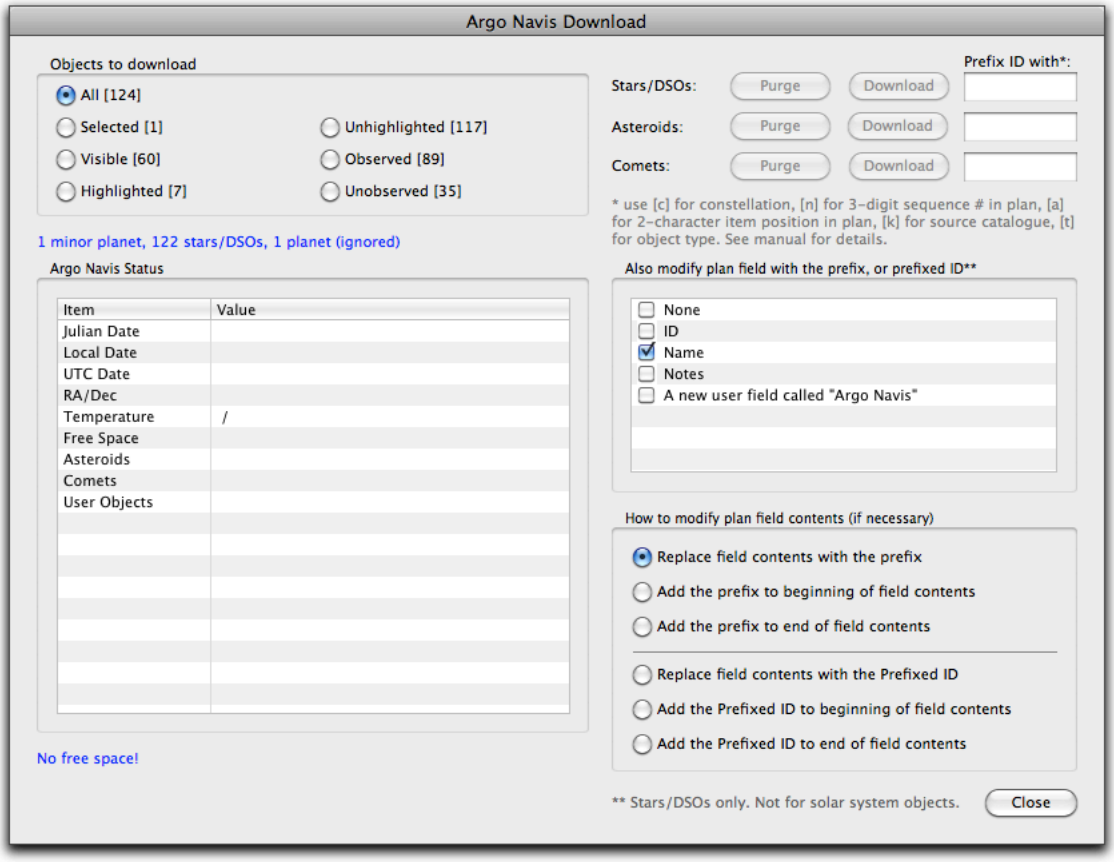


Figure 318: Argo Navis download dialog

Note that the Argo Navis unit must be in “navis” mode in order to be seen by AstroPlanner. You must put the Argo Navis into SETUP LOAD CAT mode prior to connecting. On the Argo Navis unit: Dial up MODE SETUP, SETUP LOAD CAT and press ENTER.

When you open the dialog via the menu command, AstroPlanner connects to the Argo Navis unit and retrieves its current status. Since user objects, comets and minor planets (asteroids) are treated separately, there are controls for each type.

The **Purge** buttons will send commands to the Argo Navis unit to eliminate all objects of the given type. **Download** will download the objects of the given type in your plan document to the Argo Navis unit.

There is a **Prefix ID with** field associated with each object type. The text will be prefixed to the ID before each object is downloaded. This can help keep plan objects together when listed on the Argo Navis screen. Some special text items can be used in these prefixes to help order the items in the Argo Navis unit. These text items are:

[c] Replace with the three-character constellation for the object (e.g. UMA, CEN).

[n] Replace with a three-digit number specifying the order in which the plan is sorted. (e.g. 020, 021).

[a] Replace with a two-character identifier specifying the order in which the plan is sorted i.e. AA, AB, AC,... ZZ.

[k] Replace with the catalogue from whence the object came (if applicable).

[t] Replace with the object type.

In addition to adding a prefix to the downloaded objects, you can also modify the plan document to match those downloaded objects. You specify which field is to be modified (ID, Name, etc.) and how it will be modified.

13.13.2 Sky Commander

The Sky Commander controller is a digital setting circle device (i.e. not a go-to controller).

Download plan to Sky Commander

The ***Telescope > Download Plan to Sky Commander...*** menu command will download the plan object RA/Dec parameters to the Sky Commander (or Sky Tracker) controller, starting at object 0. If there are more than 59 objects (the maximum allowable), then the first 59 will be transferred. *Note that the controller must not be connected for this to work.*

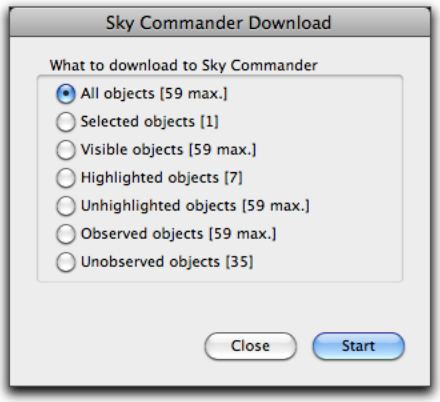


Figure 319: Download plan to Sky Commander dialog

Send object coordinates to Sky Commander

The ***Telescope > Send Object Coordinates to Sky Commander*** menu command is enabled if you are connected to a Sky Commander and an object is selected in the object list. It will place that object's RA/Dec coordinates directly into object #99, allowing the user to then use the Sky Commander to "zero" that object on the DSCs.

13.13.3 Orion Intelliscope

AstroPlanner supports the Orion IntelliScope Computerized Object Locator. This is a digital setting circle system based on the Tangent BBox design. Since the IntelliScope system returns Azimuth and Altitude readings only, this system works a little differently from other controllers supported by AstroPlanner.

In particular, it is important that the following parameters be set correctly, in order that AstroPlanner can convert the Alt-Azimuth readings to correct RA/Dec readings:

- Local Date and Time
- Site Latitude and Longitude
- Site offset from GMT

After alignment, the IntelliScope Computerized Object Locator returns an Azimuth reading with respect to the azimuth when the system was powered-up. For this reason it is necessary to calibrate the azimuth with a known star. Each time you connect, a calibration dialog appears.

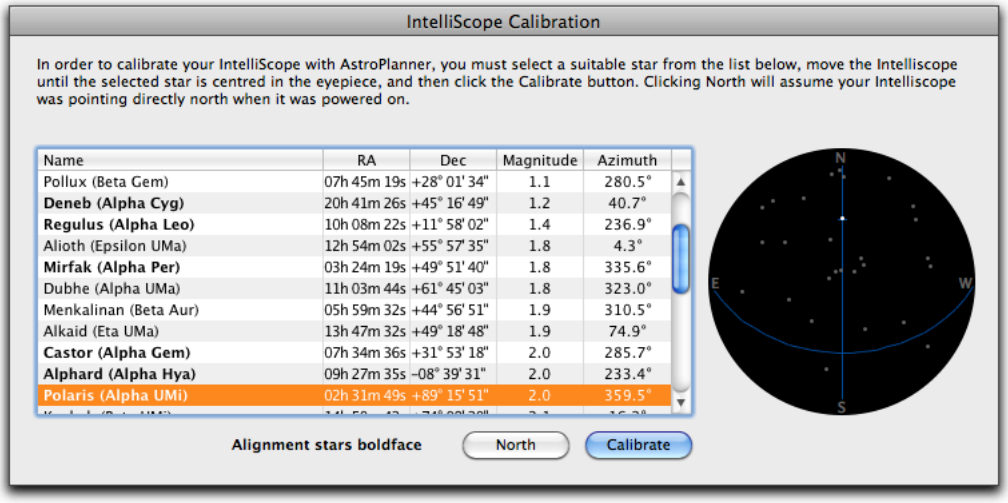


Figure 320: Intelliscope calibration dialog

The sky chart shows the location of the stars in grey, with the selected one in white. The meridian, equator and user site horizon (if defined) are also displayed.

Select a star from the list, point the telescope at the selected star and click the **Calibrate** button. If you pointed the telescope exactly at North (0°) before power- up, you can click the **North** button instead. The calibration star method is probably the more accurate of the two.

The second and subsequent times you connect, an **Already Calibrated** button appears. If you have not changed the alignment of the IntelliScope Computerized Object Locator, or powered it down and up again, you can bypass the calibration step by clicking this button.

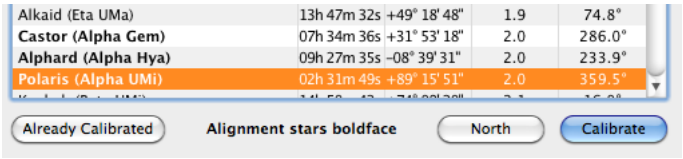


Figure 321: Intelliscope calibration dialog on subsequent connection

14 Telescope alignment

AstroPlanner includes various methods to help with polar-mounted telescope alignment (i.e. aligning the polar or R.A. axis with the celestial pole so that the telescope only has to be driven in R.A. and the Declination remains constant. Some of these require a computerised Go-to mount with applicable functionality.

14.1 Iterative polar alignment

This procedure helps you through an iterative polar alignment process for your computerised mount. It's especially useful if your telescope mount is mounted on a wedge. It assumes that before you start you have already polar mounted your telescope, done a rough polar alignment on your pole star (Polaris or Sigma Octantis), and done a one-star polar alignment.

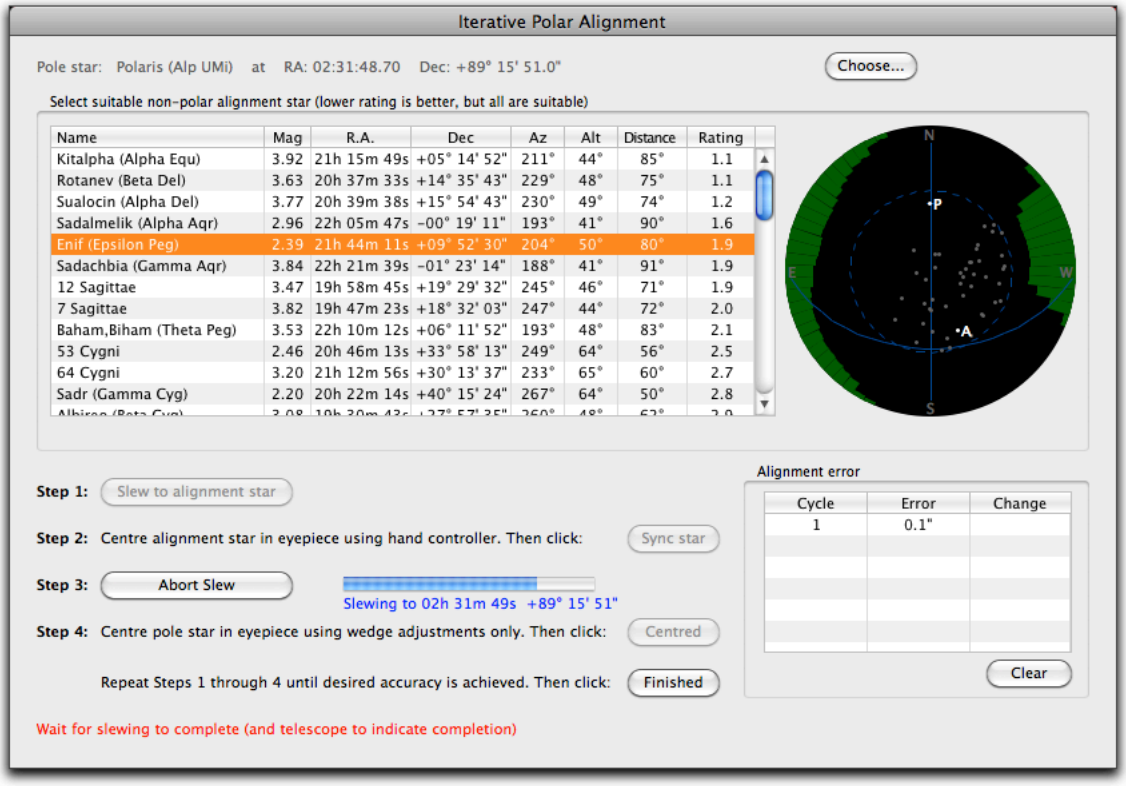


Figure 322: Iterative polar alignment dialog

AstroPlanner produces a list of suitable non-polar alignment stars. These stars are chosen according to the criteria:

- Magnitude 4.0 or brighter.
- Altitude more than 40° above horizon (and not hidden by obstacles).
- More than 30° from the pole.
- Not close to the same RA as the pole star, or the pole star's RA + 12 hours.

A **Rating** column shows how "ideal" the star is. The lower the number, the better the star will be for the polar alignment process.

The sky chart at the right shows the pole star and the selected star in white, and other suitable stars in grey. The 40° altitude is marked by a dashed circle. The user horizon is shown.

If you have a telescope capable of performing the Sync operation programmatically then you can use this dialog to do all the slewing back and forth to the stars for you.

The method used is this:

Step 1: Click the button to slew the telescope to the chosen alignment star.

Step 2: Use the telescope hand controller *only* to centre the alignment star in the eyepiece (a reticle eyepiece might help here). Once you've done that, click on the ***Sync Star*** button. The amount of the error is displayed in the list on the right.

Step 3: Click the button to slew the telescope to the pole star.

Step 4: Now use your wedge physical adjustments *only* to centre the star in the eyepiece. In fact it is safer to adjust halfway to the pole star, and not all the way. **Do not** use the hand controller. Click the ***Centred*** button when you've done that.

Now repeat steps 1 through 4 until the error displayed in the list on the right is minimal. Click the ***Finish*** button whenever you're happy.

Warning. This procedure is only as accurate as your telescope's encoder accuracy, so don't expect to get much better than 1 minute of arc accuracy in your alignment, and probably less with a less capable telescope.

You can use the ***Choose...*** button to select a suitable pole star if the default one is unacceptable. Note: only visible stars, and those that are not outside telescope limits, are shown.

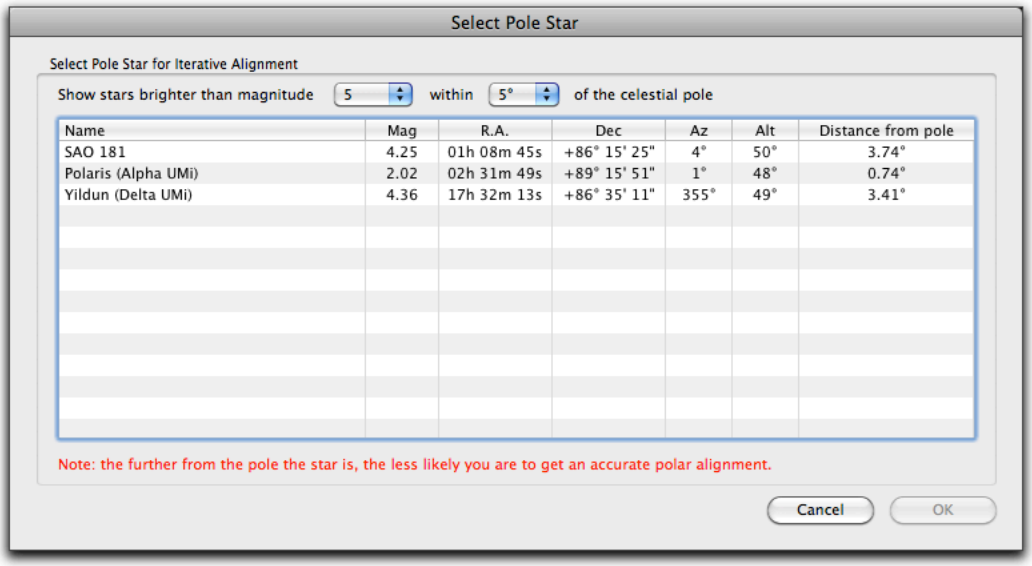


Figure 323: Select the pole star

14.2 Polar drift alignment

In order best to utilise the method of polar drift alignment, you need to pick two stars to test drift on:

- A star close to the meridian (the great circle passing through the poles and the zenith) and near the celestial equator (Declination 0°)
- A star above the eastern horizon (there's also a "Western horizon" option for those who can't see the eastern horizon) and near the celestial equator.

The polar drift alignment helper locates such stars for you and allows you to slew your telescope to those stars. Use ***Telescope > Polar Drift Alignment Helper***.

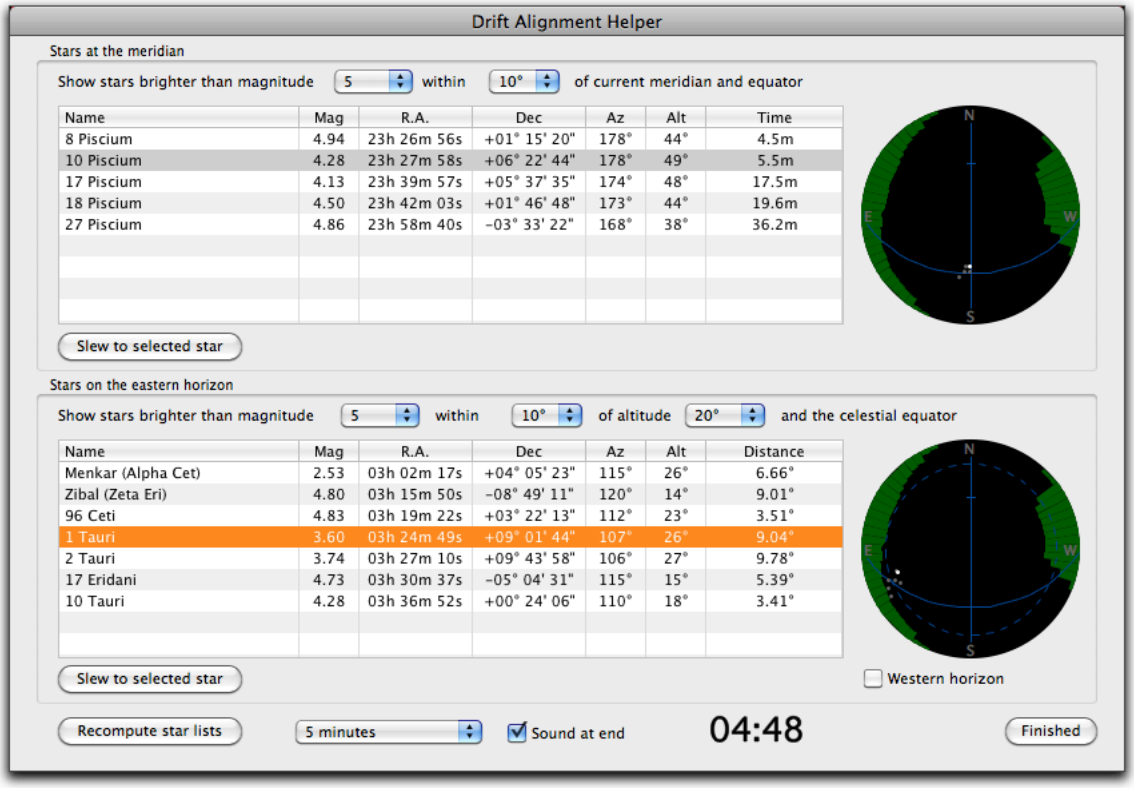


Figure 324: Polar drift alignment dialog

The dialog presents you with two lists of stars based on the two criteria above. Above each list are popup menus that allow you to adjust constraints on the stars in the list.

If no stars appear in the lists, it means that the specified restraints are too tight, or perhaps you have an obstacle defined for your eastern/western horizon. Try expanding the criteria using the popup menus.

Since the current meridian moves at a sidereal rate, you might want to click the ***Recompute star lists*** button occasionally.

There is a built-in timer to remind you to check the alignment when a fixed time is up. Selecting the time from the popup menu at bottom centre will start the timer counting down. The **Sound at end** checkbox will beep the computer after the period is over.

The sky charts show the selected star in white, and other suitable stars in grey. The equator, meridian and altitude lines are marked. The user horizon is shown.

14.3 Polar alignment scope tool

With a suitable plan document at the front, choose ***Telescope > Polar Alignment Scope View*** to display a window showing the view you would hope to see through a polar alignment scope at the current local date/time and the currently-selected site. A polar alignment scope is a small telescope that sits inside, or parallel to, the R.A. axis tube of a polar mount (typically a German equatorial mount). The scope has a reticle that is designed specifically to align on the pole star (Polaris in the northern hemisphere, Sigma Octantis in the southern hemisphere). If the pole star is placed at a particular spot on the reticle, the mount should (theoretically) be aligned with the celestial pole.

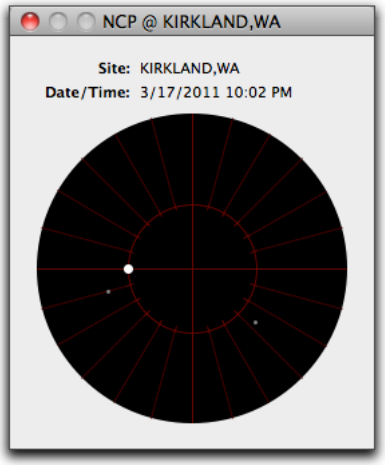


Figure 325: Polar alignment scope view

The view shows the pole star and some brighter stars near it that should be visible through the scope. The chart can be customised by right-clicking. The popup menu allows you to select the field of view of your polar scope (in degrees), whether the reticle is sized for Polaris (Alpha UMi) or Sigma Oct, and how the scope inverts the view.

14.4 1-star polar alignment

If you have a polar-mounted telescope with a computerised mount that allows syncing to given RA/Dec coordinates, then you can use this feature to do a 1-star alignment. Use ***Telescope > 1-star Polar Alignment...*** and select a suitable star to align to (the list should contain all visible stars down to about magnitude 3). Move your telescope until the selected star is centred in the eyepiece and click the ***Sync*** button. The telescope will be commanded to sync the mount to the coordinates of star.

This alignment procedure assumes that your telescope mount is exactly aligned with the celestial pole.

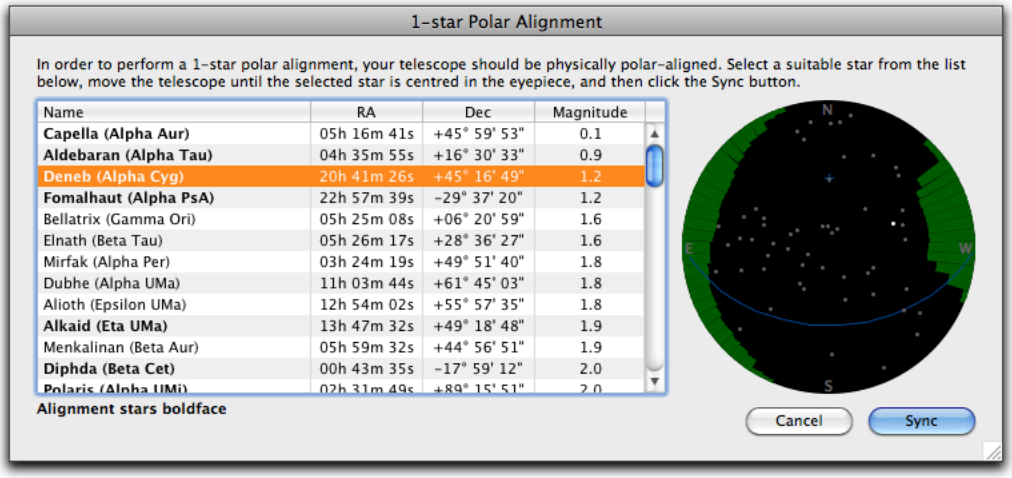


Figure 326: 1-star polar alignment dialog

15 Printing

Printing is typically instigated by using ***File > Print...***. If it is the first time you are using that menu command during the application run, then the Page Setup dialog[1] will appear before the Print dialog. You can also manually display the Page Setup dialog using ***File > Page Setup...***.

15.1 Sky and Field of View Charts

If you are viewing a chart on the **Sky** or **Field of View** tabs of the plan document window, then choosing ***File > Print...*** will print that chart on a single printer page. A chart printing dialog is displayed before the standard system Print dialog.

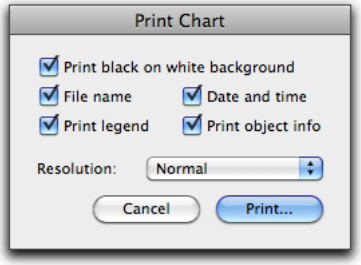


Figure 327: Chart printing dialog

- **Print black on white background**. Print the chart in black (stars, lines, etc.) with a white background. This is typically always on, unless you own a printer ink/toner cartridge company.
- **File name**. Print the plan file name in the page footer.
- **Date and time**. Print the current plan local date and time in the page footer. If the date/time is fixed, that value will be printed. This could be useful to determine the date/time for which the chart was printed, when viewed at a later date.
- **Print legend**. (*Field of View only*) Print a legend for the various types of objects and star sizes printed.
- **Print object info**. (*Field of View only*) Print information about the central object.
- **Resolution**. Normal resolution prints the chart scaled so that it is roughly WYSIWYG (What You See Is What You Get). You can also elect to increase the "resolution" (to 150%, 200%, 300% 500%, or Highest). This will decrease the size of objects and text correspondingly. This might look better on your printer, but also might require a magnifying glass to read.

15.2 Objects

When the **Objects** tab of the plan document window is foremost, you can use ***File > Print...*** to print a list of those objects present in the plan.

---

1. The Page Setup dialog allows you to set up a number of printer-specific parameters, such as margins, portrait vs. landscape printing, page size, scale factor, and so on. These settings stay in effect for the rest of the application run, unless modified via File > Page Setup...

The printing dialog prints to a "preview" window, allowing the report to be examined before it is printed.

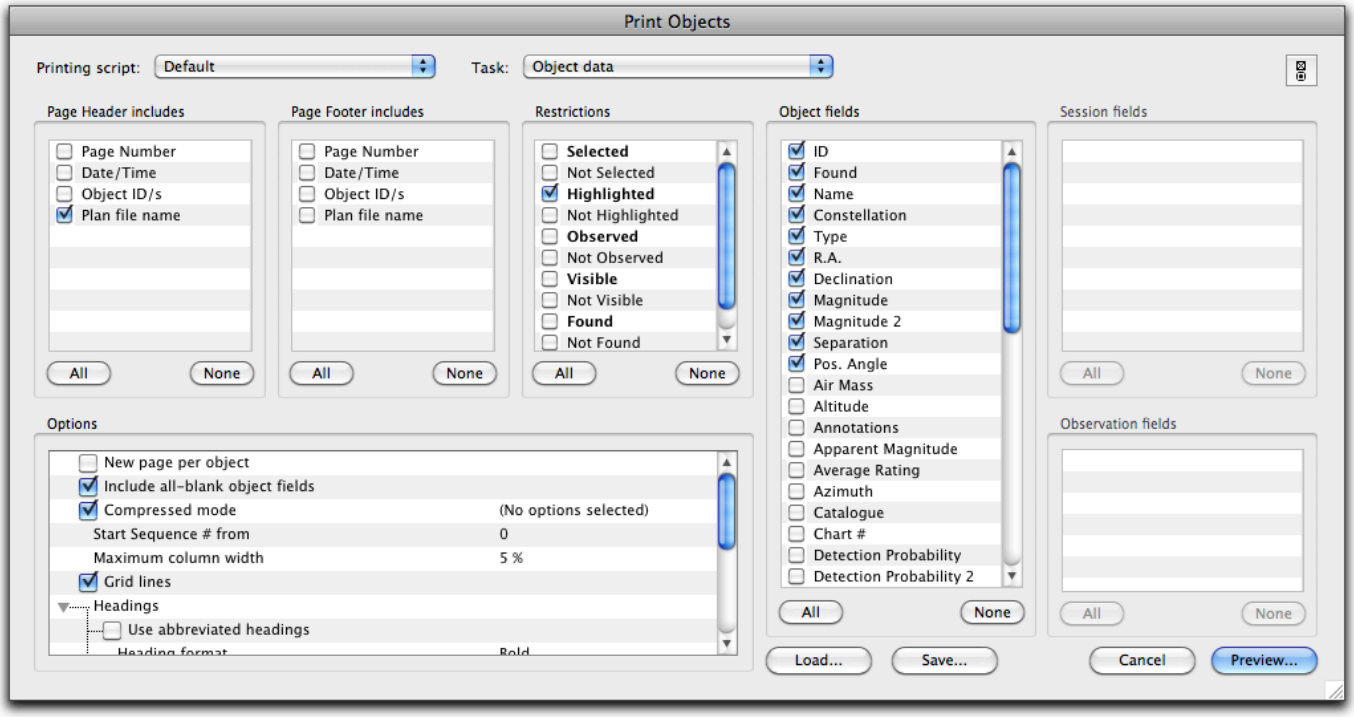


Figure 328: Print Objects dialog

Printing of objects (and observations) is done via a script. This script is selected in the **Printing script** popup menu at the top left. Unless you have downloaded an alternative user-contributed printing script, this menu will only contain the built-in ***Default*** script. The **Task** popup menu contains a list of the various printing tasks you can perform. For this section, we are only concerned with the ***Object data*** task. The other lists and options pertain to the task at hand (where applicable).

- **Page header includes**. These are items that can be included in the page header area for each printed page.
- **Page Footer includes**. These are items that can be included in the page footer area for each printed page.
- **Restrictions**. These are restrictions on which objects are to be included in the printed report. If *no* checkboxes are checked, all objects in the list will be included. If any checkboxes are checked, then only those objects that fall into that category will be included (e.g. if **Not Observed** and **Visible** are checked, then only those objects that are currently above the horizon *and* haven't been observed will be included).
- **Object fields**. A list of object fields to be included in the printed report for each object. Checking an entry includes it. Dragging the entries with the mouse allows them to be ordered. All the fields are data fields, computed fields, or user-defined fields for the object. The **Sequence #** field prints a number, representing the order of the objects in the object list.
- **Options**. Various formatting options for the printed report. These are currently listed below.

- **Load & Save**. Any option or field settings you make are saved with the plan document. You can also use the ***Save...*** and ***Load...*** buttons to save those settings in a separate settings file. This is useful to transfer settings between plan documents, for example.

15.2.1 Object options

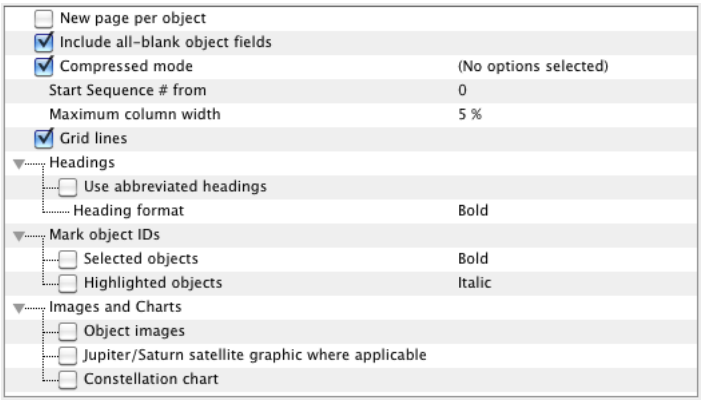
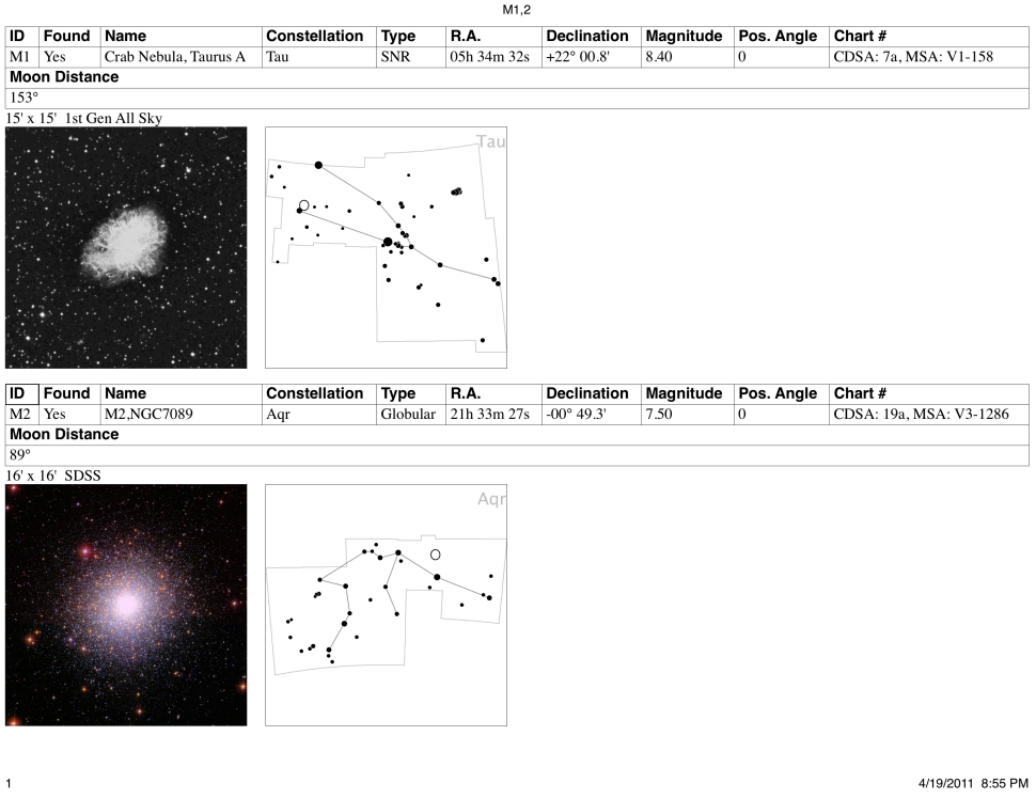


Figure 329: Object printing options

- **New page per object**. Start a new page for each object.
- **Include all-blank object fields**. If a particular object field (e.g. Size) is blank for all relevant objects, then this option will stop that field from being printed.
- **Compressed mode**. Print a single line for each object, field field headings at the top of each page. There are two checkbox options associated with this mode: **Multi-line** - allow the object fields to be printed over several lines (to avoid truncation on a single line). **Separator lines** - draw a horizontal line between each object entry.
- **Start sequence # from**. An integer number to start the first Sequence # entry. i.e. the first object in the list will be printed with this number, which will be incremented for the second object, etc.
- **Maximum column width**. The maximum width of a column as a percentage of page width.
- **Grid lines**. Draw grid lines around the text.
- **Headings > Use abbreviated headings**. Use shortened forms of headings (e.g. "Dec" instead of Declination").
- **Headings > Heading format**. Whether the heading is printed using a bold, italic or underlined font, whether it is inverted (black background with white text), etc.
- **Mark object IDs > Selected objects**. How to print object IDs for *selected* objects in the list, using a bold, italic or underlined font, inverted (black background with white text), etc.
- **Mark object IDs > Highlighted objects**. How to print object IDs for *highlighted* objects in the list, using a bold, italic or underlined font, inverted (black background with white text), etc.
- **Images and Charts > Object images**. Display any images associated with the object, and how to print those images (inverted colours, E/W flipped, etc.).
- **Images and Charts > Jupiter/Saturn satellite graphic**. If the object is Jupiter or Saturn, print a graphic showing the current positions of the satellites.

- **Images and Charts > Constellation chart**. Print a graphic showing the constellation containing the graphic, and a small circle showing the object's position within the constellation.

15.2.2 Examples



M1,2

ID	Found	Name	Constellation	Type	R.A.	Declination	Magnitude	Pos. Angle	Chart #
M1	Yes	Crab Nebula, Taurus A	Tau	SNR	05h 34m 32s	+22° 00.8'	8.40	0	CDSA: 7a, MSA: V1-158
Moon Distance									
153°									

15' x 15' 1st Gen All Sky

ID	Found	Name	Constellation	Type	R.A.	Declination	Magnitude	Pos. Angle	Chart #
M2	Yes	M2,NGC7089	Aqr	Globular	21h 33m 27s	-00° 49.3'	7.50	0	CDSA: 19a, MSA: V3-1286
Moon Distance									
89°									

16' x 16' SDSS

1 4/19/2011 8:55 PM

Figure 330: Standard-mode object report with images and constellation charts

M1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,35,36

ID	Found	Name	Constellation	Type	R.A.	Declination	Magnitude	Pos. Angle
M1	Yes	Crab Nebula, Taurus A	Tau	SNR	05h 34m 32s	+22° 00.8'	8.40	0
M2	Yes	M2,NGC7089	Aqr	Globular	21h 33m 27s	-00° 49.3'	7.50	0
M3	Yes	M3,NGC5272	CVn	Globular	13h 42m 11s	+28° 22.5'	7.00	0
M4	Yes	Cat's Eye	Sco	Globular	16h 23m 35s	-26° 31.5'	7.50	0
M5	Yes	M5,NGC5904	Ser	Globular	15h 18m 33s	+02° 04.9'	7.00	0
M6	Yes	Butterfly Cluster	Sco	Open	17h 40m 20s	-32° 15.2'	4.50	0
M7		Scorpion's Tail, Ptolemy's Cluster	Sco	Open	17h 53m 51s	-34° 47.6'	3.50	0
M8	Yes	Lagoon Nebula, Dragon Nebula	Sgr	Open+D Neb	18h 03m 41s	-24° 22.7'	5.00	0
M9	Yes	M9,NGC6333	Oph	Globular	17h 19m 12s	-18° 31.0'	9.00	0
M10	Yes	M10,NGC6254	Oph	Globular	16h 57m 09s	-04° 05.9'	7.50	0
M11	Yes		Sct	Open	18h 51m 05s	-06° 16.2'	7.00	0
M12	Yes	Gumball Globular	Oph	Globular	16h 47m 14s	-01° 56.8'	8.00	0
M13	Yes		Her	Globular	16h 41m 41s	+36° 27.5'	7.00	0
M14	Yes	M14,NGC6402	Oph	Globular	17h 37m 36s	-03° 14.7'	9.50	0
M15	Yes	Great Pegasus Cluster	Peg	Globular	21h 29m 58s	+12° 10.0'	7.50	0
M16	Yes		Ser	Open+D Neb	18h 18m 48s	-13° 48.3'	6.50	0
M17	Yes		Sgr	Open+D Neb	18h 20m 47s	-16° 10.3'	7.00	0
M18	Yes	Black Swan	Sgr	Open	18h 19m 58s	-17° 06.1'	8.00	0
M19	Yes	M19,NGC6273	Oph	Globular	17h 02m 38s	-26° 16.0'	8.50	0
M20	Yes	Trifid Nebula, The Clover	Sgr	Open+D Neb	18h 02m 42s	-22° 58.2'	5.00	0
M21	Yes	M21,NGC6531	Sgr	Open	18h 04m 13s	-22° 29.3'	7.00	0
M22	Yes		Sgr	Globular	18h 36m 24s	-23° 54.2'	6.50	0
M23	Yes	M23,NGC6494	Sgr	Open	17h 57m 04s	-18° 59.1'	6.00	0
M24	Yes	Small Sagittarius Star Cloud	Sgr	Open	18h 18m 26s	-18° 24.3'	4.50	0
M25	Yes	M25	Sgr	Open	18h 31m 42s	-19° 07.0'	6.50	0
M26	Yes	M26,NGC6694	Sct	Open	18h 45m 18s	-09° 23.0'	9.50	0
M27	Yes		Vul	P Neb	19h 59m 36s	+22° 43.2'	7.50	0
M28	Yes	M28,NGC6626	Sgr	Globular	18h 24m 33s	-24° 52.1'	8.50	0
M29	Yes	Cooling Tower	Cyg	Open	20h 23m 57s	+38° 30.5'	9.00	0
M30	Yes	M30,NGC7099	Cap	Globular	21h 40m 22s	-23° 10.7'	8.50	0
M31	Yes	Andromeda Galaxy	And	Galaxy	00h 42m 44s	+41° 16.1'	4.30	35
M32	Yes	Satellite Of Andromeda Galaxy	And	Galaxy	00h 42m 42s	+40° 51.9'	9.10	170
M33	Yes		Tri	Galaxy	01h 33m 51s	+30° 39.6'	6.20	23
M35	Yes	M35,NGC2168	Gem	Open	06h 09m 00s	+24° 21.0'	5.50	0
M36	Yes	Pinwheel Cluster	Aur	Open	05h 36m 18s	+34° 08.3'	6.50	0

1 4/19/2011 8:47 PM

Figure 331: Compressed-mode object report

15.3 Objects & observations

When the **Objects** tab of the plan document window is foremost, you can use ***File > Print...*** to print a list of those objects present in the plan, together with observations associated with those objects.

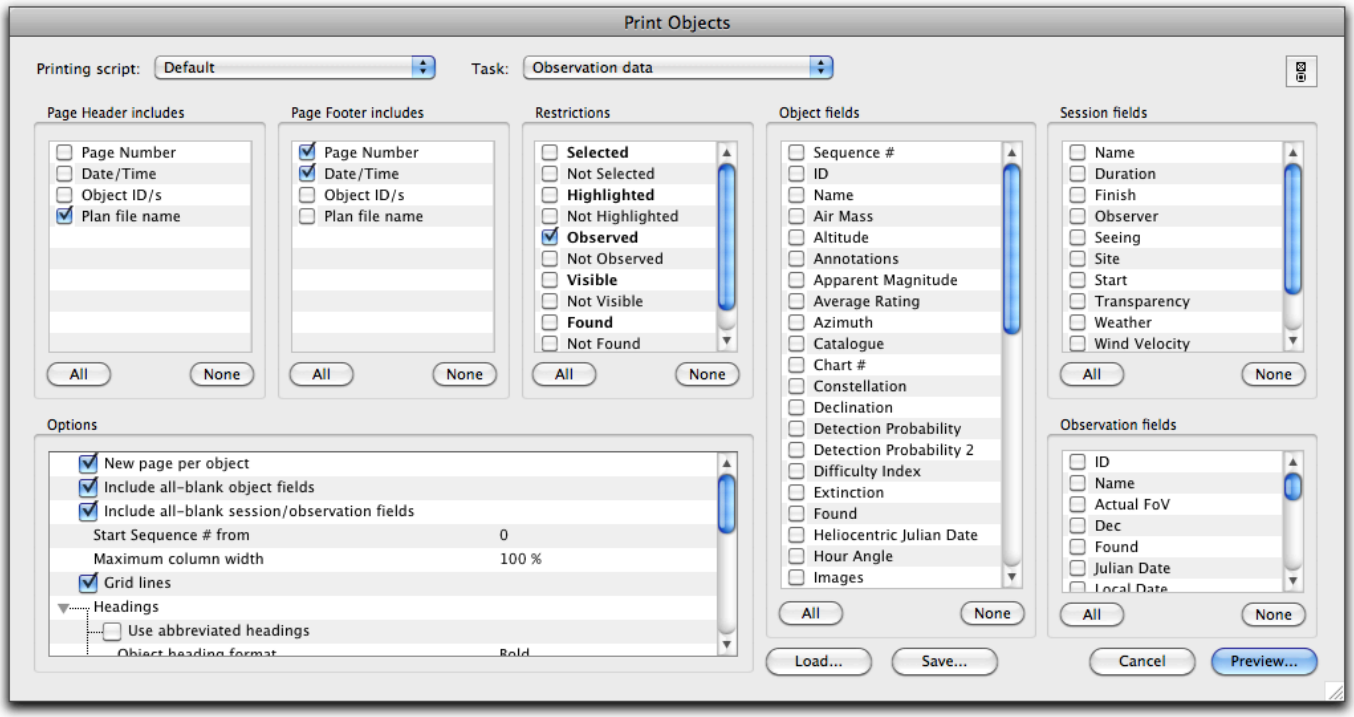


Figure 332: Print Objects & Observations

The operation is almost identical to that described in Section 15.2 on page 224, except that you use the **Observation data** task, and with the addition of session and observation fields and some additional options. Those additional items are described below.

- **Session fields**. A list of observing session fields to be (optionally) included in the printed report for each object. Checking an entry includes it. Dragging the entries with the mouse allows them to be ordered. All the fields are data fields, computed fields, or user-defined fields for the session.
- **Observation fields**. A list of observation fields to be included in the printed report for each object. Checking an entry includes it. Dragging the entries with the mouse allows them to be ordered. All the fields are data fields, computed fields, or user-defined fields for the observation.

15.3.1 Object + Observation options

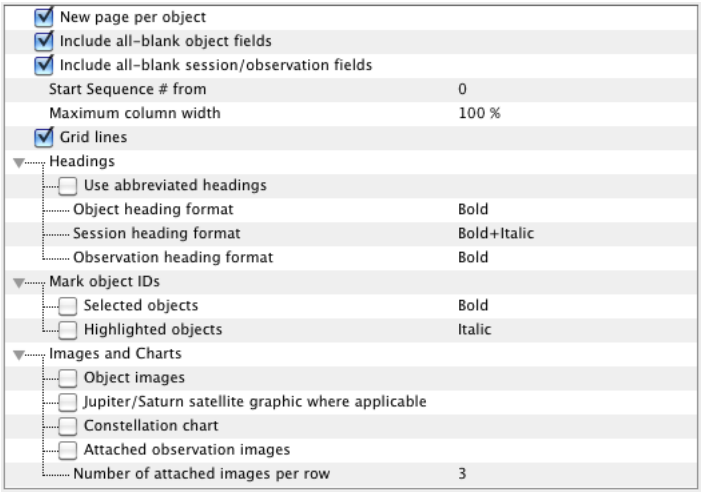
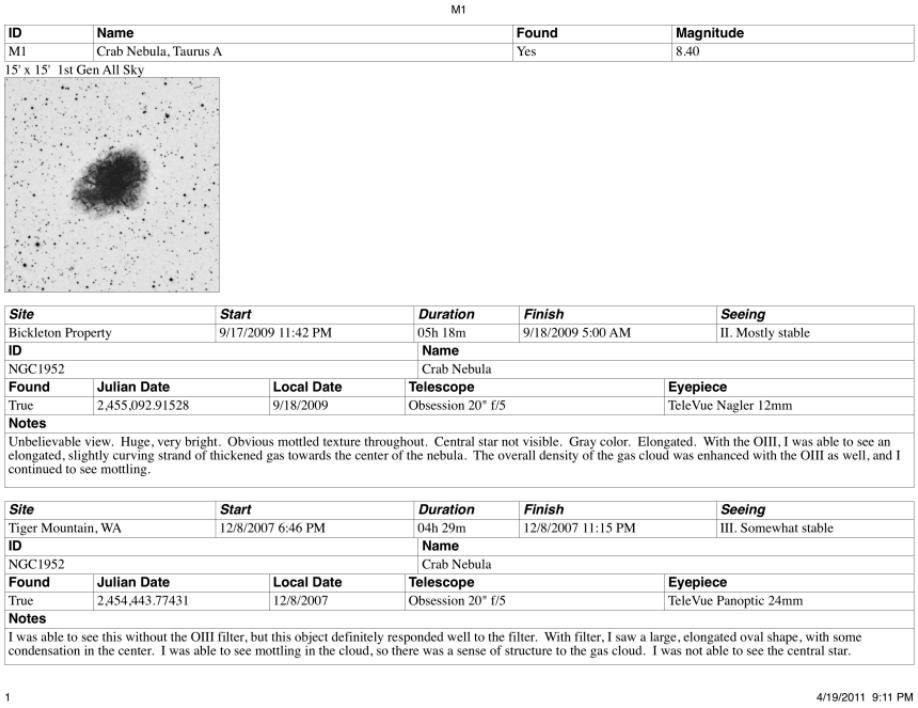


Figure 333: Object + Observation printing options

Similar to Object options above, with the following differences:

- **Include all-blank session/observation fields**. If a particular session or observation field (e.g. Name) is blank for all relevant sessions/observations, then this option will stop that field from being printed.
- **Headings > Object heading format**. Whether the headings for object fields are printed using a bold, italic or underlined font, whether they are inverted (black background with white text), etc.
- **Headings > Session heading format**. Whether the headings for session fields are printed using a bold, italic or underlined font, whether they are inverted (black background with white text), etc.
- **Headings > Observation heading format**. Whether the headings for observation fields are printed using a bold, italic or underlined font, whether they are inverted (black background with white text), etc.
- **Images and Charts > Attached observation images**. Display any images attached to the object's observations, and how to print those images (inverted colours, E/W flipped, etc.).
- **Images and Charts > Number of attached images per row**. How many images should be printed across the width of the page.

15.3.2 Examples



M1

ID	Name	Found	Magnitude
M1	Crab Nebula, Taurus A	Yes	8.40

15' x 15' 1st Gen All Sky

Site	Start	Duration	Finish	Seeing
Bickleton Property	9/17/2009 11:42 PM	05h 18m	9/18/2009 5:00 AM	II. Mostly stable

ID	Name
NGC1952	Crab Nebula

Found	Julian Date	Local Date	Telescope	Eyepiece
True	2,455,092.91528	9/18/2009	Obsession 20" f/5	TeleVue Nagler 12mm

Notes

Unbelievable view. Huge, very bright. Obvious mottled texture throughout. Central star not visible. Gray color. Elongated. With the OIII, I was able to see an elongated, slightly curving strand of thickened gas towards the center of the nebula. The overall density of the gas cloud was enhanced with the OIII as well, and I continued to see mottling.

Site	Start	Duration	Finish	Seeing
Tiger Mountain, WA	12/8/2007 6:46 PM	04h 29m	12/8/2007 11:15 PM	III. Somewhat stable

ID	Name
NGC1952	Crab Nebula

Found	Julian Date	Local Date	Telescope	Eyepiece
True	2,454,443.77431	12/8/2007	Obsession 20" f/5	TeleVue Panoptic 24mm

Notes

I was able to see this without the OIII filter, but this object definitely responded well to the filter. With filter, I saw a large, elongated oval shape, with some condensation in the center. I was able to see mottling in the cloud, so there was a sense of structure to the gas cloud. I was not able to see the central star.

1 4/19/2011 9:11 PM

Figure 334: Object+Observation example

15.4 Observing forms

When the **Objects** tab of the plan document window is foremost, you can use ***File > Print...*** to print a list of those objects present in the plan, together with observation templates (empty observation fields, sketching templates, etc.). This form is designed to be printed out and filled in at the telescope with a pencil or pen.

The operation is almost identical to that described in Section 15.2 on page 224, except that you use the **Observing forms** task, and with the addition of session and observation fields and some additional options. Those additional items are described below.

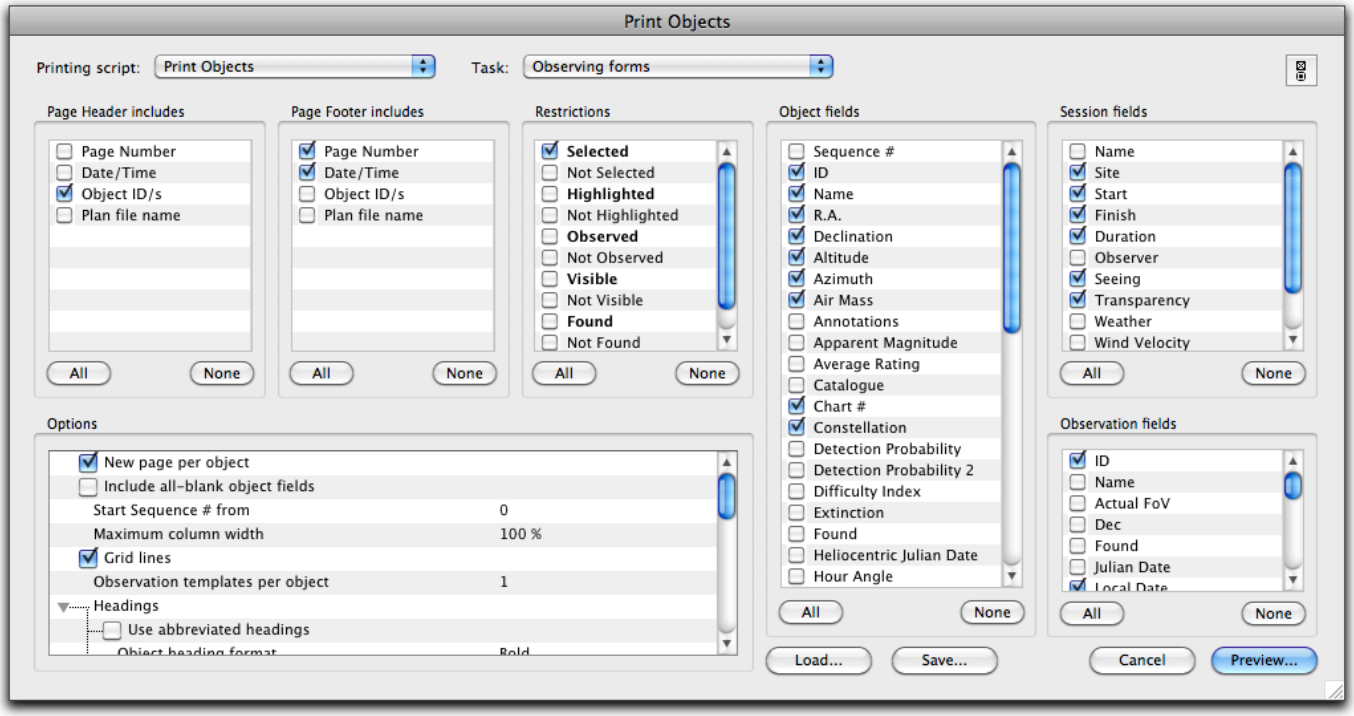


Figure 335: Printing observing forms

- **Session fields**. A list of observing session fields to be (optionally) included in the printed report for each object. Checking an entry includes it. Dragging the entries with the mouse allows them to be ordered. All the fields are data fields, computed fields, or user-defined fields for the session. The fields will all be empty of data so that they can be manually entered in the field.
- **Observation fields**. A list of observation fields to be included in the printed report for each object. Checking an entry includes it. Dragging the entries with the mouse allows them to be ordered. All the fields are data fields, computed fields, or user-defined fields for the observation. The fields will all be empty of data so that they can be manually entered in the field.

15.4.1 Observing form options

Similar to Object options above, with the following differences:

- **Observation templates per object**. How many observation templates to draw for each object. Set to 1 if you only plan to make a single observation of each object.
- **Headings > Object heading format**. Whether the headings for object fields are printed using a bold, italic or underlined font, whether they are inverted (black background with white text), etc.
- **Headings > Session heading format**. Whether the headings for session fields are printed using a bold, italic or underlined font, whether they are inverted (black background with white text), etc.
- **Headings > Observation heading format**. Whether the headings for observation fields are printed using a bold, italic or underlined font, whether they are inverted (black background with white text), etc.
- **Images and Charts > Number of attached images per row**. How many images should be printed across the width of the page.

- **Sketching templates**. Include circular sketching templates for sketching the field of view at the telescope.
- **Sketching templates > Template diameter**. The diameter of the circles, in cm.
- **Sketching templates > Template background**. The colour to use outside the circles, to improve contrast (white (none), black, or grey).
- **Data from previous observations > Include observation data**. You can also include data from previously-logged observations for comparison reasons, if you wish, using this option.
- **Data from previous observations > Show attached observation images**. Include any images attached to previously-logged observations.

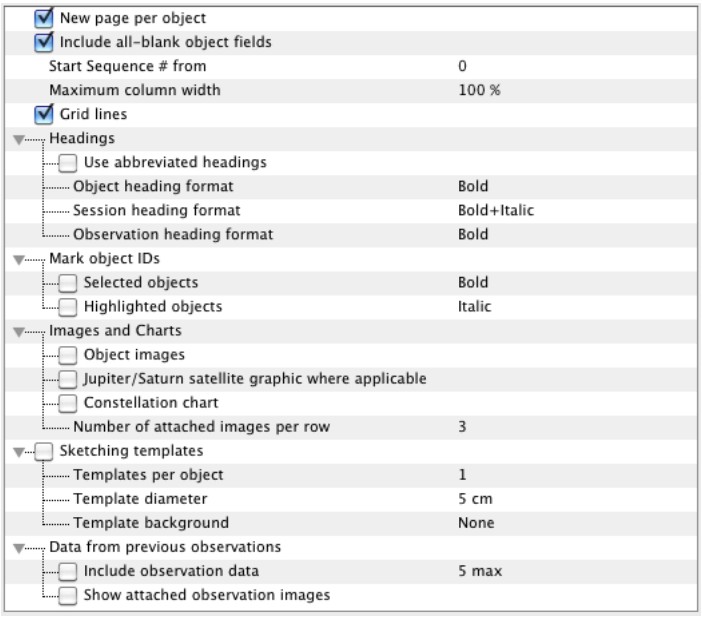
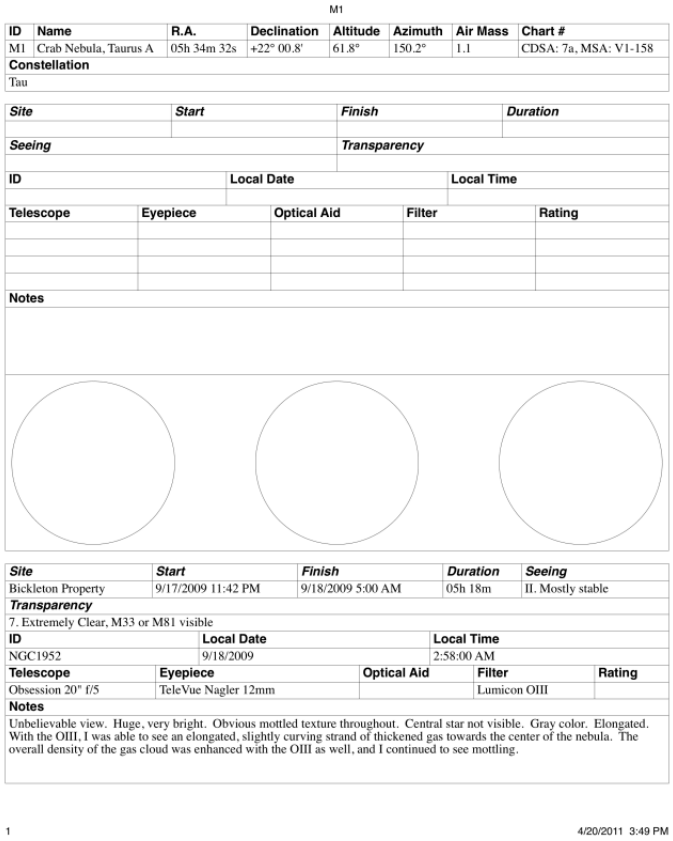


Figure 336: Observing form options

15.4.2 Examples



M1

ID	Name	R.A.	Declination	Altitude	Azimuth	Air Mass	Chart #
M1	Crab Nebula, Taurus A	05h 34m 32s	+22° 00.8'	61.8°	150.2°	1.1	CDSA: 7a, MSA: V1-158

Constellation

Tau

Site	*Start*	*Finish*	*Duration*

Seeing	*Transparency*

ID	Local Date	Local Time

Telescope	Eyepiece	Optical Aid	Filter	Rating

Notes

Site	*Start*	*Finish*	*Duration*	*Seeing*
Bickleton Property	9/17/2009 11:42 PM	9/18/2009 5:00 AM	05h 18m	II. Mostly stable

Transparency

7. Extremely Clear, M33 or M81 visible

ID	Local Date	Local Time
NGC1952	9/18/2009	2:58:00 AM

Telescope	Eyepiece	Optical Aid	Filter	Rating
Obsession 20" f/5	TeleVue Nagler 12mm		Lumicon OIII	

Notes

Unbelievable view. Huge, very bright. Obvious mottled texture throughout. Central star not visible. Gray color. Elongated. With the OIII, I was able to see an elongated, slightly curving strand of thickened gas towards the center of the nebula. The overall density of the gas cloud was enhanced with the OIII as well, and I continued to see mottling.

1 4/20/2011 3:49 PM

Figure 337: Observing form example

15.5 Finder charts

When the **Objects** tab of the plan document window is foremost, you can use ***File > Print...*** to print finder charts for those objects present in the plan, together with object information, images, and sketching templates, etc. This report is designed to be used in the field to determine where to look in the sky for the object/s.

The operation is almost identical to that described in Section 15.2 on page 224, except that you use the **Finder charts** task, with the addition of additional options. Those additional items are described below.

Note that there are *many* options to customise this report to your liking. Try the defaults first, and then start fiddling with the options until you get what you want.

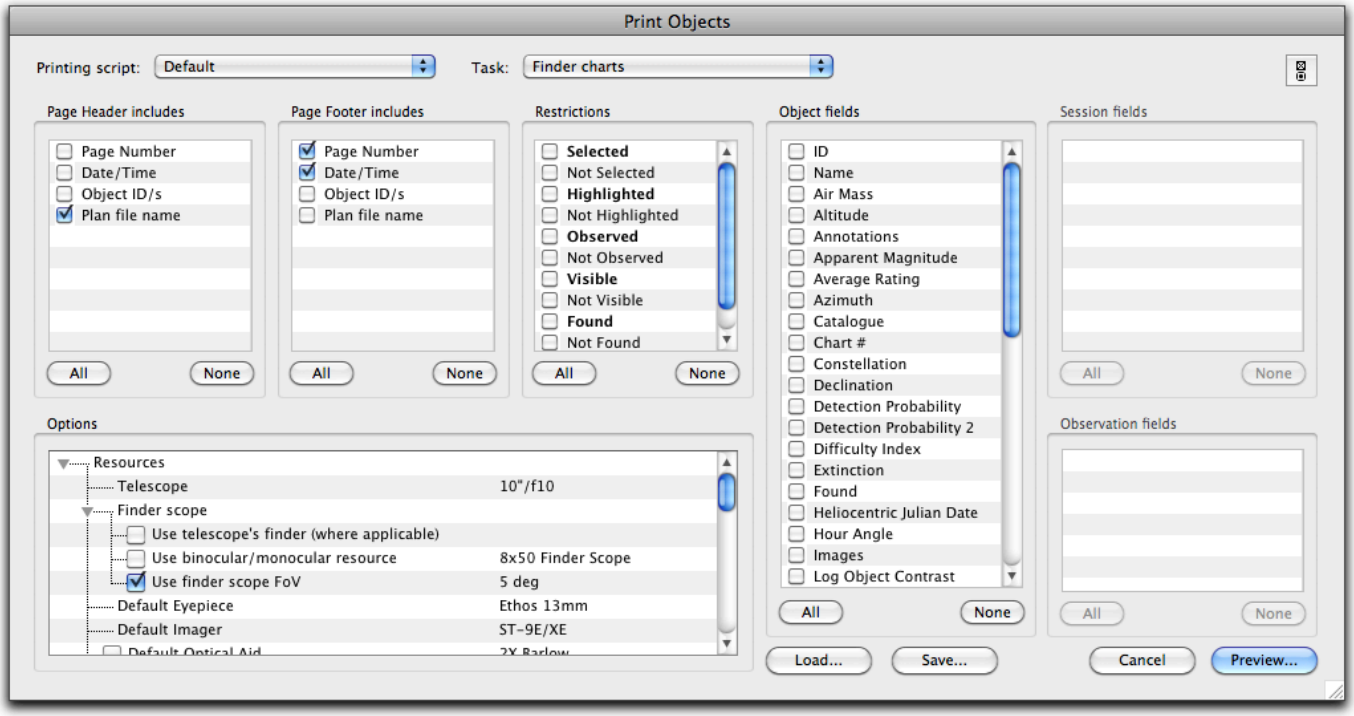


Figure 338: Printing Finder charts

15.5.1 Finder chart options

The options have been broken into sections here for convenience.

Resources

This section describes the resources you will be observing with.

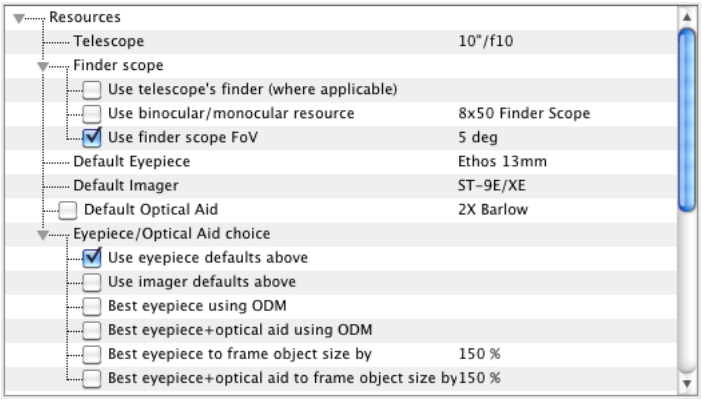


Figure 339: Finder chart options: Resources

- **Resources: Telescope**. The telescope (resource) you will be observing with.
- **Resources: Finder scope**. The telescope finder scope to be used for the Finder scope chart (where applicable). This can be one of:

  Use the telescope's finder. The Telescope resource is assumed to define a finder scope, and that scope's FoV will be used.

  Use binocular/monocular resource. Select and use a binocular/monocular type Telescope resource as the finder.

Use finder scope FoV. Specify a finder scope field of view in degrees.

- **Default Eyepiece**. The default Eyepiece to use for the Eyepiece/imager chart. This might not get used, depending on the value of the Choice option below.
- **Default Imager**. The default Imager to use for the Eyepiece/imager chart. This might not get used, depending on the value of the Choice option below.
- **Default Optical Aid**. The default Optical Aid resource to be used. If the checkbox is checked then it will be used together with the chosen eyepiece or imager.
- **Eyepiece/Optical Aid choice**. How to choose what eyepiece or imager is used for the Eyepiece/imager chart. The choice will be one of the following:

  Use eyepiece defaults above. The Eyepiece/imager chart will use the specified default eyepiece and (optionally) the specified default optical aid.

  Use imager defaults above. The Eyepiece/imager chart will use the specified default imager and (optionally) the specified default optical aid.

  Best eyepiece using ODM. The Eyepiece/imager chart will use an eyepiece which will be chosen by the ODM computation to determine the best magnification to detect the object.

  Best eyepiece+optical aid using ODM. The Eyepiece/imager chart will use an eyepiece and possibly an optical aid which will be chosen by the ODM computation to determine the best magnification to detect the object.

  Best eyepiece to frame object size by. The Eyepiece/imager chart will use an eyepiece which will be chosen to frame the object by a factor specified. e.g. if the factor is 200%, the eyepiece will be chosen to get a field of view twice the diameter of the object's size.

  Best eyepiece+optical aid to frame object size by. The Eyepiece/imager chart will use an eyepiece and possibly an optical aid which will be chosen to frame the object by a factor specified. e.g. if the factor is 200%, the eyepiece/optical aid will be chosen to get a field of view twice the diameter of the object's size.

Charts: All-sky & Naked-eye

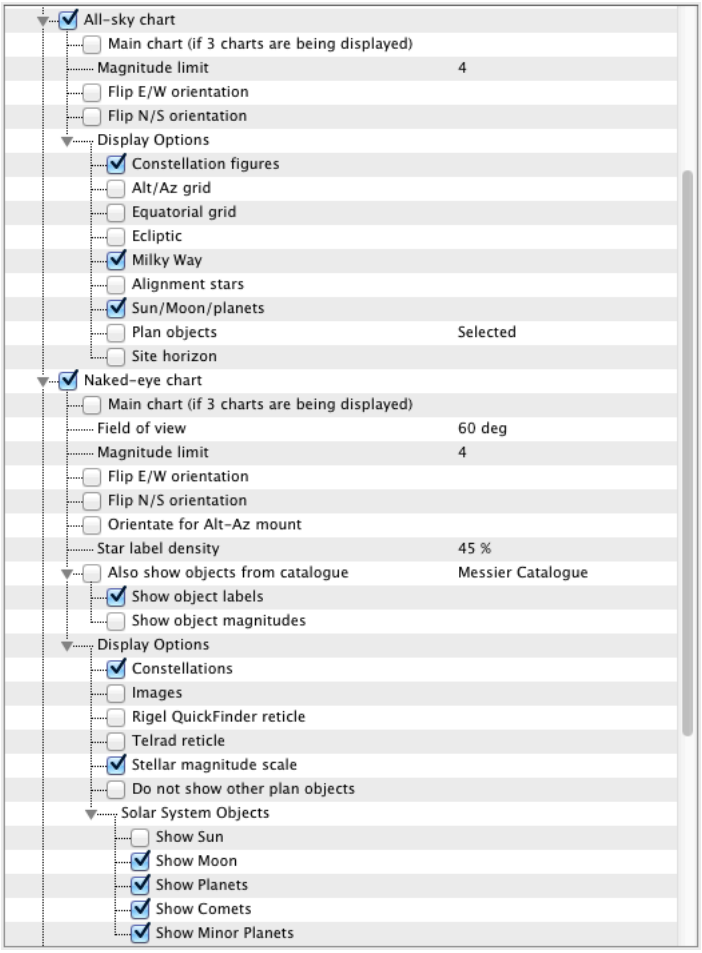


Figure 340: Finder chart options: All-sky and Naked-eye charts

- **All-sky chart**. Check this to include an all-sky chart (same as that found in the Sky tab of the plan document window).
- **All-sky chart > Main chart**. If you are displaying three charts, the third chart is typically sized larger than the other two. Check this option if you want the All-sky chart to be the third chart.
- **All-sky chart > Magnitude limit**. Magnitude limit for stars in the chart.
- **All-sky chart > Flip E/W orientation**. Flip the East/West orientation of the chart.
- **All-sky chart > Flip N/S orientation**. Flip the North/South orientation of the chart.
- **All-sky chart > Display options**. These options are a subset of those found in the Display Options for the Sky chart.

- **Naked-eye chart**. Check this to include a naked-eye chart. This is a wide-angle view of the sky, up to 60 degrees across.

- **Naked-eye chart > Main chart**. If you are displaying three charts, the third chart is typically sized larger than the other two. Check this option if you want the Naked-eye chart to be the third chart.
- **Naked-eye chart > Field of view**. The field of view (in degrees) of the chart.
- **Naked-eye chart > Magnitude limit**. Magnitude limit for stars in the chart.
- **Naked-eye chart > Flip E/W orientation**. Flip the East/West orientation of the chart.
- **Naked-eye chart > Flip N/S orientation**. Flip the North/South orientation of the chart.
- **Naked-eye chart > Orientate for Alt-Az mount**. Orientate the chart as it would be seen through an alt-az mounted scope, or indeed, by the naked eye with respect to the horizon.
- **Naked-eye chart > Star label density**. The density of stars with labels (a lower percentage will label only brighter stars).
- **Naked-eye chart > Also show objects from catalogue**. Show objects from another non-stellar catalogue on the chart. You can also specify whether to show labels (IDs) and magnitudes for those catalogue objects.
- **Naked-eye chart > Display options**. These options are a subset of those found in the Display Options for the Field of View chart.

Charts: Finder scope and Eyepiece/imager

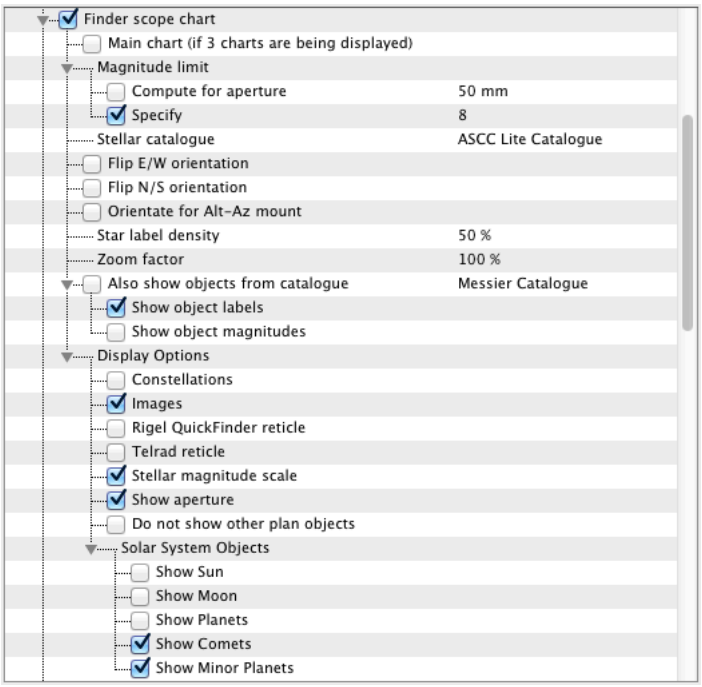


Figure 341: Finder chart options: Finder scope chart

- **Finder scope chart**. Check this to include a finder scope chart.

- **Finder scope chart > Main chart**. If you are displaying three charts, the third chart is typically sized larger than the other two. Check this option if you want the finder scope chart to be the third chart.
- **Finder scope chart > Magnitude limit**. Magnitude limit for stars in the chart. Can be either of:

  Compute for aperture. Compute the theoretical magnitude limit for the specified aperture.

  Specify. Specify the magnitude limit.
- **Finder scope chart > Stellar catalogue**. Specify the stellar catalogue to use to plot stars. Make sure it contains stars down to the magnitude limit specified above.
- **Finder scope chart > Flip E/W orientation**. Flip the East/West orientation of the chart.
- **Finder scope chart > Flip N/S orientation**. Flip the North/South orientation of the chart.
- **Finder scope chart > Orientate for Alt-Az mount**. Orientate the chart as it would be seen through an alt-az mounted scope.
- **Finder scope chart > Star label density**. The density of stars with labels (a lower percentage will label only brighter stars).
- **Finder scope chart > Zoom factor**. The chart will, by default, show a field of view of 100% of the actual finder FoV. You can increase this, in which case the finder FoV will be shown as a circle on the chart.
- **Finder scope chart > Also show objects from catalogue**. Show objects from another non-stellar catalogue on the chart. You can also specify whether to show labels (IDs) and magnitudes for those catalogue objects.
- **Finder scope chart > Display options**. These options are a subset of those found in the Display Options for the Field of View chart.

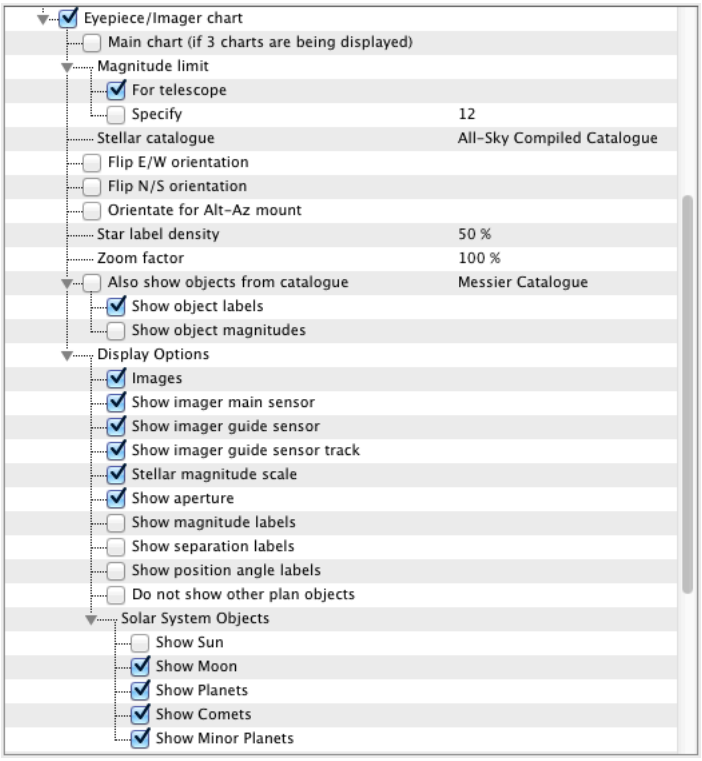


Figure 342: Finder chart options: Imager/eyepiece chart

- **Eyepiece/imager chart**. Check this to include a finder scope chart.
- **Eyepiece/imager chart > Main chart**. If you are displaying three charts, the third chart is typically sized larger than the other two. Check this option if you want the eyepiece/imager chart to be the third chart.
- **Eyepiece/imager chart > Magnitude limit**. Magnitude limit for stars in the chart. Can be either of:

  For telescope. Use the telescope resource's magnitude limit.

  Specify. Specify the magnitude limit.
- **Eyepiece/imager chart > Stellar catalogue**. Specify the stellar catalogue to use to plot stars. Make sure it contains stars down to the magnitude limit specified above.
- **Eyepiece/imager chart > Flip E/W orientation**. Flip the East/West orientation of the chart.
- **Eyepiece/imager chart > Flip N/S orientation**. Flip the North/South orientation of the chart.
- **Finder scope chart > Orientate for Alt-Az mount**. Orientate the chart as it would be seen through an alt-az mounted scope.
- **Eyepiece/imager chart > Star label density**. The density of stars with labels (a lower percentage will label only brighter stars).
- **Eyepiece/imager chart > Zoom factor**. The chart will, by default, show a field of view of 100% of the actual FoV. You can increase this, in which case the finder FoV will be shown as a circle on the chart.

- **Eyepiece/imager chart > Also show objects from catalogue**. Show objects from another non-stellar catalogue on the chart. You can also specify whether to show labels (IDs) and magnitudes for those catalogue objects.
- **Eyepiece/imager chart > Display options**. These options are a subset of those found in the Display Options for the Field of View chart.

Other options

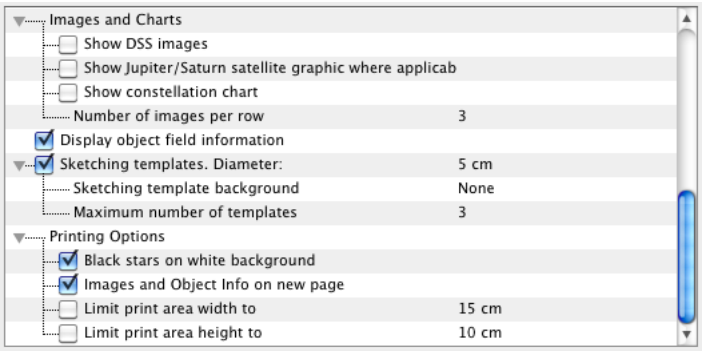


Figure 343: Finder chart options: Other options

- **Images and Charts**. Additional charts and images to add (assuming there's space on the page).

  Show DSS images. Show any cached DSS images of the object.

  Show Jupiter/Saturn satellite graphic. If the object is Jupiter or Saturn, show a chart of the satellite positions.

  Show constellation chart. Show a chart of the constellation containing the object.

  Number of images per row. How many images across the space used for images.
- **Display object field information**. Include a table of useful object data fields.
- **Sketching templates. Diameter**. Include sketching templates, with the specified diameter.

  Sketching template background. Specify the template sketching area background (the area outside the circle).

  Maximum number of templates. Maximum number of sketching templates to include.
- **Printing options**.

  Black stars on white background. Unless you have a lot of ink, keep this switched on.

  Images and object info on new page. If there isn't enough space for images, etc., they can be placed on a second page using this option.

  Limit print area width to.

  Limit print area height to. Limit the area on the page used for printing to a specified size. This is useful if you are, say, printing 4 x 6 index cards.

15.5.2 Examples

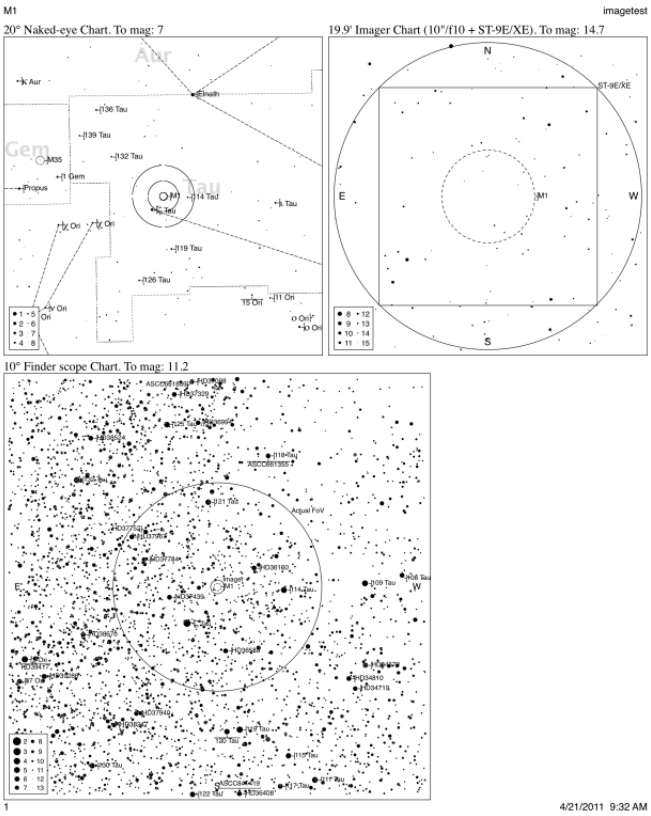


Figure 344: Finder charts - Page 1

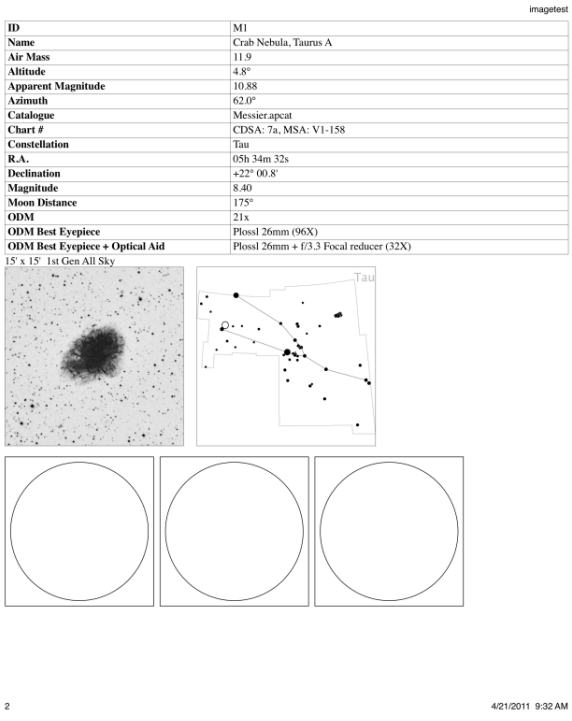


Figure 345: Finder charts - Page 2

15.6 Observing sessions & observations

Observation and session data can also be printed from the Observation database window (***Observation > Show Observation Database***) via ***File > Print...***.

15.6.1 Print session data only

Select the **Session data only** task. Select the session fields you wish to print in the **Session fields** list. Reorder the fields by dragging the entries.

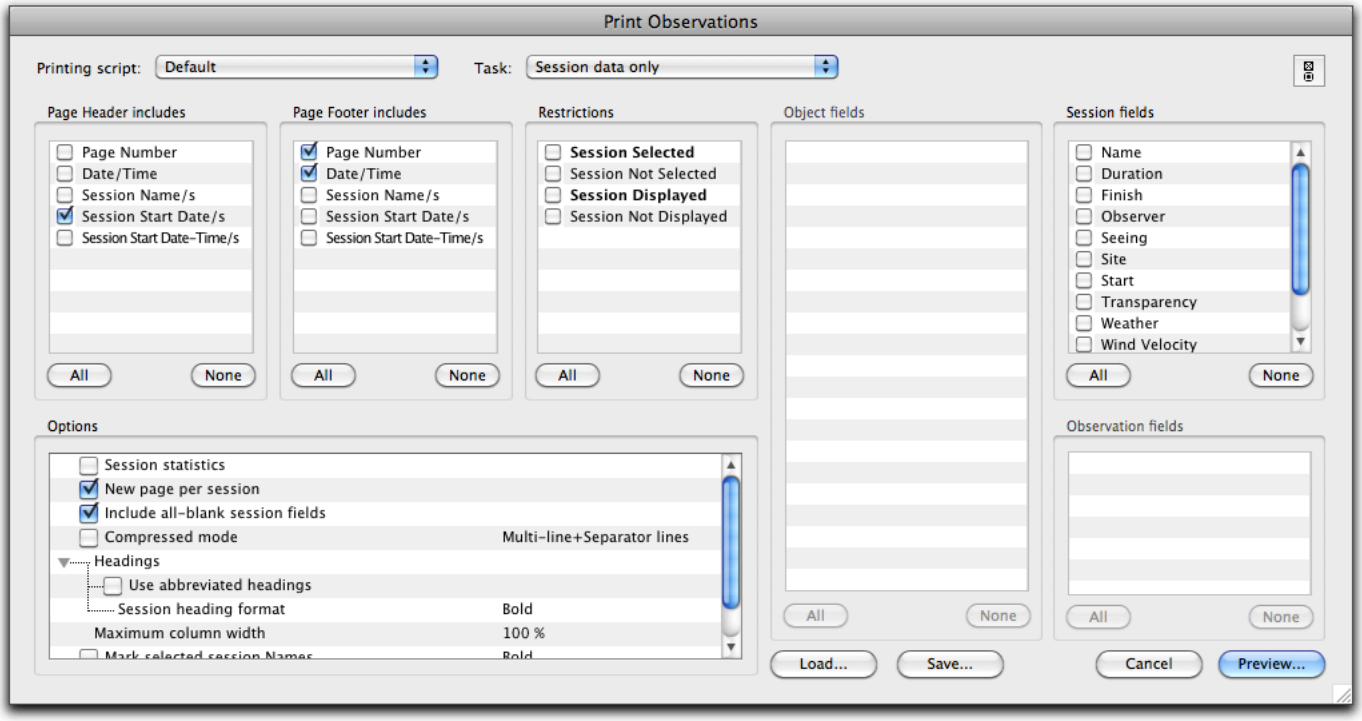


Figure 346: Print session data only

Page header and footer options

- **Page Number**. Page number starting at 1.
- **Date/Time**. The current local date/time.
- **Session Name/s**. The session Name field data.
- **Session Start Date/s**. The session start date.
- **Session Start Date-Time/s**. The session start date and time.

Restrictions

The Restrictions list specifies which sessions to include in the report. If all the entries are unchecked, all sessions in the database will be printed. Restrictions are:

- **Session Selected**. Report includes only those sessions *selected* in the database window sessions list.
- **Session not Selected**. Report includes only those sessions *not selected* in the database window sessions list.

- **Session Displayed**. Report includes only those sessions *displayed* in the database window sessions list. i.e. if you have used the display restrictions underneath the observations list in the database window to eliminate some sessions from the list, then these will not be included in the report.
- **Session not Displayed**. Report includes only those sessions *not displayed* in the database window sessions list. i.e. if you have used the display restrictions underneath the observations list in the database window to eliminate some sessions from the list, then these will be included in the report.

Options

- **Session statistics**. Print a summary of the printed sessions at the end of the report.
- **New page per session**. Start a new page for each session.
- **Include all-blank session fields**. If a particular session field (e.g. Observer) is blank for all relevant sessions, then this option will stop that field from being printed.
- **Compressed mode**. Print a single line for each session, with field headings at the top of each page. There are two checkbox options associated with this mode: **Multi-line** - allow the session fields to be printed over several lines (to avoid truncation on a single line). **Separator lines** - draw a horizontal line between each session entry.
- **Headings > Use abbreviated headings**. Use shortened forms of headings (e.g. "Start" instead of "Start Date").
- **Headings > Session heading format**. Whether the heading is printed using a bold, italic or underlined font, whether it is inverted (black background with white text), etc.
- **Maximum column width**. The maximum width of a column as a percentage of page width.
- **Mark selected session Names**. How to print session Names for *selected* sessions in the list, using a bold, italic or underlined font, inverted (black background with white text), etc.
- **Grid lines**. Draw grid lines around the text.

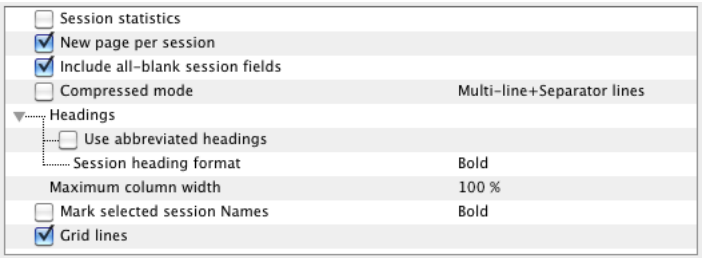


Figure 347: Session data print options

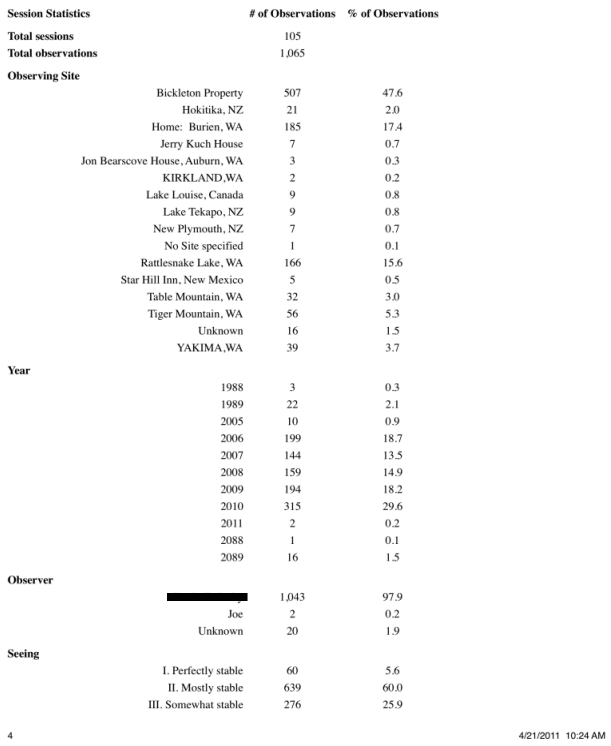
Examples

4/23/1988; 4/29/1989; 9/22/1989; 9/22/1989; 9/27/2005; 10/8/2005; 3/17/2006; 3/18/2006; 3/22/2006; 3/23/2006; ...; 12/8/2007

Site	Start	Duration	Finish
Rattlesnake Lake, WA	4/23/1988 9:55 PM	00h 34m	4/23/1988 10:29 PM
YAKIMA,WA	4/29/1989 10:20 PM	00h 42m	4/29/1989 11:02 PM
YAKIMA,WA	9/22/1989 12:20 PM	00h 25m	9/22/1989 12:45 PM
YAKIMA,WA	9/22/1989 10:00 PM	01h 54m	9/22/1989 11:54 PM
Lake Louise, Canada	9/27/2005 8:50 PM	00h 40m	9/27/2005 9:30 PM
Star Hill Inn, New Mexico	10/8/2005 9:05 PM	00h 54m	10/8/2005 9:59 PM
New Plymouth, NZ	3/17/2006 8:50 PM	00h 42m	3/17/2006 9:32 PM
New Plymouth, NZ	3/18/2006 8:20 PM	00h 35m	3/18/2006 8:55 PM
Hokitika, NZ	3/22/2006 7:50 PM	02h 25m	3/22/2006 10:15 PM
Hokitika, NZ	3/23/2006 8:50 PM	01h 16m	3/23/2006 10:06 PM
Hokitika, NZ	3/24/2006 8:37 PM	01h 10m	3/24/2006 9:47 PM
Lake Tekapo, NZ	3/28/2006 8:50 PM	00h 33m	3/28/2006 9:23 PM
Lake Tekapo, NZ	3/29/2006 8:50 PM	01h 11m	3/29/2006 10:01 PM
Home: Burien, WA	4/22/2006 10:20 PM	01h 25m	4/22/2006 11:45 PM
Home: Burien, WA	4/27/2006 10:50 PM	00h 55m	4/27/2006 11:45 PM
Home: Burien, WA	5/2/2006 9:40 PM	03h 10m	5/3/2006 12:50 AM
Home: Burien, WA	5/16/2006 10:18 PM	03h 12m	5/17/2006 1:30 AM
Home: Burien, WA	5/29/2006 11:20 PM	02h 48m	5/30/2006 2:08 AM
Home: Burien, WA	6/16/2006 11:45 PM	01h 50m	6/17/2006 1:35 AM
Tiger Mountain, WA	6/24/2006 10:30 PM	03h 38m	6/25/2006 2:08 AM
Home: Burien, WA	6/30/2006 11:40 PM	02h 35m	7/1/2006 2:15 AM
Rattlesnake Lake, WA	7/15/2006 10:35 PM	02h 40m	7/16/2006 1:15 AM
Rattlesnake Lake, WA	7/23/2006 10:30 PM	02h 55m	7/24/2006 1:25 AM
Rattlesnake Lake, WA	7/26/2006 10:10 PM	02h 47m	7/27/2006 12:57 AM
Home: Burien, WA	8/16/2006 10:40 PM	01h 20m	8/17/2006 12:00 AM
Home: Burien, WA	9/11/2006 9:35 PM	01h 25m	9/11/2006 11:00 PM
Lake Louise, Canada	9/23/2006 8:52 PM	00h 53m	9/23/2006 9:45 PM
Rattlesnake Lake, WA	10/11/2006 7:35 PM	02h 16m	10/11/2006 9:51 PM
Rattlesnake Lake, WA	10/21/2006 8:05 PM	01h 30m	10/21/2006 9:35 PM
Home: Burien, WA	1/11/2007 6:55 PM	01h 35m	1/11/2007 8:30 PM
Home: Burien, WA	1/30/2007 6:34 PM	00h 33m	1/30/2007 7:07 PM
Home: Burien, WA	3/14/2007 8:57 AM	01h 06m	3/14/2007 10:03 AM
Home: Burien, WA	3/14/2007 8:45 PM	00h 30m	3/14/2007 9:15 PM
Home: Burien, WA	3/16/2007 10:05 PM	02h 09m	3/17/2007 12:14 AM
Rattlesnake Lake, WA	4/6/2007 9:20 PM	02h 31m	4/6/2007 11:51 PM
Home: Burien, WA	5/7/2007 10:50 PM	02h 04m	5/8/2007 12:54 AM
Rattlesnake Lake, WA	5/9/2007 10:05 PM	02h 49m	5/10/2007 12:54 AM
Table Mountain, WA	7/7/2007 10:45 PM	03h 35m	7/8/2007 2:20 AM
Home: Burien, WA	8/1/2007 11:13 PM	01h 37m	8/2/2007 12:50 AM
Table Mountain, WA	8/10/2007 10:00 PM	04h 10m	8/11/2007 2:10 AM
Rattlesnake Lake, WA	8/14/2007 11:25 PM	01h 14m	8/15/2007 12:40 AM
Table Mountain, WA	9/8/2007 8:50 PM	03h 15m	9/9/2007 12:05 AM
Tiger Mountain, WA	10/13/2007 8:11 PM	03h 09m	10/13/2007 11:20 PM
Home: Burien, WA	10/25/2007 8:20 PM	00h 25m	10/25/2007 8:45 PM
Home: Burien, WA	10/26/2007 8:05 PM	00h 25m	10/26/2007 8:30 PM
Tiger Mountain, WA	12/8/2007 6:46 PM	04h 29m	12/8/2007 11:15 PM

1 4/21/2011 10:23 AM

Figure 348: Session data example



Session Statistics	# of Observations	% of Observations
Total sessions	105	
Total observations	1,065	
Observing Site		
Bickleton Property	507	47.6
Hokitika, NZ	21	2.0
Home: Burien, WA	185	17.4
Jerry Kuch House	7	0.7
Jon Bearscove House, Auburn, WA	3	0.3
KIRKLAND,WA	2	0.2
Lake Louise, Canada	9	0.8
Lake Tekapo, NZ	9	0.8
New Plymouth, NZ	7	0.7
No Site specified	1	0.1
Rattlesnake Lake, WA	166	15.6
Star Hill Inn, New Mexico	5	0.5
Table Mountain, WA	32	3.0
Tiger Mountain, WA	56	5.3
Unknown	16	1.5
YAKIMA,WA	39	3.7
Year		
1988	3	0.3
1989	22	2.1
2005	10	0.9
2006	199	18.7
2007	144	13.5
2008	159	14.9
2009	194	18.2
2010	315	29.6
2011	2	0.2
2088	1	0.1
2089	16	1.5
Observer		
[redacted]	1,043	97.9
Joe	2	0.2
Unknown	20	1.9
Seeing		
I. Perfectly stable	60	5.6
II. Mostly stable	639	60.0
III. Somewhat stable	276	25.9

4 4/21/2011 10:24 AM

Figure 349: Session statistics example[1]

15.6.2 Print observation data only

Select the **Observation data only** task. Select the session fields you wish to print in the **Observation fields** list. Reorder the fields by dragging the entries.

Page header and footer options

- **Page Number**. Page number starting at 1.
- **Date/Time**. The current local date/time.
- **Observation ID/s**. The ID fields for observations displayed on the page.

Restrictions

The Restrictions list specifies which observations to include in the report. If all the entries are unchecked, all observations in the database will be printed. Restrictions are:

- **Observation Selected**. Report includes only those observations *selected* in the database window observations list.
- **Observation not Selected**. Report includes only those observations *not selected* in the database window observations list.
- **Observation Found**. Report includes only those observations marked as having been found.
- **Observation not Found**. Report includes only those observations not marked as being found.
- **Observation Displayed**. Report includes only those observations *displayed* in the database window observations list. i.e. if you have used the display restrictions underneath the observations

1. The black "bar" is redacted information (the observation database used for illustration contains real third-party data).

list in the database window to eliminate some observations from the list, then these will not be included in the report.

- **Observation not Displayed**. Report includes only those observations *not displayed* in the database window observations list. i.e. if you have used the display restrictions underneath the observations list in the database window to eliminate some observations from the list, then these will be included in the report.

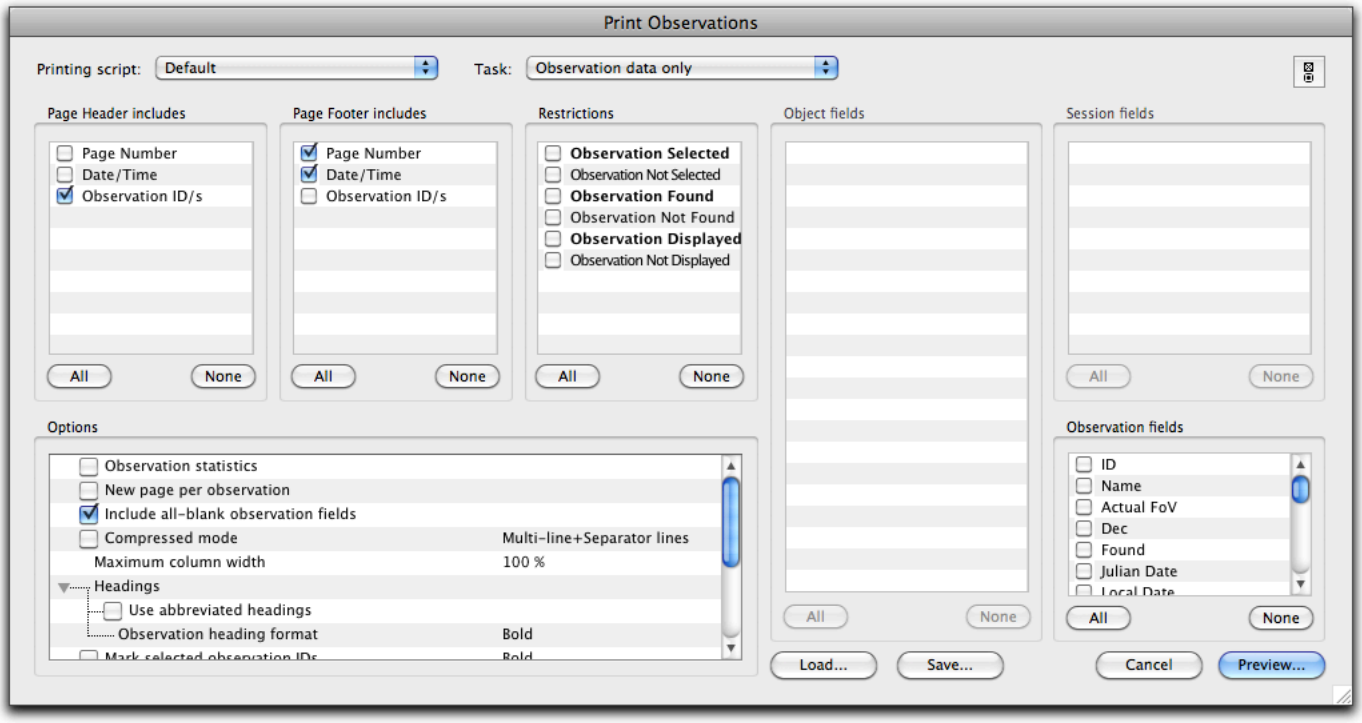


Figure 350: Print observation data only

Options

- **Observation statistics**. Print a summary of the printed observations at the end of the report.
- **New page per observation**. Start a new page for each observation.
- **Include all-blank observation fields**. If a particular observation field (e.g. Name) is blank for all relevant observations, then this option will stop that field from being printed.
- **Compressed mode**. Print a single line for each observation, with field headings at the top of each page. There are two checkbox options associated with this mode: **Multi-line** - allow the observation fields to be printed over several lines (to avoid truncation on a single line). **Separator lines** - draw a horizontal line between each observation entry.
- **Headings > Use abbreviated headings**. Use shortened forms of headings (e.g. "Julian" instead of "Julian Date").
- **Headings > Observation heading format**. Whether the heading is printed using a bold, italic or underlined font, whether it is inverted (black background with white text), etc.
- **Maximum column width**. The maximum width of a column as a percentage of page width.

- **Mark selected observation IDs**. How to print observation IDs for *selected* observations in the list, using a bold, italic or underlined font, inverted (black background with white text), etc.
- **Grid lines**. Draw grid lines around the text.
- **Images and Charts > Show attached observation images**. Display any images attached to the observations, and how to print those images (inverted colours, E/W flipped, etc.).
- **Images and Charts > Number of attached images per row**. How many images should be printed across the width of the page.
- **Images and Charts > Show constellation chart**. Display a constellation chart showing the constellation containing the observed object.

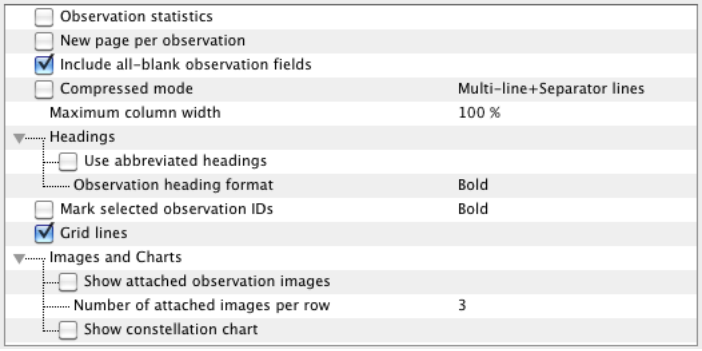


Figure 351: Observation data print options

Examples

NGC6826,7016

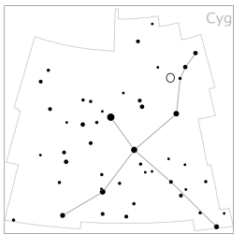
ID	Name	Type	RA	Dec	Constellation	Julian Date
NGC6826	Blinking Nebula	Planetary Nebula	19:44:48	+50° 31' 30"	Cyg	2,455,422.81111

Local Date	Local Time
8/14/2010	12:28:00 AM

Found	Telescope	Eyepiece	Optical Aid	Filter	Actual FoV	Magnification
True	Obsession 20" f/5	Pentax XW 7mm		Lumicon OIII	n/a	n/a

Notes

The wind was blowing and shaking the scope. At 363x, this is a bright, and beautiful blue-gray disk. Central star was bright and obvious. Moderate size. The blinking effect is confirmed, as focusing on central star causes the gas to become subdued - it did not disappear altogether, but it did weaken. I do not see the dark lane or spot mentioned in my notes. With an OIII filter, the central star disappeared and the halo became more extended and with a filmy perimeter; also, it was no longer circular, as there were now bulges evident in varying directions.



ID	Name	Type	RA	Dec	Constellation	Julian Date
NGC7016	NGC7016	Galaxy	21:07:16	-25° 28' 09"	Cap	2,455,422.82431

Local Date	Local Time
8/14/2010	12:47:00 AM

Found	Telescope	Eyepiece	Optical Aid	Filter	Actual FoV	Magnification
True	Obsession 20" f/5	Pentax XW 7mm			n/a	n/a

Notes

Very low altitude view; approximately 17-18 degrees altitude, so a dim view. I saw all three galaxies in the field of view at 363x, and they formed a sort of crooked isosceles triangle. All were visible with direct vision, but barely so. Little detail evident. The brightest member seemed to be NGC7018; it also seemed a little larger and had a slightly elongated halo. The other two galaxies were side-by-side, SW of NGC7018. NGC7016 is the westernmost of the pair, and seemed a hair brighter and larger than NGC7017. However with averted vision they both seemed about the same brightness. No detail evident, as both were faint smudges. Other galaxies in the field were not visible.

1 4/21/2011 11:40 AM

Figure 352: Observations only example

Observation Statistics	# of Observations	% of Observations
Total observations	58	
Object Type		
Galaxy	38	65.5
Globular Cluster	2	3.4
Knot	4	6.9
Normal Spiral Galaxy	1	1.7
Open Cluster	3	5.2
P Neb	3	5.2
Planetary Nebula	4	6.9
Triple	1	1.7
Unknown	2	3.4
Rating		
None	58	100.0
Telescope		
Obsession 20" f/5	58	100.0
Eyepiece		
Pentax XW 7mm	33	56.9
TeleVue Nagler 12mm	20	34.5
TeleVue Nagler 26mm	5	8.6
Imager		
None	58	100.0
Optical Aid		
None	58	100.0
Filter		
Lumicon OIII	4	6.9
Lumicon UHC	1	1.7
None	53	91.4

Figure 353: Observation statistics example

15.6.3 Print session & observation data

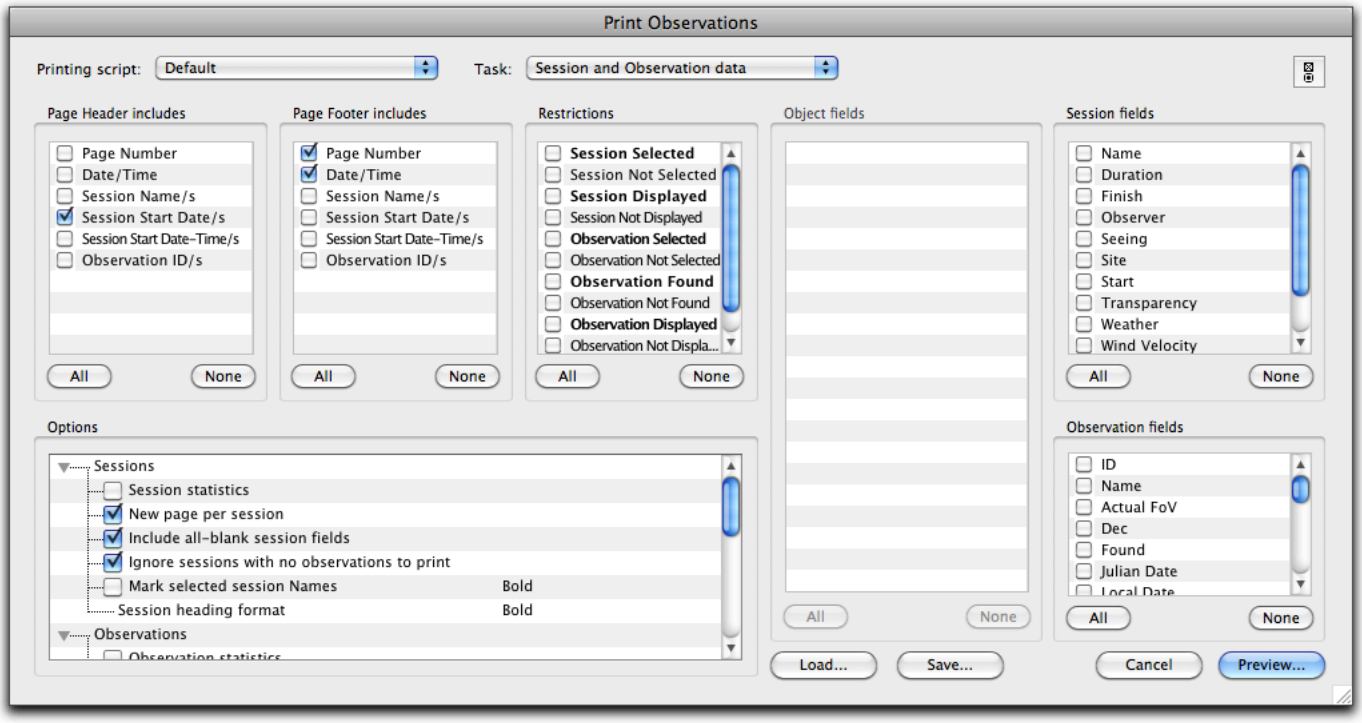


Figure 354: Print session and observation data

This is a combination of the above two report types. For each session, the session data is printed, followed by observations made in that session. See above for definition of the options, etc.

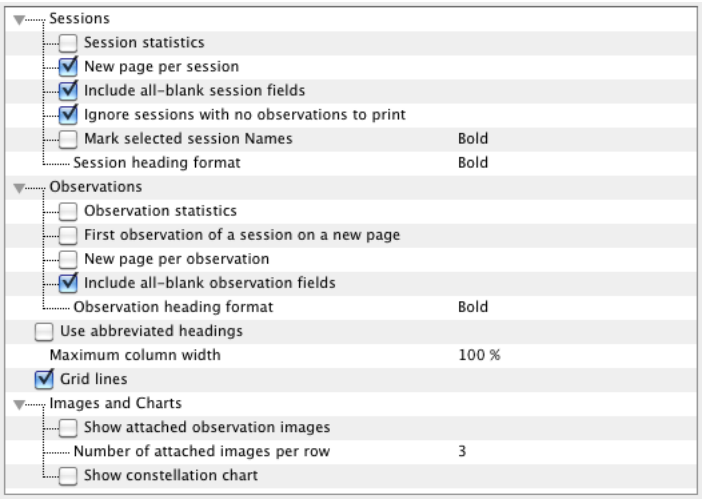
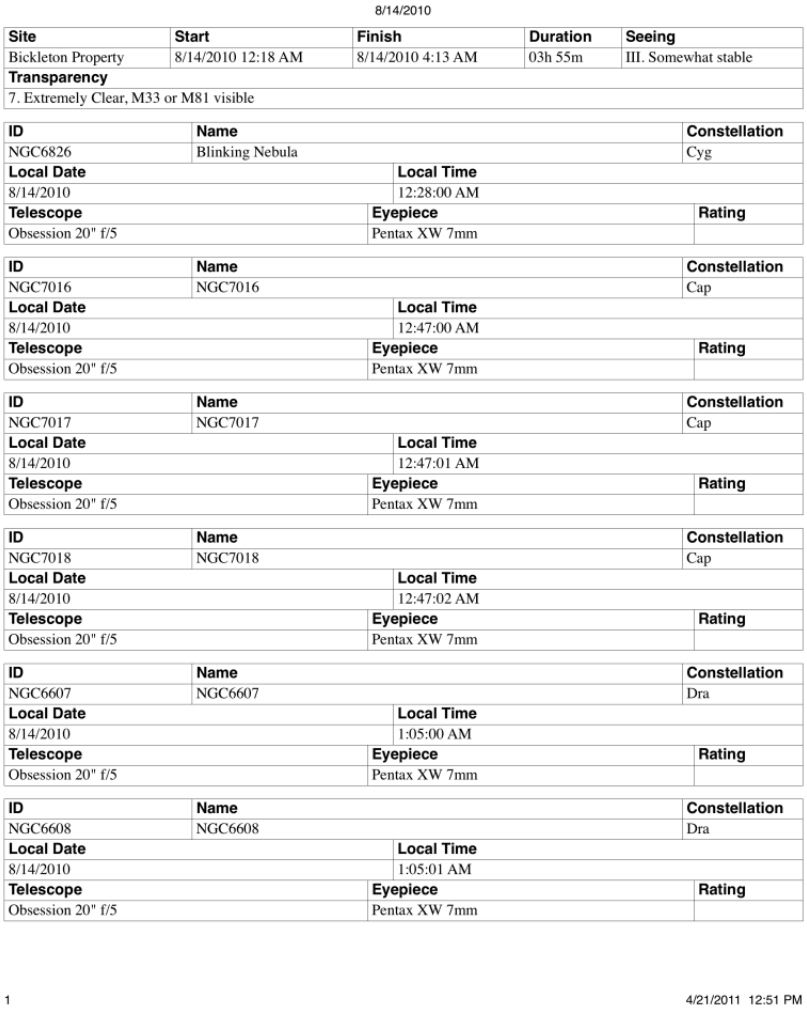


Figure 355: Session and observation print options

Examples



8/14/2010

Site	Start	Finish	Duration	Seeing
Bickleton Property	8/14/2010 12:18 AM	8/14/2010 4:13 AM	03h 55m	III. Somewhat stable
Transparency				
7. Extremely Clear, M33 or M81 visible				

ID	Name	Constellation
NGC6826	Blinking Nebula	Cyg
Local Date	**Local Time**	
8/14/2010	12:28:00 AM	
Telescope	**Eyepiece**	**Rating**
Obsession 20" f/5	Pentax XW 7mm	

ID	Name	Constellation
NGC7016	NGC7016	Cap
Local Date	**Local Time**	
8/14/2010	12:47:00 AM	
Telescope	**Eyepiece**	**Rating**
Obsession 20" f/5	Pentax XW 7mm	

ID	Name	Constellation
NGC7017	NGC7017	Cap
Local Date	**Local Time**	
8/14/2010	12:47:01 AM	
Telescope	**Eyepiece**	**Rating**
Obsession 20" f/5	Pentax XW 7mm	

ID	Name	Constellation
NGC7018	NGC7018	Cap
Local Date	**Local Time**	
8/14/2010	12:47:02 AM	
Telescope	**Eyepiece**	**Rating**
Obsession 20" f/5	Pentax XW 7mm	

ID	Name	Constellation
NGC6607	NGC6607	Dra
Local Date	**Local Time**	
8/14/2010	1:05:00 AM	
Telescope	**Eyepiece**	**Rating**
Obsession 20" f/5	Pentax XW 7mm	

ID	Name	Constellation
NGC6608	NGC6608	Dra
Local Date	**Local Time**	
8/14/2010	1:05:01 AM	
Telescope	**Eyepiece**	**Rating**
Obsession 20" f/5	Pentax XW 7mm	

1 4/21/2011 12:51 PM

Figure 356: Session+observations example

16 Journal

The journal feature (**Observation > Journal**) is a convenient place to keep bits of textual information, stories, observing reports, etc. It consists of a linear collection of entries, each entry having a date, a subject, and some associated notes.

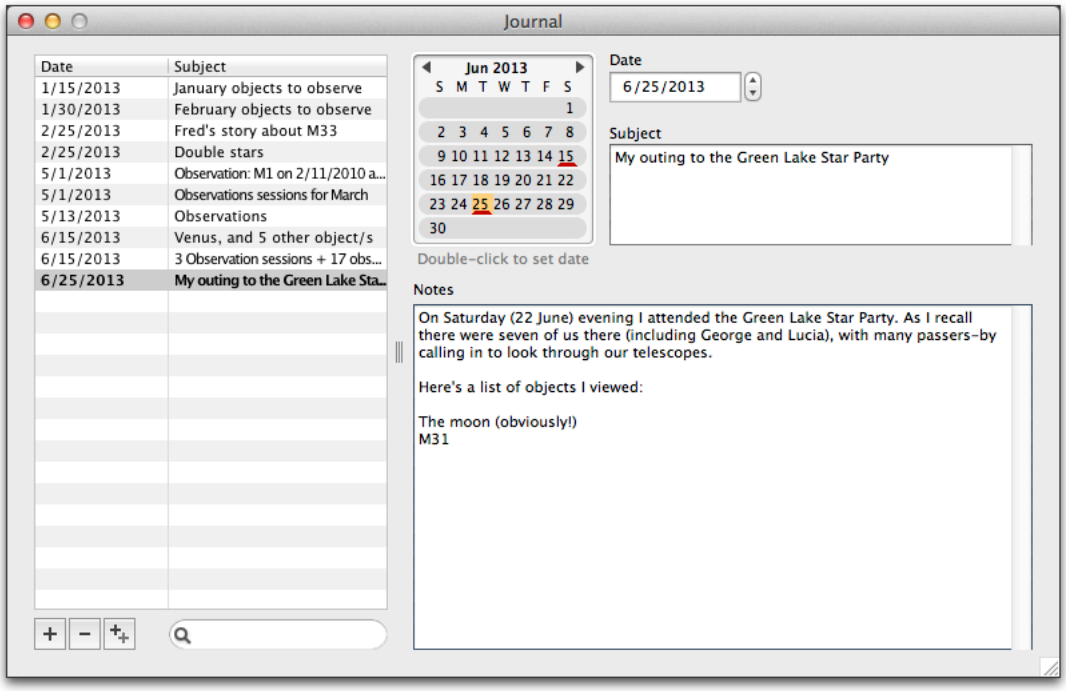


Figure 357: Journal window

The list of journal entries on the left can be sorted (by clicking the column headings). Buttons beneath the list allow you to add a new journal entry, delete an existing journal entry, or duplicate an existing entry.

If a journal entry is selected in the list, the entry and all others on the same date are displayed in a bold face.

The date of a journal entry can be changed, either by using the Date selector, or by double-clicking the appropriate day on the mini-calendar widget.

The mini-calendar highlights the date of the currently-selected entry. Additionally any dates in the displayed month that have one or more entries will be underlined in red. Single-clicking a date will select and display the first journal entry for that date.

The find widget under the list of entries can be used to search all journal entries and display only those entries containing the search text in either the subject or notes part.

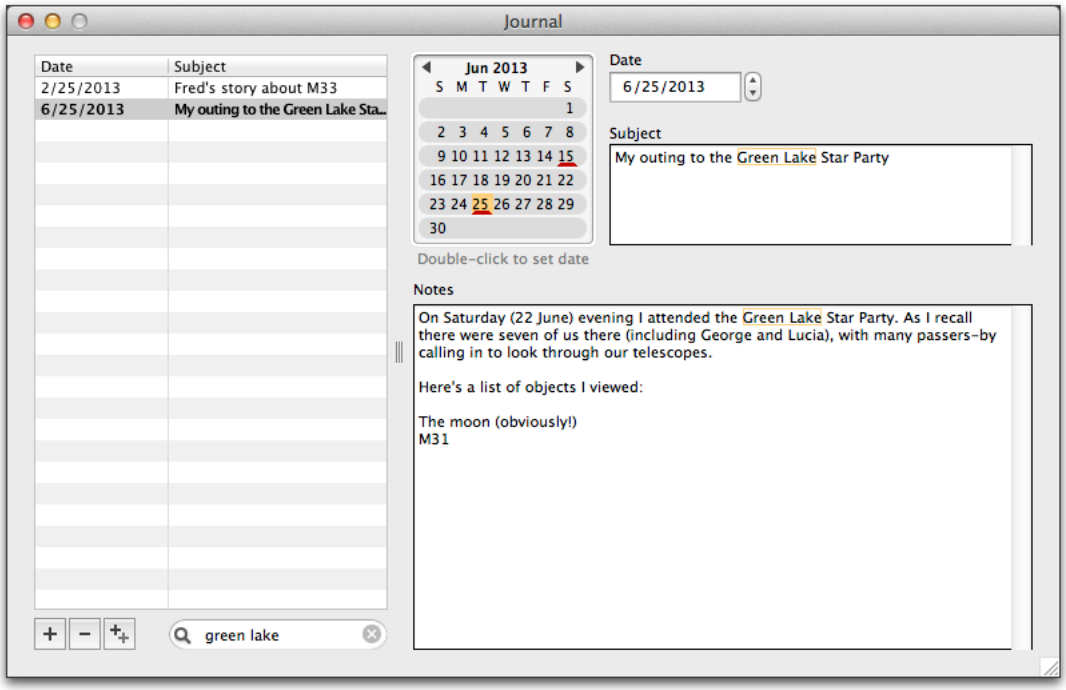


Figure 358: Searching the journal

It is possible to create journal entries from various places in the application:

- Text fields have a **Create New Journal Entry from Text** entry in their right-click menu.
- Right-clicking the list of observations allows you to create a new journal entry containing a text summary of the observation.
- Right-clicking the list of observation sessions allows you to create a new journal entry containing a text summary of the selected session/s and observations.

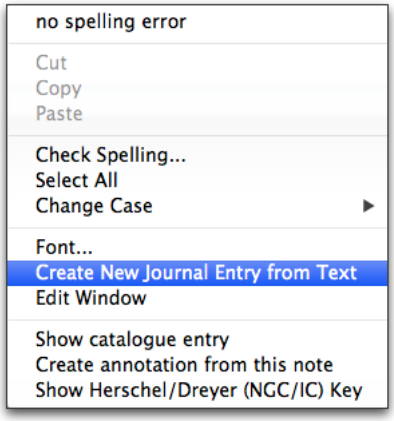


Figure 359: Create journal entry from a text field

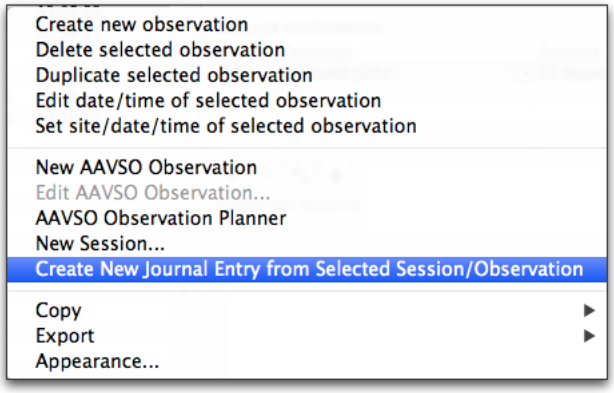


Figure 360: Create journal entry from an observation list entry

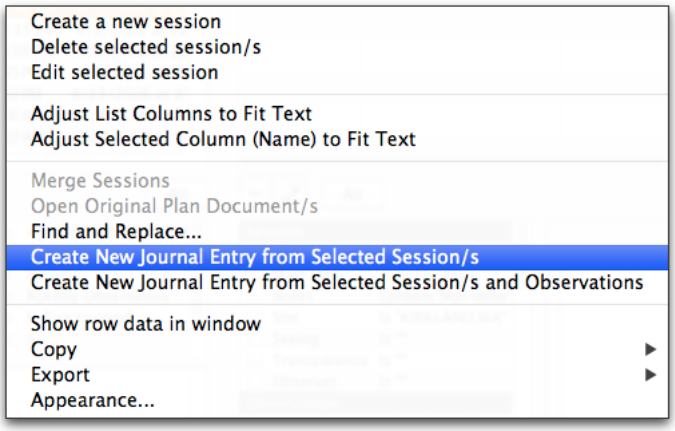


Figure 361: Create journal entry from a session list entry

17 Downloading and using sky images

AstroPlanner has the ability to download images of your plan objects, which can be used for pre-visualization of the objects before observing or imaging them, or comparing what you imaged or observed through the telescope with a “standard” image.

The images are downloaded from a number of on-line sky survey databases. These are primarily monochrome images from the first or second generation Palomar Digital Sky Survey (DSS) or colour images from the Sloan Digital Sky Survey (SDSS)[1].

See Figure 362 through Figure 364 for some examples.

1. Note the SDSS currently only includes coverage of part of the northern sky.

The images are stored in a database and are typically accessed via their associated ID and/or coordinates of the centre of the image. You can download images in different angular sizes. The downloaded images are all square (i.e. the same angular size vertically and horizontally).

Note: for DSS (POSS) images, the downloaded images are stored at full resolution. This means that the larger the angular size of the image, the greater the amount of disk space required to store them, and the slower they will be to download and to retrieve from the database.

Image preferences can be changed to suit the user. They are described in detail on page 312.

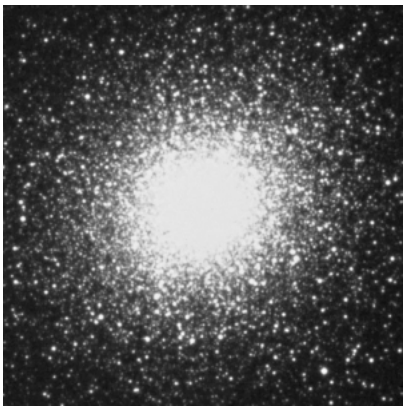


Figure 362: DSS Image (POSS 1G Red) of M13

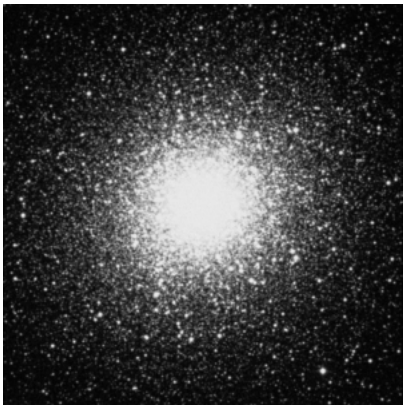


Figure 363: DSS Image (POSS 2G Red) of M13

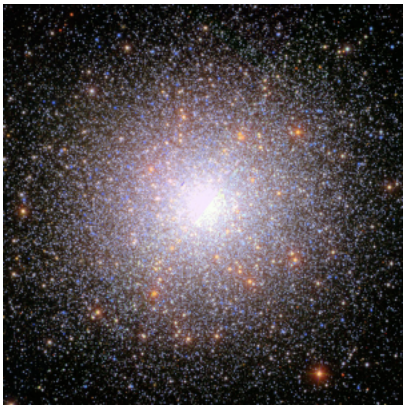


Figure 364: SDSS Image of M13

17.1 Downloading

Downloading is typically done manually, as described below. You can also set up preferences to download images automatically (where possible). See Image preferences (page 312) for details on setting this up.

17.1.1 Opening the download window

In order to download images, you must have a plan document open and it must contain at least one object. To download images for one or more of the objects in the plan, use the ***Image > Download images...*** menu command. Alternatively, select one or more objects in the plan's object list, right-click and choose ***Other > Download images...***.

If you are viewing the Field of View chart, you can also download an image centred on the current Field of View coordinates by clicking the ***Images*** button to the right of the chart. When the Field of View Images window opens, select the Download tab.

Note that the left hand pane of the window might show existing images of the object where applicable.

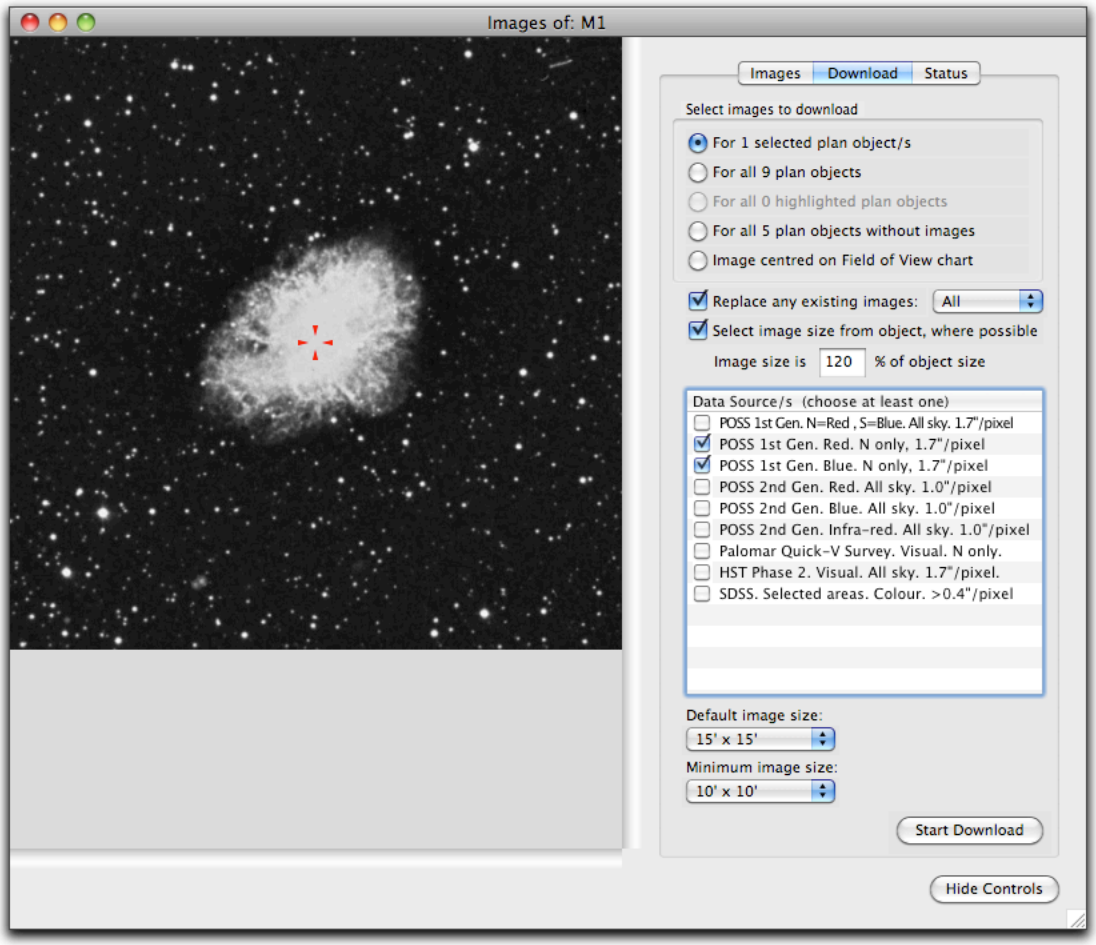


Figure 365: Image download window

17.1.2 Image download options

Select images to download: Select which of the plan objects you want to download images for. This can be the currently selected object/s in the plan, all of the objects in the plan, the highlighted objects, all the objects in the plan that currently have no images associated with them or, in the case of the Field of View chart, images centred on that chart.

Replace any existing images: If this option is checked, then any existing images of the same size and data source will be replaced by newly-downloaded copies. You can also select to replace only the newest or oldest image if there are multiple copies.

Select image size from object, where possible: If the object being targeted for an image download has a defined size (e.g. 15'x10'), then this option (if checked) will use that object size to determine the angular size of the downloaded image/s. The image size is then specified as a percentage of the object size (in order to allow a gap around the object). If the object does not define a size, the the default image size is used (see below).

Data source/s: You need to check at least one data source (sky survey) from whence the image/s will be downloaded. If you check more than one, the same image (i.e. the same size and centre coordinates) will be downloaded from each data source. This is useful if, say, you always want a red and blue image, and possibly a colour SDSS image where applicable.

Default image size: This is the size of image that will be downloaded. If the **Select image size from object, where possible** setting is checked then this size will be used if the object does not have a specified size.

Minimum image size: If the **Select image size from object, where possible** setting is used, then this represents the minimum size of image that will be downloaded.

17.1.3 Starting and monitoring image downloads

Click the ***Start Download*** button to queue up the specified image downloads. The specified images are added to the download queue, and if the queue was previously empty, downloading begins. All downloading, decompressing, decoding, etc. takes place in a background thread and you can continue working.

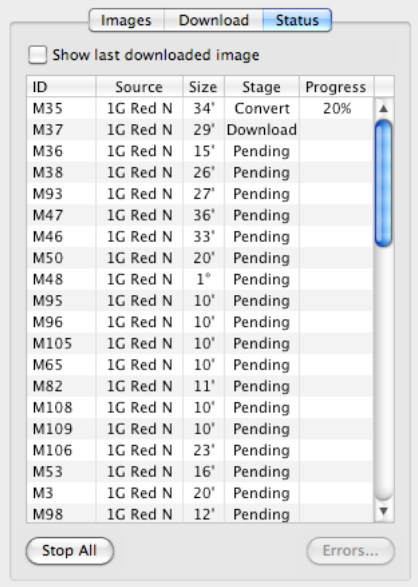


Figure 366: Image download queue

The queue in the Status tab shows the list of images being downloaded (object ID, the source chosen, the image size to be downloaded, the stage of the download (e.g. download, decompress, convert, etc.), and the progress of the current stage as a percentage.

The ***Stop All*** button is used to abandon all downloads currently in the queue. If an error is detected while downloading or converting an image, an error is logged, and the next image in the queue is downloaded. If there are errors, the ***Errors...*** button is enabled and can be used to get a summary of the errors.

The ***Show last downloaded image*** checkbox can be used to show a preview of the last image to be downloaded (see Figure 367).

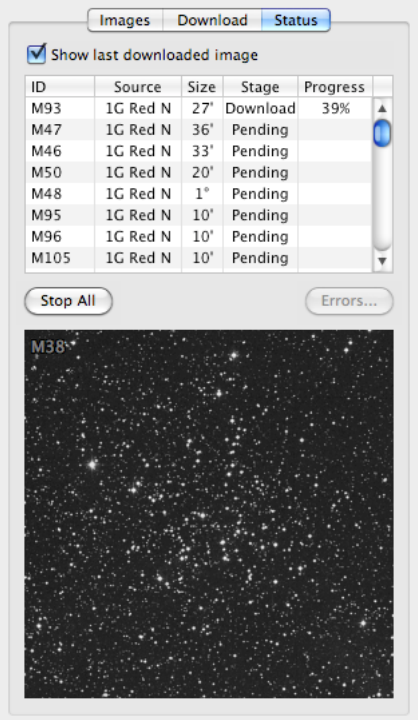


Figure 367: Showing last downloaded image

17.2 Object list

You can show any images associated with an object in the object list by clicking on and selecting that object. If the selected object has any images (i.e. any images in the database that contain the coordinates of the object) then they will be displayed to the right of the object list.

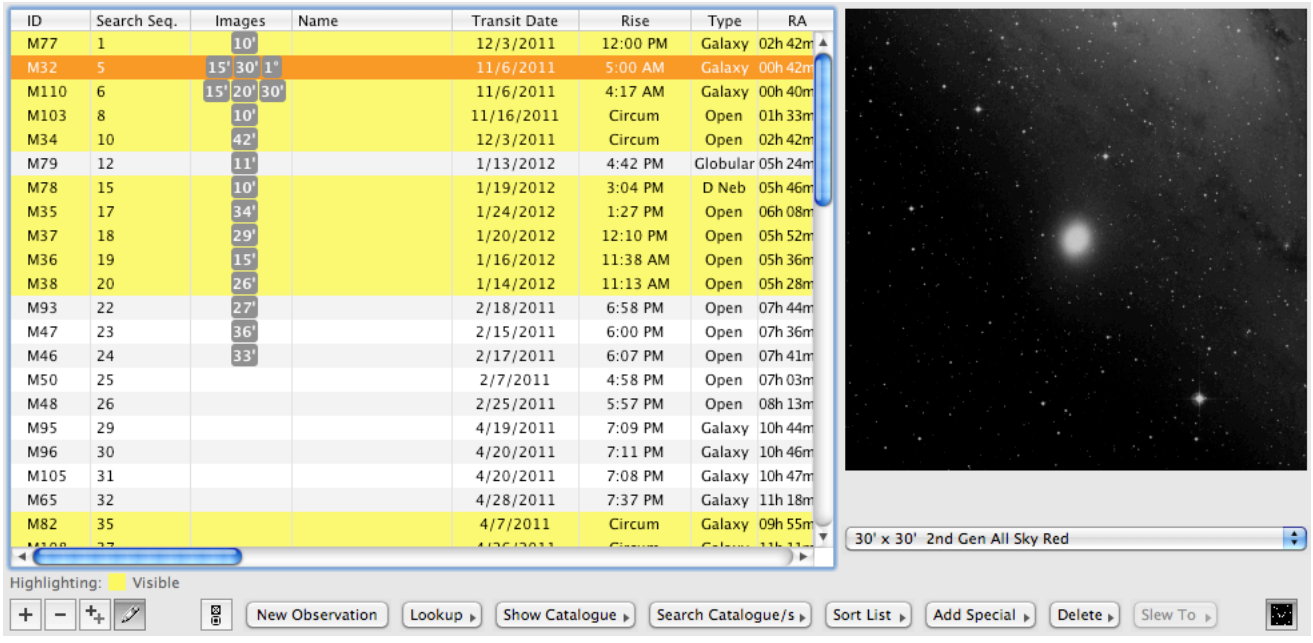


Figure 368: Images associated with selected objects

The popup menu underneath the image contains a list of all known images of that object. Selecting any entry in the menu will display the applicable image.

This display of images can be turned on and off by toggling the small square button to the lower right of the image display, to the right of the ***Slew To*** popup button.

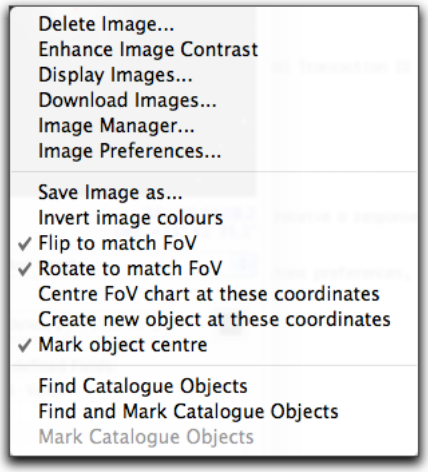


Figure 369: Right-click image menu

Right-clicking the image displays a popup menu with various options (not all of which are necessarily enabled):

- **Delete Image**. Delete the currently-displayed image from the image database.
- **Enhance Image Contrast**. Enhance the contrast of the currently-displayed image. This will darken the background sky, possibly at the expense of subtle detail. Since this operates on the image itself, it cannot be undone.
- **Display Images**. Open the image display window for the selected object (see Section 17.4 on page 263).
- **Download Images**. Opens the image download window ready to download images for the selected object (see Section 17.1.1 on page 256).
- **Image Manager**. Open the Image Manager (see Section 17.5 on page 265).
- **Image Preferences**. Open the Image Preferences window (see Section 20.10 on page 312).
- **Save Image As**. Opens a dialog that lets you save the currently-displayed image as an image file in one of several formats (Figure 370). Some file formats might not be available depending on your OS platform and/or installed software. You can choose to save the image as its original size (default) or you can change the size settings to suit. The JPEG file format also allows you to specify quality, etc.
- **Invert image colours**. This toggles the display of images with either a white or black sky background.
- **Flip to match FoV**. This toggles the display of images to match the orientation of the field of view chart (i.e. the N,S,E,W cardinal points).
- **Rotate to match FoV**. This toggles the display of images to match the rotation angle of the field of view chart.

- **Centre FoV chart at these coordinates**. The field of view chart will be redrawn, centred at the coordinates of the point where the mouse was right-clicked.
- **Create new object at these coordinates**. A new object will be created in the plan, with the coordinates of the point where the mouse was right-clicked.
- **Mark object centre**. This toggles the display of red cross hairs on the image marking the coordinates of the selected object.
- **Find Catalogue Objects**. Search the installed catalogues for any objects that appear in the displayed image. Once that is done, hovering the cursor over such an object in the image will display the ID of the object below the image (Figure 371).
- **Find and Mark Catalogue Objects**. Does the same as Find Catalogue Objects, but also circles the found objects in red on the image (Figure 372).
- **Mark Catalogue Objects**. After doing a Find Catalogue Objects, this will then mark the objects in red.
- **Unmark Catalogue Objects**. Removes the marked objects added as described above.
- **Show Catalogue Entry**. Displays a sub-menu containing the catalogue entries for marked objects as described above. Selecting an object with open the relevant catalogue and display the object.

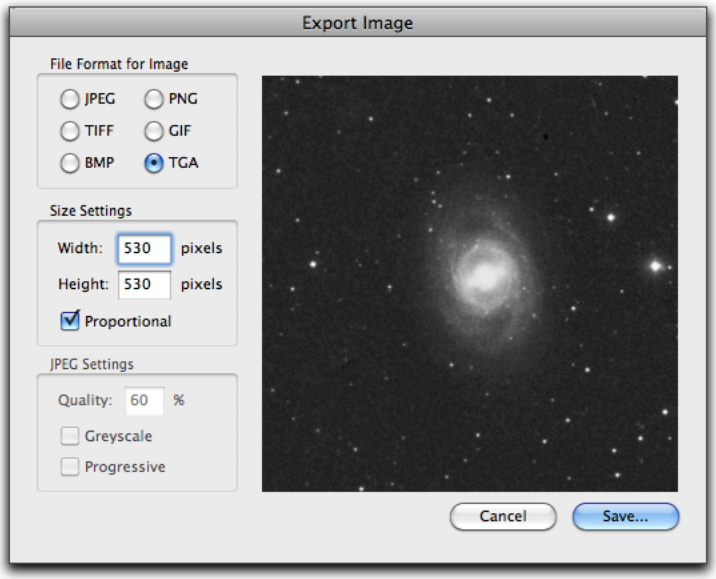


Figure 370: Save Image As dialog

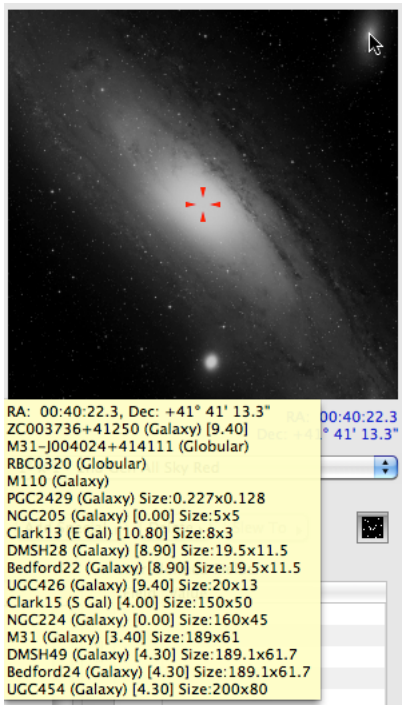


Figure 371: After Find Catalogue Objects

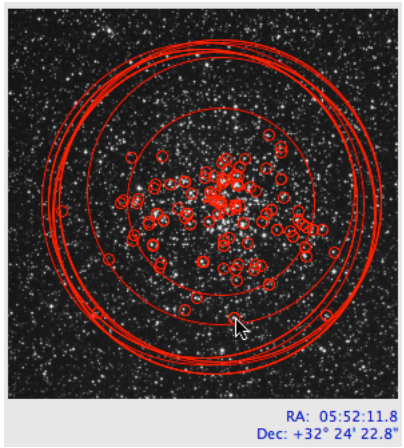


Figure 372: Find and Mark Catalogue Objects

17.3 Field of View chart

It is possible to include images in the field of view chart. Any images that overlap the current field of view will be displayed (by default).

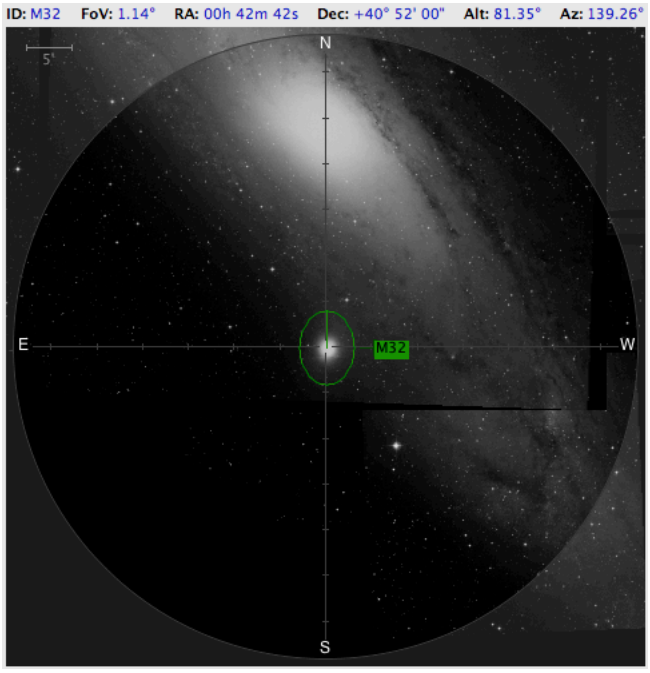


Figure 373: Images displayed in the field of view chart

This feature is enabled by using the ***Display > Images*** option in the Display Options panel.

17.4 Images window

To display images of an object in a separate window, select the object in the object list and choose ***Image > Display Images...***, or right-click and choose ***Display Images***.

The images are displayed in a panel with controls on the right. You can hide the controls by clicking the ***Hide Controls*** button (which changes to ***Show Controls***).

The controls in the ***Images*** tab allow you to select the image being displayed (if the object has more than one image associated with it). There's also a popup menu that contains a list of objects (**Other IDs**) in the current plan document that also have associated images. Choosing from this list allows you to display images from other objects.

The ***FoV Overlay*** tab will overlay the image with one or more circular field of view reticles, centred on the image. These can be of fixed size, or computed from the telescope/eyepiece/imager/optical aid resources selected (see Figure 375).

The ***Fit to Window*** checkbox, when checked, will resize the image to fit into the given space. Otherwise, the image is displayed at full resolution, and scroll bars provided where necessary so that you can navigate around the image.

The ***Custom Reticles*** tab does the same thing with any custom reticles you might have defined.

The ***Angle*** slider allows you to rotate (non-circular) reticles on the image in order to frame the image, where necessary.

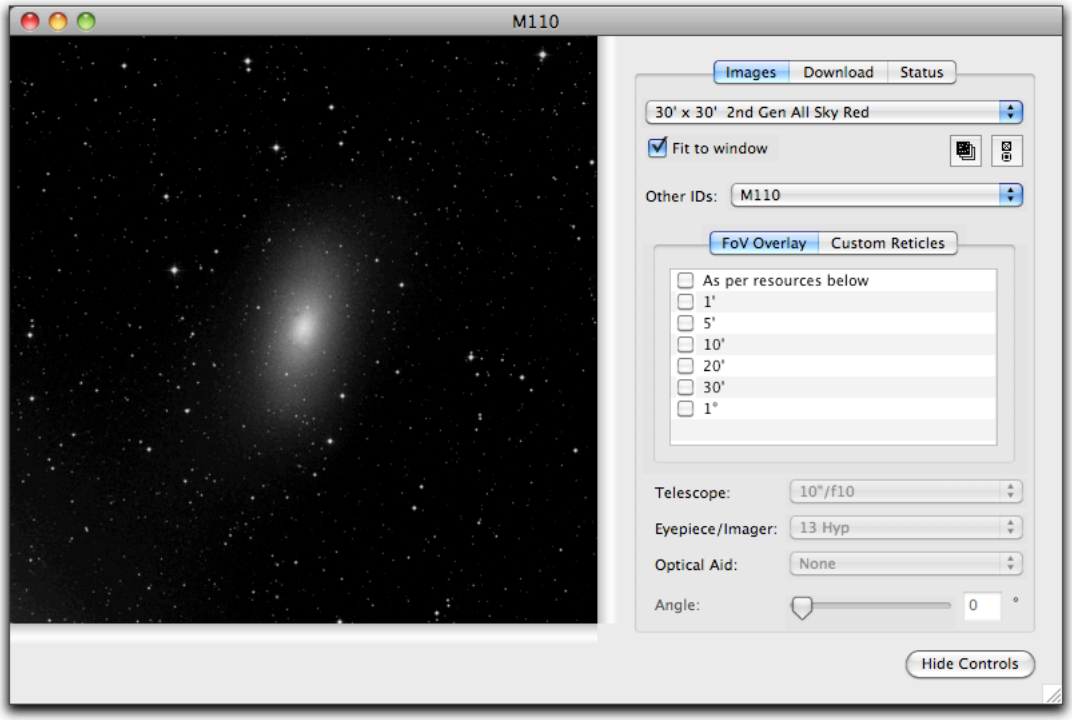


Figure 374: Image display window

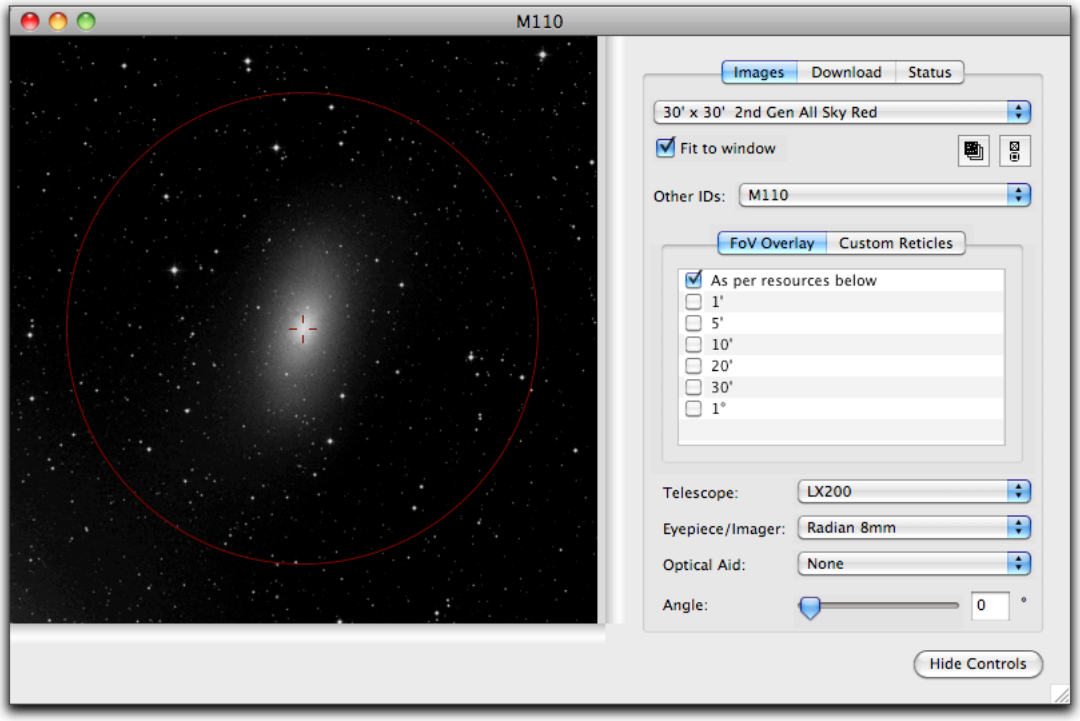


Figure 375: Field of view overlay

Right-clicking an image offers a number of options:

Delete Image. Deletes the currently-displayed image from the image database (and displays another image associated with the current object if possible).

Enhance Image Contrast. Enhances the current image's contrast. This will only work if the contrast has not yet been enhanced for the current image.

Centre FoV/Imager/Reticle here.

Centre the FoV overlay or custom reticle overlays at the point where the cursor was when you right-clicked. Useful for experimenting with imager framing, etc.

Save Image as.... Save the currently-displayed image to an external file in a common format (e.g. JPEG, PNG, etc.)

Invert image colours. This setting toggles on and off. When on, the image colours will be inverted. In particular, if the image is white on black (the default) then the image will be displayed as black on white. Note that this does not affect the image in the database.

Flip to match FoV. This setting toggles on and off. When on, the image will be inverted horizontally and/or vertically to match the settings for the plan document's field of view chart. Note that this does not affect the image in the database.

Rotate to match FoV. This setting toggles on and off. When on, the image will be rotated to match the orientation of the plan document's field of view chart. Note that this does not affect the image in the database.

Centre FoV chart at these coordinates. Centre the plan document's field of view chart at the point where the cursor was when you right-clicked.

Create new object at these coordinates. Create a new object in the plan document, with RA/Dec co-ordinates at the point where the cursor was when you right-clicked.

Mark object centre. This setting toggles on and off. When on, small red cross-hairs will mark the centre of the underlying object in the image. This might not be at the centre of the image itself.

Find Catalogue Objects. Searches your collection of catalogues and finds any objects the exist within the bounds of the displayed image. Once this has completed, you can move the cursor around inside the image and any known objects will be displayed in a help tag.

Find and Mark Catalogue Objects. Same as for ***Find Catalogue Objects***, but the objects are also marked with a red circle on the image.

Mark Catalogue Objects. If ***Find Catalogue Objects*** was previously used, the objects are marked with a red circle on the image.

Show Catalogue Entry. If the cursor is over a known object, a hierarchical list of catalogue entries is shown. Selecting one of them will open the relevant catalogue and display the object entry.

17.5 Image Manager

The image manager is a feature that allows you to examine the contents of your image database in a structured fashion. Access to the manager window is via the ***Image > Image Manager...*** menu command, and is also available via right-clicking any image being displayed from the database and choosing the ***Image Manager...*** entry.

The Image Manager window consists of a hierarchical list of images (in various subcategories) on the left side, and an image display area on the right side where any images you select are displayed.

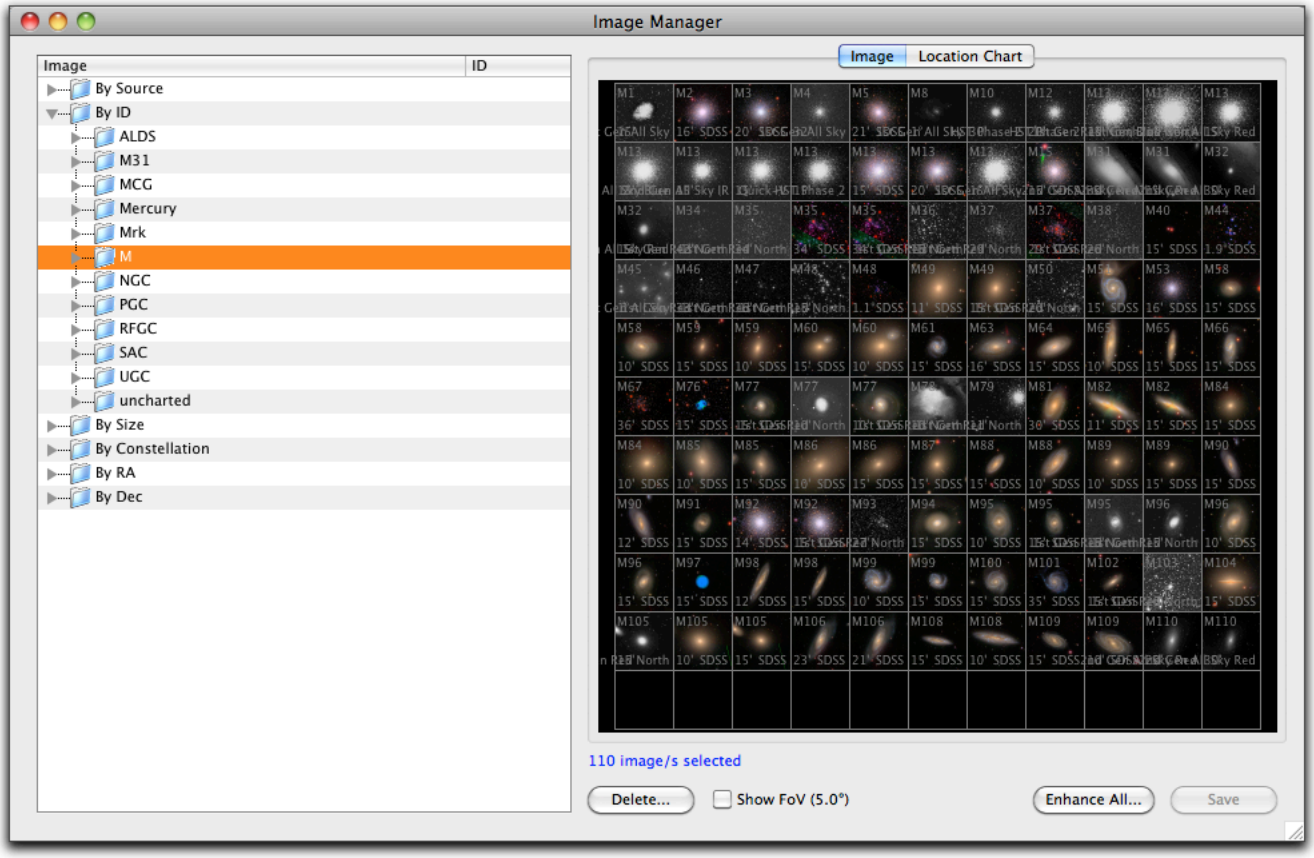


Figure 376: Image Manager window

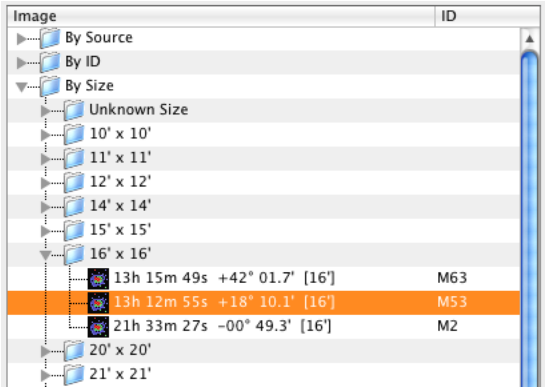


Figure 377: Hierarchical image list

The image list splits the database images into various categories:

- By **Source**. The source data set from where the image was downloaded (e.g. SDSS).
- By **ID**. The ID of the image object, where applicable (e.g. all Messier object images would be in the "M" category).
- By **Size**. Each different image size has a category (e.g. 15' X 15').
- By **Constellation**. Images are sorted into categories by constellation (e.g. Cepheus).
- By **RA**. Images are sorted into category by right ascension hour (i.e. 00h, 01h, ... ,23h).

- By **Dec**. Images are sorted into category by declination in 10° steps (i.e. -90° to -80°, ... , +80° to +90°).

Selecting a single image displays that image on the right side of the window. Selecting more than one image tiles the images. You can also select a category (a node in the hierarchy with a folder icon) and all images within that category will be displayed (with an upper limit of 120 images).

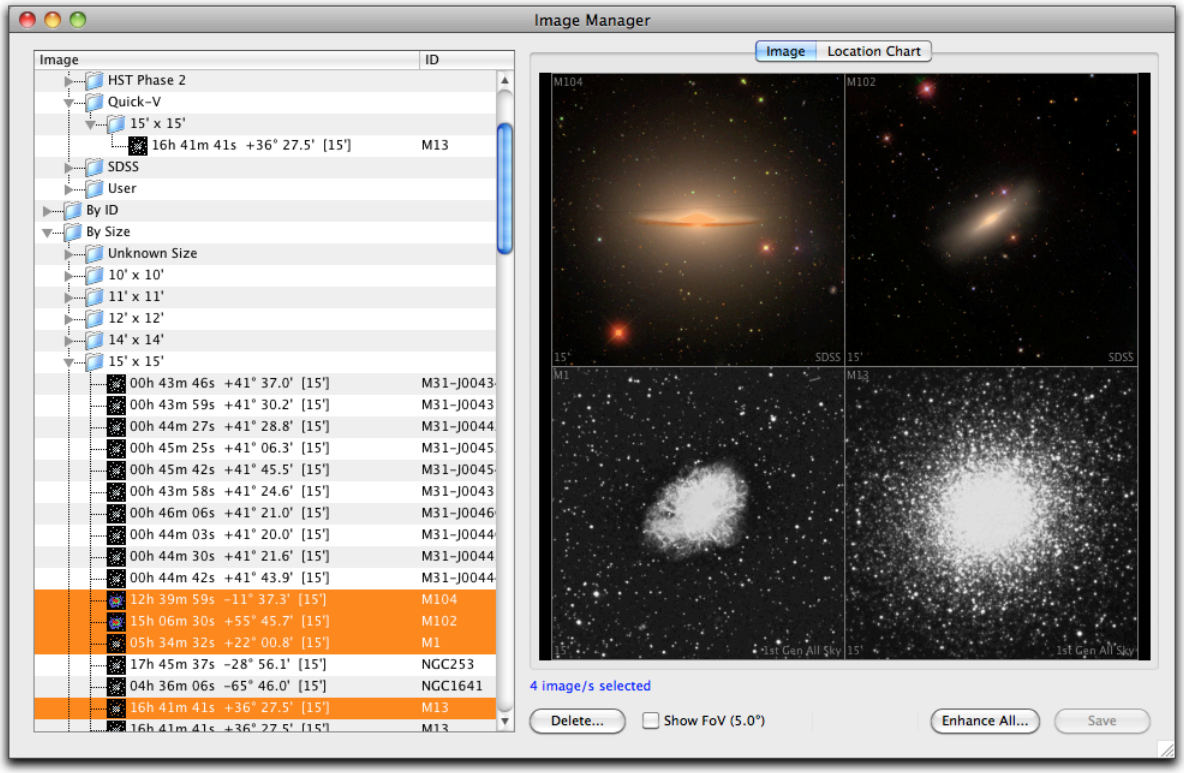


Figure 378: Image display

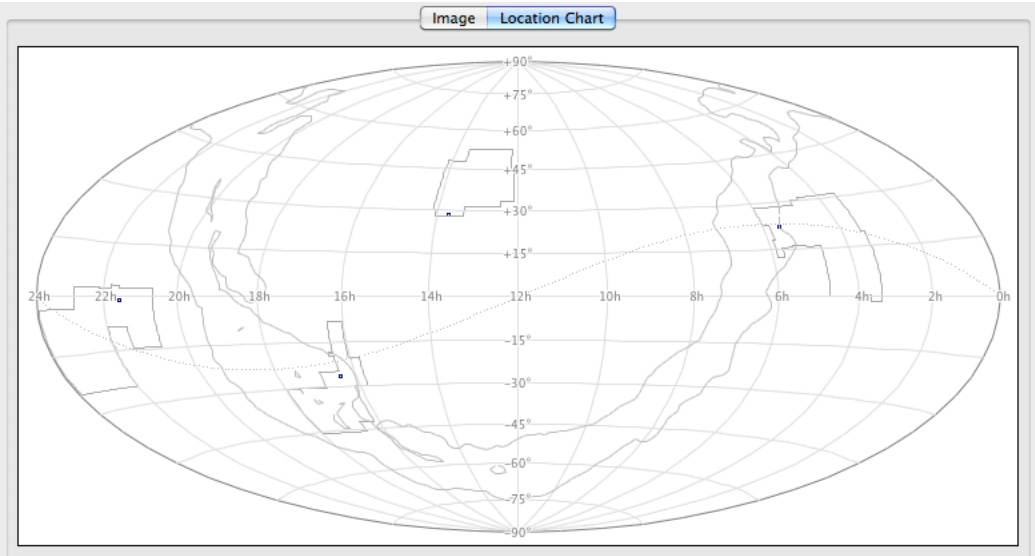


Figure 379: Location chart

When one or more images are selected you can also use the Location Chart tab to show an all-sky chart with the position of the selected images shown. Double-clicking an image on the chart will select that image and display it.

The ***Delete...*** button can be used to delete any selected images from the database.

The ***Enhance/Enhance All*** button can be used to "enhance" the image (improve its contrast), and the ***Save*** button will make those enhancements permanent if desired.

The **Show FoV** checkbox, if checked, will superimpose a circle the size of the field of view chart in the topmost plan window.

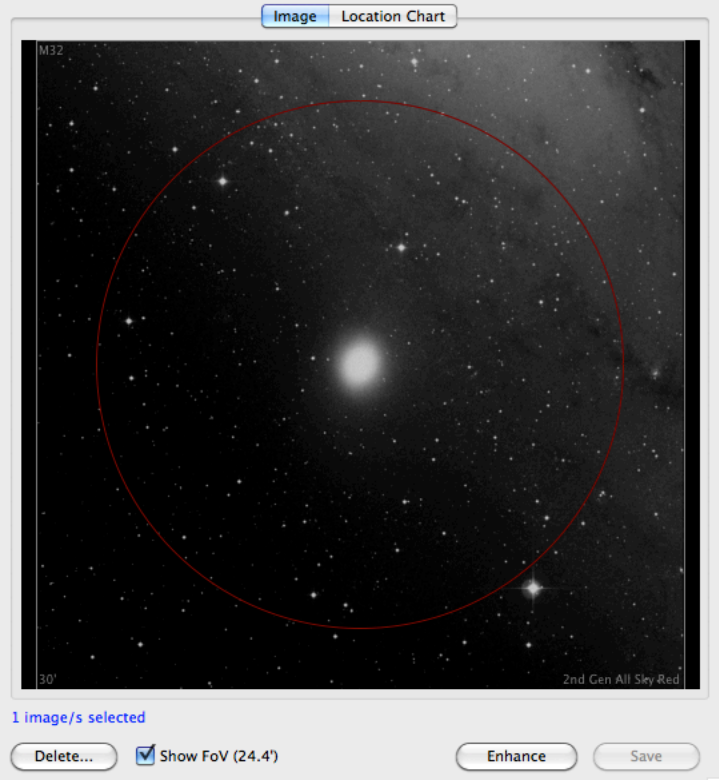


Figure 380: FoV on image

If the selected image is a User Image (one added via the **Image > Add User Image...** feature, see Section 11.6.22 on page 176), the an Edit... button appears under the image and the parameters of that user image can be changed.

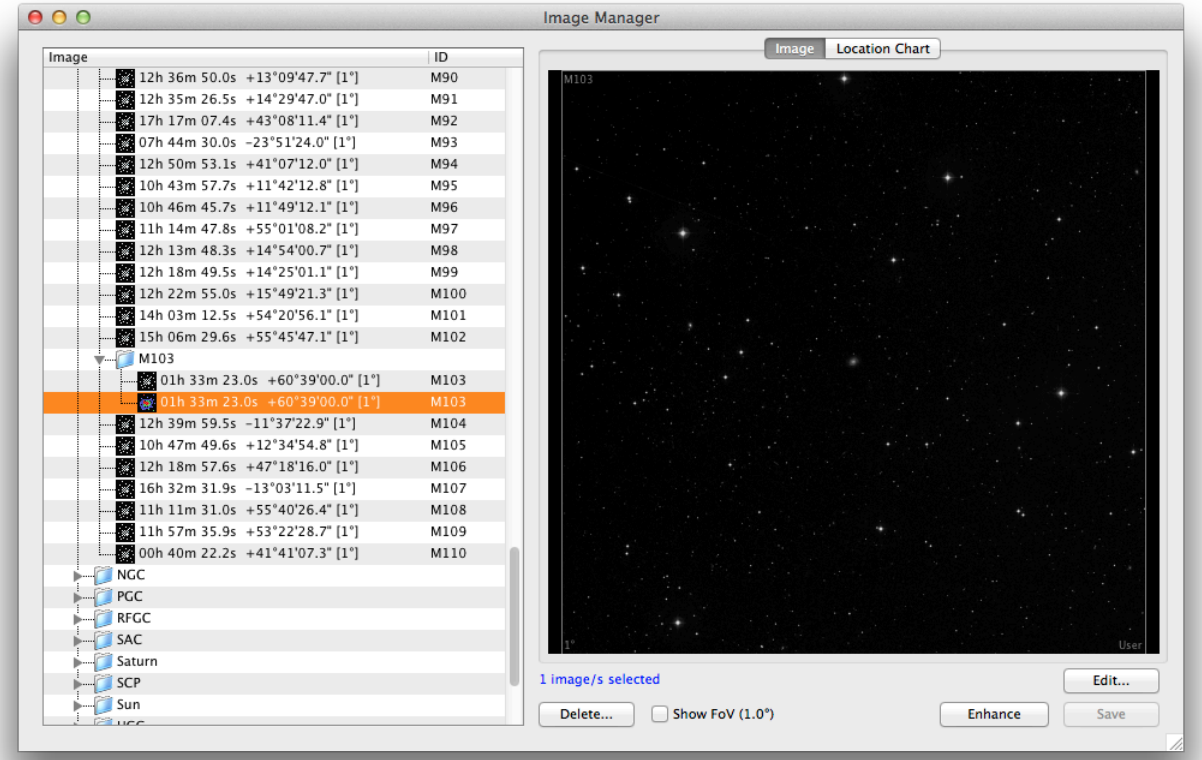


Figure 381: Editing a User Image (Edit... button)

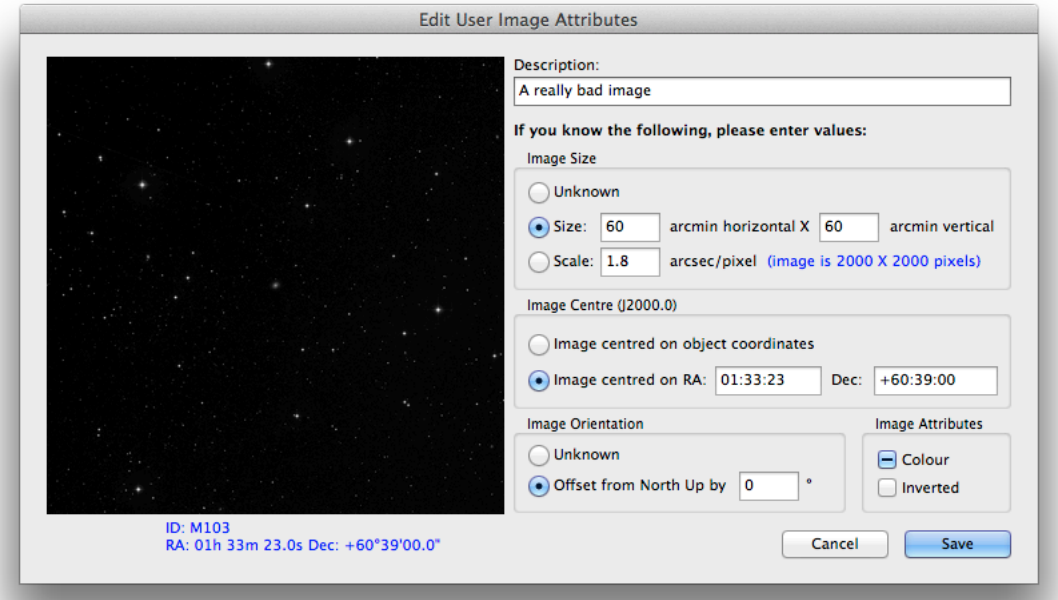


Figure 382: Editing a User Image

18 Highlighting & associating list objects

18.1 Highlighting objects

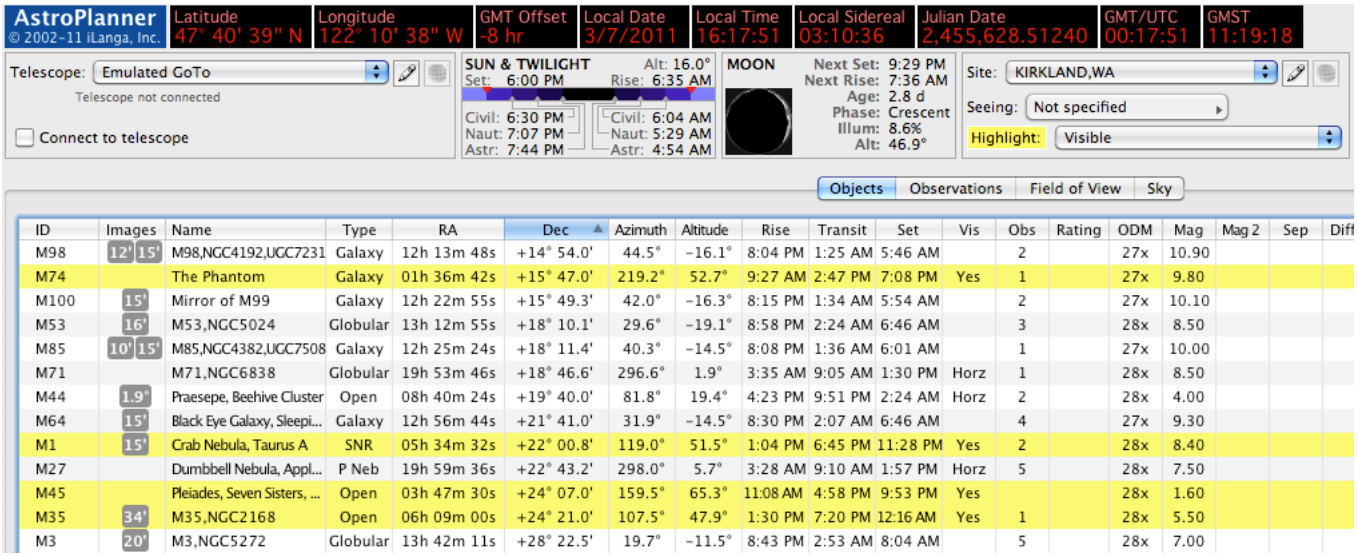
Highlighting is the act of changing the background colour of objects in the object list based on some rules. Note that this is different from the act of *selecting* one or more objects in the list using the mouse.

Many actions and scripts can operate on highlighted objects only. so this can be useful to narrow down objects to process.

Highlighting can change over time. For example, if the highlighting rule is true if the object is Visible, then the highlighting status will change if the object drops below or rises above the horizon.

18.1.1 Simple highlighting

There are some simple highlighting *scenarios* that cover most users' needs. You select the highlighting scenario via the **Highlight** popup just above the tabs on the plan document window. In Figure 383 the scenario is "Visible". This will highlight any object that is currently visible (i.e. the Vis column is "Yes").



ID	Images	Name	Type	RA	Dec	Azimuth	Altitude	Rise	Transit	Set	Vis	Obs	Rating	ODM	Mag	Mag 2	Sep	Diff
M98	12' 15'	M98,NGC4192,UGC7231	Galaxy	12h 13m 48s	+14° 54.0'	44.5°	-16.1°	8:04 PM	1:25 AM	5:46 AM		2		27x	10.90			
M74		The Phantom	Galaxy	01h 36m 42s	+15° 47.0'	219.2°	52.7°	9:27 AM	2:47 PM	7:08 PM	Yes	1		27x	9.80			
M100	15'	Mirror of M99	Galaxy	12h 22m 55s	+15° 49.3'	42.0°	-16.3°	8:15 PM	1:34 AM	5:54 AM		2		27x	10.10			
M53	16'	M53,NGC5024	Globular	13h 12m 55s	+18° 10.1'	29.6°	-19.1°	8:58 PM	2:24 AM	6:46 AM		3		28x	8.50			
M85	10' 15'	M85,NGC4382,UGC7508	Galaxy	12h 25m 24s	+18° 11.4'	40.3°	-14.5°	8:08 PM	1:36 AM	6:01 AM		1		27x	10.00			
M71		M71,NGC6838	Globular	19h 53m 46s	+18° 46.6'	296.6°	1.9°	3:35 AM	9:05 AM	1:30 PM	Horz	1		28x	8.50			
M44	1.9°	Praesepe, Beehive Cluster	Open	08h 40m 24s	+19° 40.0'	81.8°	19.4°	4:23 PM	9:51 PM	2:24 AM	Horz	2		28x	4.00			
M64	15'	Black Eye Galaxy, Sleepi...	Galaxy	12h 56m 44s	+21° 41.0'	31.9°	-14.5°	8:30 PM	2:07 AM	6:46 AM		4		27x	9.30			
M1	15'	Crab Nebula, Taurus A	SNR	05h 34m 32s	+22° 00.8'	119.0°	51.5°	1:04 PM	6:45 PM	11:28 PM	Yes	2		28x	8.40			
M27		Dumbbell Nebula, Appl...	P Neb	19h 59m 36s	+22° 43.2'	298.0°	5.7°	3:28 AM	9:10 AM	1:57 PM	Horz	5		28x	7.50			
M45		Pleiades, Seven Sisters, ...	Open	03h 47m 30s	+24° 07.0'	159.5°	65.3°	11:08 AM	4:58 PM	9:53 PM	Yes			28x	1.60			
M35	34'	M35,NGC2168	Open	06h 09m 00s	+24° 21.0'	107.5°	47.9°	1:30 PM	7:20 PM	12:16 AM	Yes	1		28x	5.50			
M3	20'	M3,NGC5272	Globular	13h 42m 11s	+28° 22.5'	19.7°	-11.5°	8:43 PM	2:53 AM	8:04 AM		5		28x	7.00			

Figure 383: Simple highlighting

The available simple highlighting scenarios are:

- **Observed**. Highlighted if at least one observation of the object has been made previously (i.e. the Obs column value is greater than zero).
- **Not Observed**. Highlighted if no observations of the object have been made previously (i.e. the Obs column value is blank/zero).
- **Visible**. Highlighted if the object is currently visible (i.e. the Vis column is "Yes").
- **Not Visible**. Highlighted if the object is not currently visible (i.e. the Vis column is not "Yes").

- **Visible and not Observed**. Highlighted if the object is currently visible (i.e. the Vis column is "Yes") *and* no observations of the object have been made previously (i.e. the Obs column value is blank/zero).
- **Visible in Current Telescope**. Highlighted if a telescope is selected and if the object's magnitude is brighter than the limiting magnitude for that telescope (i.e. it is theoretically visible).
- **Not Visible in Current Telescope**. Highlighted if a telescope is selected and if the object's magnitude is dimmer than the limiting magnitude for that telescope (i.e. it is not theoretically visible).

You can change the default highlight background colour via the Object List preferences. See Section 20.5.8 on page 296.

18.1.2 Forced highlighting & unhighlighting

You can "force" an object to be highlighted if it is currently not highlighted. Similarly, you can "force" an object which is currently highlighted to be unhighlighted.

Use ***Object > Highlight > Toggle Forced Highlighting/Unhighlighting*** to change the status of selected object/s (or right-click and use ***Toggle Forced Highlighting/Unhighlighting***).

You can also remove this "forced" status from selected objects. Use ***Object > Highlight > Remove Any Forced Highlighting/Unhighlighting*** (or right-click and use ***Remove Any Forced Highlighting/Unhighlighting***).

The Forced status is represented by special colours. You can change those default background colours via the Object List preferences. See Section 20.5.8 on page 296.

18.1.3 Custom highlighting

For more complex highlighting situations, you can create your own custom highlighting scenarios.

A custom *scenario* consists of between one and four *rule sets*. Each rule set consists of a number of *rules*. For an object to be highlighted, at least one (or perhaps all) of the rule sets must be triggered. For a rule set to be triggered, the object must satisfy at least one (or perhaps all) of the rules in the rule set.

The various rules that are triggered are summarised underneath the object list in the Objects tab of the plan document window. If more than one rule set is triggered for an object, the object entry is striped with the relevant colours. For example, in Figure 384 two rule sets are active. The first, in blue, is triggered if the object's altitude is greater than 30°. The second, in pink, is triggered if the ID starts with "M". M97 and M108 trigger both rule sets. M102 triggers only the second rule set.

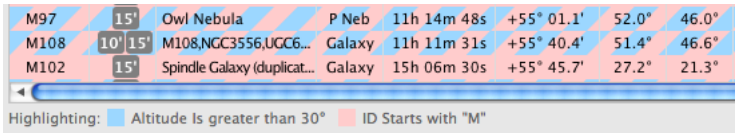


Figure 384: Custom highlighting with multiple rule sets

To create or edit custom highlighting scenarios, choose ***Edit Custom Highlighting...*** from the Highlighting popup, or use ***Object > Highlight > Edit Custom Highlighting...***

The editing dialog (Figure 385) edits various predefined scenarios you have created (in the list at the lower right of the dialog window). The Custom Default is always present and cannot be renamed. To create a new scenario, click the ***+*** button. To delete an existing scenario (apart from the

Custom Default), use the **-** button. The scenario selected in the list is the one being edited. If you use the **+** button to create a new scenario, it will duplicate the settings of the currently selected scenario.

A scenario consists of one to four rule sets, listed along the top of the window. Use the radio button next to each rule set to choose that set for editing. The colour used for highlighting a particular rule set is shown and can be changed by clicking. A rule set is active only if it has one or more rules selected. In the example in Figure 385 only Rule Set #1 would be active.

For each rule set you specify which (selected) rules are used to determine whether the rule set is triggered. The popup for this function can be:

- **All rules true**. Effectively a logical AND of all the selected rules.
- **Any rule true**. Effectively a logical OR of all the selected rules.
- **All rules false**. Effectively a logical NOR of all the selected rules.
- **Any rule false**. Effectively a logical NAND of all the selected rules.
- **Ignore all rules**. Effectively disables this rule set. Useful for temporarily disabling the rule set.

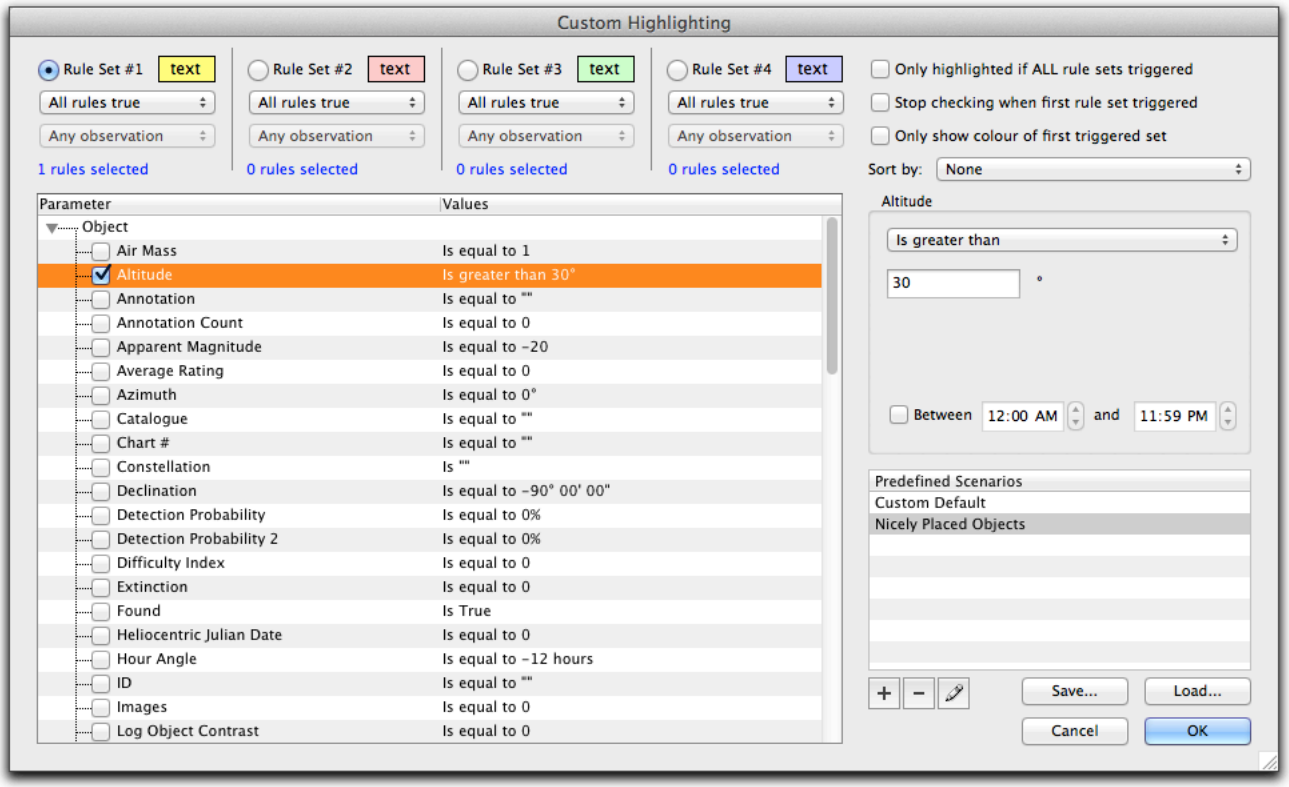


Figure 385: Custom highlighting editor dialog

If you specify a rule on an Observation, then for any object, each associated observation is considered. The popup at the top then specifies which observations the rule is applicable to:

- **Any observation**. The rule is true if any associated observation matches the rule condition.
- **All observations**. The rule is true if all associated observations match the rule condition.
- **Oldest observation**. The rule is true if the oldest associated observation matches the rule condition.

- **Latest observation**. The rule is true if the latest associated observation matches the rule condition.

For example, in Figure 386 highlighting of an object will occur only if (a) the object type is a Galaxy, and (b) at least one observation of that object was made using a Plössl eyepiece.

Editing of rules is done by selecting the rule in the hierarchical list at the lower left of the window. An editing pane for that rule appears on the right and allows editing of the conditional part of the rule.

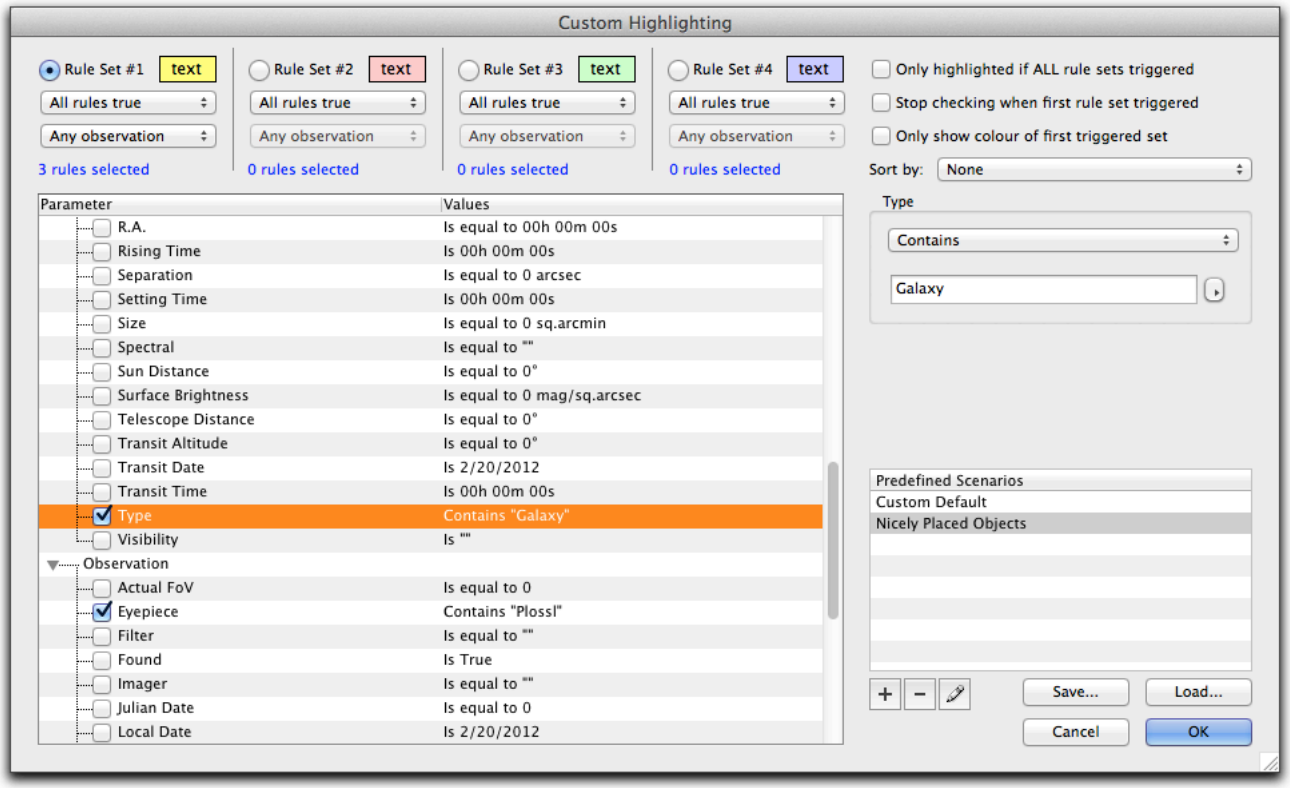


Figure 386: Custom highlighting with observation rule

Options at the top right are:

Only highlighted if ALL rule sets triggered. If this is unchecked (default), the highlighting will occur if *any* rule set is triggered. If it is checked then *all* (active) rule sets must be triggered for highlighting to occur.

Stop checking when first rule set triggered. Stop the rule-testing as soon as the first rule set is triggered, and colour the object entry appropriately with a single colour.

Only show colour of first triggered set. If multiple rule sets were triggered, only show the colour for the first one triggered.

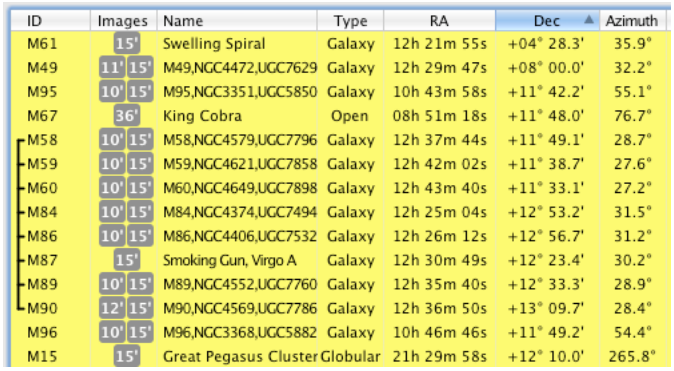
Sort by. Also sort the object list by the selected sort order when this scenario is selected for use. Sort orders are created using the **Sort List** popup under the object list (see Section 11.2.13 on page 110).

Saving and loading the contents of the custom rule sets can be done using the ***Save...*** and ***Load...*** buttons. This is convenient for transferring custom scenarios between plan documents.

18.2 Associating objects

Sometimes it is convenient to associate two or more objects as being, say, part of a larger entity or *association*. For example, you might want to associate a number of galaxy objects as being part of a cluster (e.g. Virgo cluster). When these objects are associated they should always remain together in the object list, in the same original order, regardless of the sort ordering of the rest of the object list. If a sort order is chosen for the list, then the objects will be not be sorted within the association, but will be ordered within the whole object list by the first object in the association.

For example, Figure 387 shows a number of associated galaxies (M58, 59, 60, 84, 86, 87, 89, and 90) that have been associated. The list has been sorted by Declination, but the associated galaxies stay in ID order within the association.



ID	Images	Name	Type	RA	Dec	Azimuth
M61	15'	Swelling Spiral	Galaxy	12h 21m 55s	+04° 28.3'	35.9°
M49	11' 15'	M49,NGC4472,UGC7629	Galaxy	12h 29m 47s	+08° 00.0'	32.2°
M95	10' 15'	M95,NGC3351,UGC5850	Galaxy	10h 43m 58s	+11° 42.2'	55.1°
M67	36'	King Cobra	Open	08h 51m 18s	+11° 48.0'	76.7°
M58	10' 15'	M58,NGC4579,UGC7796	Galaxy	12h 37m 44s	+11° 49.1'	28.7°
M59	10' 15'	M59,NGC4621,UGC7858	Galaxy	12h 42m 02s	+11° 38.7'	27.6°
M60	10' 15'	M60,NGC4649,UGC7898	Galaxy	12h 43m 40s	+11° 33.1'	27.2°
M84	10' 15'	M84,NGC4374,UGC7494	Galaxy	12h 25m 04s	+12° 53.2'	31.5°
M86	10' 15'	M86,NGC4406,UGC7532	Galaxy	12h 26m 12s	+12° 56.7'	31.2°
M87	15'	Smoking Gun, Virgo A	Galaxy	12h 30m 49s	+12° 23.4'	30.2°
M89	10' 15'	M89,NGC4552,UGC7760	Galaxy	12h 35m 40s	+12° 33.3'	28.9°
M90	12' 15'	M90,NGC4569,UGC7786	Galaxy	12h 36m 50s	+13° 09.7'	28.4°
M96	10' 15'	M96,NGC3368,UGC5882	Galaxy	10h 46m 46s	+11° 49.2'	54.4°
M15	15'	Great Pegasus Cluster	Globular	21h 29m 58s	+12° 10.0'	265.8°

Figure 387: Associated objects

Associated objects are displayed with connecting lines on the left side of the ID column.

You initially **create** an association by selecting two or more objects in the object list. Then associate them by choosing ***Object > Associate > Associate Selected Objects*** (or right-clicking and choosing ***Associate selected objects***).

You can **add** additional objects to the association by dragging the entry in the object list onto the objects currently associated.

You can **reorder** the objects within the association by dragging the member objects up or down with the mouse.

To **remove** one or more objects from an association, use one of these methods:

- Drag the object/s to a point outside of the association.
- Select the object/s and use ***Object > Associate > Disassociate Selected Object/s***.
- Select the object/s, right-click and use ***Disassociate selected object/s***.

Object associations are stored with the object data in the plan document.

19 User-defined fields

For many items that are handled by the application, you can add your own user-defined fields. In particular, you can define user-defined fields for:

- Objects
- Observations
- Observation sessions
- Observation attachments
- Resources
- Plan documents

All of these user-defined fields are globally applicable to the items for which they are defined, apart from the Object user-defined fields, which are local to the plan document in which they are defined.

There is no limit to the number of user-defined fields you can define (within reason).

Some examples: you might want to add a Weight field to Telescope resources, a Quantum Efficiency field to Imager resources, a Weather or Temperature field to observation sessions, etc.

The fields are typically displayed in a two-column list (Figure 388). You can edit the values by clicking on the entry in the right-hand column.

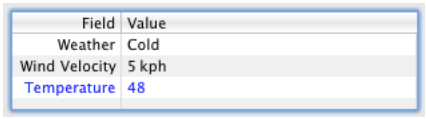


Figure 388: User-defined field list

19.1 Field values vs. field definitions

Each user-defined field entry or *value* attached to an item has two parts: a field name and a corresponding value (e.g. "Temperature" and "48"). Both are stored as strings.

Additionally, there should also be a user-defined field *definition* corresponding to the field name. This definition contains information pertaining to then type of the field (number, string, etc.), how the field value should be displayed, units, range of valid values, etc.

You can delete a field definition without deleting the underlying values. In this case, the entries will be displayed in a blue colour (e.g. Temperature in Figure 388) and will be treated as simple character strings (i.e. no range checking, etc. will be done if the value is edited).

19.2 Field types

Each user-defined field is defined to be one of several possible types.

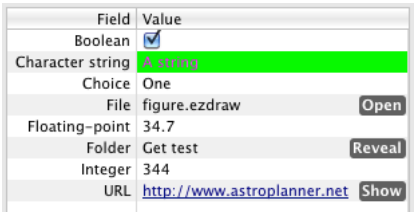


Figure 389: User-defined field types

19.2.1 Boolean value

This is a field that can only have two states: on/off, yes/no, true/false, etc. A checkbox is displayed in the value column.

19.2.2 Character string

This is the default. Any string of characters is valid.

19.2.3 Choice

Choose one of several fixed values. e.g. an "OTA" field for telescope resources might have the choices: "Metal tube", "Truss", "Carbon fibre tube", "Cardboard tube". The values are selected by a popup menu containing the choices.

19.2.4 File reference

A reference to a file on your hard disk. Clicking the value field allows you to select a file. The file name is displayed, and an Open button shown. Clicking that button will open the file with an appropriate application.

19.2.5 Floating-point number

A floating-point number. You can specify range of valid values, decimal places to display, etc.

19.2.6 Folder reference

A reference to a folder on your hard disk. Clicking the value field allows you to select a folder. The folder name is displayed, and an Reveal button shown. Clicking that button will reveal the folder in the Finder (Mac) or Windows Explorer (Windows).

19.2.7 Integer number

An integer number. You can specify range of valid values, etc.

19.2.8 Internet URL

A valid URL can be put in this field. A Show button is displayed. Clicking Show will load the page into your browser.

19.2.9 Script

The value is computed by means of a script. See Section 27.10 on page 377 for more information.

19.3 Creating and editing a user-defined field

Right-click the user-defined field list and choose ***Edit User-defined Fields...***. The user-defined field editor (See Figure 391 for example) has a list of fields on the left. Click the **+** button to create a new user-field definition. Give the field a *title* (this appears on the left side of the user-defined field list), and choose a field *type*. Different types might have additional fields.

You can select a non-standard text colour and background colour, by using the colour checkboxes and clicking the colour swatches to choose an appropriate colour. You can also specify the style of the displayed text (**bold**, *italic* and/or underline).

If you want a tooltip to appear when you hover the mouse cursor over the field, you can enter it here. This might be useful as a memory device if the field can contain certain values.

The ***Load...*** and ***Save...*** buttons allow you transfer the set of definitions between computers, or between plan documents (plan documents each define their own set of user-defined fields).

19.3.1 Boolean value

In addition to the common fields, you need to specify the following:

- **Text**. This is the text that appears in, for example, the object list to show the value of the field. e.g. Yes/No, True/False, On/Off, etc. Note that if the value has not yet been selected (see below), the displayed text will be blank.
- **First click**. If the value of a boolean user-defined field field has not yet been set, the checkbox is shown in an "indeterminate" state. To enter a value, you click the checkbox. The first time you do that, this setting determines which state the checkbox takes on.

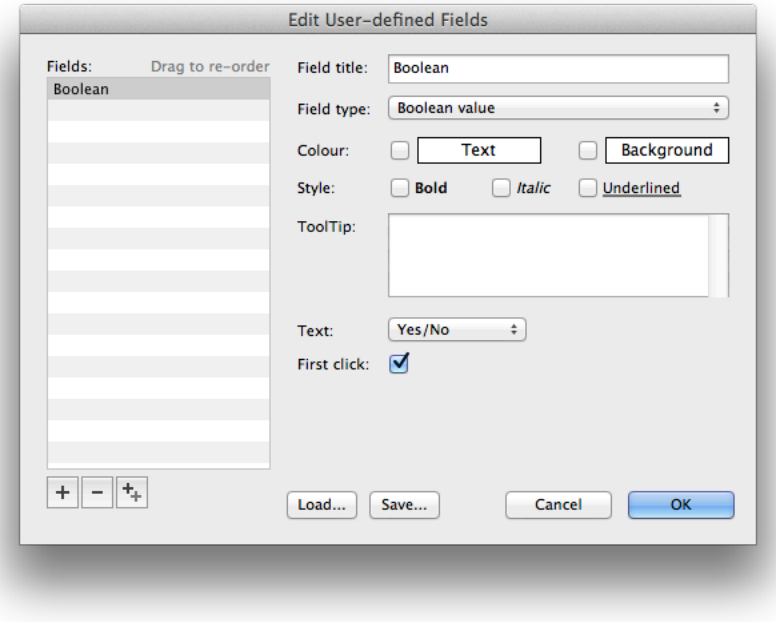


Figure 390: Edit boolean user-defined field

19.3.2 Character string

There are no additional values to enter here.

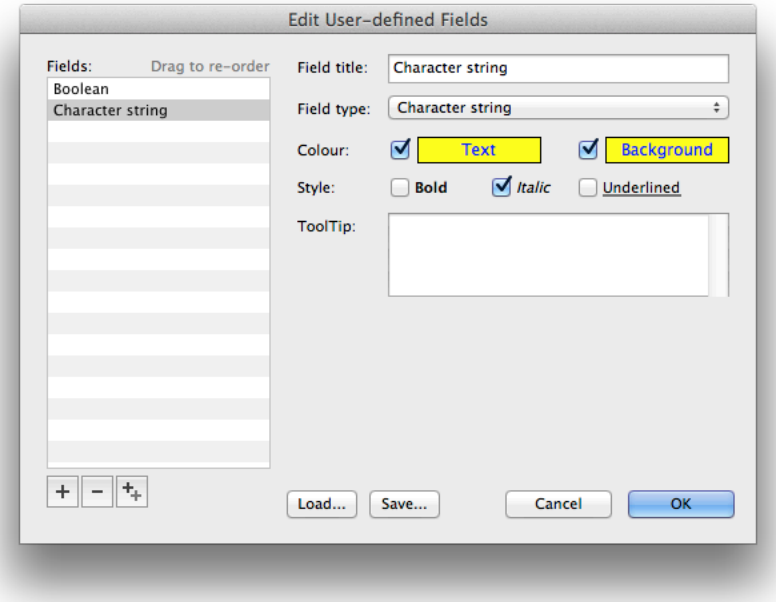


Figure 391: Edit character string user-defined field

19.3.3 Choice

In addition to the common fields, you need to specify the following:

- **Choices**. These are the values that will appear in the popup menu, one choice per line.

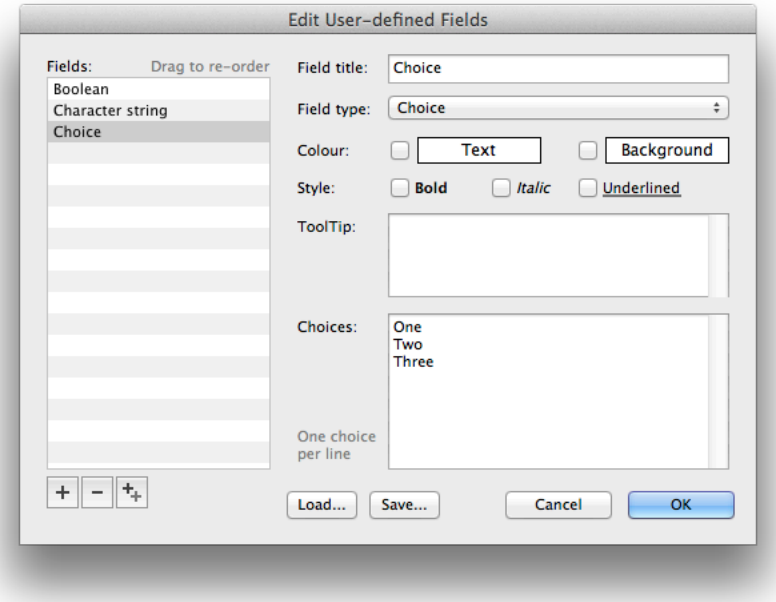


Figure 392: Edit choice user-defined field

19.3.4 File reference

There are no additional values to enter here.

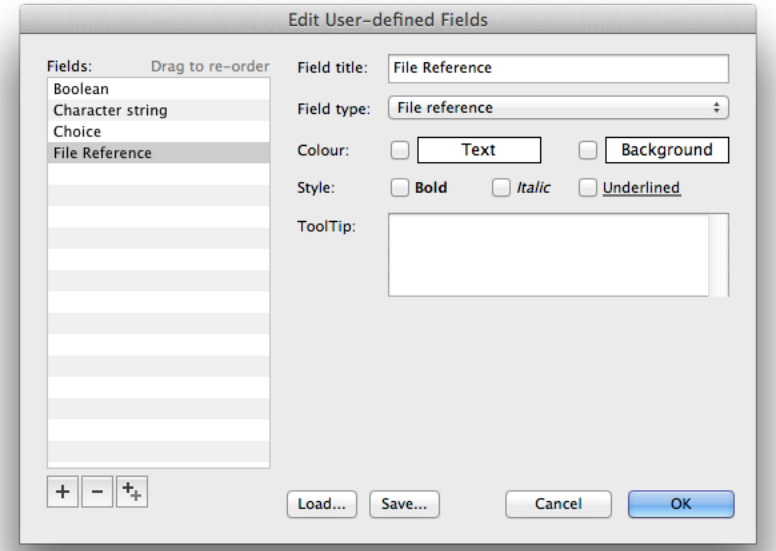


Figure 393: Edit file reference user-defined field

19.3.5 Floating-point number

In addition to the common fields, you need to specify the following:

- **Units**. If your numbers have units (e.g. °F, kph, arcsec, etc.) then this string will be displayed after the number in the list. It will not appear when you edit the number value however.
- **Decimals**. The number of decimal places to display after the decimal point. A negative number specifies the *maximum* number of decimal places. e.g. if Decimals = 3 and the value is 123.4, then 123.400 will be displayed. If Decimals = -3 and the value is 123.4, then 123.4 will be displayed.
- **Range**. You can specify lower and/or upper bounds for the numbers you enter. If the numbers are outside these bounds, they will be displayed in red.

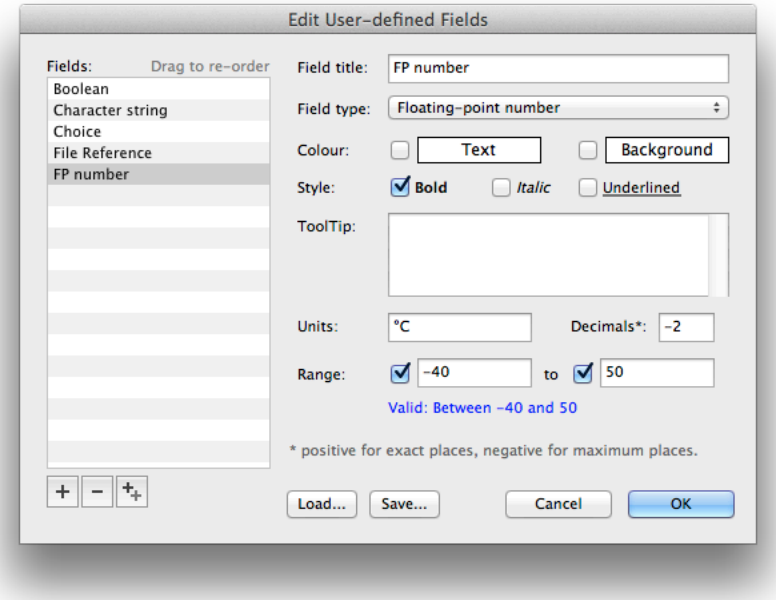


Figure 394: Edit floating-point number user-defined field

19.3.6 Folder reference

There are no additional values to enter here.

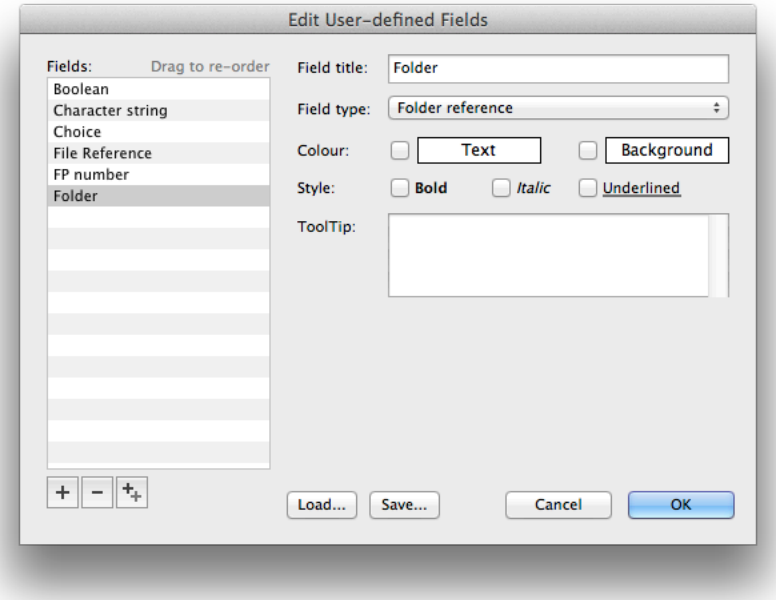


Figure 395: Edit folder reference user-defined field

19.3.7 Integer number

In addition to the common fields, you need to specify the following:

- **Units**. If your numbers have units (e.g. °F, kph, days, etc.) then this string will be displayed after the number in the list. It will not appear when you edit the number value however.
- **Range**. You can specify lower and/or upper bounds for the numbers you enter. If the numbers are outside these bounds, they will be displayed in red.

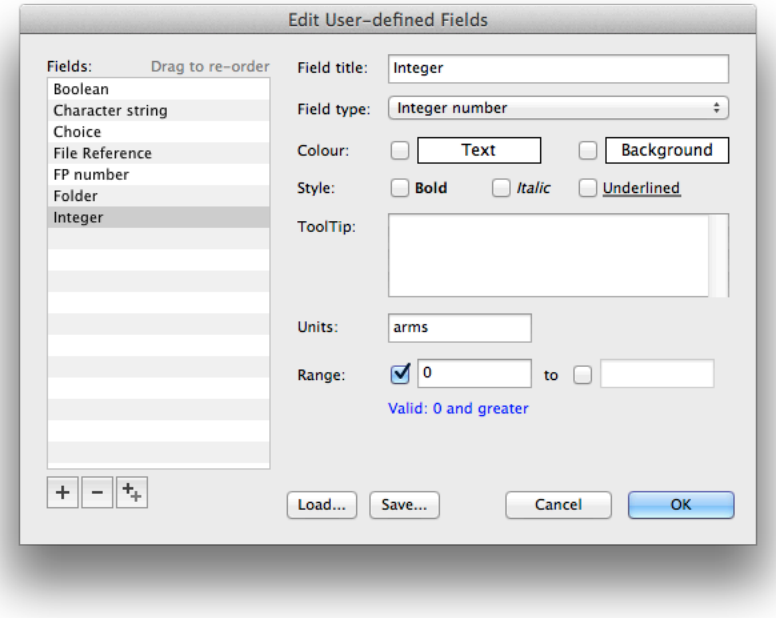


Figure 396: Edit integer number user-defined field

19.3.8 Internet URL

There are no additional values to enter here.

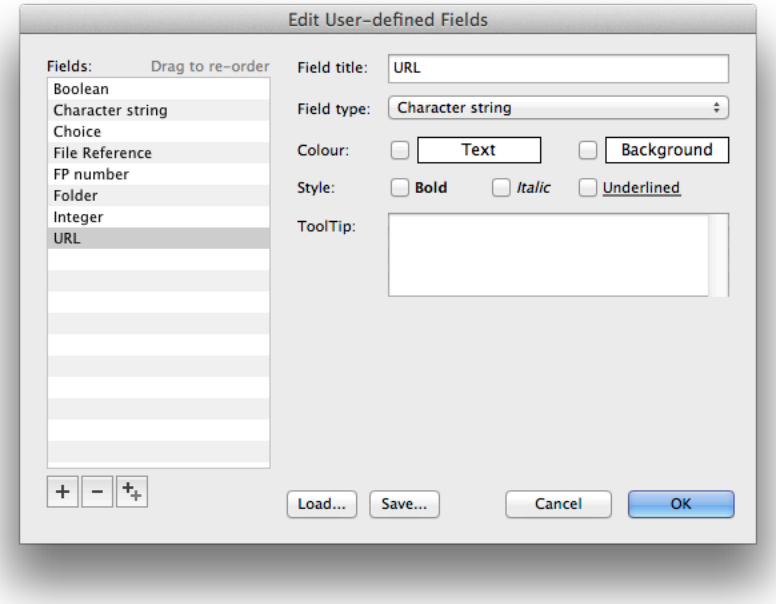


Figure 397: Edit Internet URL user-defined field

19.3.9 Script

In addition to the common fields, you need to specify the following:

- **Script**. The script that is to be run to compute the value of the user-defined field. Only special *User Field* scripts are listed. See Section 27.10 on page 377 for more details.
- **Parameter**. User Field scripts accept an optional parameter that can be used to determine what information they should compute or return. If required enter the parameter value here. e.g. A script might compute the position of an object. By setting the parameter to "RA" it will return the R.A. value, and "Dec" would return the Declination.
- **Returns numeric result**. Set this if the script returns a numeric result.

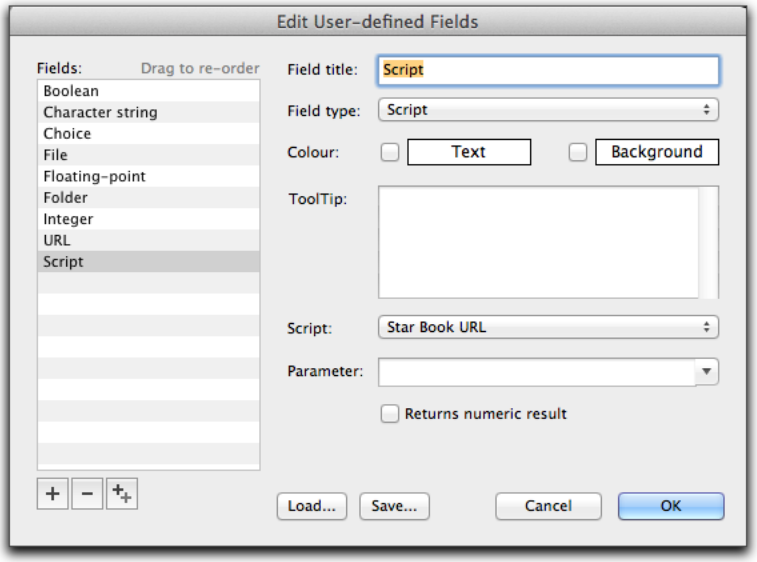


Figure 398: Edit script user-defined field

19.4 Deleting a user-defined field & values

A user-defined field definition can be deleted from the editor dialog as shown above. Although the definition is then deleted, the underlying values are not automatically deleted. If such values exist, they will be displayed in a blue colour after any fields with corresponding definitions. You can delete the values by right-clicking and using ***Delete xxx value*** or ***Delete all xxx values***, where xxx is the user-defined field name.

19.5 Object list user-defined fields

Right-clicking the object list user-defined fields listbox shows "**Show Column: xxxx**" or "**Hide Column: xxxx**" (for defined fields xxxx). Selecting one of these toggles the column's visibility in the object list. Note that it doesn't change the position of the column - to do that you'll still need to go to **Edit > List Columns...**

20 Preferences

20.1 General preferences

General preferences refer to settings that do not fall into any specific area covered by the other preferences listed below. They are accessed by the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), and selecting the ***General*** tab.

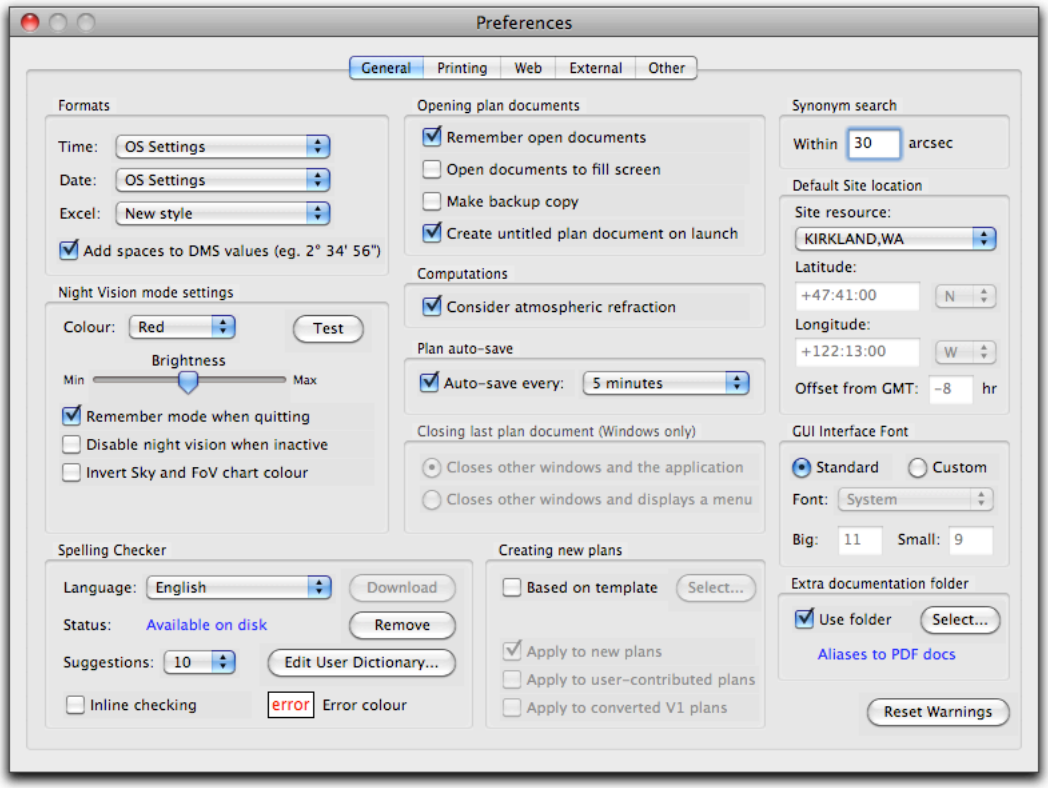


Figure 399: General preferences

20.1.1 Formats

Time. The default time display format. If you choose OS Settings then time will be displayed the same way as it is set in your operating system Date/Time control panel or System Preferences. Other you can set the application to force a 24 hour clock (i.e. 3:15pm would be displayed as 15:15).

Date. The default date display format. If you choose OS Settings then dates will be displayed the same way as it is set in your operating system Date/Time control panel or System Preferences. Other you can set the application to force various date formats.

Excel. When exporting to Excel you can define which file format you wish to use:

- ***Old style***. Compatible with older versions of Excel. However, fields are limited to 255 characters maximum. If this limit is exceeded for a field, it will be split over two or more rows.
- ***Old style with truncation***. As above, but if a field exceeds 255 characters it will be truncated at 255 characters.
- ***New style***. Compatible with newer versions of Excel. No field length limits.

Add spaces to DMS values. When angular values are displayed, they are typically displayed without spaces (e.g. 123°45'12"). If this option is selected, spaces are added for readability (e.g. 123° 45' 12").

20.1.2 Night Vision mode settings

Colour. The fundamental colour to use. Red (traditional), Green (preferred by some since green is more visible at low light intensities than red), and Grey.

Brightness. This slider changes the maximum colour intensity.

Remember mode when quitting. Remember if you were in night vision mode when you quit, and re-instate that mode next time you run AstroPlanner.

Disable night vision when inactive. Disable night vision when another application is brought to the front.

Invert Sky and FoV chart colour. Change the Sky and Field of View charts to display black stars on a red/green/grey background.

Also attempt gamma colour control. *Windows only*. It is theoretically possible to adjust the video gamma to display tones of red/green/grey on Windows. In reality, only some Windows graphics cards allow this, and even then it's not particularly effective. Try this option and see what happens.

Test. Tests the night vision mode for 5 seconds and then switches back to normal (in case you can't see what you're doing when everything goes dim).

20.1.3 Spelling checker

AstroPlanner has a built-in spelling checker that operates on all text fields (those that allow multiple lines of text). These settings define how the system functions.

Language. Choose the language you wish to use. English is the default and is immediately available. French, German, Italian and Spanish are available, but need to be downloaded from the Internet.

Status. Whether the selected language is available, or needs to be downloaded.

Download. Download the spelling dictionary for the selected language.

Remove. Remove the selected language dictionary from disk.

Suggestions. The maximum number of spelling suggestions per error.

Edit User Dictionary.... Edit the supplemental user dictionary. Add, remove or change words from the custom user dictionary. Use the ***Add Astro Words*** button to populate the list with a number of common (and not-so-common) astronomical terms.

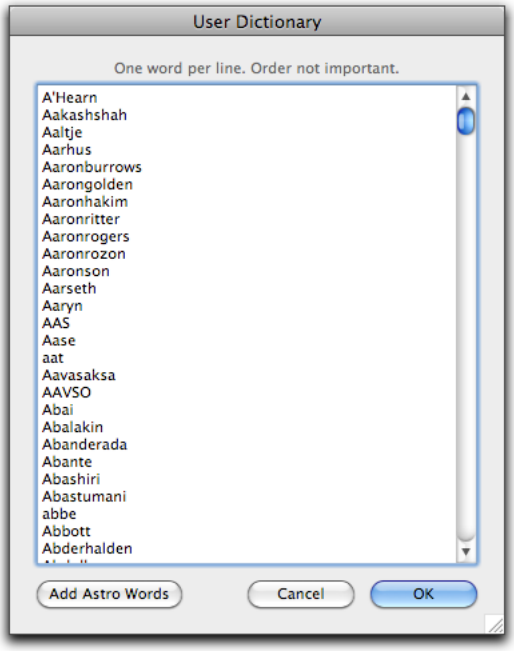


Figure 400: Edit user dictionary

Inline checking. Mark errors "on the fly" by changing the colour of the word in error.

Error colour. The colour of words in error. Click the swatch to change the colour.

20.1.4 Opening plan documents

Remember open documents. If any (non-untitled) plan documents are open when you quit AstroPlanner, then this option makes sure they are remembered, and next time you run the AstroPlanner application those documents will be re-opened automatically (assuming they were not subsequently moved or deleted).

Note: (*Windows only*) If you close the last plan document and that in turn closes the application, that last plan document will be remembered.

Open documents to fill screen. Normally, the size and position of plan document windows are remembered when they are closed and restored when the document is reopened. This setting will always open a document to fill the screen.

Make backup copy. Whenever you open a document, a backup copy is made in the same folder as the original, but with "_Backup" appended to the name. If such a file already exists it will be overwritten. This is useful if you make changes to the document, and then decide you didn't want to do that.

Create untitled plan document on launch. (*Macintosh only*) The normal behaviour when an application is started is to open an untitled, empty document if no other documents were opened. This option allows you to disable that behaviour and not create an empty document.

20.1.5 Computations

Consider atmospheric refraction. Take into account the effects of atmospheric refraction when computing object altitude above the horizon. This can increase the amount of computation needed, but gives better results for objects close to the horizon.

20.1.6 Plan auto-save
Automatically save the open plan document to disk periodically (if changes have been made).

20.1.7 Closing last plan document
(*Windows only*) What to do when you close the only remaining plan document window. Typically this will cause the application to quit, but another option is to display an empty background window with a menu that allows you to open another plan document without quitting.

20.1.8 Creating new plans
Normally a new untitled plan document is opened with default settings. You can use the **Based on template** option to base the new document on the settings found in an existing plan document (which you specify). Settings include object list column settings, field of view and sky chart settings, etc. You can apply this template to new plans, downloaded user-contributed plans, and/or plans that are converted from old V1.x AstroPlanner plan documents.

20.1.9 Synonym search
When you do synonym searches (e.g. ***Object > Search > Lookup Synonyms...***), this setting specifies how close a plan object needs to be from a catalogue object (in arcseconds) for those objects to be considered (potential) synonyms.

20.1.10 Default site location
If you don't set the Site for a plan document, this setting specifies a default site to use (to compute visibility of objects, etc.). You can select an existing site resource, or you can select "*No site. Use values below*" and enter the latitude, longitude and GMT offset manually.

20.1.11 GUI interface font
The GUI (Graphical User Interface) normally uses fonts and sizes defined by the operating system. You can define your own font and size settings here. **Warning**: the GUI will not resize to handle larger or smaller fonts, so you might experience user interface anomalies if you stray from the standard settings.

20.1.12 Extra documentation folder
If you have extra documentation (HTML and PDF documents) that you might access while using AstroPlanner, you can use this option to define a folder that contains those documents. Any relevant documents found in that folder will be added to the end of the ***Help*** menu.

20.1.13 Reset Warnings
Many alert dialogs give you the option: "*Don't show this again*". If you select that option, that alert will not be shown the next time the alert is called. This reset button effectively turns all those settings off, so that all alerts will be seen again.

20.2 Printing preferences
Printing preferences are settings applicable to any printing done from AstroPlanner. They are accessed by the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), and selecting the ***Printing*** tab.

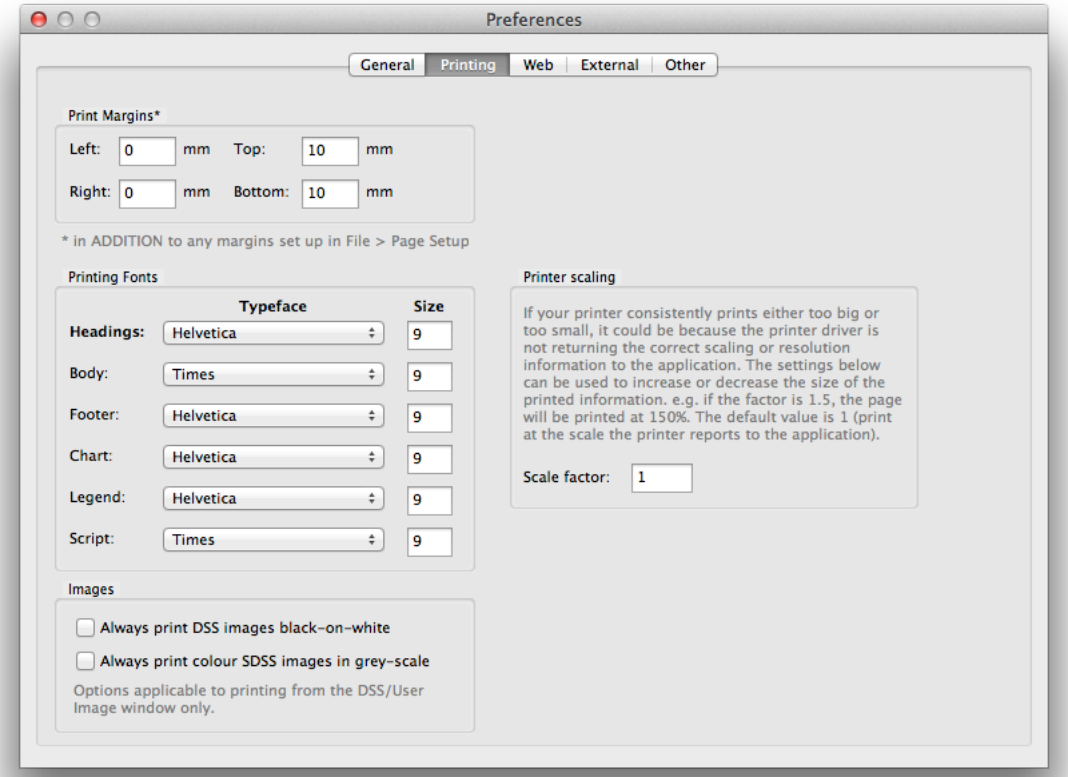


Figure 401: Printing preferences

20.2.1 Print margins

These represent margins (measured in mm) to be used on each printed page. Note that these margins are in addition to any margins you define in ***File > Page Setup...***

20.2.2 Printing fonts

These are fonts and sizes used (by default) when print charts and reports. Headings, Body and Footer refer to printed reports (objects and observations), Chart and Legend to printed field of view or sky charts, and Script to any tables or text created by a script.

20.2.3 Images

Always print DSS images black-on-white. Whenever a DSS image is printed from the image display window, invert the grey-scale so that stars are printed black and the background sky in white. Apart from saving ink, such printed images might be easier to view under low light.

Always print colour SDSS images in grey-scale. Whenever a colour SDSS image is printed from the image display window, convert the colours to monochrome.

20.2.4 Printer scaling

If your printer consistently prints either too big or too small, it could be because the printer driver is not returning the correct scaling or resolution information to the application. The printer scaling value can be used to increase or decrease the size of the printed information. e.g. if the factor is 1.5, the page will be printed at 150%. The default value is 1 (print at the scale the printer reports to the application).

20.3 Web preferences

Web preferences are settings applicable to any Internet access from AstroPlanner. They are accessed by the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), and selecting the ***Web*** tab.

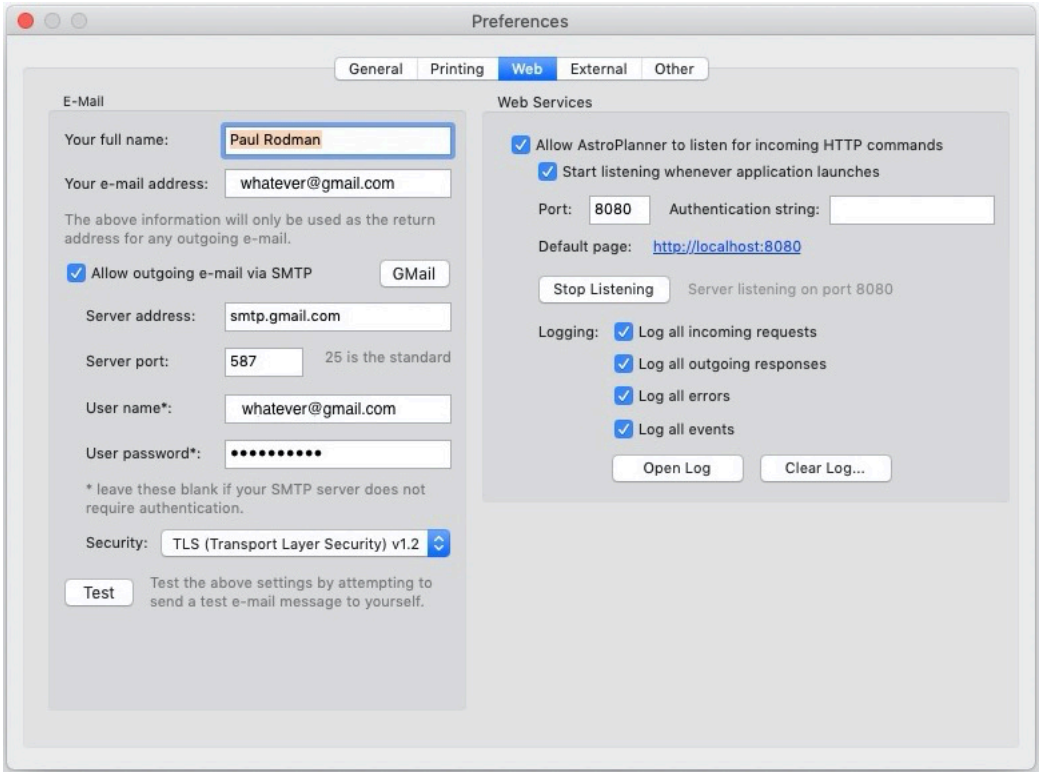


Figure 402: Web preferences

20.3.1 E-Mail

Your full name and address. These settings will be used to create an e-mail return address for any outgoing e-mail messages.

Allow outgoing e-mail via SMTP.

If you are able to send e-mail from your computer via SMTP (the most common e-mail protocol), then select this option and fill in the settings below it. If you don't select this option you will still be able to send bug reports, but will be unable to attach any files, screenshots, etc.

GMail. If you are using a GMail address (@gmail.com) then this button will set the correct settings for you (apart from your password).

Server address & port. The SMTP server address and port number. Typically, if your e-mail address is xxxxx@yyyyy, then the server address will be mail.yyyyy or smtp.yyyyy, but this varies with Internet providers.

User name & password. If your SMTP server requires a login (most do) then this will be your user ID and password (typically this is the same as the ID and password you use for checking for incoming e-mail).

Security. The kind of secure connection to use. If in doubt, use None.

Test. Clicking this attempts to send a brief test e-mail message to yourself to see if the settings work.

20.3.2 Web Services

This (somewhat specialised) feature causes the AstroPlanner application to act as a web (HTTP) client, and it can listen for and react to certain commands sent from another application, browser, or another instance of AstroPlanner on another computer. You can specify the port number to listen on, and you can log transactions to a file. The **Authentication string**, if present, is required to be passed in incoming messages. Such messages will be ignored if the authentication string does not match.

Currently all operations are script-based (e.g. running a script on the computer, etc.). If you click the **Start Listening** button and then click the **Default page** link, your browser should show a list of commands and the command format, including links to test the functionality.

The commands and responses are all JSON encoded.

20.4 External applications preferences

External applications preferences are settings applicable to selected applications that can be accessed or controlled from AstroPlanner. The preferences are accessed by the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), and selecting the ***External*** tab.

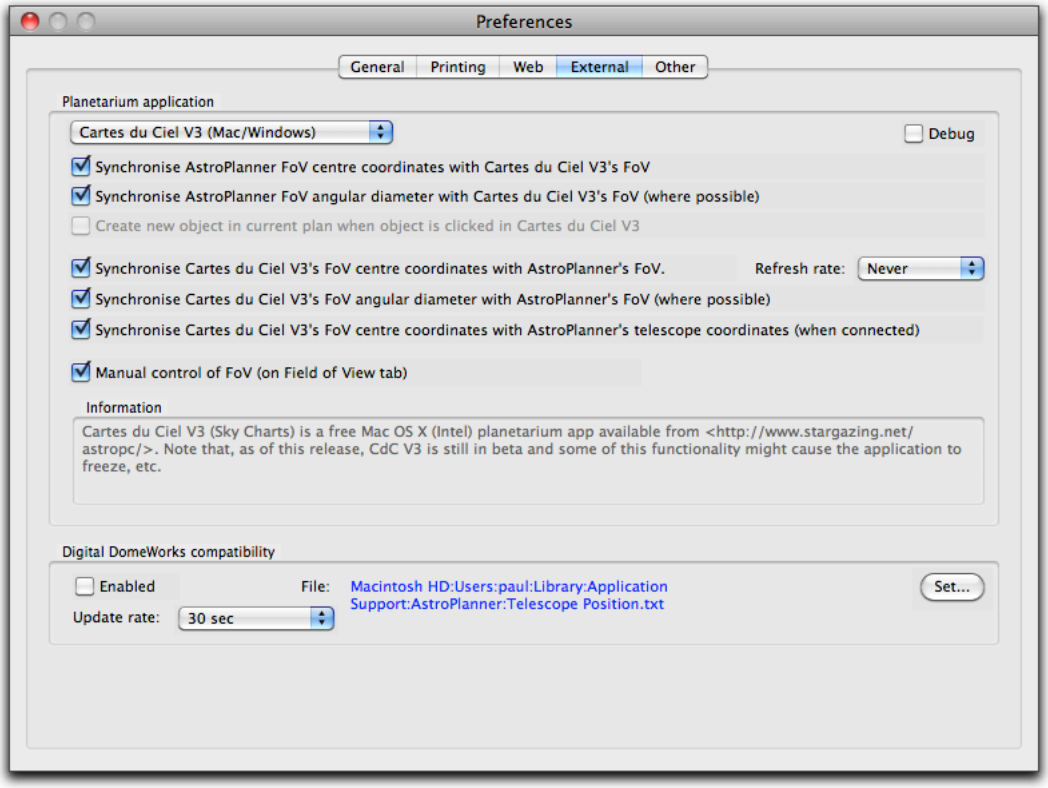


Figure 403: External applications preferences

20.4.1 Planetarium application

AstroPlanner is able to communicate with selected 3rd-party planetarium applications (see Section 21.2 on page 321). These settings let you choose the planetarium application you wish to use, and how you want to communicate with it.

The popup menu lists all possible applications. These are, currently:

- Cartes du Ciel (Sky Charts) V2 (Windows-only)
- Cartes du Ciel (Sky Charts) V3 (Macintosh & Windows)
- C2A (Windows-only)

Others might be introduced in future releases.

There are a number of checkboxes to enable communication features (where applicable). **xxx** represents the name of the planetarium application:

- **Synchronise AstroPlanner FoV centre coordinates with xxx's FoV**. Asks the planetarium application for the current coordinates of the field of view being shown, and changes AstroPlanner's field of view chart to be centred at the same coordinates.
- **Synchronise AstroPlanner FoV angular diameter with xxx's FoV**. Asks the planetarium application for the current size of the field of view being shown, and changes AstroPlanner's field of view chart to be the same size (where possible[1]).
- **Create new object in current plan when object is clicked in xxx**. This is a way to identify objects in the planetarium application, and AstroPlanner will create a new object in the plan's object list. Note that "clicking" might be qualified in the planetarium application, e.g. control-clicking, shift-clicking, etc.
- **Synchronise xxx's FoV centre coordinates with AstroPlanner's FoV**. Whenever AstroPlanner's field of view chart changes its centre coordinates, the planetarium application is asked to change its centre to the same coordinates.
- **Synchronise xxx's FoV angular diameter with AstroPlanner's FoV**. Whenever AstroPlanner's field of view chart changes its diameter, the planetarium application is asked to change its diameter to the same size.
- **Synchronise xxx's FoV centre coordinates with AstroPlanner's telescope coordinates**. If AstroPlanner has a computerised telescope connected, then whenever the telescope pointing coordinates change, the planetarium application is asked to change its centre to the same coordinates.
- **Manual control of FoV**. If this is checked then the "→E" and "←E" buttons next to the field of view chart are enabled, allowing manual control of the above features.
- **Refresh rate**. The rate at which the above synchronisations are done automatically. If this setting is "Never" (recommended), then the manual control option should be checked.
- **Debug**. If this setting is checked, debugging information is output to a debug window. This is only really necessary if you are not getting a response from the planetarium application.

20.4.2 Digital DomeWorks compatibility

The Digital DomeWorks control software can check a text file for new pointing coordinates in order to rotate a dome to reflect the current telescope pointing coordinates. These settings enable this option, specify the name and path of the file on your disk, and specify how often to change the text file.

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1. AstroPlanner has a maximum field of view chart diameter of 60°. Most planetarium applications allow larger values than this.

20.5 Object list preferences

Object list preferences can be accessed from:

- Main menu: ***Object > Object List Preferences...***
- Right-clicking the object list and choosing ***Other > Object List Preferences...*** from the popup menu.
- By clicking the preferences button under the object list in the Objects tab of a plan document window (marked in Figure 404).
- Using the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), selecting the ***Other*** tab, and clicking the relevant ***Open*** button.

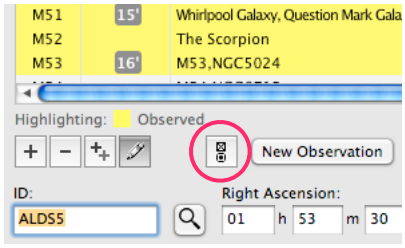


Figure 404: Object List Preferences button

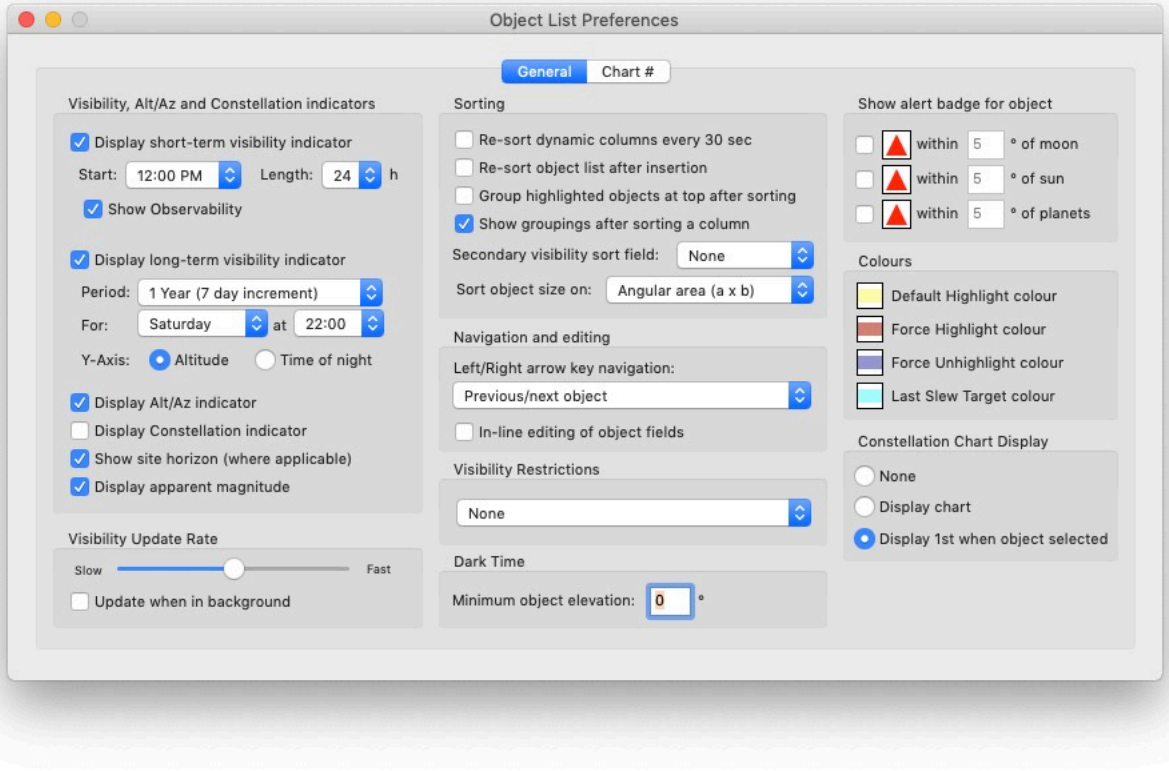


Figure 405: Object List preferences window

20.5.1 Visibility, Alt/Az and Constellation indicators

These indicators are (optionally) displayed above the object list.

Display short-term visibility indicator. The checkbox toggles on and off the display of the short-term visibility indicator. The indicator shows the altitude of the selected object over a short period (≤ 24 hours). The **Start** and **Length** values determine the start time of the chart and the number of hours duration. These items can also be selected by right-clicking the chart in question.

Display long-term visibility indicator. The checkbox toggles on and off the display of the long-term visibility indicator. The indicator shows the altitude of the selected object over a long period (≤ 12 months, determined by the **Period** value). The altitude is shown for a particular day of the week and time (the **For** values). The chart y-axis can either show altitude above the horizon (marked by a red cross), or a time-of-night indication of when the object is above the horizon (shown as a vertical yellow line). These items can also be selected by right-clicking the chart in question.

Display Alt/Az indicator. This checkbox toggles on and off the display of the alt/az indicator. The indicator shows the azimuth and altitude of the selected object, as well as the distance of the object from the sun and moon (in degrees). This item can also be selected by right-clicking the chart in question.

Display Constellation indicator. This checkbox toggles on and off the display of the constellation indicator. The indicator shows a graphical representation of the constellation containing the selected object. This item can also be selected by right-clicking the chart in question.

Show site horizon. Show the user-defined site horizon (if available) in applicable indicators (short- and long-term visibility and alt/az).

Display apparent magnitude. Display the apparent magnitude of the object in the short- and long-term visibility indicators. If the cursor is moved over the indicators, the apparent magnitude of the object is displayed for the time given by the x-axis.

20.5.2 Visibility update rate

This slider controls how often the visibility is recalculated for objects in the object list. Faster calculation will improve the accuracy of the altitude/azimuth and visibility, at the expense of slowing down overall response and possible flickering effects.

Update when in background. When another application is brought to the front, visibility calculations are typically suspended until AstroPlanner is once more the active application. This checkbox allows visibility calculations to continue while the application is deactivated. This might affect other applications, and laptop battery life.

20.5.3 Visibility restrictions

When computing the current visibility of an object, this setting allows you to consider an object non-visible based on sky darkness:

- **None**. Sky darkness is not considered (i.e. if the object is above the horizon, it is considered visible).
- **Civil Twilight**. During the daytime (between sunrise and sunset), all objects are considered invisible.
- **Nautical Twilight**. Objects are consider invisible before the start of nautical twilight in the evening and after the end of nautical twilight in the morning.
- **Astronomical Twilight**. Objects are consider invisible before the start of astronomical twilight in the evening and after the end of astronomical twilight in the morning.

- **Full Darkness**. Objects are consider invisible after the end of astronomical twilight in the evening and before the start of astronomical twilight in the morning.

20.5.4 Constellation chart display

Display constellation charts for objects. This is on by default and determines if a constellation chart is generated and displayed when an object is selected. If the **Display 1st when object selected** option is selected, then the chart will be initially displayed in front of any images associated with the object.

20.5.5 Sorting

Re-sort dynamic columns every 30 seconds. If this option is checked, then if you have sorted on a dynamic column (i.e. one containing an object parameter that can change over time, such as altitude, visibility, etc.), that column will be sorted again automatically every 30 seconds.

Re-sort object list after insertion. If an object is inserted at the end of the list, it could affect the sort order of the list. If this option is checked then the list will be re-sorted after such an insertion, where necessary.

Group highlighted objects at top after sorting. When this option is checked, every time the list is sorted, all highlighted objects (where applicable) will appear before all unhighlighted objects.

Show groupings after sorting a column. If this option is set then whenever you sort the object list, a black line will appear between groupings (e.g. sort on Constellation - the line appears between constellation changes; sort on R.A. - the line appears on every hour change, etc.). See Figure 406 for an example.

ID	Comp	Type	Const	Images	Vis	RA	Dec	Azimuth	Altitude	One
M68		Globular	Hya	D	Yes	12h 39m 28.2s	-26°44'31.7"	106°	47°	
M83		Galaxy	Hya	D	Yes	13h 37m 00.3s	-29°51'51.3"	112°	35°	
M13		Globular	Her	D		16h 41m 41.2s	+36°27'35.3"	59°	-27°	
M92		Globular	Her	D		17h 17m 07.4s	+43°08'11.4"	52°	-34°	
M35		Open	Gem	D	Horz	06h 09m 00.0s	+24°21'00.0"	311°	23°	
M102		Galaxy	Dra	D		15h 06m 29.6s	+55°45'47.1"	35°	-15°	
M39		Open	Cyg	D		21h 31m 42.0s	+48°25'00.0"	359°	-64°	
M29		Open	Cyg	D		20h 23m 57.0s	+38°30'30.0"	37°	-68°	
M63		Galaxy	CVn	D	Horz	13h 15m 49.2s	+42°01'46.0"	39°	7°	
M94		Galaxy	CVn	D	Horz	12h 50m 53.1s	+41°07'12.0"	36°	11°	
M51		Galaxy	CVn	D	Horz	13h 29m 52.5s	+47°11'44.5"	36°	2°	
M3		Globular	CVn	D	Horz	13h 42m 11.3s	+28°22'35.0"	53°	11°	
M106		Galaxy	CVn	D	Horz	12h 18m 57.6s	+47°18'16.0"	28°	11°	
M98		Galaxy	Com	D	Yes	12h 13m 48.3s	+14°54'00.7"	51°	35°	
M99		Galaxy	Com	D	Yes	12h 18m 49.5s	+14°25'01.1"	52°	35°	
M100		Galaxy	Com	D	Yes	12h 22m 55.0s	+15°49'21.3"	52°	33°	
M85		Galaxy	Com	D	Yes	12h 25m 24.1s	+18°11'26.9"	50°	31°	
M88		Galaxy	Com	D	Yes	12h 31m 59.2s	+14°25'12.3"	55°	32°	
M91		Galaxy	Com	D	Yes	12h 35m 26.5s	+14°29'47.0"	55°	32°	
M64		Galaxy	Com	D	Yes	12h 56m 43.7s	+21°40'57.6"	53°	23°	
M53		Globular	Com	D	Yes	13h 12m 55.3s	+18°10'07.2"	58°	22°	
M44		Open	Cnc	D	Yes	08h 40m 24.0s	+19°40'00.0"	343°	46°	
M67		Open	Cnc	D	Yes	08h 51m 18.0s	+11°48'00.0"	344°	55°	

Figure 406: Object list sorted by constellation

Secondary visibility sort field. When sorting on the Visibility (Vis) column, this setting chooses a secondary parameter/column to sort on if the Visibility values are the same: Altitude, Azimuth, R.A., Declination, Rise time, Transit time, or Set time.

Sort object size on. When sorting the Size column, you can choose to sort an object with Size = a x b on angular area (a multiplied by b), longest dimension (a), or shortest dimension (b). If the size is given as a single dimension, A, then both dimensions are considered to be equal to A.

20.5.6 Navigation and editing

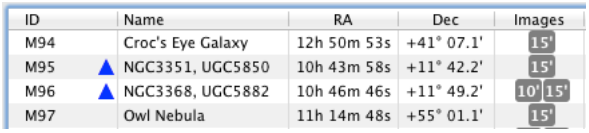
Left/Right arrow key navigation. This option determines what effect the left- and right-arrow keys have when navigating the object list:

- **None**. No effect.
- **Previous/next object**. Left-arrow moves to the previous object in the list; right-arrow moves to the next object in the list.
- **Previous/next highlighted object**. Left-arrow moves to the previous highlighted object in the list; right-arrow moves to the next highlighted object in the list.
- **Previous/next observed object**. Left-arrow moves to the previous object with associated observations in the list; right-arrow moves to the next object with associated observations in the list.
- **Previous/next non-observed object**. Left-arrow moves to the previous object with no associated observations in the list; right-arrow moves to the next object with no associated observations in the list.
- **Previous/next visible object**. Left-arrow moves to the previous currently-visible object in the list (i.e. Vis = Yes); right-arrow moves to the next currently-visible object in the list.
- **Previous/next object with images**. Left-arrow moves to the previous object with associated images in the list; right-arrow moves to the next object with associated images in the list.
- **Previous/next object of the same type**. Left-arrow moves to the previous object with the same Type in the list; right-arrow moves to the next object with the same Type in the list.

In-line editing of object fields. When this option is checked, in-line editing of object fields in the object list is permitted (i.e. clicking on an editable column will allow instant editing of the object value).

20.5.7 Show alert badge for object

These items define alert "badges" to be displayed in the ID column of the object list if an object is within the given angular distance of the sun, the moon, or a bright planet (Mercury through Saturn).



ID	Name	RA	Dec	Images
M94	Croc's Eye Galaxy	12h 50m 53s	+41° 07.1'	15'
M95	NGC3351, UGC5850	10h 43m 58s	+11° 42.2'	15'
M96	NGC3368, UGC5882	10h 46m 46s	+11° 49.2'	10' 15'
M97	Owl Nebula	11h 14m 48s	+55° 01.1'	15'

Figure 407: Alert badges in ID column

20.5.8 Colours

These colours are used to shade the background of a row in the object list. Clicking the colour swatch allows the colour to be changed.

Default Highlight colour. If an object is highlighted (but not Custom highlighted), this colour is used.

Force Highlight colour. If an object has been Force Highlighted, this colour is used.

Force Unhighlight colour. If an object has been Force Unhighlighted, this colour is used.

Last Slew Target colour. If an object was the target of the last telescope slew, this colour is used.

20.5.9 Dark Time

The **minimum object elevation** setting specifies the minimum altitude that an object can have during astronomical darkness in order for it to be considered in Dark Time. This is used by the Dark Start, Dark End, and Dark Duration object list columns (page 98).

20.5.10 Charts/Atlases for Chart# column

This is found in the Chart # tab of the preferences window.

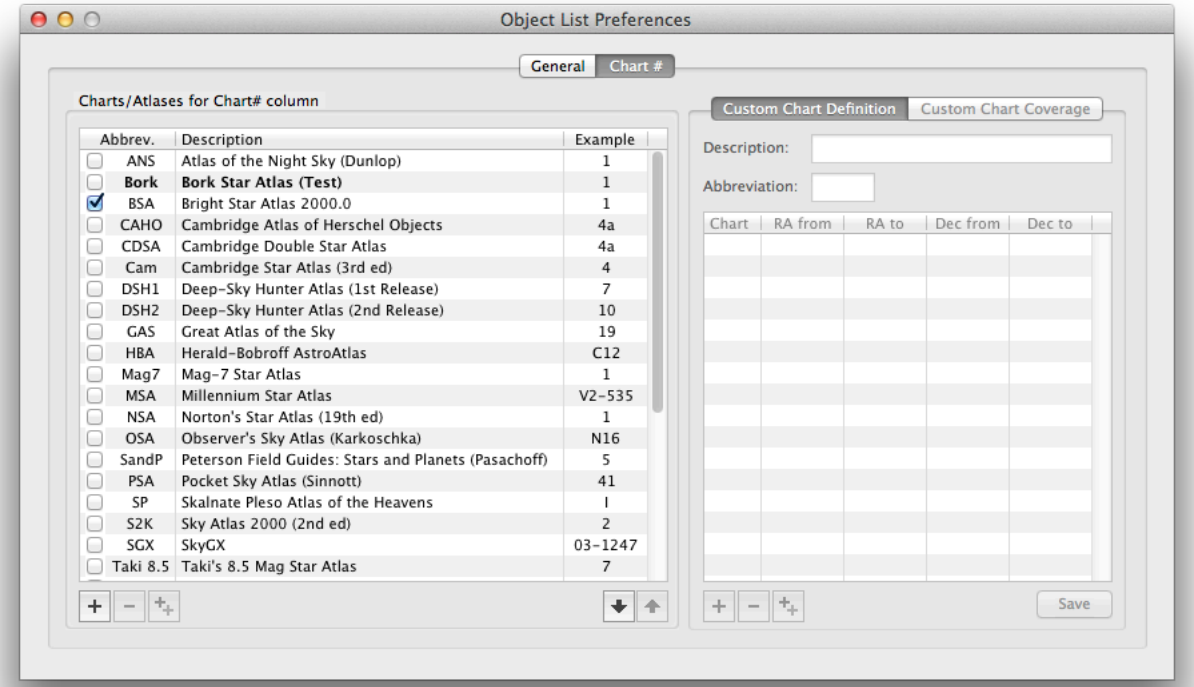


Figure 408: Chart # atlas list

This is a list of supported charts/atlases. By checking one or more of these entries, the relevant chart number/s for an object will be displayed in the Chart # column.

The default is to show all of the chart numbers for each selected chart/atlas, separated by commas. However, if you right-click the object list and choose the Chart/s submenu, you can elect just to show the chart numbers for one of them. This is useful if you own and use more than one atlas.

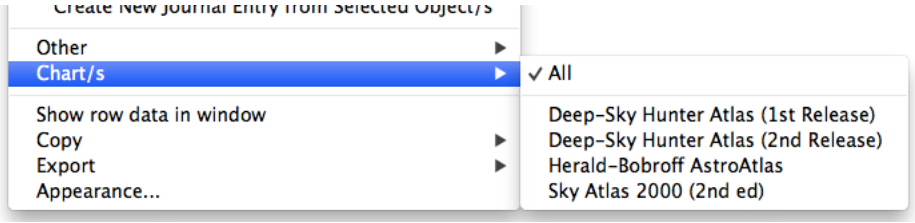


Figure 409: Chart/s submenu

Creating a custom chart definition

If you have a set of charts or an atlas that is not built-in to the application, you can create your own custom definition. Use the "+" button under the list of charts to create a new definition. This creates a new definition and displays the definition on the right of the window.

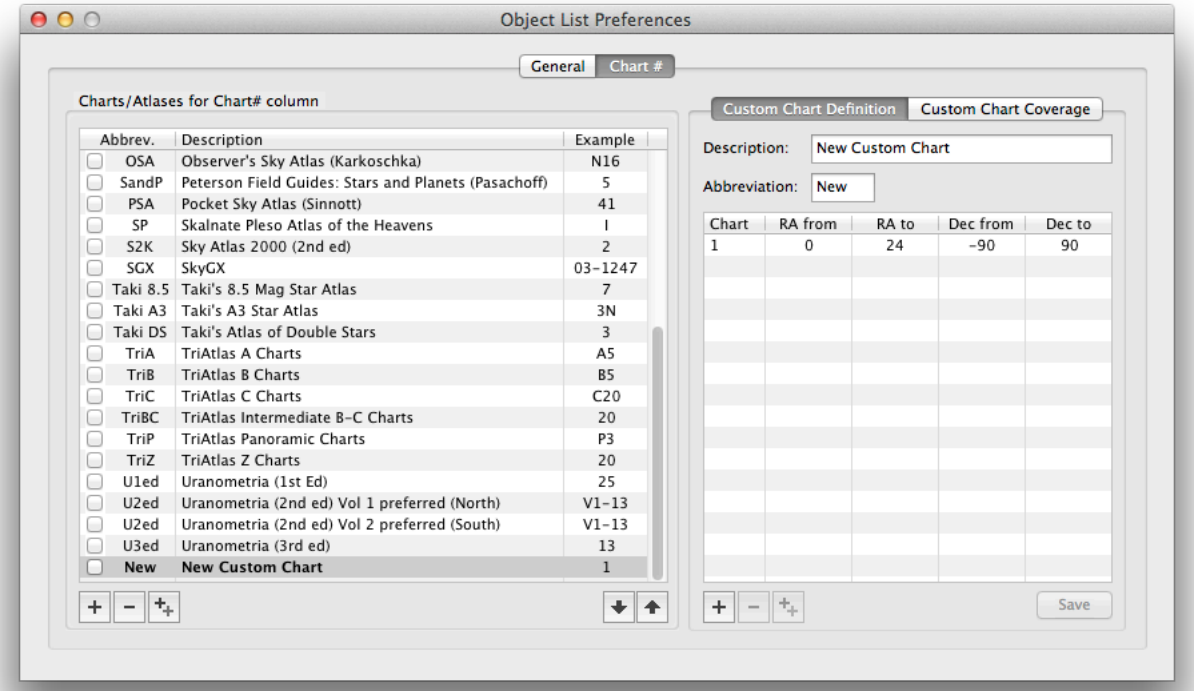


Figure 410: Creating a new custom chart definition

Change the Description and Abbreviation fields to suitable values. Use the "+" button under the definition to add lines to the definition, "-" to delete a line, or "++" to duplicate a line.

Each line of the definition represents an area of sky bounded by RA and Dec bounds. The chart number containing that area of sky is part of the line. Edit the values directly in the list. When you've finished, click the **Save** button.

Note the following:

- When the application looks up a chart number for a given RA/Dec, it searches the definition sequentially from the first line until it finds one where ***RA from*** ≤ RA ≤ ***RA to*** and ***Dec from*** ≤ Dec ≤ ***Dec to***. When it finds such a line it returns the corresponding chart number.

- Chart numbers can be any string of one or more characters, e.g. 5, 11a, V2-15, etc. See the example column in the main chart list.
- ***RA from*** must be less than ***RA to***, and ***Dec from*** must be less than ***Dec to***.
- If a chart covers the RA = 0 boundary, then create two lines. e.g. if chart 6 covers RA=20h to RA=4h, Dec=-10° to Dec=+10°, then create a line for chart 6 that covers RA = 20h to 24h, Dec = -10° to +10°, and a second line for chart 6 that covers RA = 0h to 4h, Dec = -10° to +10°.
- Overlapping areas are fine.
- If there's a small detail chart then make sure its definition appears before the larger chart/s containing it so that any coordinates in that small chart get chosen first.

You can use the Custom Chart Coverage tab to check that the charts you've defined cover the required area of sky.

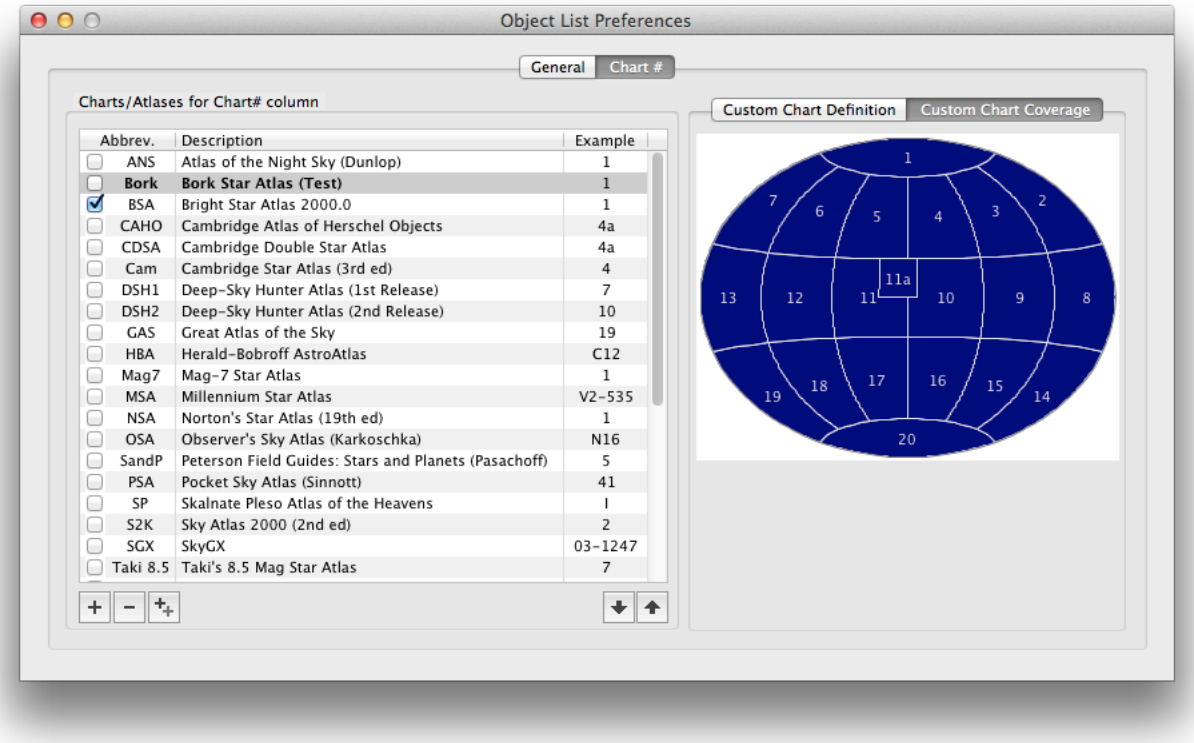


Figure 411: Custom Chart Coverage

User-contributed custom chart definitions

You can use the down-arrow button under the list of chart definitions to download user-contributed chart definitions, and the up-arrow button to upload your own definitions.

20.6 Field of View chart preferences

Field of view chart preferences can be accessed by:

- Clicking the preferences button at the bottom-right of the chart in the Field of View tab of a plan document window (marked in Figure 412).

- Using the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), selecting the ***Other*** tab, and clicking the relevant ***Open*** button.

Figure 412: Field of View chart preferences button

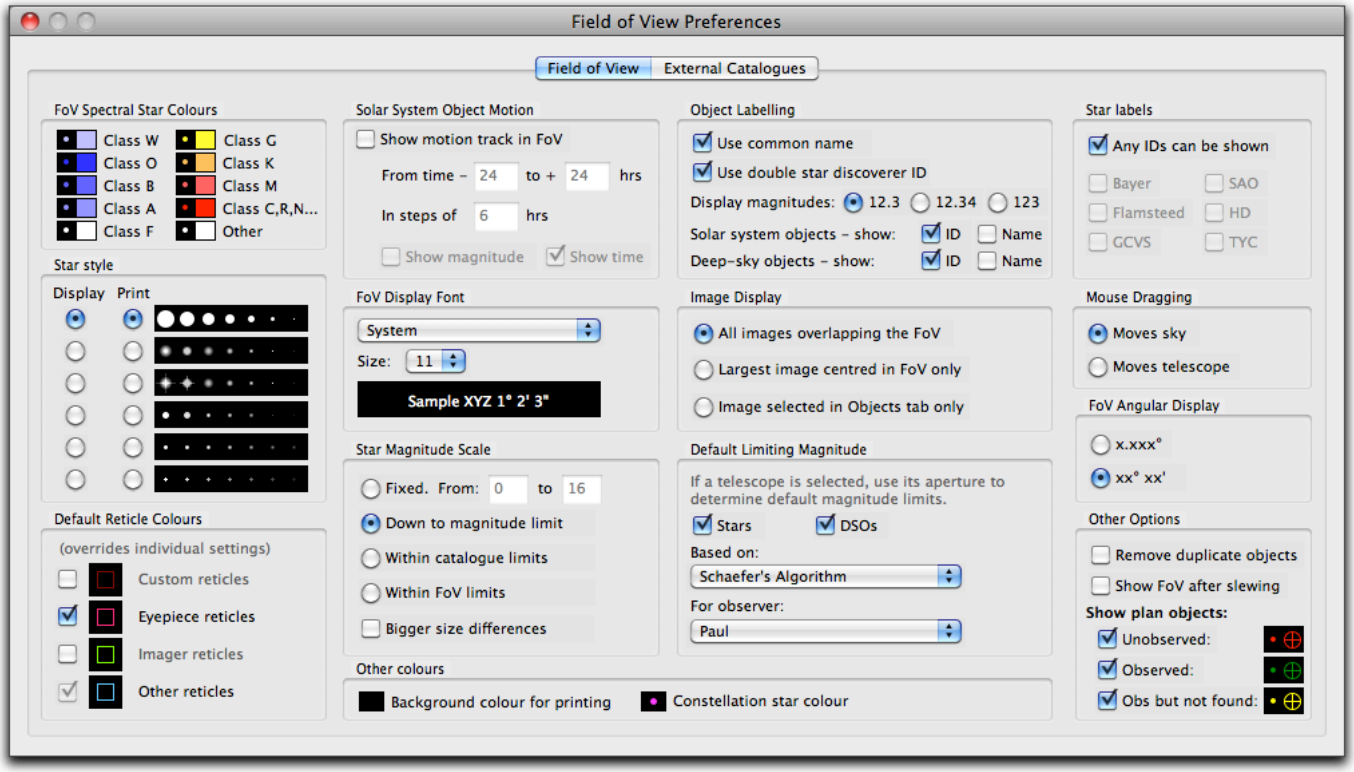


Figure 413: Field of View chart preferences

20.6.1 FoV Spectral Star Colours

These are the colours used to show catalogue stars in the chart if such stars include spectral class information and if the ***Display > Spectral Colours*** option is selected in the ***Display Options*** for the chart. Clicking the colour swatches allows changing the colour.

20.6.2 Star style

This option defines how stars are drawn in the chart. There's a separate option for printing.

20.6.3 Default Reticle Colours

Defines colours that are used for various reticle types. If checked, these will override the colours individually assigned to the reticles. Clicking the colour swatches allows changing the colour.

20.6.4 Solar System Object Motion

If the Show motion track in FoV option is selected, then any solar system object (planets, comets and minor planets) will show a track of its motion in time across the sky. The time span is specified in

hours, with a step interval. The **Show magnitude** option will show the object's magnitude at each step. The **Show time** option will show the relative time in hours at each step. Figure 414 shows the motion track of a comet over 48 hours (from -24 to +24 hours in steps of 6 hours), with the **Show time** option used.

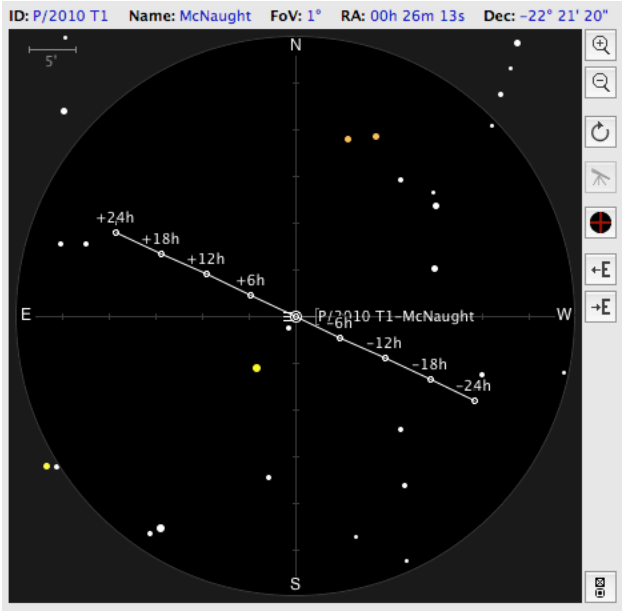


Figure 414: Motion track in field of view chart

20.6.5 FoV Display Font

Select the font and size used to display text in the chart. Default is System 11.

20.6.6 Star Magnitude Scale

This option allows selection of how the stars in the FoV are scaled:

- **Fixed**. Always scale stars on a fixed scale. This might be useful to compare charts across multiple telescopes, parts of the sky, etc.
- **Down to magnitude limit**. This is the default. Assume the magnitude limit (determined by the slider to the right of the chart) determines the smallest stars to show on the chart. This generally renders a chart that is close to reality for a given telescope (assuming the magnitude limit is that of the selected telescope).
- **Within catalogue limits**. Determine the magnitude limits by the dimmest/brightest stars in the catalogues being displayed.
- **Within FoV limits**. Determine the magnitude limits by the dimmest/brightest stars in the displayed field of view chart.

Bigger size differences. Make the differences between star sizes for different magnitudes larger.

20.6.7 Other colours

Background colour for printing. This is the colour used to print the background sky (unless you are printing black-on-white). You can choose a suitable colour to, for example, save on ink cartridges. Click the colour swatch to choose the colour.

Constellation star colour. If you are displaying constellation figures in the chart (by way of the Display Options), then this colour defines the colour for stars considered part of the "standard" constellation. Click the colour swatch to choose the colour.

20.6.8 Object Labelling

Use common name. If a star has a known common name, then display that rather than the stars ID (e.g. display "Polaris" rather than "α UMi").

Use double star discoverer ID. When labelling double stars, use the discoverer ID rather than the catalogue ID (e.g. HJ2414 rather than WDS07459+2000).

Display magnitudes. How to display magnitudes in the chart. Either one decimal place, two decimal places, or one decimal place without the decimal point (some like to do this to avoid the decimal point being mistaken for a star).

Solar system objects. For any displayed solar system objects, you can elect to display the ID or the Name, or both.

Deep-sky objects. For any displayed non-solar-system objects, you can elect to display the ID or the Name, or both.

20.6.9 Image Display

How to handle multiple images in the field of view chart:

- **All images overlapping the FoV**. Default. Any and all images that overlap the chart will be displayed.
- **Largest image centred in FoV only**. Only the largest image, centred at the coordinates of the chart's centre, will be displayed.
- **Image selected in Objects tab only**. Only the image currently being displayed next to the object list (i.e. for the selected object) will be displayed.

20.6.10 Default Limiting Magnitude

How to determine the initial settings for the Star and DSO magnitude limits for the field of view chart. If **Stars** and/or **DSOs** are checked then the corresponding magnitude limit sliders will be set **Based on**:

- **Telescope aperture only**. Uses the computed (or manually set) magnitude limit value for the selected Telescope resource.
- **Telescope + Eyepiece + Aid**. Bases the magnitude limit on a formula that is dependent on magnification (or defaults to the above if an eyepiece isn't specified).
- **Schaefer's Algorithm**. Uses Schaefer's comprehensive algorithm to determine actual magnitude limit, which also takes into account the observer's age, eyesight, etc. (specified as an Observer resource).

20.6.11 Star labels

Determines which IDs are used for labelling stars. If **Any IDs can be shown** is selected, then the chart will use any ID available. Otherwise you can choose one or more of the specified ID types. If the star has one or more of the selected IDs, a label will be shown, otherwise it won't.

20.6.12 Mouse Dragging

What happens when you (left) click and drag the mouse with the cursor in the chart:

- **Moves sky**. The background sky is effectively dragged. i.e. if you drag from left to right, the coordinates of the centre of the chart will move to the left.
- **Moves telescope**. The telescope or chart centre is effectively dragged. i.e. if you drag from left to right, the coordinates of the centre of the chart will move to the right.

20.6.13 FoV Angular Display

When you option-drag (Macintosh) or Alt-drag (Windows) on the chart, the angular distance you have dragged (as well as the angle w.r.t. north) is displayed. This setting determines whether the distance is displayed in decimal degrees, or degrees/minutes/seconds.

20.6.14 Other Options

Remove duplicate objects. If duplicate catalogue objects are found (if more than one stellar catalogue is being displayed), then this option will find any duplicate objects and remove them. Objects from larger catalogues will be preferentially removed. e.g. If you display the Bright Star catalogue as well as the Hubble GSC catalogue, then the Bright Star objects will be preferred over any equivalent Hubble objects. The downside is that this can take some computation if many objects are being displayed.

Show FoV after slewing. When telescope slewing is instigated from the plan document, automatically switch to the Field of View tab after slewing.

Show plan objects. Determines if plan objects are displayed in the chart, and if so, in what colour. You can select different colours for objects that have no associated observations (**Unobserved**), objects that have one or more associated observations logged (**Observed**), and those objects that have observations logged, but which were not found in any of the observations (**Obs but not found**). Click the colour swatches to change colours.

20.6.15 External Catalogues

External catalogues are non-AstroPlanner stellar catalogues that might be available to the user. The contents of these catalogues can be displayed in the field of view chart, but not searched or used elsewhere. They are also not available to unregistered users.

These catalogues are typically available on CD-ROM, DVD-ROM, or on-line via the Internet. There is a tab for each available catalogue type. Currently these are:

- **USNO A2.0**. The USNO A2.0 Stellar Catalog, is a catalogue of 526,280,881 stars covering the entire sky, with coverage down to magnitude 19+. It is available as a set of 11 CD-ROMs or 2 DVD-ROMs.
- **USNO SA2.0**. The USNO SA2.0 is a catalogue of 55,368,239 stars intended to provide a grid of astrometric reference stars covering the whole sky. It is a spatially sub-sampled version of the full USNO A2.0 catalogue, designed for folk who are doing astrometric work. It is available on a single CD-ROM.
- **USNO B1.0**. The USNO B1.0 catalogue is an all-sky catalogue that presents positions, proper motions, magnitudes in various optical passbands, and star/galaxy estimators for 1,042,618,261 objects. The catalogue is believed to be complete down to magnitude 21. Currently it is available either on-line or accessed directly from hard disk (80GB+).
- **UCAC2**. The UCAC2 or Second U.S. Naval Observatory CCD Astrograph Catalog, is a catalogue of 48,330,571 stars covering the sky from -90 to +40 degrees in declination and going up to +52 degrees in some areas. It covers magnitudes down to 17+. It is available on 3 CD-ROMs.

- **UCAC3**. The UCAC3 or Third U.S. Naval Observatory CCD Astrograph Catalog, is a catalogue of 100,766,420 stars covering the sky from -90 to +90 degrees in declination. It covers magnitudes down to 17+. It is available on a double-sided DVD-ROM.
- **UCAC4**. The UCAC4 or Fourth U.S. Naval Observatory CCD Astrograph Catalog, is a catalogue of 113,780,093 stars covering the sky from -90 to +90 degrees in declination. It covers magnitudes down to 16+. It is available on a double-sided DVD-ROM. It corrects many errors in UCAC3.
- **NOMAD**.The Naval Observatory Merged Astrometric Dataset (NOMAD) catalogue is an all-sky catalogue that presents positions, proper motions, magnitudes in various optical passbands, and star/galaxy estimators for over a billion objects. All bright stars are included. Only available on-line. It is a combination of objects derived from the following catalogues:

    1. Hipparcos Catalogue, else
    2. UCAC2 catalog (for stars of magnitude 10 or fainter), else
    3. Tycho-2 Catalogue, else
    4. USNO-B1.0 catalog.

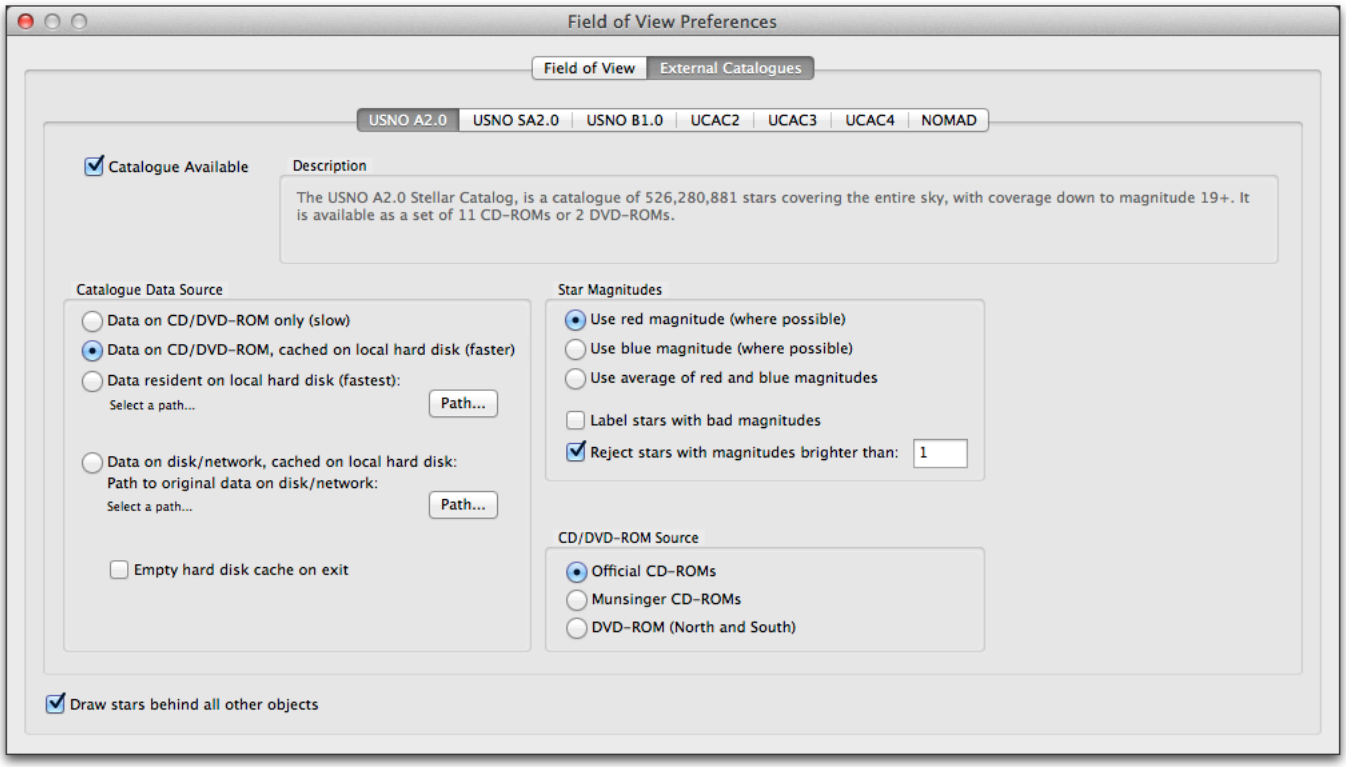


Figure 415: External Catalogues preferences

In order to enable an external catalogue for display, you need to check the **Catalogue Available** checkbox. Once this is done, the catalogue/s will appear at the end of the list of AstroPlanner catalogues on the Field of View tab (in the External Catalogues section).

Each catalogue type has a number of settings, typically specifying where the catalogue is stored, how to interpret the magnitude data, and what kind of media is being used.

20.7 Sky chart preferences

Sky chart preferences can be accessed by:

- Clicking the preferences button at the bottom-right of the chart in the Sky tab of a plan document window (marked in Figure 416).
- Using the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), selecting the ***Other*** tab, and clicking the relevant ***Open*** button.

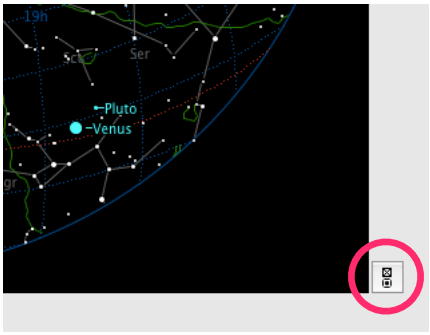


Figure 416: Sky preferences button

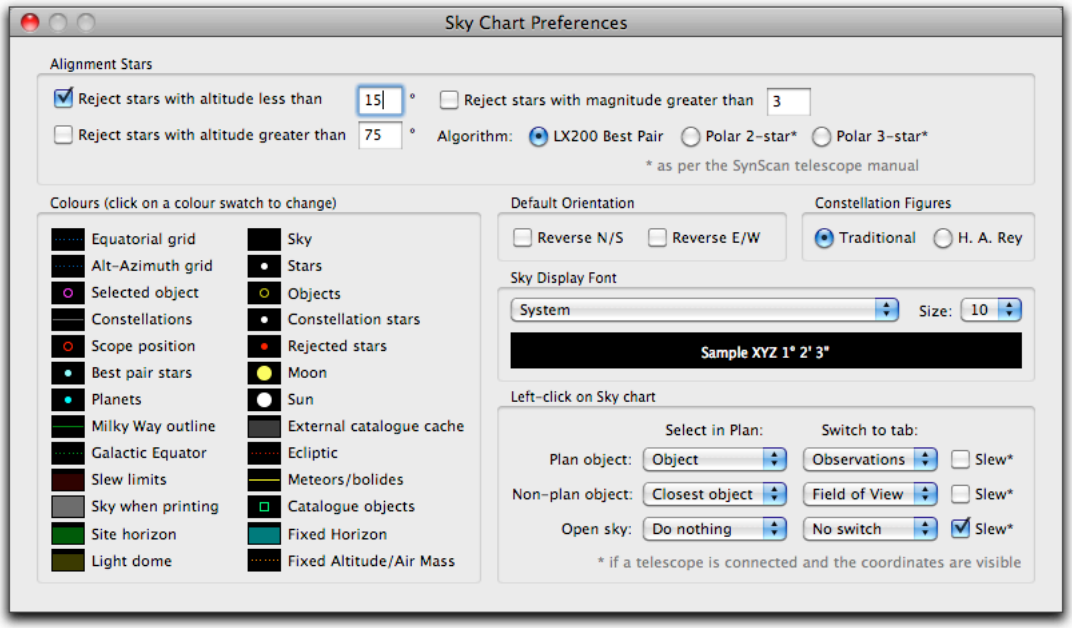


Figure 417: Sky preferences window

20.7.1 Alignment Stars

Reject stars with altitude less than/greater than. These settings will ensure that alignment stars that are too close to the horizon, or too close to the zenith, will be marked as "rejected" and shown in red on the Sky chart (when alignment stars are selected in the Display Options).

Reject stars with magnitude greater than. Similarly, stars that are too dim can be rejected. Useful if you are in a particularly bright sky situation, or are unfamiliar with the dimmer stars.

Algorithm. This is the algorithm used to determine the "optimum" pairs or triples of alignment stars. The **LX200 Best Pair** algorithm was designed specifically for the LX200 Classic telescope, but some folk believe that it works well for any alt-az telescope mount that needs a 2-star alignment. The **Polar 2-star** and **Polar 3-star** algorithms are simplified algorithms for alignment of polar mounts based on the SynScan mount controller.

20.7.2 Colours

These colour swatches can be used to customise all the colours used in the Sky chart. Click on any swatch to change the colour.

20.7.3 Default Orientation

Set the default orientation of the chart. This orientation is the one used to display the chart in any plan document by default. You can subsequently invert E/W or N/S via the Display options if necessary.

20.7.4 Constellation Figures

Choose between traditional constellation "stick figures", and those used by H. A. Rey in his book: *The Stars: A New Way to See Them* (http://www.amazon.com/exec/obidos/tg/detail/-/0395248302/)

20.7.5 Sky Display Font

Select the font and size used in the Sky chart.

20.7.6 Left-click on Sky chart

Specify what happens when you (left) click on the Sky chart. If you click on a displayed plan object, a non-plan object (e.g. a star or catalogue object), or open sky, you can specify what to select in the plan object list, which tab to change to, and whether to slew the telescope to the object in question.

You can choose to select the plan object (if a plan object was clicked on) or closest plan object.

For example, in Figure 417, if you click on a plan object in the sky chart, that object will be selected and you will change to the Observations tab. If you click on a non-plan object in the chart, the closest plan object will be selected, and its field of view chart displayed. If you click open sky in the chart, the telescope will slew to the cursor position (assuming a suitable telescope is currently connected).

20.8 Catalogue preferences

Catalogue preferences can be accessed by:

- Using the ***File > Catalogue Manager...*** menu command and choosing the **Preferences** tab.
- Using the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), selecting the ***Other*** tab, and clicking the relevant ***Open*** button.

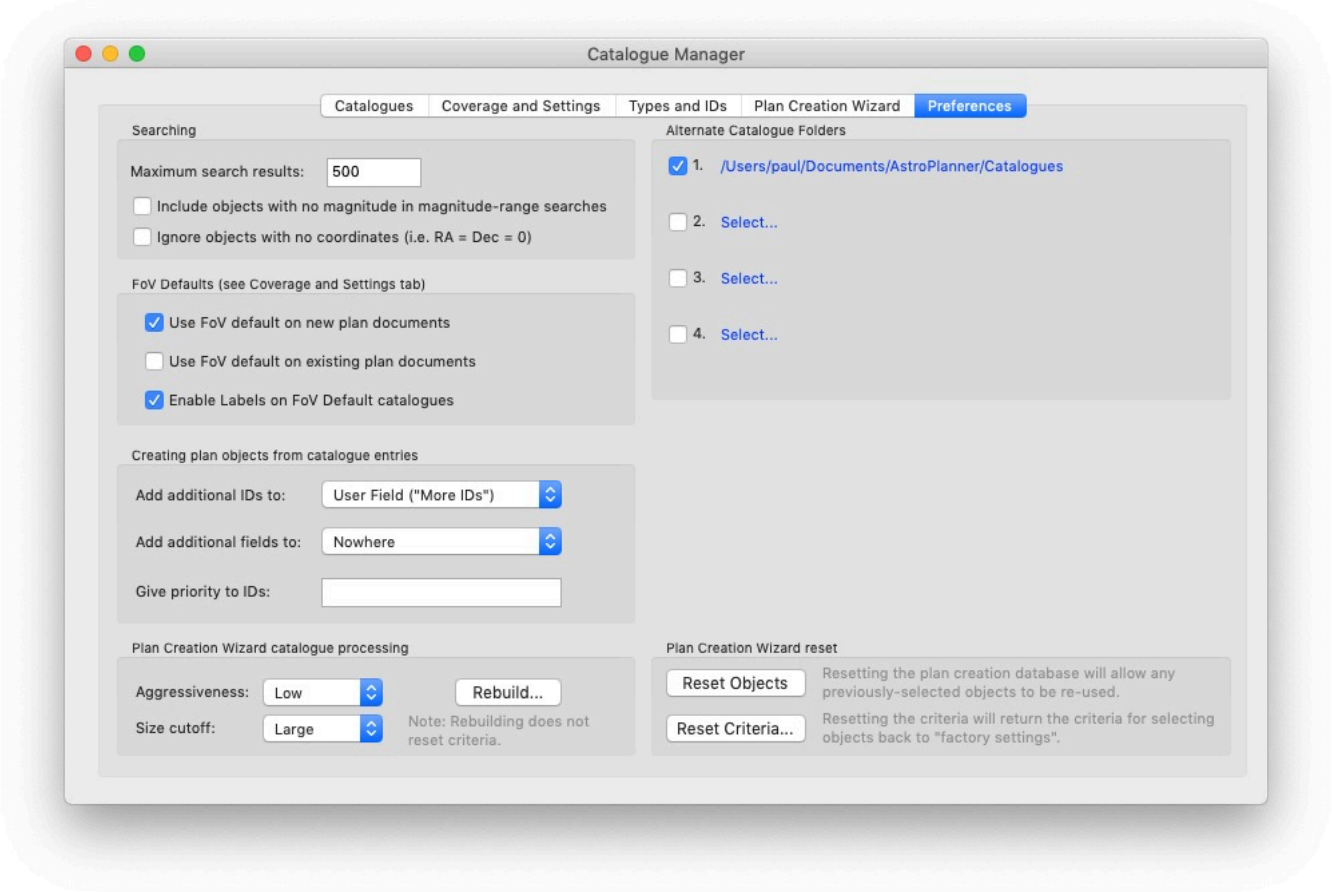


Figure 418: Catalogue preferences

20.8.1 Maximum search results

When searching catalogues for matching objects, this is the maximum number of hits that will be processed. If the limit is exceeded, a warning is displayed and you can choose to continue the search or abandon it.

20.8.2 Include objects with no magnitude in magnitude-range searches

When searching catalogues using a magnitude range as part of the search terms, this option will also include objects that have no defined magnitude, but that would otherwise satisfy the search terms.

20.8.3 Ignore objects with no coordinates (i.e. RA = Dec = 0)

Some catalogues contain the occasional object that has no coordinates (RA = Dec = 0). Generally you would want to ignore these when searching, but turning off this option will include them in any searches.

20.8.4 FoV Defaults

Each catalogue has an associated **FoV Default** flag that can be set (see the **Coverage and Settings** tab of the Catalogue Manager window). This section defines when and how that flag is used.

Use FoV Default on new plan documents. For any *new* plan document, select all catalogues for the Field of View chart that have the FoV Default set.

Use FoV Default on existing plan documents. When opening any *existing* plan document, select all catalogues for the Field of View chart that have the FoV Default set.

Enable Labels on FoV Default catalogues. In addition to selecting catalogues above, also set the Label flag for those catalogues, so that labels are displayed in the field of view chart.

20.8.5 Creating plan objects from catalogue entries

Add additional IDs to. When a catalogue entry/object is added to a plan, and it has more than one associated ID, this setting allows you (optionally) to add those additional IDs to the object Name field, the object Notes field, or a User-defined field called "More IDs".

Add additional fields to. When a catalogue entry/object is added to a plan, and it has field items that do not correspond to columns in the object list (e.g. proper motion, etc.), this setting allows you (optionally) to add those additional fields to the object Name field, the object Notes field, ors User-defined fields with appropriate names.

Give priority to IDs. When a catalogue entry/object is added to a plan, and it has more than one associated ID, this setting allows you to give priority to certain selected IDs. e.g. "M, NGC, IC" would use the Messier (M) ID as the primary ID if present, NGC otherwise, or IC otherwise. If none of those IDs are present, then the first available ID is used (typically the primary ID for the catalogue).

20.8.6 Plan Creation Wizard catalogue processing

The Plan Creation Wizard creates its own database based on the catalogues you have installed. It uses a background thread to create the database (when you first run the application after installation, or whenever you add, delete or update a catalogue). This thread can take a while to process catalogues, and during that time the application can become unresponsive, especially on Windows. This settings allow you to change how this process is done.

Aggressiveness. The more aggressive the setting, the faster the background thread will process catalogues, at the expense of application responsiveness.

Size cutoff. This determines what catalogues are included. Typically only catalogues with fewer than a few hundred thousand relevant objects are processed. You can adjust this maximum, at the expense of potentially missing out on some objects for the database.

Rebuild.... Rebuild the Plan Creation Wizard database from scratch. This is not typically necessary, but you never know... This does not reset the criteria. See below if you need to reset the criteria.

20.8.7 Alternate Catalogue Folders

Catalogues are generally kept in a special location on your hard disk (you can use ***Help > Where's My Stuff...*** to find out where). You can also specify up to four additional/alternate folders containing catalogue files. This is useful if you're sharing catalogues from an older version of AstroPlanner, or if you want to install a larger catalogue (e.g. USNO A2.0) on another disk, etc.

20.8.8 Plan Creation Wizard reset

Reset Objects. As the plan creation wizard is used, it marks any objects it retrieves from its database as "used" so that they will not get retrieved a second time. Using this Reset button will mark all objects in the plan creation wizard's database as "unused".

Reset Criteria. Resetting the criteria will return the criteria for selecting objects back to "factory settings".

20.9 Observation preferences

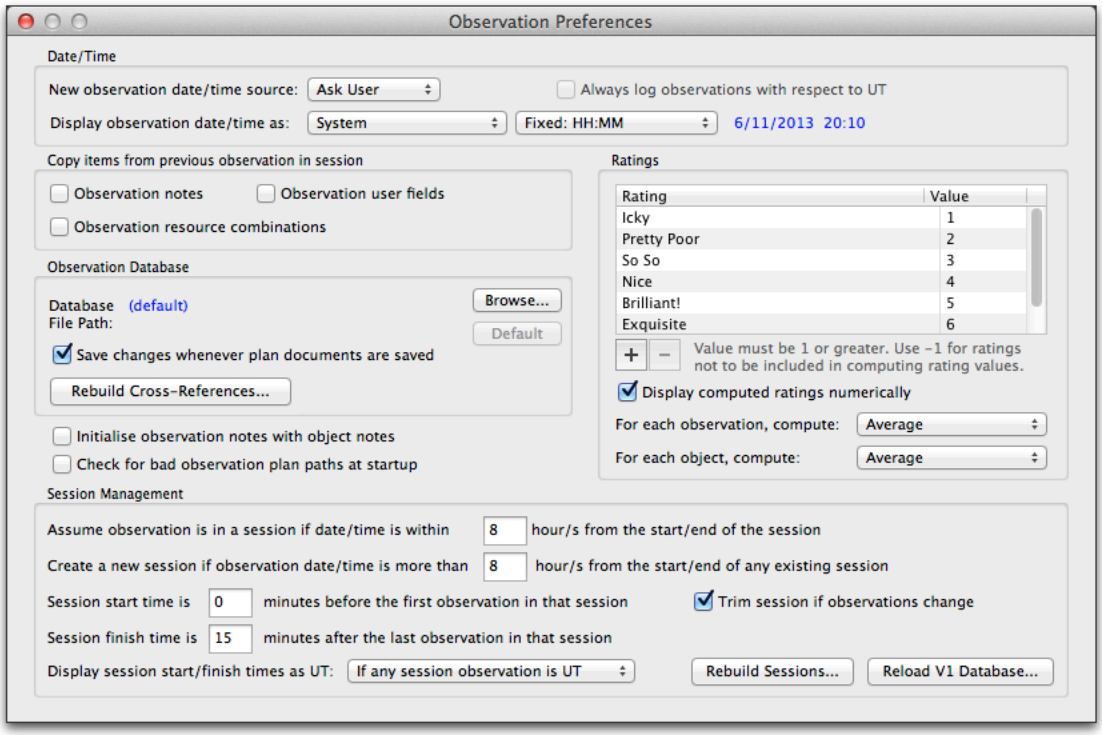


Figure 419: Observation preferences window

20.9.1 Date/Time

New observation date/time source. When you create a new observation, the source of that date and time is determined by this setting.

- **Computer**. The current local date/time is used.
- **Telescope**. If a telescope is connected, and has the capability of being interrogated for its date/time, then that is used. If not, the current local date/time is used.
- **Ask user**. The user is asked to supply the current date/time via a dialog.

Always log observations with respect to UT. If the above setting is **Computer** or **Telescope**, this option, if checked, will make the observation with respect to UT (Universal Time or GMT).

Display observation date/time as. Whenever an observation date and/or time is displayed, these settings are used to determine the format. The current date and time is displayed in the selected format at the right. The date can be:

- **System**. Use the operating system settings to display the date.
- **Fixed: YYYY/MM/DD**. Always show the date as YYYY/MM/DD.
- **Fixed: YYYY.YYY**. Show the date as the year and fraction of the year.
- **Fixed: YYYY-MM-DD**. Always show the date as YYYY-MM-DD.

The time can be:

- **System (short)**. Use the operating system settings to display the time in short format (hours and minutes).
- **System (long)**. Use the operating system settings to display the time in long format (hours, minutes and seconds).
- **Fixed: HH:MM**. Display hours and minutes. 24-hour clock.
- **Fixed: HH:MM.M**. Display hours and minutes+fraction. 24-hour clock.
- **Fixed: HH:MM:SS**. Display hours, minutes and seconds. 24-hour clock.

20.9.2 Copy items from previous observation in session

When you create a new observation, this setting gives you the option of copying data from the previous observation in the current session into the new observation. You choose one or more of: Notes, any user-defined field values (where applicable), and/or resource combinations.

20.9.3 Observation Database

Database File Path. If you wish to use a database located somewhere other than the standard folder location, you can use this setting to do so. Use the ***Default*** button to reset this to the default location.

Save changes whenever plan documents are saved. When you start up the application, the observation database is copied to a temporary location. When the application is quit, the temporary database automatically overwrites the existing one (if changes were made). The setting will also do the overwrite operation every time a plan document is saved.

Rebuild Cross References.... The observation database maintains a list of cross-references between IDs of observed objects. If you add additional catalogues, the list might be incomplete. This button allows you to rebuild the cross-reference list, using all available catalogues. Warning: this can take a while if you have lots of observations. Be prepared to take a coffee break.

20.9.4 Initialise observation notes with object notes

When creating a new observation, this option will initialise the observation notes with the contents of the Notes field for the observed object, where applicable.

20.9.5 Check for bad observation plan paths at startup

The observation database is (by default) checked at startup for any observations that are associated with a plan document that is no longer available at the previously-defined path. You are given the choice to re-attach a plan document, etc. You are also given the choice never to see that irritating dialog again. This option re-enables the path checking at startup.

20.9.6 Session Management

Assume observation is in a session. If a new observation is created that has a date/time that is later than the specified time before the current beginning of a session, and earlier than the specified time after the current end of the session, then that observation is assumed to be in that session. The session start or end time will be adjusted to include the observation date/time.

Create a new session. If a new observation is created that has a date/time that is earlier than the specified time before any existing session, and later than the specified time after the current end of any existing session, then a new session is started. The session start or end time will be adjusted to include the observation date/time. If the date/time falls between the above limits, the user is asked

via a dialog whether a new session should be started, or whether an existing one should be extended.

Session start time/session finish time. These values are added to the beginning or end of a session (i.e. the date/time of the first and last observation. This could be construed as the time required to set up the telescope, break it down, etc.

Trim session if observations change. If you delete the first or last observation in a session, this option will trim the session start or finish time to compensate.

Display session start/finish times as UT. Determines if the session date/times should displayed as UT (Universal Time/GMT), based on the session's observations. The choices are:

- Never
- Always
- If any session observation is UT
- If all session observations are UT

Rebuild Sessions.... If the need arises, this button will delete all existing sessions and rebuild them based on the underlying observations. It will attempt to keep any observation names, notes, and/or user-defined field values, but this is not guaranteed in all cases.

Reload V1 Database.... This action will request the location of an AstroPlanner V1 database file and convert it for use in V2. This will destroy any existing V2 observations and sessions.

20.9.7 Ratings

The Ratings field can have multiple numeric values, starting at 1. These settings allow you to set up the values that are valid, and an alphanumeric rating to go with each numeric value. Use the **+** button to add a new entry, and **-** to delete. Click on the entries to edit. If you want to include values that shouldn't be included in computing rating values (e.g. "Was not observed", "Seeing not adequate", etc.), then assign a value of -1.

Display computed ratings numerically. If a computed rating (e.g. average rating for a given object) is displayed, then it can be displayed numerically (e.g. 3.5) or alphanumerically (e.g. "Nice") - in which case the numeric value will be rounded.

For each observation, compute. When displaying the rating for an observation, the individual ratings logged for each resource combination (e.g. eyepiece/telescope combination) is computed as one of:

- Average
- Minimum
- Maximum
- Median

For each object, compute. When displaying the rating for an object, the individual ratings logged for each resource combination (e.g. eyepiece/telescope combination) of each observation for that object is computed as one of:

- Average
- Minimum

- Maximum
- Median

20.10 Image preferences

Image preferences can be accessed from various places:

- Via main menu: ***Image > Image Preferences...***
- Right-clicking an image and choosing ***Image Preferences...*** from the popup menu.
- By clicking the preferences button in the Images display window (marked in Figure 420).

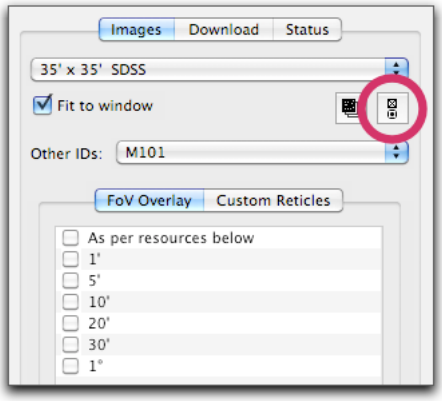


Figure 420: Image preferences button

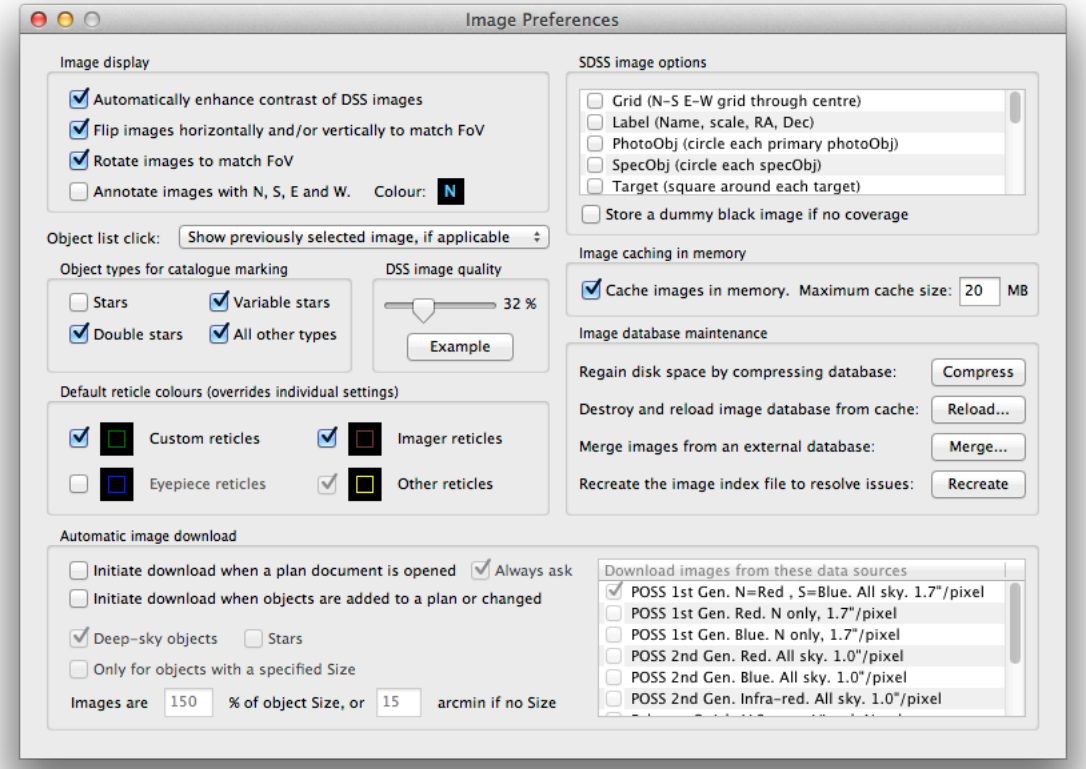


Figure 421: Image Preferences window

20.10.1 Image display

Automatically enhance contrast of DSS images. When DSS images are downloaded the contrast might be such that the background sky is not black when it should be. This option automatically adjusts the contrast of images so that the sky background is black. Note that this might cause loss of any faint detail in the image.

Flip images horizontally and/or vertically to match FoV. The images are flipped to match the E/W and N/S orientation of the plan document's field of view chart.

Rotate images to match FoV. The displayed images are rotated to match the rotational orientation of the plan document's field of view chart, where applicable.

Annotate images with N, S, E and W. Annotate the edges of the images to indicate the cardinal directions. Click the colour swatch to change the text colour.

20.10.2 Object list click

When you select an object in the plan document's object list, and it has more than one associated image, this setting determines which of those images is displayed by preference:

Don't show cached images
Show previously selected image, if applicable
Show 5' x 5' image, if applicable
Show 10' x 10' image, if applicable
Show 30' x 30' image, if applicable

Show 1° x 1° image, if applicable
Show 2° x 2° image, if applicable
Smallest size image
Largest size image
Smallest size image ≥ object size, if applicable
Colour image, if applicable

20.10.3 Object types for catalogue marking

The types of objects that will show an image "badge" when you display a catalogue. This allows you to ignore, say, stars (that appear in many images and can slow down catalogue display if enabled).

20.10.4 DSS image quality

DSS images are downloaded and saved as JPEG images. This setting defines the quality of those saved images. Since JPEG images utilise "lossy" compression, lower quality images take up a lot less space on hard disk. To see the effects of changing image quality, click the **Example** button.

The example window shows an original image on the left, and a modified quality image on the right. Use the Zoom slider to zoom in, and use the Quality slider to show the effect of making the image quality a particular value. You'll see that the quality of the image doesn't change much as you decrease its value below 100%, but once you get below 20% the artifacts become more apparent.

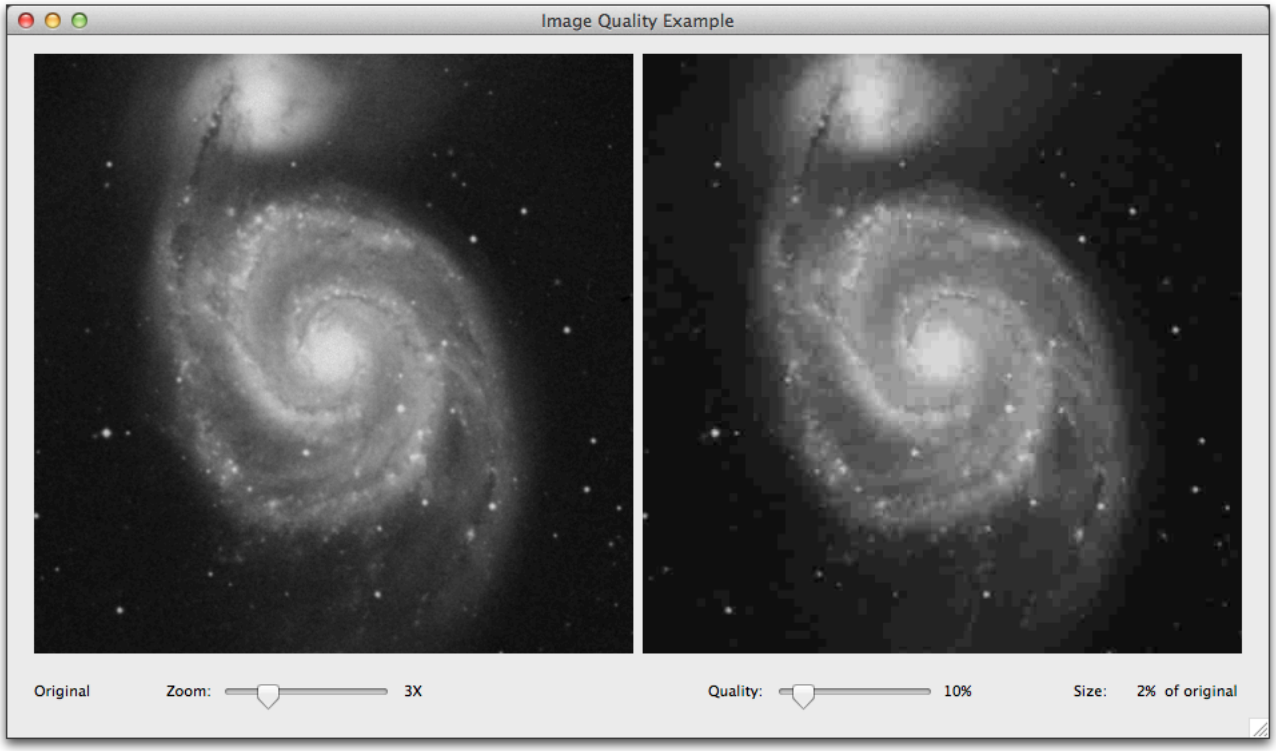


Figure 422: Image quality example window

20.10.5 Default reticle colours

These settings allows you to override the colour that the various reticle types use by default. Select the checkbox to override the colours (note that the Other category is *always* overridden). Click the colour swatches to edit the colours.

20.10.6 SDSS image options

These are options for SDSS colour images only. The list of checkboxes offers several options available for the downloaded images from the SDSS web site. Typically they will all be off, unless you have a specific need.

Store a dummy black image if no coverage. SDSS currently only covers part of the northern sky. If you try and retrieve an SDSS image from a non-covered part of the sky, you typically get an error and no image is stored. This setting will store a special (and small) all-black image. This has the advantage that the application will not try and re-download the same SDSS image again (assuming you have that option set when downloading).

20.10.7 Image caching in memory

Images are stored in a disk-based database. If you are flipping between a few images this can cause delays while the image is retrieved from the database. This is particularly noticeable for large angular size images. This setting will cache those retrieved images in memory, on a first-come-first-served basis which will improve access and display time.

20.10.8 Image database maintenance

These are actions that you can use where necessary to maintain the database. Typically you would only use these if a problem exists.

Regain disk space by compressing database. Over time, if images are deleted, the database does not automatically re-use that space for new images, since retrieving the space takes a non-trivial amount of time. If you have that time to spare, use this action. It has no effect on the database contents apart from doing an internal reshuffling, and is safe to do whenever you like.

Destroy and reload image database from cache. When you move from AstroPlanner V1 to AstroPlanner V2 and beyond, the image database is built from the old image caching technique used in the older versions. If you want to start again and rebuild the database from the older cache, use this action. Warning: it will destroy all images and image data in the current database.

Merge images from an external database. If you are operating AstroPlanner on more than one computer and you want to merge new images from another image database, you can use this action. Use ***Help > Where's My Stuff...*** on the secondary computer to locate the image database that you want to merge.

Recreate the image index file to resolve issues. To speed up image access, a cache file is created. This can, on occasion get out of sync with the database. This option will recreate the file. It should have no adverse effects.

20.10.9 Automatic image download

Normally, image downloading is done manually upon request, but these options allow for automatic download of objects in the background (assuming suitable Internet access is available). Note that these settings only apply to non-solar-system objects (i.e. stars and DSOs)

Initiate download when a plan document is opened. Whenever you open a plan document, and objects exist in that document without associated images in the database, then images will be downloaded for those objects. This will be done silently, unless the **Always ask** checkbox is checked, in which case you'll be asked if you want to proceed with the download.

Initiate download when objects are added to a plan or changed. When an object is added to an open plan document, or an object in that plan is changed (its coordinates are changed), start an automatic download for that object.

Deep-sky objects/Stars. Specifies what kind of objects will have images downloaded. Typically you would probably only want images of DSOs. However, double star observers might disagree.

Images are xxx % of object Size, or yyy arcmin if no Size. If the object has a defined size (e.g. 15 x 10), then the downloaded image will be xxx % of the largest dimension of that size. If the object does not have a defined size, then the image will default to being yyy' X yyy'.

20.11 Scripting preferences

Scripting preferences can be accessed from various places:

- Via main menu: ***Script > Script Preferences...***
- By clicking the preferences button in the script editor window (marked in Figure 423).

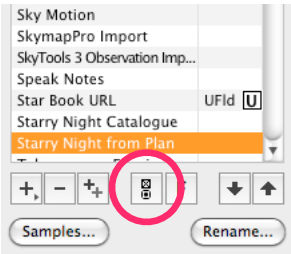


Figure 423: Script preferences button

20.11.1 Editor Settings

These are settings that influence how the dedicated script editor behaves.

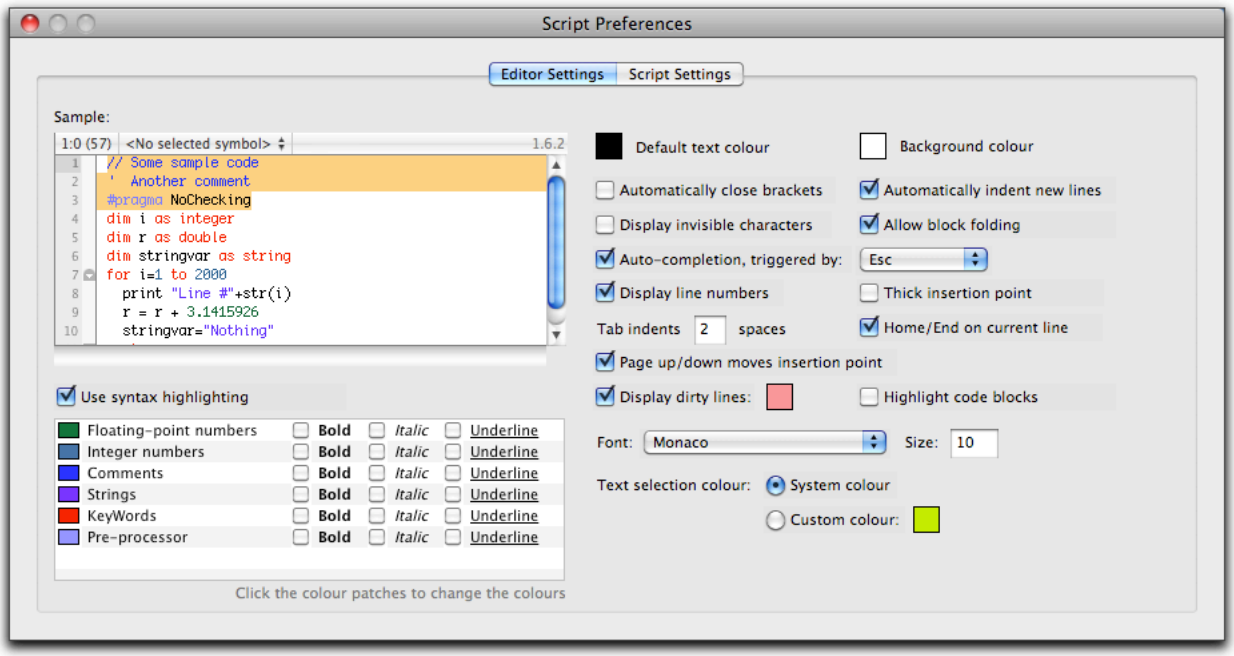


Figure 424: Script preferences window - Editor Settings

The **Sample** is a mini-editor that reflects any changes you make to the settings, so that you can see the effects of doing so.

Use syntax highlighting. If this option is on, then the text is coloured according to syntax. The list below the checkbox gives the various syntactical items that can be highlighted together with the colours to be used, and bold/italic/underline options. Click the colour swatches to change the colours.

Default text colour. Normally black, but you might prefer another colour (especially if you change the next setting). Click the colour swatch to change the colour.

Background colour. Normally white, but some might prefer a blue or black background. Click the colour swatch to change the colour.

Automatically close brackets. When this option is selected, then whenever you type an open bracket ("(", "[", or "{"), a matched closing bracket will be inserted automatically immediately after the text cursor.

Automatically indent new lines. Automatically indent/outdent new lines according to the syntax. e.g. if you type an "if...then" statement and hit Enter, the next line will be indented with respect to the "if...then" line. If you subsequently type a matching "end if" statement, it will be outdented.

Display invisible characters. Characters that are normally invisible (e.g. space, newline, etc.) will be displayed with a visible character.

Allow block folding. Blocks (e.g. if...then - end if, do...until, while...wend, etc.) will have special folding widgets displayed in the left margin. Clicking on such a widget will "collapse" the block down to a single line as an editing convenience. Clicking again "expands" or restores the block.

Auto-completion. When you type a reserved word or commonly-used framework class name, it will be auto-completed (i.e. as you type the start of the word, the rest is displayed after the cursor). If you hit the specified trigger key/s, the displayed word will be automatically completed. If there is more than one possible word, a popup menu will let you select the correct choice.

Display line numbers. Line numbers are displayed to the left of the text.

Thick insertion point. If the standard blinking insertion point character is difficult to see, you can opt for a thicker character.

Tab indents. For tabbing, or auto-indenting, this specifies the number of spaces to insert for each tab/indent.

Home/End on current line. Normally the **Home** key moves to start of the text (on the first page), and then **End** key to end of the text on the last page. This setting makes **Home** go to the beginning of the current line, and **End** to the end of the current line.

Page up/down moves insertion point. When you use the **Page Up** or **Page Down** keys, the standard behaviour is to scroll to the next page without moving the insertion point. This option moves the insertion point to the beginning of the page currently shown.

Display dirty lines. "Dirty" lines (i.e. those that have been changed by editing) are shown by marking them in the left margin with the specified colour. Click the colour swatch to change the colour.

Highlight code blocks. If this option is selected then moving the cursor to the left margin of any code block (e.g. if...then - end if, do...until, while...wend, etc.) will temporarily highlight the extent of

that block. If this option is not selected, then this behaviour only happens if you click the mouse in the margin next to a block.

Font. The font and size of the text being edited.

Text selection colour. When you select text (e.g. by dragging the mouse, or using shift-click, etc.) this is the colour used for the selection background. The **System colour** setting uses the standard operating system setting for this. However, the **Custom colour** setting can be used to customise that colour. Click the colour swatch to change the colour.

20.11.2 Script Settings

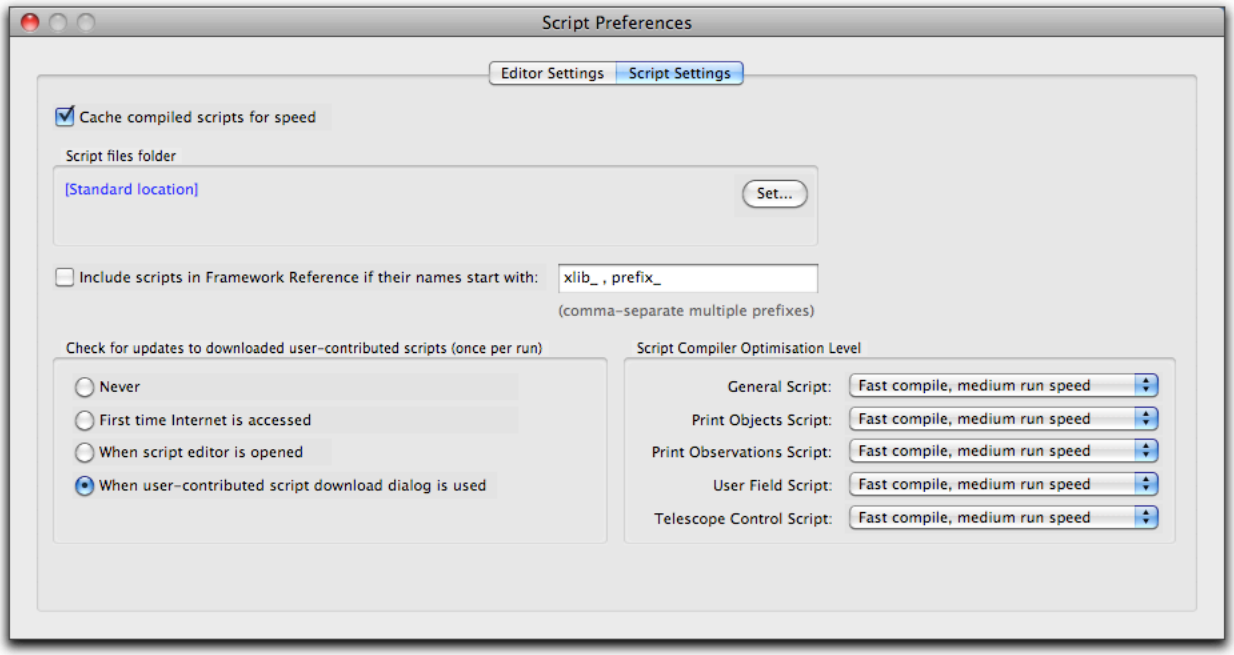


Figure 425: Script preferences window - Script Settings

Cache compiled scripts for speed. When this option is selected, a script is pre-compiled the first time it is used, but not thereafter (unless a change is made to the script). If the option is not selected, the script is compiled every time it is run. This can add significant delays to each run.

Script files folder. The standard location for scripts is in the Application Support folder. This setting lets you select another folder to use. This can be useful if you want to share a scripting folder with another editing application, etc.

Include scripts in Framework Reference. You can add your own script files to the Framework Reference window if this option is selected. Only scripts that start with the given prefixes will be included.

Check for updates to downloaded user-contributed scripts. If you download a user-contributed script, there's a chance that it will be updated. This setting allows you to check the on-line inventory to see if there's a more recent version of any script you previously downloaded. The choices specify when this check is done.

Script Compiler Optimisation Level. For the various types of scripts, these settings specify the compiler optimisation level to use. The more optimisations used, the slower the initial compile, but

the faster the script running speed. Typically a fast compile is more desirable than a (relatively small) increase in run speed - unless you have a very compute-intensive script.

20.12 Other preferences

Other preferences consist of some shortcuts to get to the various preferences windows, as well as a way to move your application support location to a non-standard location. They are accessed by the ***AstroPlanner > Preferences*** menu command (Macintosh) or ***Edit > Preferences*** menu command (Windows), and selecting the ***Other*** tab.

Clicking the ***Open*** button for any of the listed preferences will open the corresponding preferences editing window.

Use alternate application support data path. Normally all the common support files (observation database, catalogues, etc.) for AstroPlanner reside in a folder in your Application Support folder. This setting allows you to select an alternative location for this folder if you so desire (perhaps for sharing purposes across computers). You'll also be given the chance to copy existing files across where applicable. *It is recommended that you use this setting only if you **really** need to.*

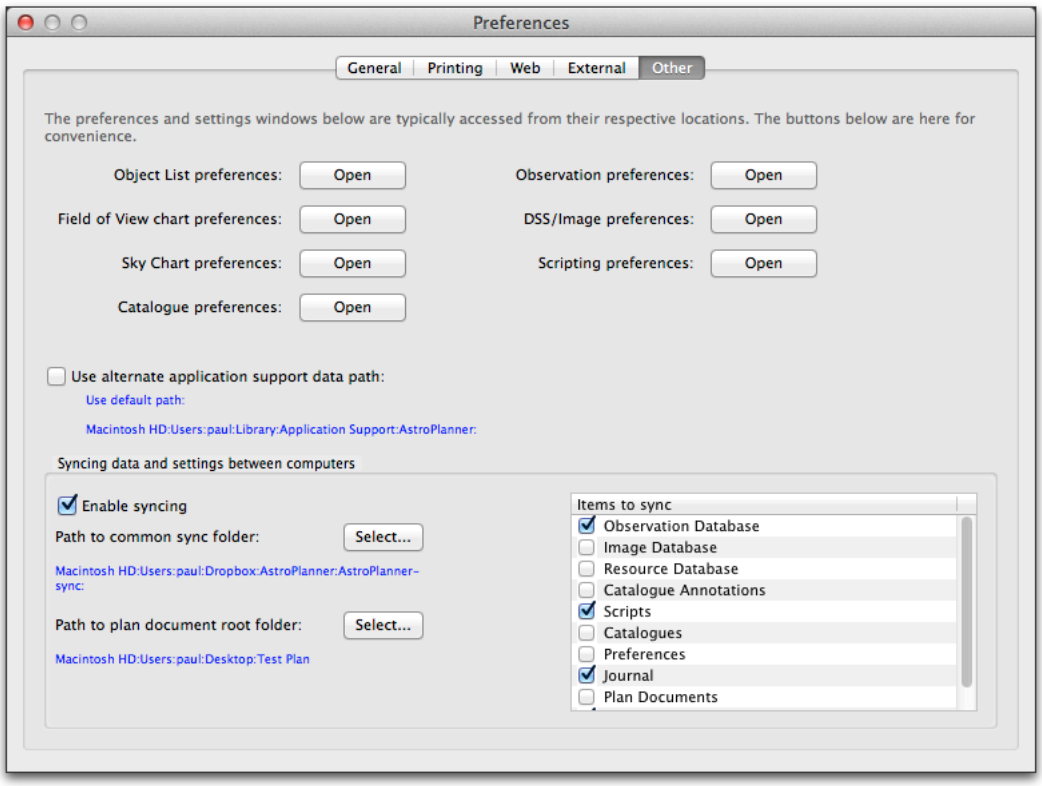


Figure 426: Other preferences

Syncing data and settings between computers. This feature, if enabled, will sync data and settings between AstroPlanner running on two or more computers. It is assumed that you are not running AstroPlanner on more than one of those computers at any one time.

The feature uses a folder that is common to all the computers to be synced. This might be a folder synced by a service such as DropBox or iCloud, a common networked drive, or a NAS drive on your local network.

On each synced copy of AstroPlanner, you select the path to to the common sync folder (which must be the same synced folder on each). Then chose the items you want to sync (noting that some of these might be quite large (e.g. Catalogues and Image Database). You can also sync plan documents in a folder and all its subfolders (by specifying the root folder containing the plan documents).

Once this is enabled, the following happens:

- When you quit from AstroPlanner, it compares the files you asked to be synced with the copies in the common sync folder. If the files don't exist or have been changed during the current run of AstroPlanner, then they are copied to the sync folder. This is done automatically and requires no intervention.
- When you start AstroPlanner, the first thing it does (if syncing is enabled) is compare the chosen files with those in the sync folder. If the synced files are newer then it will list any new files and ask if you want to refresh the older files before continuing.

Note:

- The mechanism does not handle file deletion. i.e. if you, say, delete a file on computer A, it will not automatically be deleted on computer B. This will need to be done manually.
- Make sure, if you're using a service such as DropBox that syncs over the Internet, that the files have had a chance to permeate to your computer before you fire up AstroPlanner.

21 Communicating with other applications

There are various ways you can communicate with applications other than AstroPlanner itself.

21.1 Importing & exporting data

You can import data from other applications by importing that data from within AstroPlanner itself (see Section 26.1 on page 349 for more details).

Other applications might be able to accept data in a format exportable by AstroPlanner (see Section 26.2 on page 359 for more details).

21.2 Direct control

AstroPlanner allows direct control of, and by, selected external applications (primarily planetarium-style applications). In order for such an external application to be supported it must have a means of communicating with it from AstroPlanner, via various technologies such as TCP/IP, AppleScript, etc. Also, the protocol for doing so must be published by the authors of those external applications.

You can support one of these applications at a time. The application is chosen in the External preferences (see Section 20.4 on page 291)

Currently, the following external applications are supported by AstroPlanner.

21.2.1 Cartes du Ciel (SkyChart)

http://www.ap-i.net/skychart/

This is a freeware planetarium application. AstroPlanner supports both V2 (Windows-only) and V3 (Windows and Macintosh).

AstroPlanner can control the pointing of the field of view in Cartes du Ciel, and vice versa.

21.2.2 C2A

http://www.astrosurf.com/c2a/english/

This is a planetarium application (Windows-only).

AstroPlanner can control the pointing of the field of view in C2A, and vice versa.

22 User-contributed observing plans

As well as creating your own observing plans, you can also benefit from the efforts of other users and download ready-to-use plan documents that have been uploaded to an online database by others. This database is common to all registered users, and you are free to upload your own plans to this database to benefit others. Obviously this feature requires a live connection to the Internet.

22.1 Downloading plans

Use the ***File > User-Contributed Plans > Download...*** menu command to bring up a window showing the inventory of available plans.

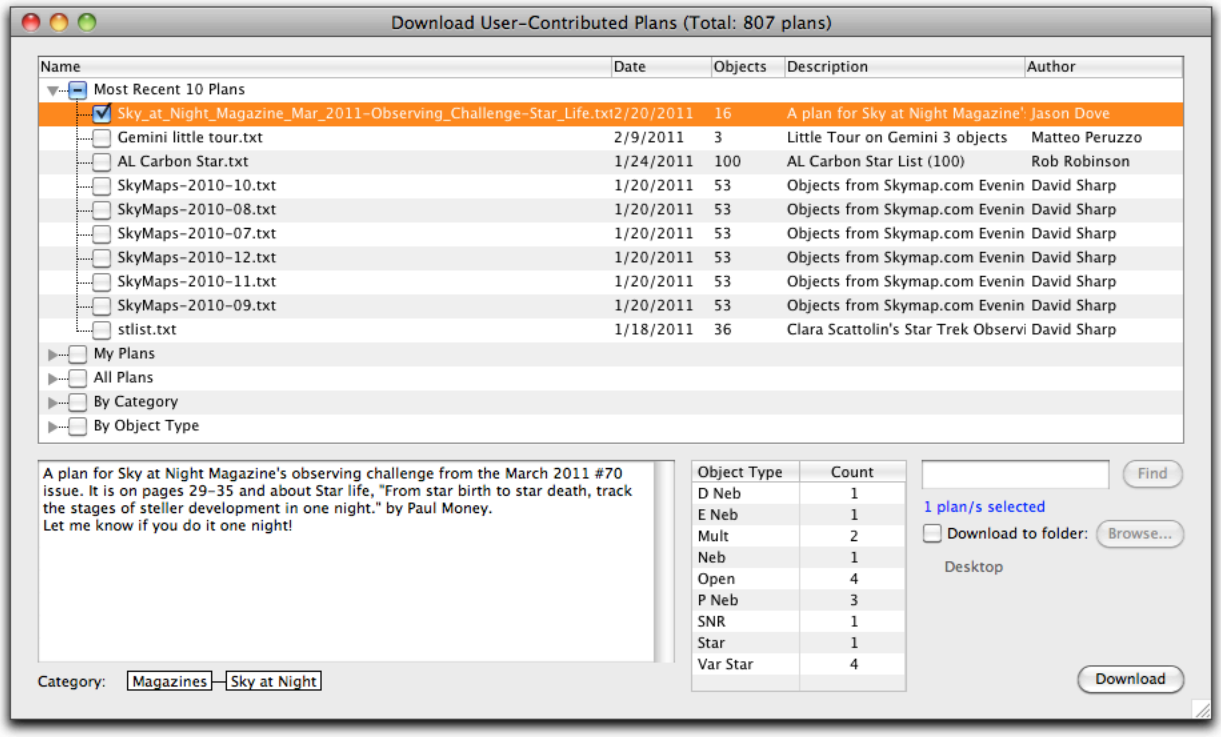


Figure 427: User-contributed plan download window

The ten most recently uploaded plans are displayed first, since these are the most commonly downloaded plans. The inventory of available plans can be displayed in various orders in a hierarchical fashion. In particular:

- **My Plans**. A list of all plans that were uploaded by you. Only you can delete or replace these plans (see below).
- **All Plans**. Can be displayed **By Date** (by year of submission), **By File Name** (alphabetically), **By Number of Objects** (number of objects in the plan document), or **By Author** (the person originally submitting the plan).
- **By Category**. Plans are stored by category and sub-category. e.g. there's a **Magazines** category that contains plans derived from magazine articles. That category has sub-categories for **Sky & Telescope**, **Astronomy**, **Sky at Night**, etc. You can "drill down" until you find the plan you want.

- **By Object Type**. A list of object types (e.g. galaxies) and which plans contain those types of objects.

Each plan entry includes the file name, the date of submission, the number of objects in the plan, (part of) the description, and the author.

Clicking on a particular plan entry displays the complete description, the category, and a list of object types present in that plan document.

You can also search for particular plan documents by typing a search string into the Find field and clicking the ***Find*** button.

Selecting a plan for download consists of checking the checkbox to the left of the plan file name. You can select more than one plan to download.

Clicking the ***Download*** button starts the download process for each selected plan. Each plan is opened into a separate plan document window. It will then be up to you to save the plan somewhere convenient.

You can also elect to download the plan documents directly to a specified folder (select the **Download to folder** checkbox, and use the **Browse...** button to choose a suitable folder). The plans will be downloaded directly to files in the specified folder, with the same name as the original plan. This is a lot quicker than the first method, especially if you are downloading several plan documents at once.

22.2 Uploading a plan

You can upload the frontmost plan document by using the ***File > User-Contributed Plans > Upload...*** menu command.

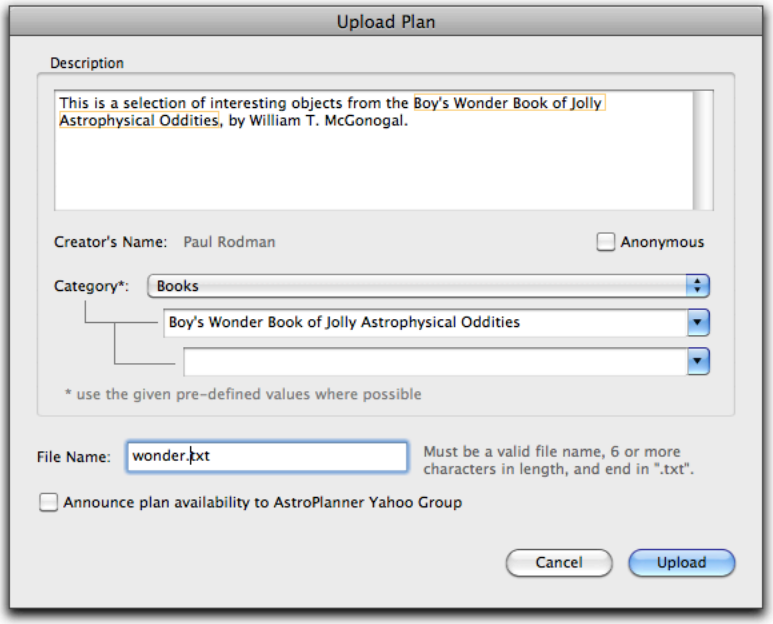


Figure 428: User-contributed plan upload dialog

You will need to enter a description and select a category for the plan document (this information comes from the plan document information (Section #.# on page #) and might already be set up.

The document will be uploaded under your registered name. You can use the **Anonymous** checkbox to ensure your identity remains hidden from other users (your plan will have the author set to "Anon." or "Anonymous").

You also need to give the plan a file name. This should be unique. If it is already in use by another user, then you'll be asked to choose another name. If it is the same name as one of your uploaded plans, then you'll be given the option to overwrite the previously-uploaded plan.

Finally, you can use the **Announce plan availability to AstroPlanner Yahoo Group** checkbox to send an automated e-mail message to the user's group to let them know of the upload.

22.3 Deleting a plan

You can delete any plan document you previously uploaded by using the ***File > User-Contributed Plans > Delete...*** menu command. Select the plans scheduled for deletion with the checkboxes, click ***Delete***, and they will be permanently removed from the on-line database.

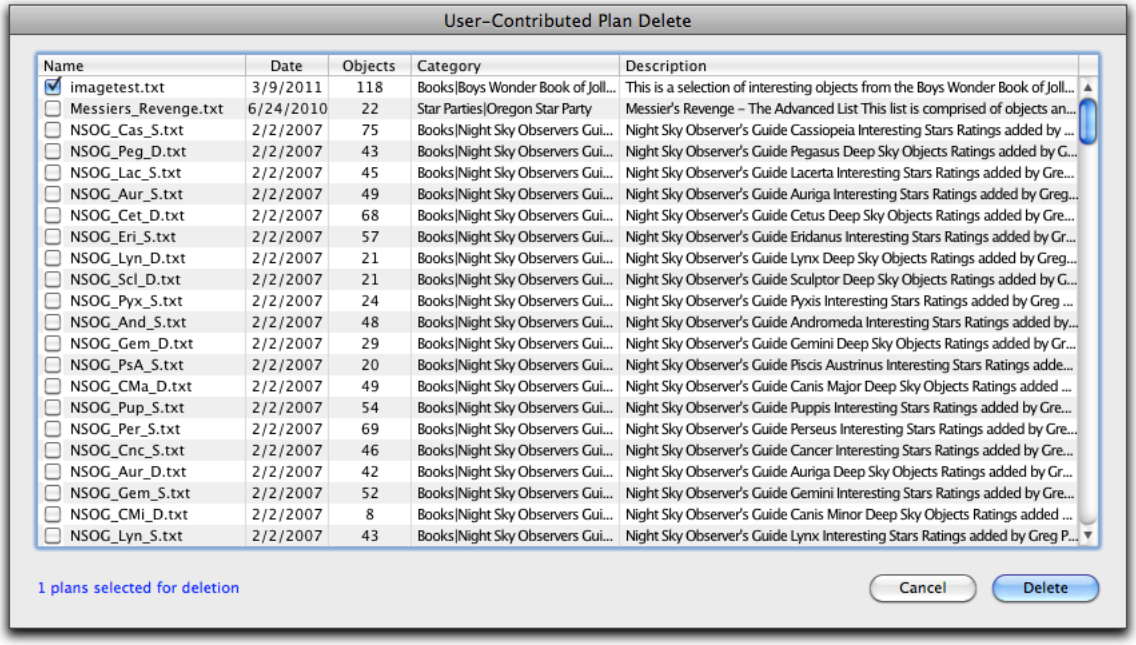


Figure 429: User-contributed plan deletion dialog

23 Managing catalogues

Catalogues are files containing collections of objects that are typically related. Most of the catalogues available for AstroPlanner are derived from professional astronomical catalogue data. This chapter is about managing these catalogues.

You always have at least one catalogue (Bright Star Catalogue) in your application's catalogue *collection*. Additionally, you might have a CD/DVD-ROM or USB flash drive from the vendor containing AstroPlanner catalogues. Most of the catalogues (apart from the bigger ones) are also available on-line and can be downloaded from the repository there.

23.1 Using the Setup Wizard

The simplest way to manage catalogues is with the Setup Wizard (***File > Setup Wizard...***), although you are pretty much limited to adding catalogues to your collection, either from a CD- or DVD-ROM, or by downloading them from the on-line repository.

The wizard dialog appears the first time you run AstroPlanner, but can be used any time to add more catalogues. Click the ***Next*** button until the **Catalogues** page appears (Figure 431). You will be asked if you want to install catalogues from a CD/DVD-ROM or USB flash drive, and to mount that disk/drive if necessary.

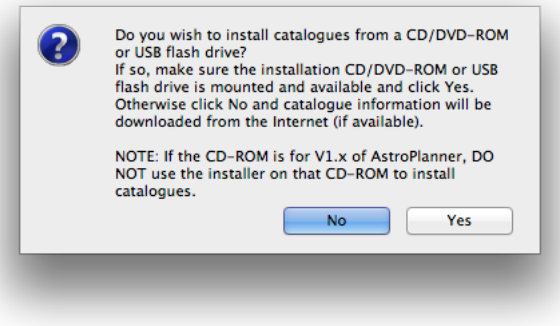


Figure 430: CD/DVD-ROM/USB flash drive warning

The available catalogues are listed in the Suggested Catalogues list. You can select any catalogues you like from the list using the checkbox next to each one (already-installed catalogues excepted). You can also use the User Survey check list on the left and let AstroPlanner make suggestions (in green) for you. Once you've made your selection, click the ***Finish*** button. The catalogues will then be installed into your collection.

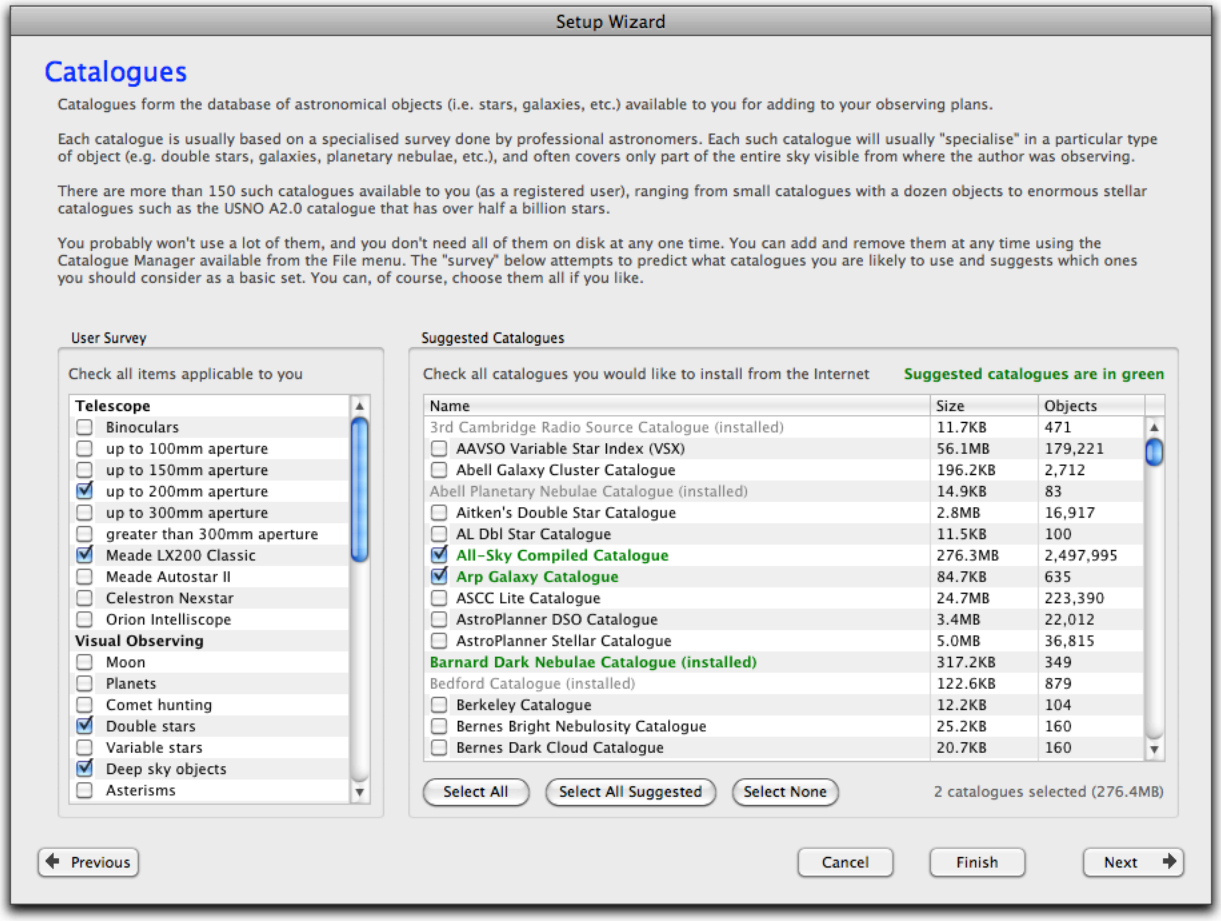


Figure 431: Setup Wizard Catalogues page

23.2 Installing, updating and removing catalogues

The most flexible way to manage your catalogue collection is by using the Catalogue Manager (***File > Catalogue Manager...***). The manager window lists all available catalogues in a list. The first column is the current **Status** and can be:

- **Not installed**. The catalogue is not currently installed in your collection, and can be installed if desired using the **Install** checkbox in the **Action** column.
- **Installed**. The catalogue is currently installed in your collection, and can be removed if desired using the **Remove** checkbox in the **Action** column.

Additionally, if the source is the on-line repository, the **Status** can also be:

- **New**. This is a new catalogue created since the last time you used the Catalogue Manager, and can be installed if desired using the **Install** checkbox in the **Action** column.

- **Deprecated**. This is a catalogue that exists in your collection, but that has been deprecated (made redundant or replaced by another catalogue)[1] since you installed it. It can be removed if desired using the **Discard** checkbox in the **Action** column.
- **Updated**. This is a catalogue that exists in your collection, but that has been updated or revised since you installed it. It can be updated if desired using the **Update** checkbox in the **Action** column.

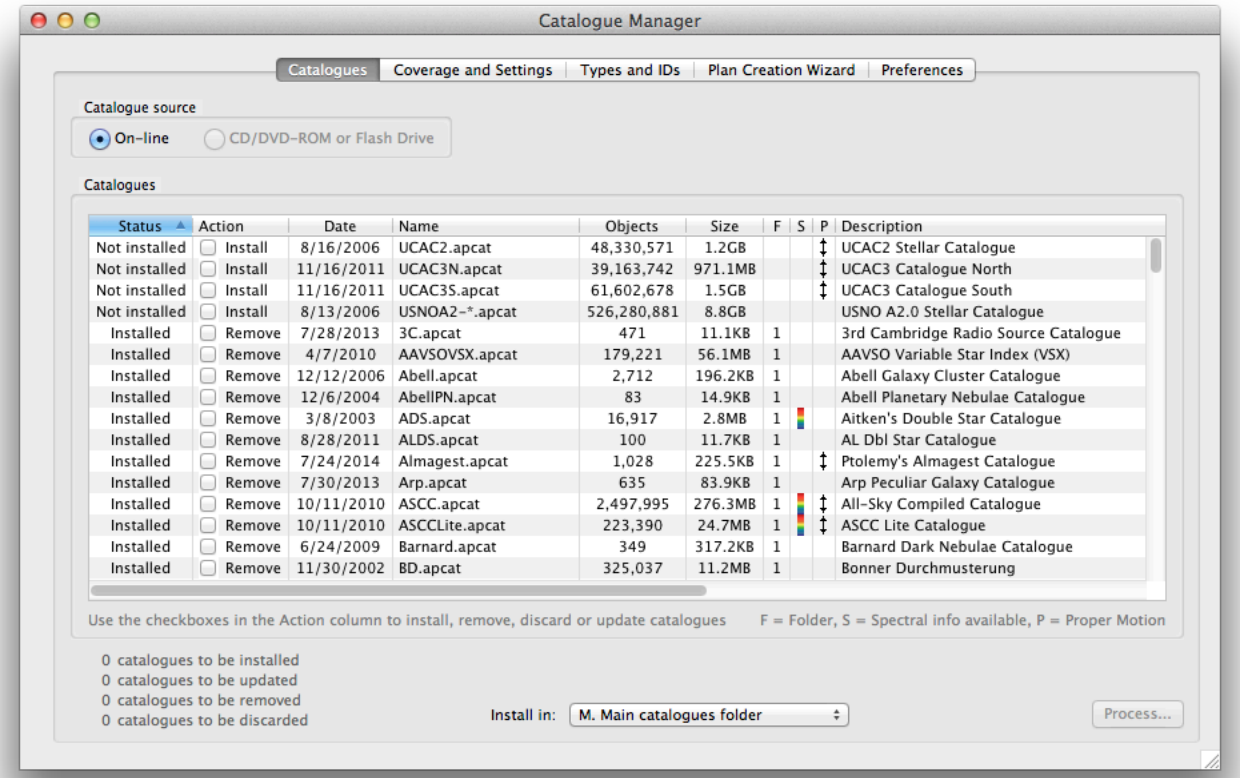


Figure 432: Catalogue manager with catalogue list

If you check any of the checkboxes in the **Action** column then the button at the lower right will be enabled. If you have multiple catalogue folders (see below) then you will need to select the folder that you wish to install to, using the **Install in** popup. The button at the lower right will change its caption to to reflect what you want to do (e.g. Install, Remove, Process, etc.). Clicking it will start the installation/update/removal process.

The **F** column specifies what folder the catalogue is installed into (useful if you have alternate catalogue folders. The **S** column contains an entry if the catalogue includes spectral information for the contained objects. The **P** column contains an entry if the catalogue includes proper motion information for the contained stellar objects.

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1. This often happens with some older catalogues that are found to be too full of bugs or inconsistencies. Such catalogues are no longer supported by the vendor. You don't have to remove them, but you will no longer be able to download them from the on-line repository. i.e. when they're gone, they're gone.

Right-clicking the list of catalogues gives you some options for selecting catalogues (i.e. turning on the checkbox in the Action column). You can select all installed catalogues, all deprecated catalogues, etc.

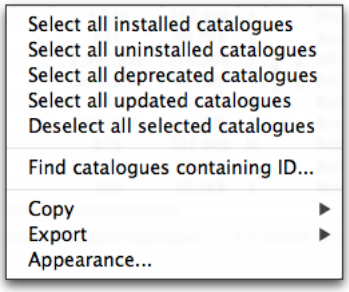


Figure 433: Catalogue Manager list options

The **Find catalogues containing ID...** item allows you to enter an object prefix, and it will list any available catalogues that have that ID prefix as a primary ID (i.e. catalogues that probably have all objects with that ID prefix), or as a secondary ID (i.e. catalogues that have at least some of the objects with that ID prefix). If the catalogues are not installed, you can then select one or more of them for installation.

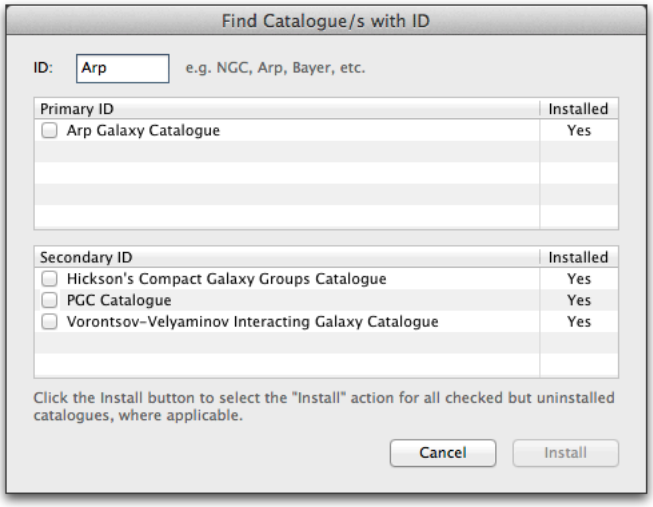


Figure 434: Find catalogues containing ID

23.3 Catalogue settings and coverage

The **Coverage and Settings** tab of the Catalogue Manager lets you set some flags on the catalogues, and also show the sky coverage of each catalogue on an all-sky map. The list contains an entry for each installed catalogue in your collection. Clicking on a catalogue entry shows the sky coverage. It also allows you to set the following flags on each catalogue:

- **Preferred (P)**. When catalogues are searched, those marked as **Preferred** are searched first.
- **Don't search (D)**. When catalogues are searched, those marked **Don't search** are skipped.

- **FoV default (F)**. When a new plan window is created, each catalogue marked as **FoV default** will be switched on in the Field of View chart catalogue list[1]. This is only done initially, and any such selected catalogues can be switched off thereafter.
- **Sky chart (S)**. Any catalogue marked as **Sky chart** will be displayed in the Sky chart if the ***Objects > Catalogue objects*** display option is used.
- **Use Name (N)**. Use the Name field of the catalogue entry instead of the ID when displaying objects in the Field of View chart (if the Name is non-blank). This is useful if the catalogue Name is more "meaningful" than the primary ID. e.g. the SAC DSO catalogue: NGC20 (Name) is better than SAC6 (ID).
- **FoV Min** and **FoV Max**. The minimum and/or maximum magnitudes to be used to limit which objects in the catalogue are displayed in the field of view chart.

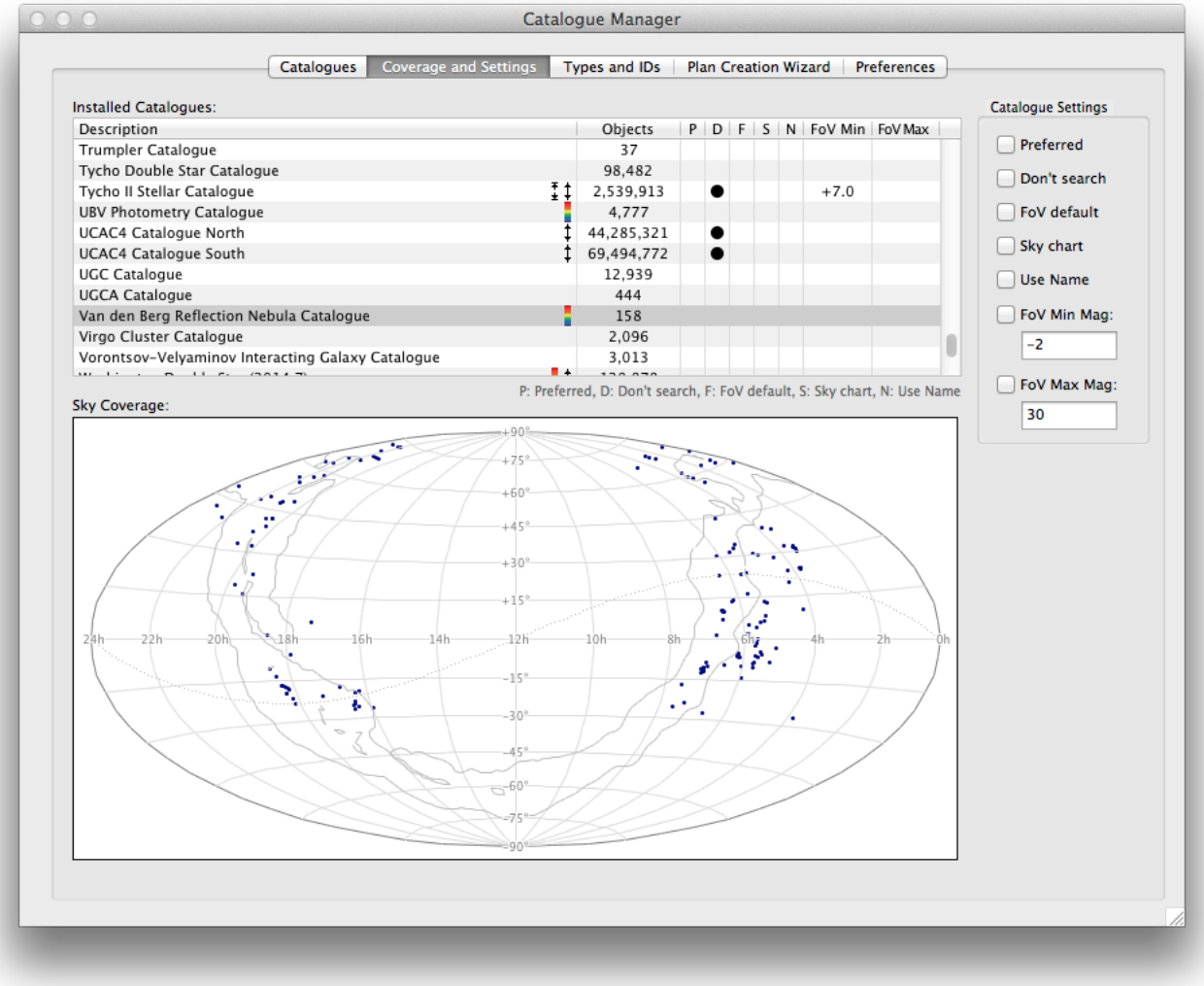


Figure 435: Catalogue coverage and settings

1. If you create a new plan using another plan document as a template, this setting will be ignored.

23.4 Catalogue Types & IDs

The **Types and IDs** tab of the Catalogue Manager displays information about what IDs are supported by what catalogues, and what object types are present in the catalogues, together with their magnitude range (where applicable). The displayed information is selected by the radio buttons at the top.

- **Catalogue vs. ID**. For each catalogue there's a matrix of IDs with a bullet where an ID is supported by the catalogue.
- **Catalogue + ID**. For each catalogue there's a list of IDs supported by the catalogue.
- **Catalogue vs. Types**. For each catalogue there's a matrix of Types with a bullet where a catalogue contains objects of that type.
- **Catalogue + Types**. For each catalogue there's a list of Types contained in that catalogue.

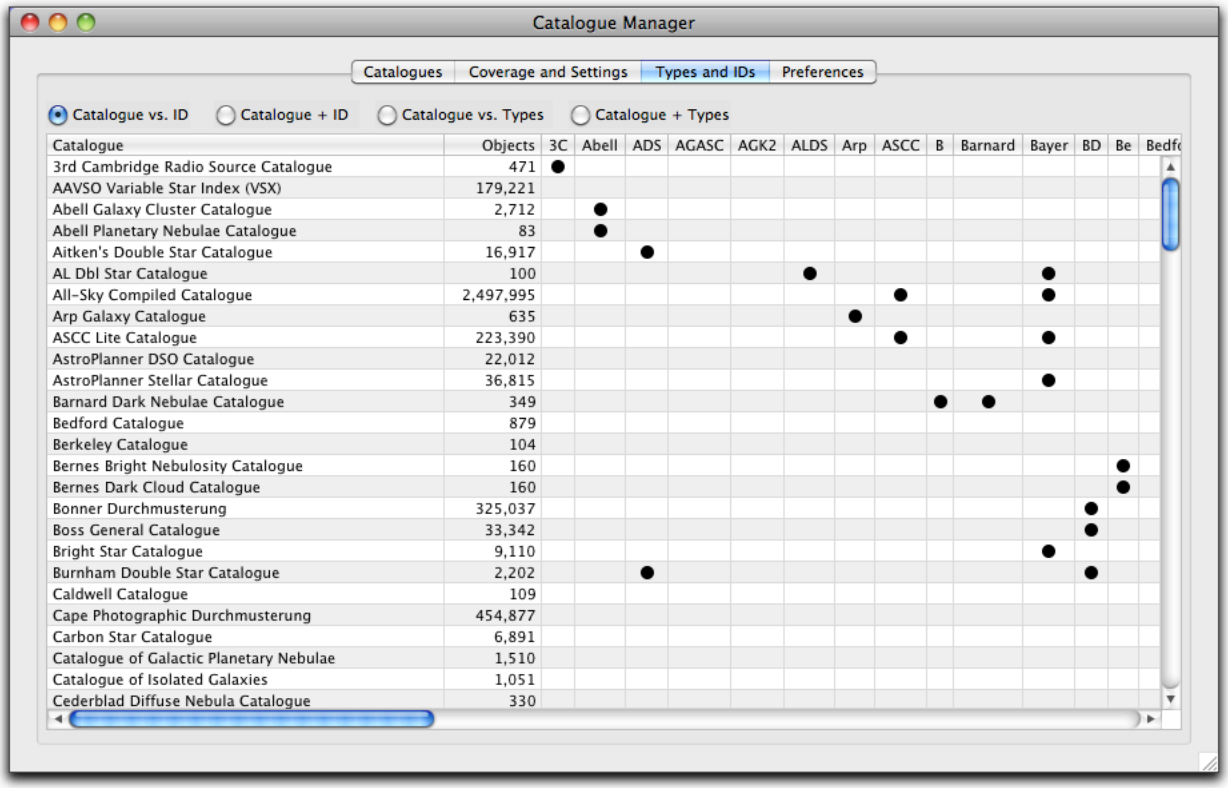


Figure 436: Catalogue vs. ID

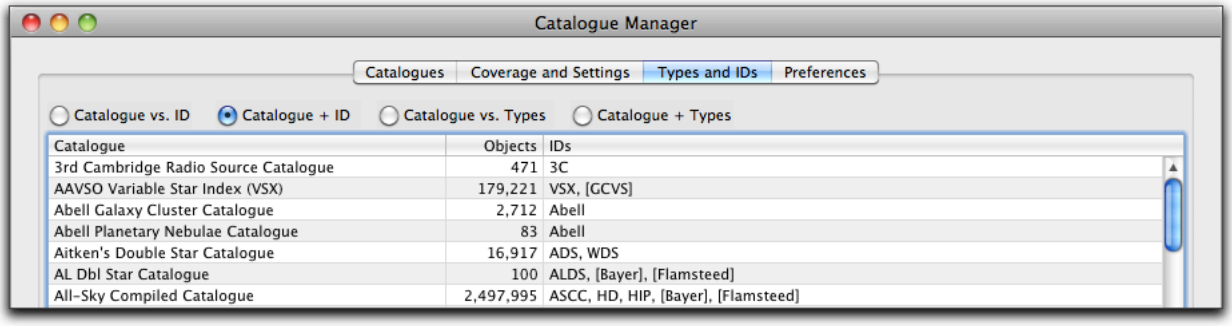


Figure 437: Catalogue + ID

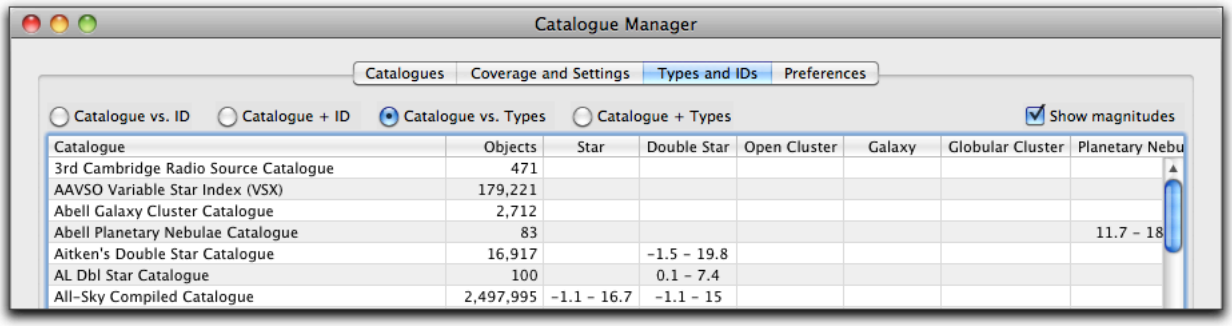


Figure 438: Catalogue vs. Types

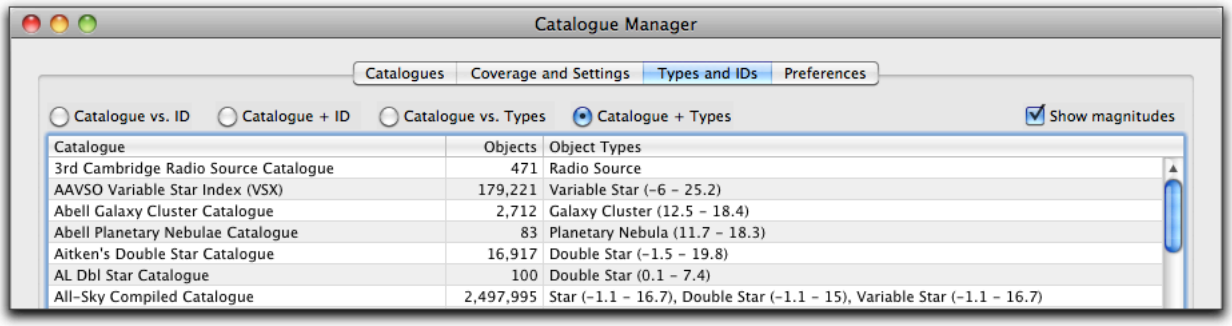


Figure 439: Catalogue + Types

23.5 Plan Creation Wizard catalogues

The Plan Creation Wizard tab contains a list of the installed catalogues that contribute to the Plan Creation Wizard's database. The top list shows the installed catalogues and a count of the number of objects they contribute to the database, including a total line at the bottom.

The second list shows uninstalled catalogues that could contribute to the wizard's database. By selecting the checkbox next to those catalogues, you can use the ***Install...*** button to install them (and thus add the objects to the database).

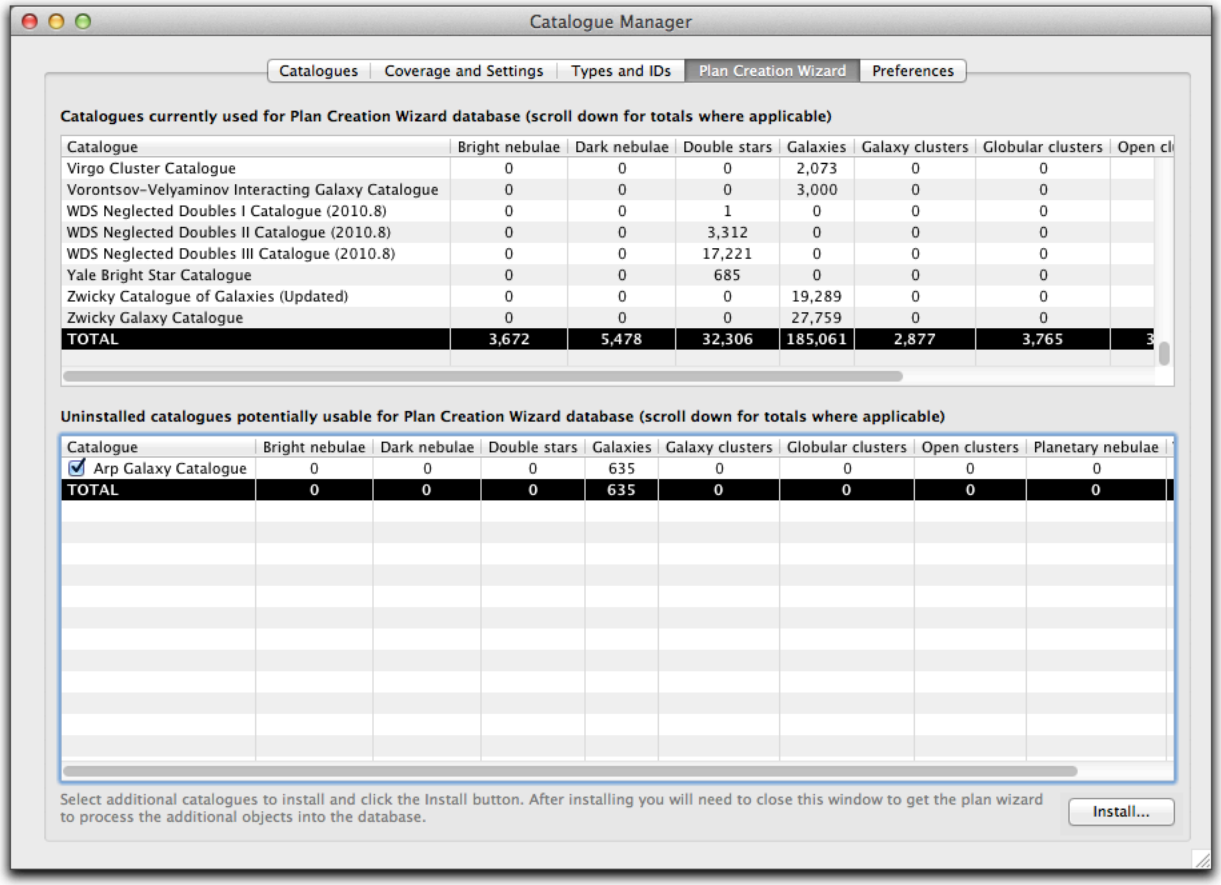


Figure 440: Plan Creation Wizard catalogues

23.6 Displaying catalogue contents

The contents of catalogues can be displayed in a window. There are various ways to do this:

- ***Object > Open Catalogue/s***.
- The ***Show Catalogue*** popup button under the object list.
- Double-clicking a catalogue entry on the Field of View tab.
- Double-clicking an installed catalogue entry in the Catalogue Manager window.

The catalogue display window has two tabs.

The **Catalogue** tab shows all of the objects in a table form.

The **Obs** column reports the number of observations of the associated object in the observation database, and the **Found** column is "Yes" if any of those observations reports that the object was found.

The **Annotations** widget displays any catalogue annotations for the selected object. See Section 23.7 on page 334 for details.

You can find a particular object by typing its ID into the Find field. The popup lists the valid IDs supported by the catalogue.

If a telescope with Go-To capability is currently connected, the ***Slew to Object*** button will slew the telescope to the selected object (assuming it's visible).

The ***Add Selected*** button will add the selected object/s to the plan document from whence the window was opened. If the **Don't add if observed** checkbox is checked, then any selected objects that have already been observed will not be added to the plan. Clicking the button will close the window, unless the **Keep window open** checkbox is checked.

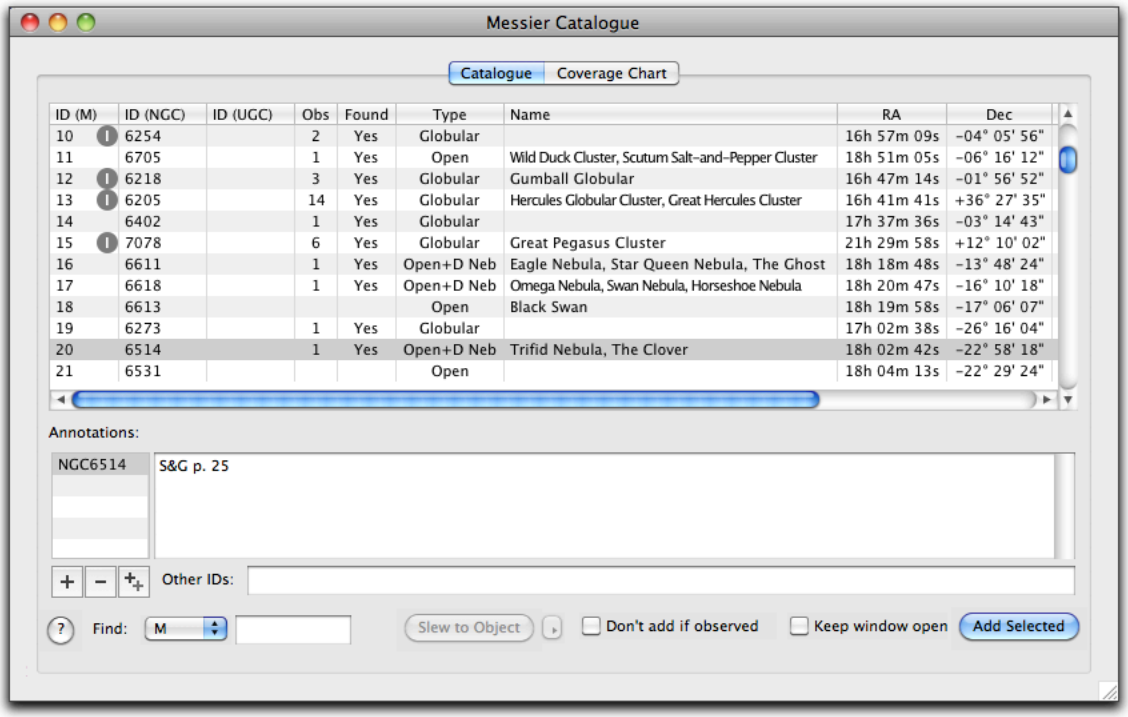


Figure 441: Catalogue display window

The ***?*** button (bottom left) displays information about the catalogue. The various types of objects in the catalogue are enumerated, together with the count and magnitude range. If a description is available for the catalogue, then it is displayed in the bottom half of the window.

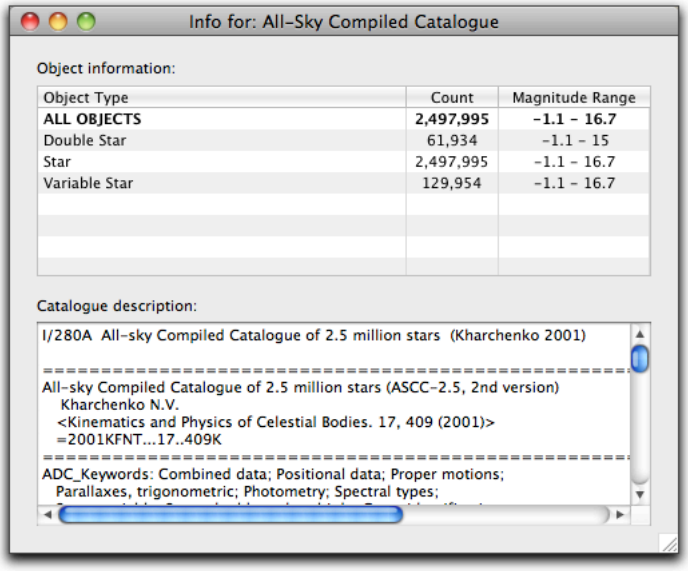


Figure 442: Catalogue information window

The **Coverage Chart** tab shows all of the catalogue objects on an all-sky Aitoff map. If one or more objects are selected in the Catalogue tab, then those objects are circled in red on the map and the constellation boundary for the enclosing constellation is shown.

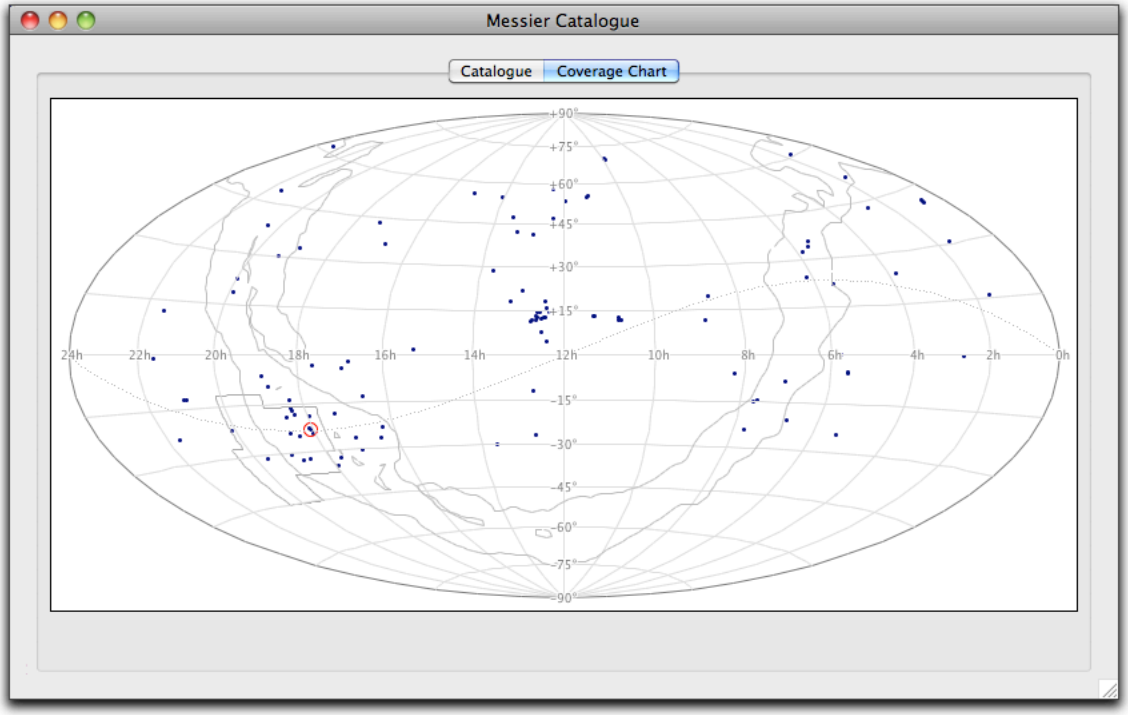


Figure 443: Catalogue coverage sky map

23.7 Catalogue annotations

Catalogue annotations are text that the user can add to specific catalogue entries, by ID. These annotations are kept in a separate database and are displayed in various places. In each place the widget has the same form.

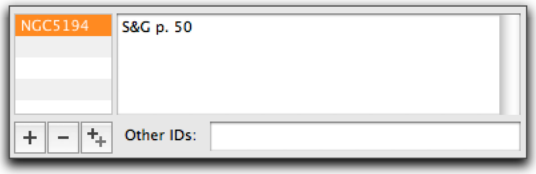


Figure 444: Annotation widget

The annotation widget consists of a list on the left containing the IDs of all relevant objects. Note that synonyms of objects will also be shown. e.g. if the annotations for M20 are being shown, then any annotations for NGC6514 (the same object) will also be shown.

On the right is a text editor field containing the annotation text.

There are buttons for adding a new annotation, deleting the selected annotation/s, and duplicating the selected annotation.

The **Other IDs** field contains any other known IDs for the annotation, separated by commas.

Places the catalogue annotation widget is found:

23.7.1 Catalogue display window

This allows you to edit annotations for the selected catalogue object.

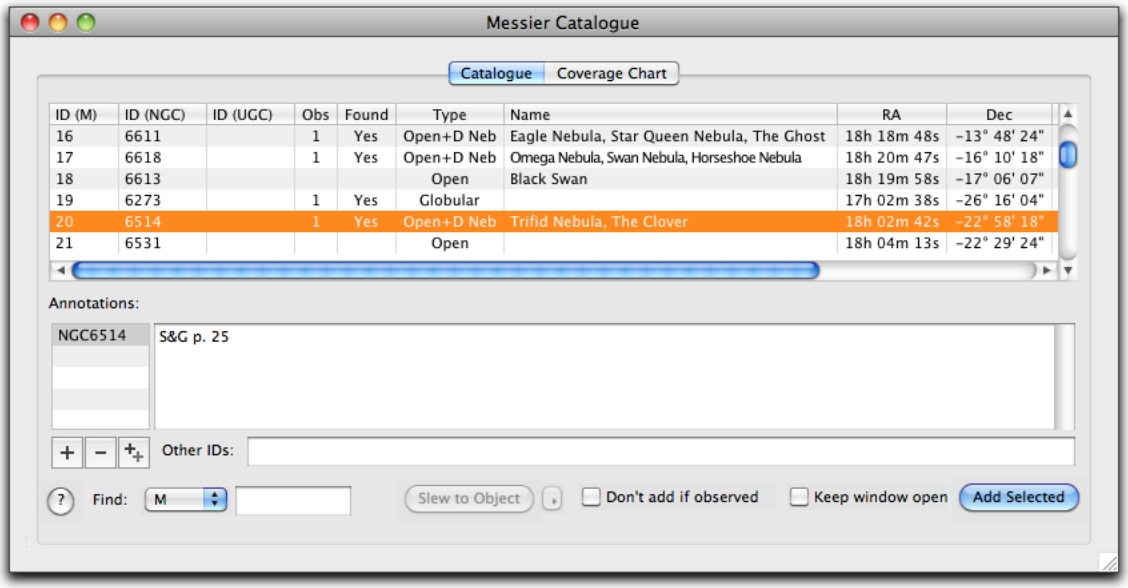


Figure 445: Annotation editing: Catalogue display window

23.7.2 Object list editor

When the object editing fields for the object list are being displayed, you can examine and edit annotations for the currently-selected object.

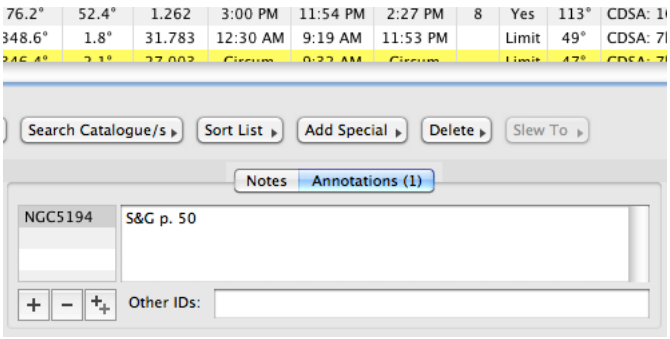


Figure 446: Annotation editing: Object list editor

23.7.3 Observation data entry

When an observation is being entered, the annotations for the selected object are displayed.

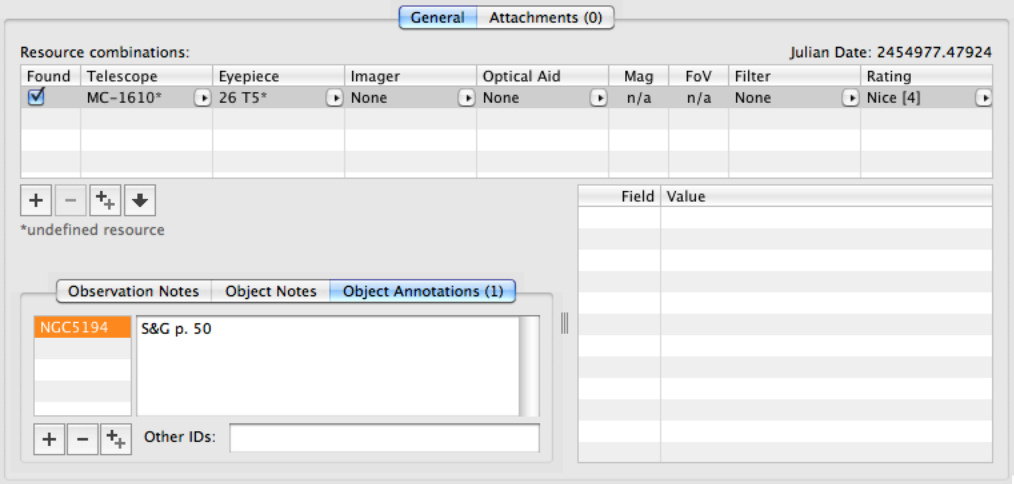


Figure 447: Annotation editing: Observation data entry

23.7.4 Annotation editor

The Annotation editor can be reached via the **Object > Edit Annotations...** menu command. This displays *all* annotations, and is a convenient way to do bulk editing, deleting, etc.

The ***Export...*** button exports all the annotations in the database to a tab-separated text file.

The ***Import...*** button imports annotations that were previously exported (perhaps on another computer).

Note that, in the case of the editor only, any changes you make will not be saved back to the annotation database until the ***Save*** button is used.

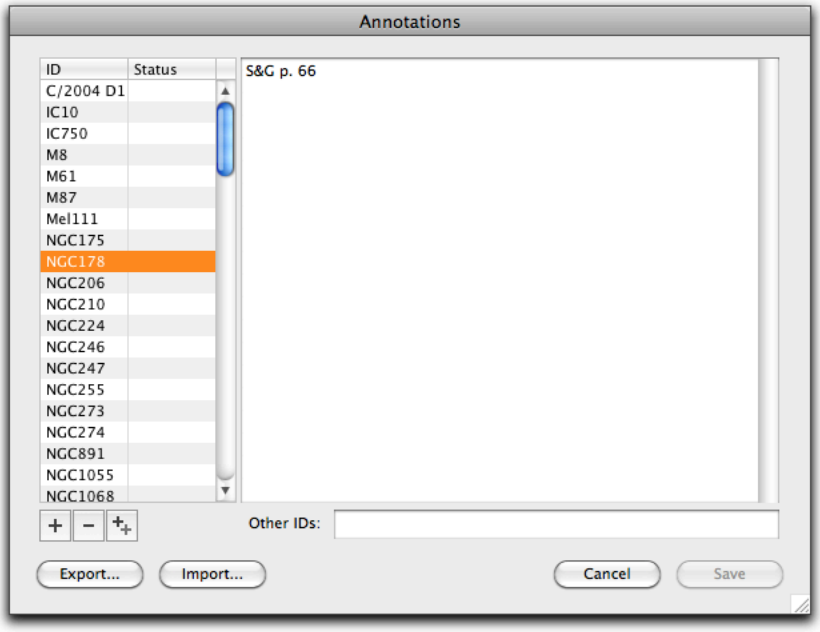


Figure 448: Annotation editing: Annotation editor

24 Comets & Minor Planets

Comets and minor planets, being solar system objects, do not have a fixed position in the sky, and rely on orbital elements (a bunch of weird-sounding numbers) to determine their current position in the sky. Those elements are typically retrieved from an on-line source as explained below. As the orbits for these objects are refined, the elements might also change over time.

24.1 Downloading comet elements

Use the ***File > Import > Comet Data...*** menu command to retrieve orbital element data. The dialog lets you choose the source of the data to import.

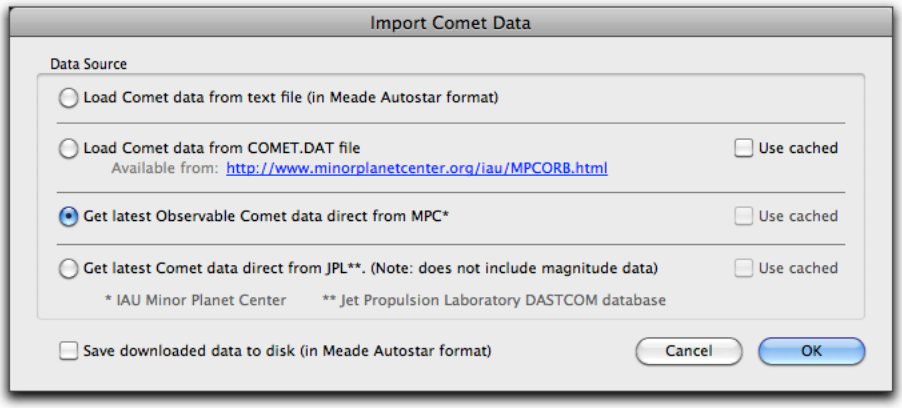


Figure 449: Select comet data source

The first two options load data from text files. The second two download the latest data from the Internet (assuming you have a connection). If you have previously downloaded from a source, the **Use cached** checkbox will be enabled. Checking this will used the cached copy rather than requiring a download.

In some instances you can check the **Save downloaded data to disk** checkbox and the downloaded data will be saved in the "standard" Meade Autostar format for comet elements.

Once you've selected the source, and clicked ***OK***, you will be presented with a list of comet objects for which elements are available (Figure 450). Select one or more comets to be added to your plan by checking the checkbox to the left of the entry in the list. The ***All*** and ***None*** buttons select all displayed comets, or clears all selections, respectively.

The list includes the ID of the comet and some other parameters computed from the comet elements and based on the current local date/time:

- **Mag**. The current estimated magnitude of the comet. This is not available in all cases (e.g. the JPL download does not include parameters to compute the magnitude).
- **Motion/hr**. The current motion per hour of the comet across the sky, in either arcminutes or arcseconds.
- **Bearing**. The current bearing of the motion of the comet with respect to north (via east) in degrees.
- **RA**. The current R.A. of the comet.

- **Dec**. The current Declination of the comet.
- **E.Lat**. The current ecliptic latitude of the comet.
- **E.Long**. The current ecliptic longitude of the comet.
- **Const**. The current constellation that the comet is travelling through.

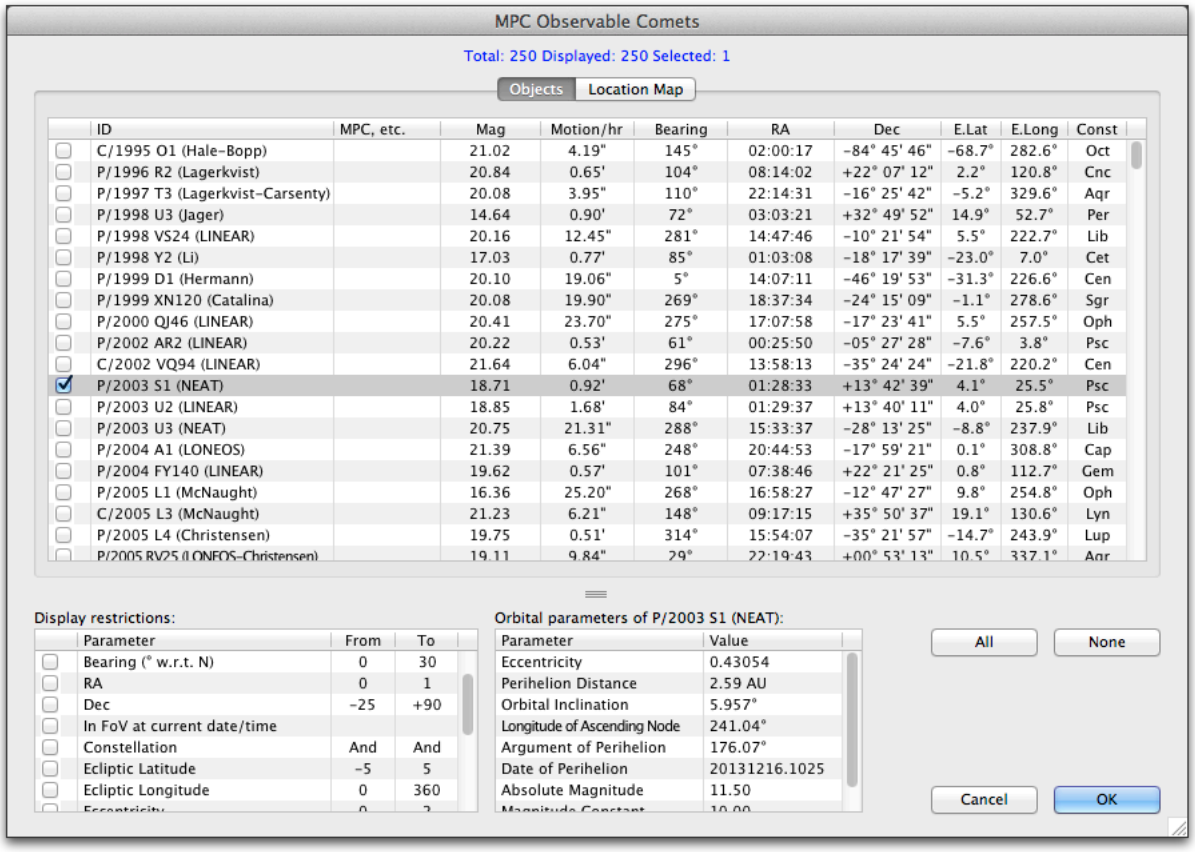


Figure 450: Comet listing dialog

The **Location Map** tab (Figure 451) shows all comets on an all-sky map, with any selected comets circled in red. Double-clicking a comet on the chart will select that line in the list.

When a comet entry is selected, the orbital parameters (elements) of the comet is displayed in a table under the list of comets.

By default the list of comets shows all available comets. However, you can use the **Display restrictions** table to select only those comets that obey the restrictions. For example, in Figure 452, the list has been restricted to comets whose current magnitude is 16 or brighter, and whose declination is -25° or greater. This reduces the list from 250 total down to 26 displayed.

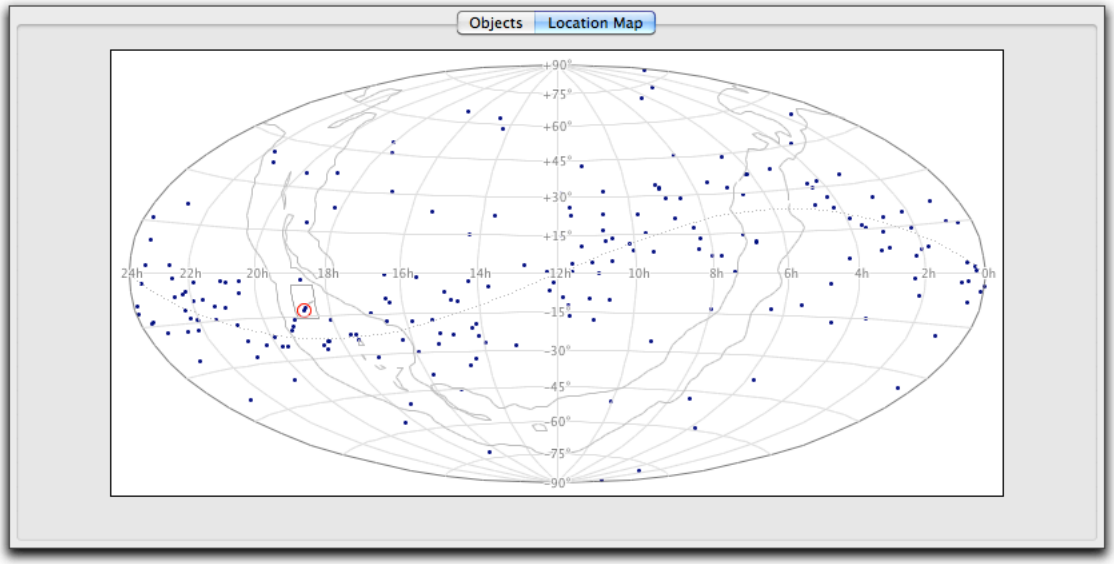


Figure 451: Comet location map

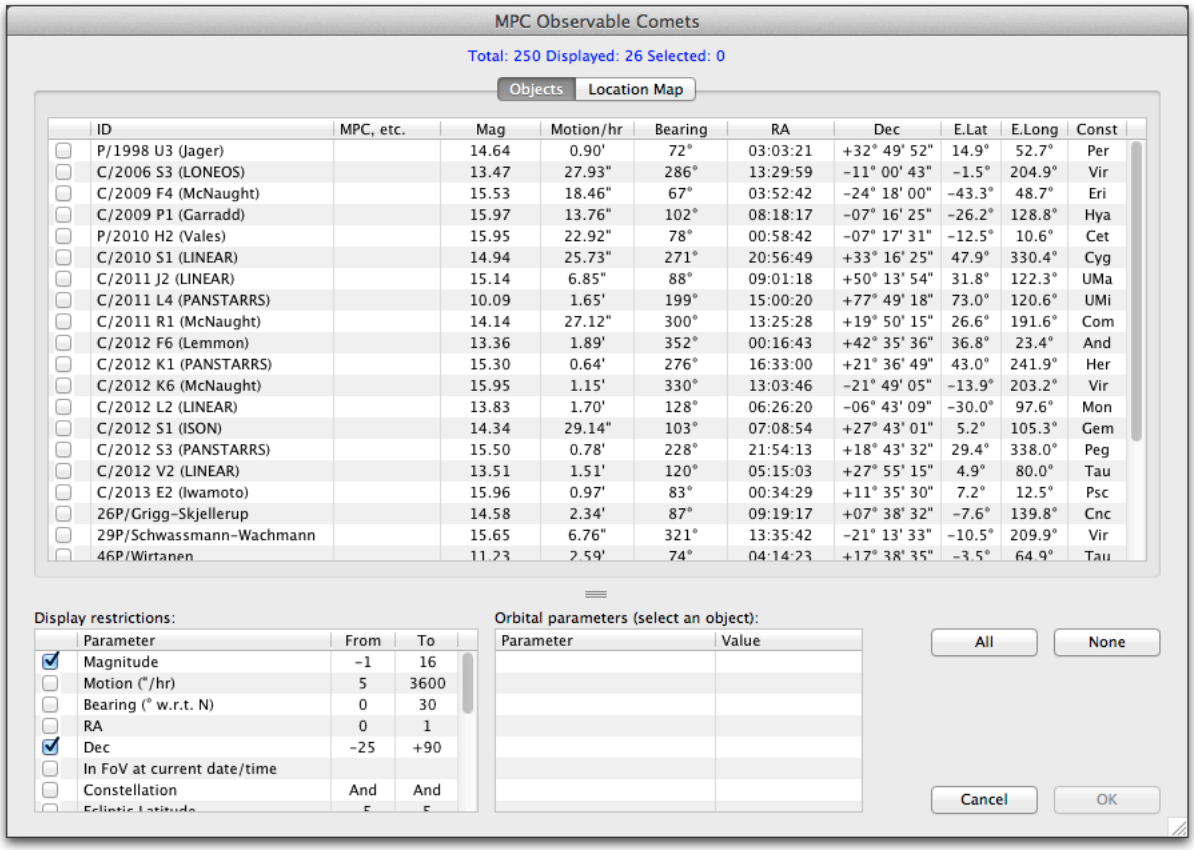


Figure 452: Comet list with display restrictions

24.2 Downloading minor planet elements

Use the ***File > Import > Minor Planet Data...*** menu command to retrieve orbital element data. The dialog lets you choose the source of the data to import.

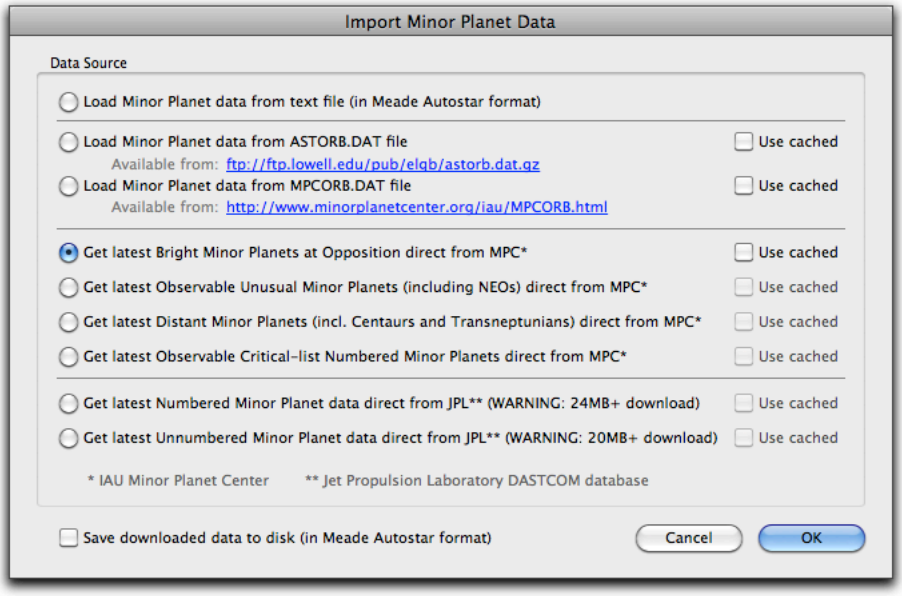


Figure 453: Select minor planet data source

The first three options load data from text files. The rest download the latest data from the Internet (assuming you have a connection). If you have previously downloaded from a source, the **Use cached** checkbox will be enabled. Checking this will used the cached copy rather than requiring a download.

In some instances you can check the **Save downloaded data to disk** checkbox and the downloaded data will be saved in the "standard" Meade Autostar format for minor planet elements.

Once you've selected the source, and clicked ***OK***, you will be presented with a list of minor planet objects for which elements are available (Figure 454). Note that the following description applies to all the data sources apart from ASTORB.DAT and MPCORB.DAT. See Section 24.2.1 on page 343 for a description of those data sources.

Select one or more minor planets to be added to your plan by checking the checkbox to the left of the entry in the list. The ***All*** and ***None*** buttons select all displayed minor planets, or clears all selections, respectively.

The list includes the ID of the minor planet and some other parameters computed from the minor planet elements and based on the current local date/time:

- **Mag**. The current estimated magnitude of the minor planet.
- **Motion/hr**. The current motion per hour of the minor planet across the sky, in either arcminutes or arcseconds.
- **Bearing**. The current bearing of the motion of the minor planet with respect to north (via east) in degrees.
- **RA**. The current R.A. of the minor planet.
- **Dec**. The current Declination of the minor planet.
- **E.Lat**. The current ecliptic latitude of the minor planet.
- **E.Long**. The current ecliptic longitude of the minor planet.

- **Const**. The current constellation that the minor planet is travelling through.

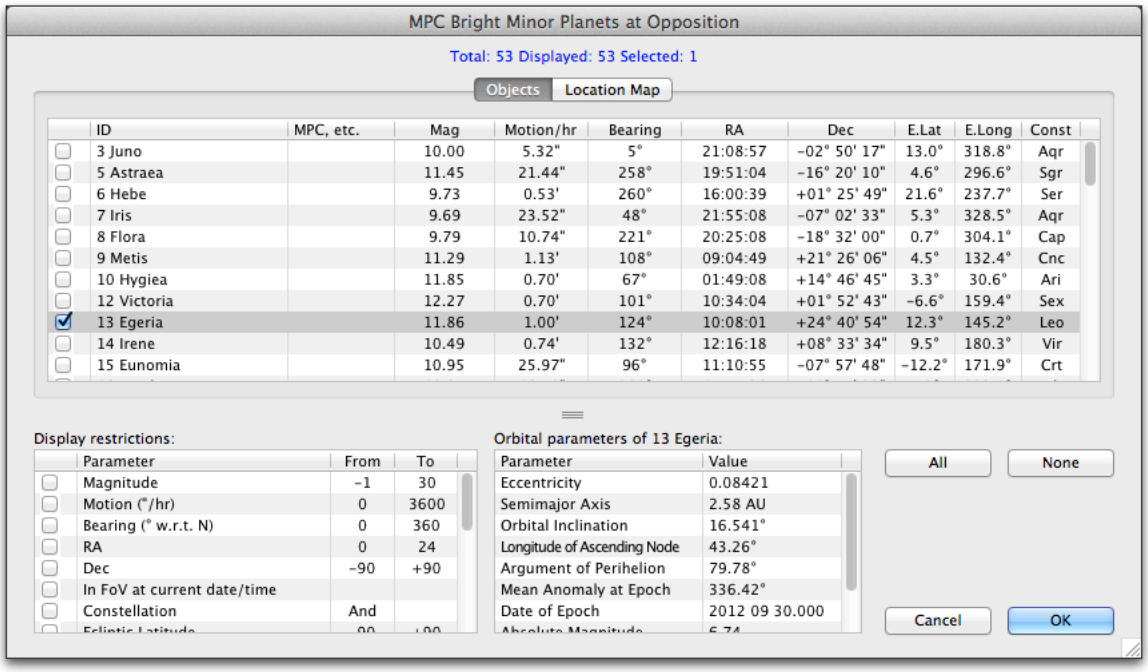


Figure 454: Minor planet listing dialog

The **Location Map** tab shows all minor planets on an all-sky map, with any selected minor planets circled in red. Double-clicking a minor planet on the chart will select that line in the list.

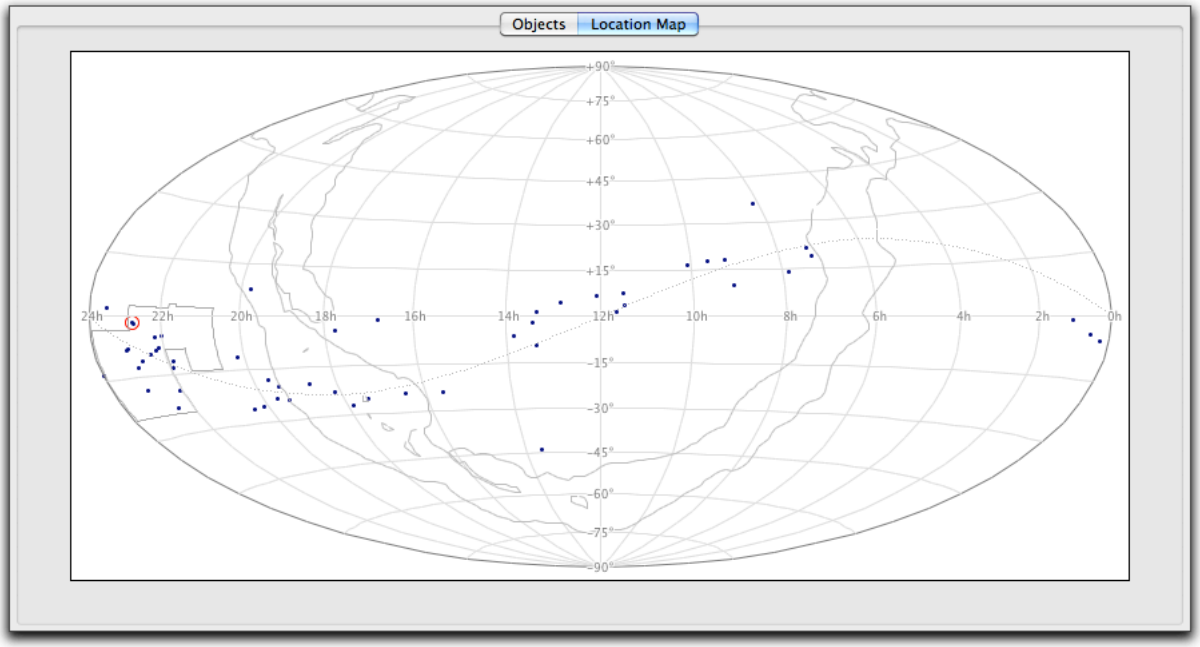


Figure 455: Minor planet location map

When a minor planet entry is selected, the orbital parameters (elements) of the minor planet are displayed in a table under the list of minor planets.

By default the list of minor planet shows all available minor planet. However, you can use the **Display restrictions** table to select only those minor planets that obey the restrictions. For example, in Figure 456, the list has been restricted to minor planets whose current magnitude is 11 or brighter, and whose declination is -30° or greater. This reduces the list from 53 total down to 14 displayed.

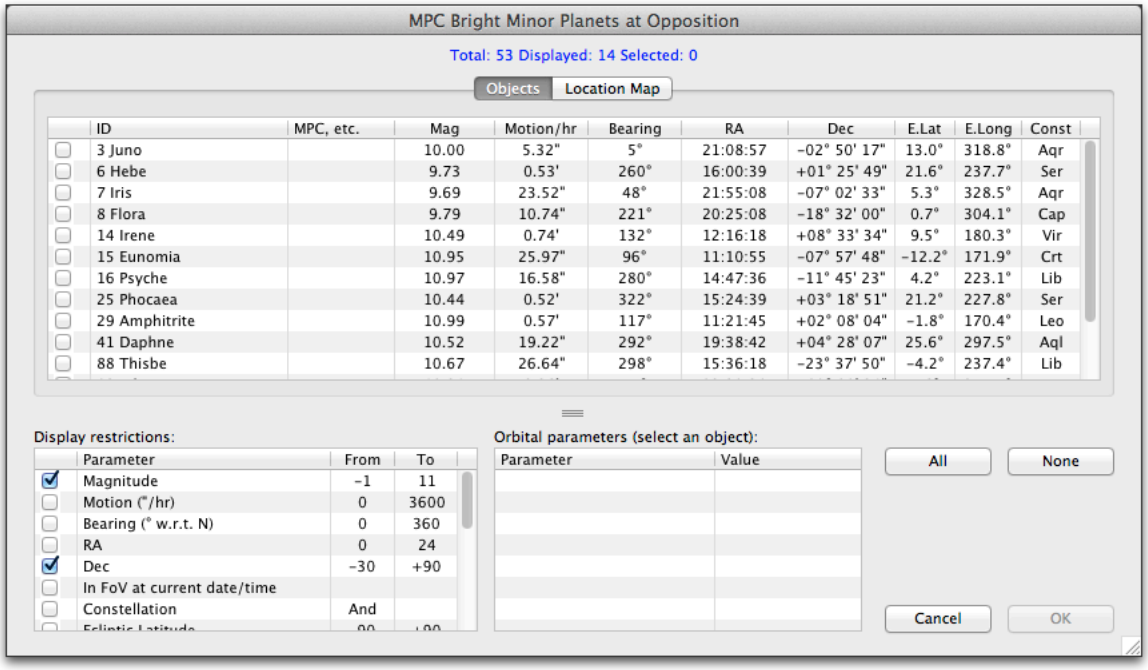


Figure 456: Minor planet list with display restrictions

24.2.1 ASTORB & MPCORB data sources

The ASTORB.DAT and MPCORB.DAT data sources are huge collections, containing many hundreds of thousands of minor planet entries. For this reason they are treated slightly differently for reasons of efficiency.

Once you've selected the source, and clicked ***OK***, you will be presented with a list of minor planet objects for which elements are available (Figure 457).

This dialog works largely the same way as the previously-described dialog for selecting minor planets, with the following differences:

Partitioning

Since there are so many entries to manage, the complete set is "partitioned" into more manageable chunks. The **Partition size** setting specifies the maximum size of each "chunk". The popup menu at the top left allows you to select the partition of your choice. The most recent entries will be listed first if the checkbox to the right of the popup is checked (the default).

Find

To help navigate around the enormous data sets, the ***Find...*** button (and ***Again*** button for subsequent searched for the same text) allows you to search for text in the currently-displayed partition. If the **Find globally** checkbox is checked, the search will search the entire data set.

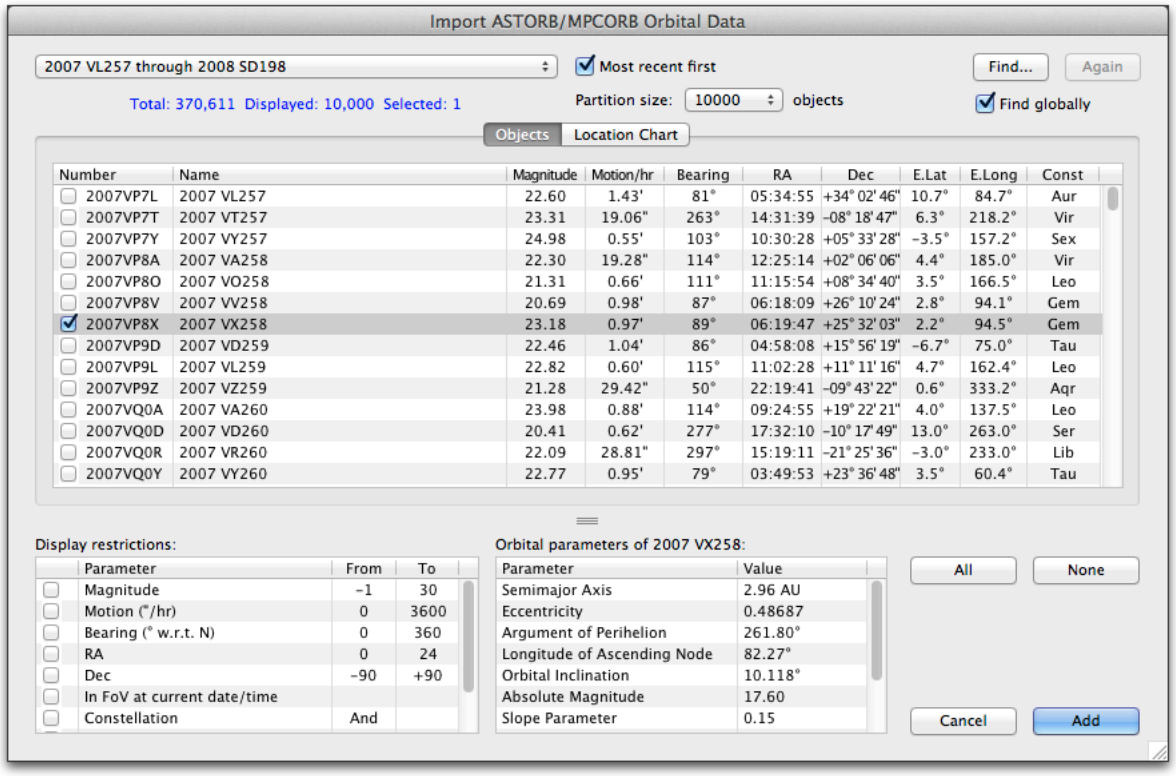


Figure 457: ASTORB/MPCORB Minor planet listing dialog

24.3 Quick insertion of a comet or minor planet

If you have previously downloaded elements for a comet or minor planet (see above)[1], then you can insert a comet/minor planet from the cached elements by using one of the following methods:

- Use the ***+*** button under the object list. In the New Object dialog, type in the name of the comet or minor planet. Then use the ***Lookup...*** button to display a list of all cached objects of the required type, with the search field preloaded with the ID.

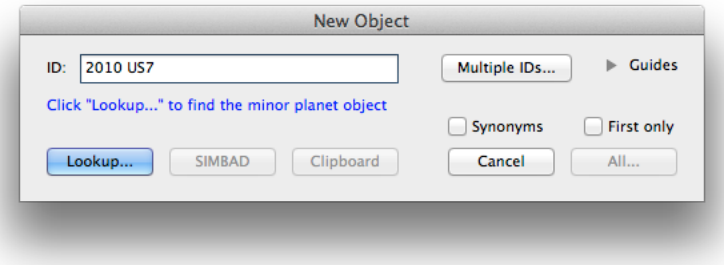


Figure 458: Entering a minor planet from the New Object dialog

1. With the exception of ASTORB and MPCORB data caches.

- Use the ***Add Special*** popup under the object list, and choose ***Comet...*** or ***Minor planet...*** to display a list of all cached objects of the required type, with the search field preloaded with the ID.

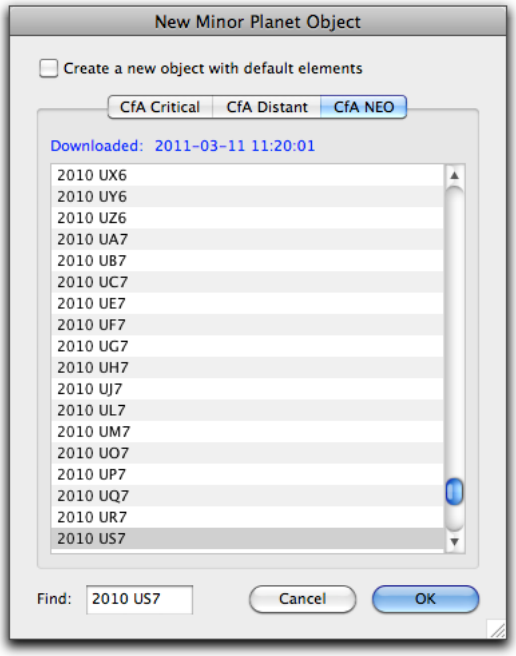


Figure 459: Cached minor planet object dialog

24.4 Creating a comet or minor planet object manually

If you have the elements for a comet or minor planet, you can enter the information manually using one of these techniques:

- Use the ***+*** button under the object list and click the ***Empty*** button in the New Object dialog to create an "empty" object in the object list. Select that object, and change its Type to "Comet" or "Minor". Once that is done, click the ***Edit Elements...*** button at the lower left of the plan window (it will be available for any Comet or Minor planet objects). Edit the elements.
- Use the ***Add Special*** popup under the object list, and choose ***Comet...*** or ***Minor planet...*** and in the dialog, check the **Create a new object with default elements** checkbox and click ***OK***. Edit the elements.

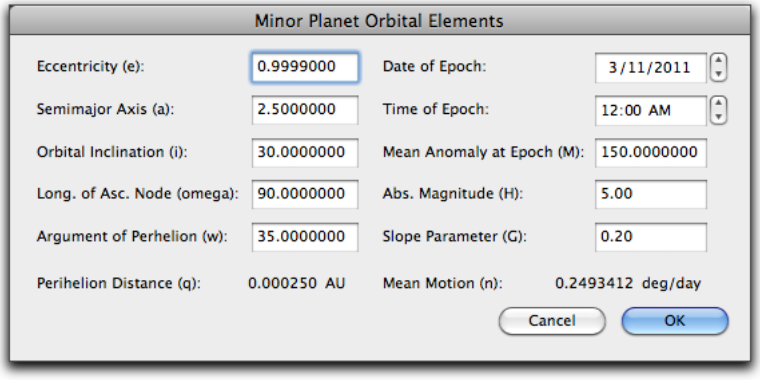


Figure 460: Manual editing of minor planet elements

24.5 Updating elements

If you have a plan with comet or minor planet objects and you wish to update the elements for those objects, you can do so by using ***Object > Refresh Objects from Catalogues...***. In the dialog, select the **Comets/Minor Planets** option (no other controls need setting) and click **OK**.

Any comet or minor planet objects in the list that were inserted from a downloaded data source will have their elements updated from the cached download (assuming there is one present).

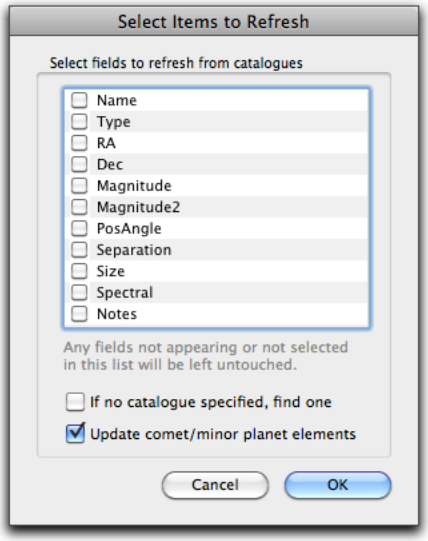


Figure 461: Refreshing comet/minor planet elements

25 Double Stars

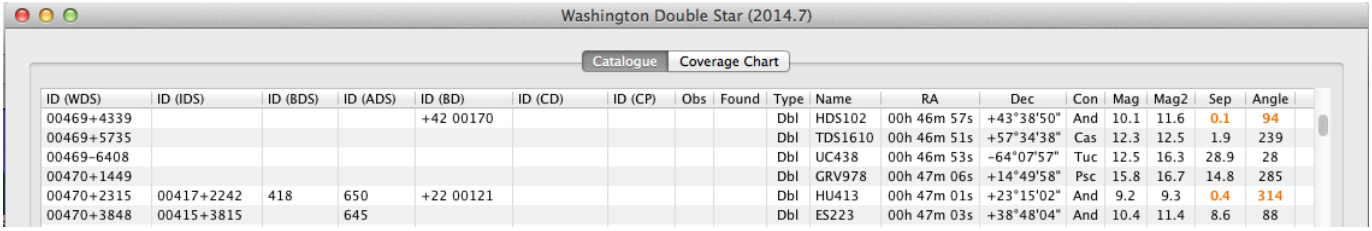
25.1 Double star orbits

Double (or multiple) star systems are not static. The primary and secondary stars typically move with respect to each other. These relative movements can be extremely small (i.e. they don't appear to move over a period of decades or longer), or they might move relatively rapidly (with noticeable relative motion over a period of months or years). The double star catalogues, and in particular the Washington Double Star (WDS) catalogue, typically only show a single instance or snapshot of relative position (separation and position angle) for each object, which might be quite out-of-date (some even 100+ years out of date).

Many such star systems have been observed and the relative positions of the stars noted over an extended period, allowing the actual orbits of the stars to be estimated. A feature in AstroPlanner allows you to see those orbits and estimate the current relative positions of the stars.

The US Naval Observatory, which maintains the WDS, also maintains a database of orbital elements for a (relatively small) subset of the double stars in the WDS. There are currently 2,400+ orbits in the database. The AstroPlanner WDS catalogues have been modified to include these data where applicable.

When you open a double-star catalogue (initially, at least, it will only be the WDS catalogues), any double star entry that has associated orbit information will be shown with the Separation and Position Angle column entries in orange (See Figure 462). In the example, two objects have orbits (orange text in the **Sep** and **Angle** columns). To see information about the orbits, select the desired object and right-click. Choose then **Show Orbit/s...** menu entry.



ID (WDS)	ID (IDS)	ID (BDS)	ID (ADS)	ID (BD)	ID (CD)	ID (CP)	Obs	Found	Type	Name	RA	Dec	Con	Mag	Mag2	Sep	Angle
00469+4339				+42 00170					Dbl	HDS102	00h 46m 57s	+43°38'50"	And	10.1	11.6	0.1	94
00469+5735									Dbl	TDS1610	00h 46m 51s	+57°34'38"	Cas	12.3	12.5	1.9	239
00469-6408									Dbl	UC438	00h 46m 53s	-64°07'57"	Tuc	12.5	16.3	28.9	28
00470+1449									Dbl	GRV978	00h 47m 06s	+14°49'58"	Psc	15.8	16.7	14.8	285
00470+2315	00417+2242	418	650	+22 00121					Dbl	HU413	00h 47m 01s	+23°15'02"	And	9.2	9.3	0.4	314
00470+3848	00415+3815		645						Dbl	ES223	00h 47m 03s	+38°48'04"	And	10.4	11.4	8.6	88

Figure 462: Double star orbit entries in a catalogue

A window is displayed with the known orbital info for that star system (Figure 463).

The orbit is plotted on axes (scaled in arcseconds from the primary - the red blob). The current position of the secondary is shown in blue, and some future positions are shown in green, with the year. The information above the chart shows that this particular orbit has an estimated period of 1550 years (1.55 Kyr), and that based on the orbit, the current separation and position angle are 5.9 arcsec and 188° respectively. The Orbit elements popup tells you that the chart is for the AB components, and the reference is given in parentheses. The fixed separation/position angle refers to the fixed values in the catalogue entry (which as mentioned before might be quite old, and possibly inaccurate).

The Elements tab shows the actual numbers, if you are interested (Figure 464). There might be more than one orbit for the system. In this case there's another AB orbit (Figure 465). Note that this (2001) orbit is significantly different from the other (1996) orbit, although the current position is

pretty much identical. Such is the world of insufficient information. As the years go by, the estimated orbital elements will undoubtedly get better.

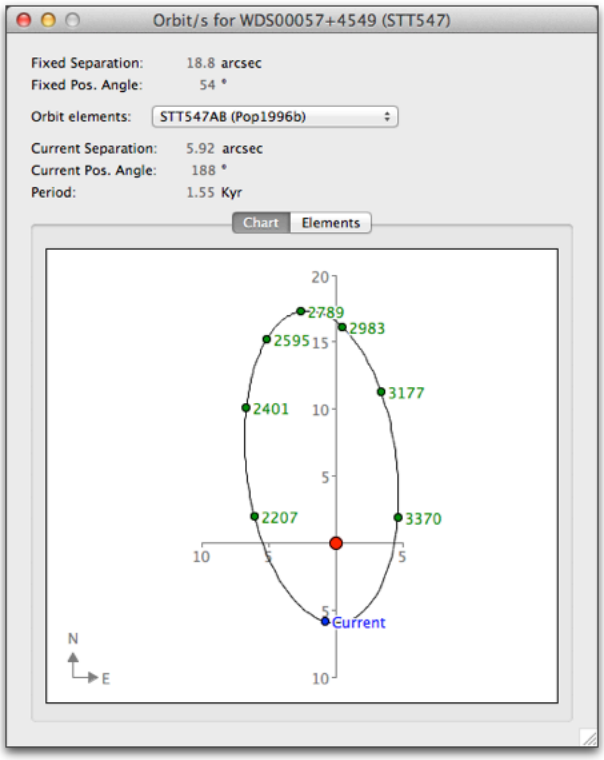


Figure 463: **Double star orbit**

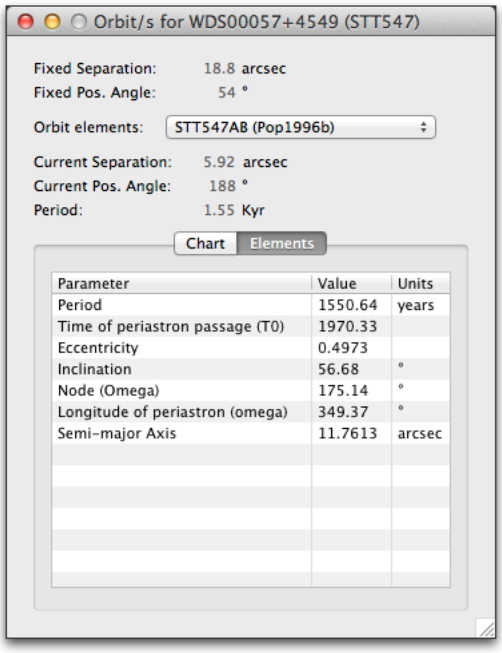


Figure 464: **Double star elements**

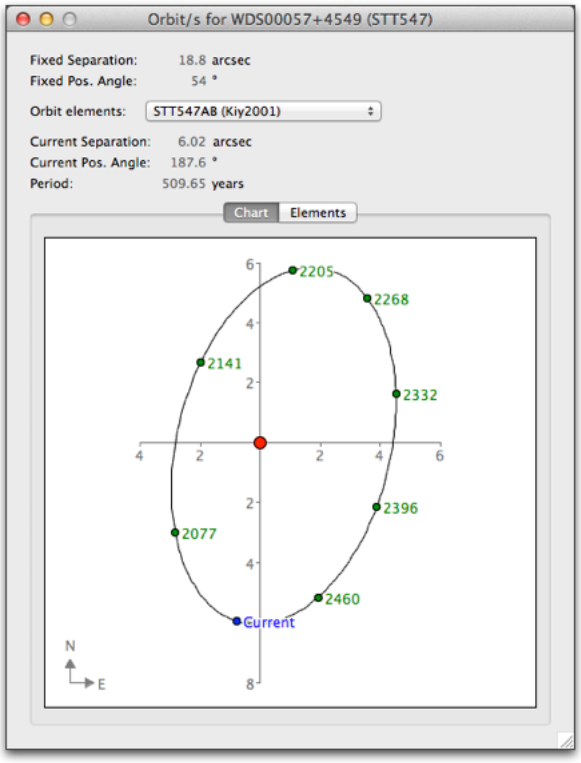


Figure 465: **Double star orbit**

The same applies to the object list and the results window (the columns are shown in orange, and there's a right-click **Show Orbit/s...** item). However, in the case of the object list there's also a **Set Object** button. Clicking it will replace the "fixed" separation/position angle values for the object with the computed current values, and the Period with the computed period.

26 Import and Export

AstroPlanner has various methods of importing and exporting objects and/or observations. These methods can be useful if you have data from other sources that need to be used by AstroPlanner, or if you wish to save data in a form that can be used by other applications.

26.1 Import

26.1.1 Generic text data files

Import objects into your plan document, or observations/sessions into the observation database, from a plain text file. Use ***File > Import > Generic Text File...*** to start the import. Note that a plan document must be open to be able to select this option, even if you are importing observation data only.

You will first be asked to locate the text file you want to import.

Then the import dialog appears. The first line to be processed is displayed in the Sample Data Line area. The rest of the parameters define the format of the incoming data.

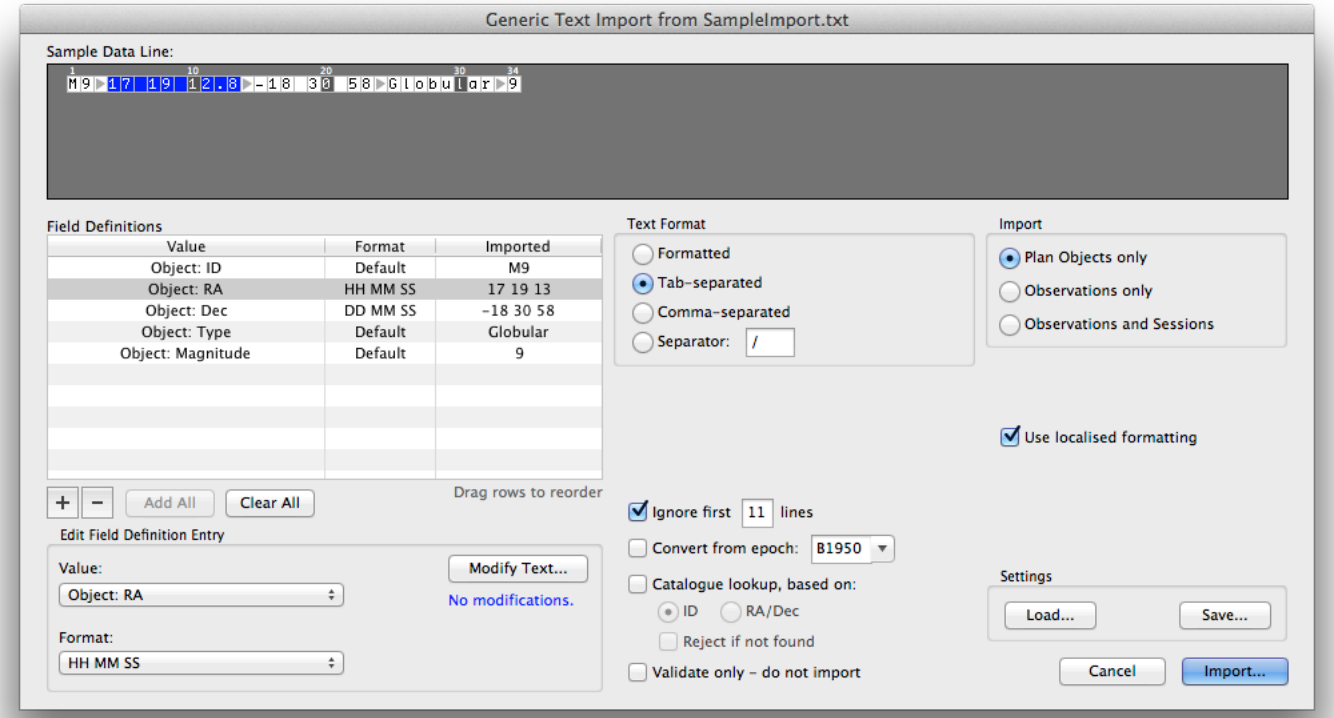


Figure 466: Generic text import dialog

The imported text file should have one *line* per imported *entity* (object, etc.). Each line should consist of a fixed number of *fields*, with each field containing the value of some *parameter* of the entity (e.g. ID, RA, Notes, etc.).

- **Field Definitions**. This list contains an entry for each imported field, and the list represents all the fields in a single line of the text data. Entity parameters are imported in the same order as the rows of the list. You can add and delete entries from the list using the **+** and **-** buttons, and the list can be reordered by dragging the rows around. The ***Clear All*** button deletes all entries, and the ***Add All*** button adds all possible fields to the list. You can edit a new or existing entry by selecting it and changing the parameters in the **Edit Field Definition Entry** section. The **Value** column contains the entity parameter to be imported; the **Format** column contains the selected format; the **Imported** column shows the value that is imported from the sample data line (the value shown in this column should match the correct value you are trying to import. If it doesn't, then the format is probably incorrect).
- **Edit Field Definition Entry**. This changes the currently-selected entry in the **Field Definitions** list. The **Value** popup is the entity parameter you want to export, and is typically a parameter of an object, session or observation. There's also an *<Ignore>* choice that can be used to ignore an empty field if necessary. The **Format** popup is the way the incoming Value is formatted. Typically you'd use the *Default* format in most cases, but some parameter types specify various formats (e.g. R.A. can be formatted in hours or degrees, as a decimal, or in the form hh:mm:ss, etc.). If you have chosen the **Text Format** to be Formatted then there will also be **Column From** and **Column To** entries. You can use the **Modify Text...** button to modify the incoming text before it is

imported (See Figure 467). You can use this feature to add, remove or replace the imported text in various ways.

- **Text Format**. The Formatted option allows you to specify the column range for each field (e.g. ID in columns 1 through 6, RA in columns 7 through 15, etc. Tab-separated, comma-separated and arbitrary-character-string-separated options assumes the requisite character string between fields of each input line.
- **Ignore first *n* lines**. Read past the first *n* lines. Useful to ignore column headings, etc.
- **Convert from epoch**. If the object coordinates (RA & Dec) of the input data are of an epoch other than J2000.0, then they should be converted from that epoch to J2000.0.
- **Catalogue lookup**. Lookup the object data in the internal catalogues. You can use ID as the key (if available in the input data), or RA/Dec. This option is useful if you have data that only has IDs, or RA/Dec coordinates. If the **Reject if not found** option is checked, then if the catalogue lookup fails to find a matching object, the input data will be ignored and a new object will not be created using the data.
- **Validate only**. Perform the import without actually creating any object/observation/session data. This is a convenient way of checking the data for errors before committing to the import.
- **Import**. Specifies what is to be exported. **Plan Objects only** will consider only objects in your object list and output a line for each. **Objects and Observations** will consider each object in your object list and output a line for each observation associated with it. Any object parameters specified will be duplicated in each observation line. **Sessions and Observations** ignores objects and looks at all observation Sessions included in the specified date range, and all observations associated with those sessions.
- **Use localised formatting**. If this option is checked, imported date, times and numbers will be assumed to be in the local format as specified by the operating system (e.g. decimal comma in Europe, etc.). If it is unchecked then the standard (U.S.?) formatting is used.
- **Settings**. Once you've set up the dialog, the ***Save...*** button allows you to save the settings to a file, which can be later retrieved using the ***Load...*** button. This is useful if you are juggling multiple import formats.

If errors occur, a dialog with a list of those errors is presented (Figure 468), listing the line number, the error type, the field in error if applicable, and the original data. You can edit the data externally with a text editor, or you can click the Edit Text... button and edit the text using the built-in text editor (which conveniently shows the line numbers, and flags the lines in question). See Figure 469.

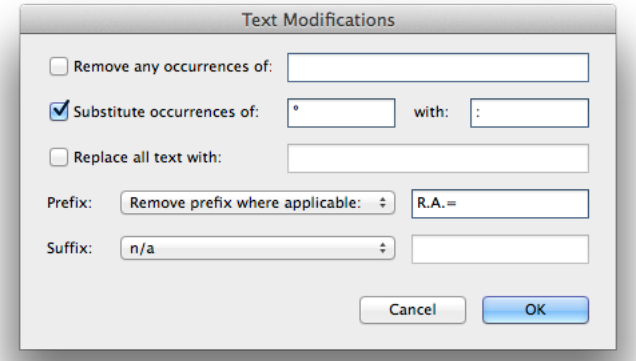


Figure 467: Text Modifications dialog

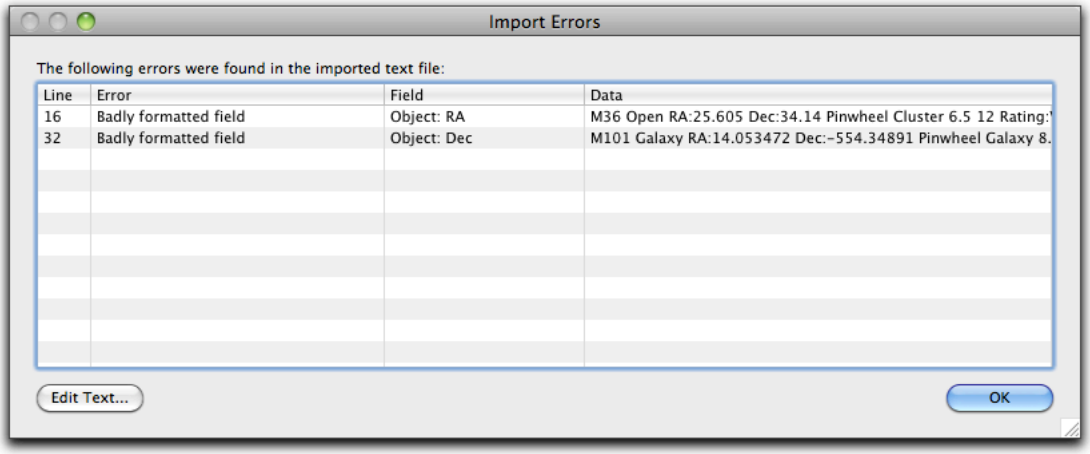


Figure 468: Import error dialog

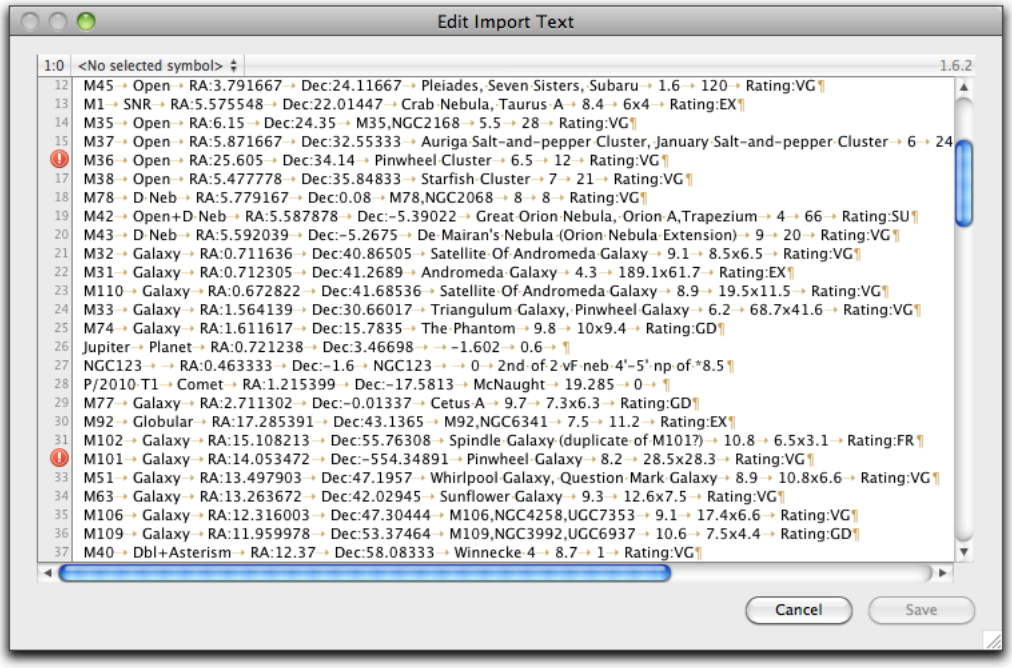


Figure 469: Import data text editor

26.1.2 Comet data

This is covered in detail in Chapter 24 on page 338.

26.1.3 Minor Planet data

This is covered in detail in Chapter 24 on page 338.

26.1.4 Supernova data

Use the ***File > Import > Supernova Data...*** menu command to retrieve supernova data. The dialog lets you choose the source of the data to import.

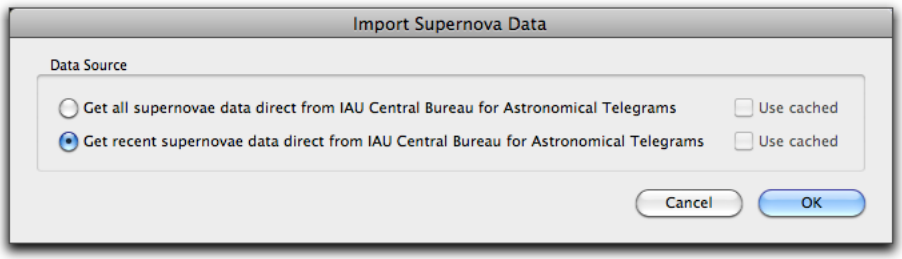
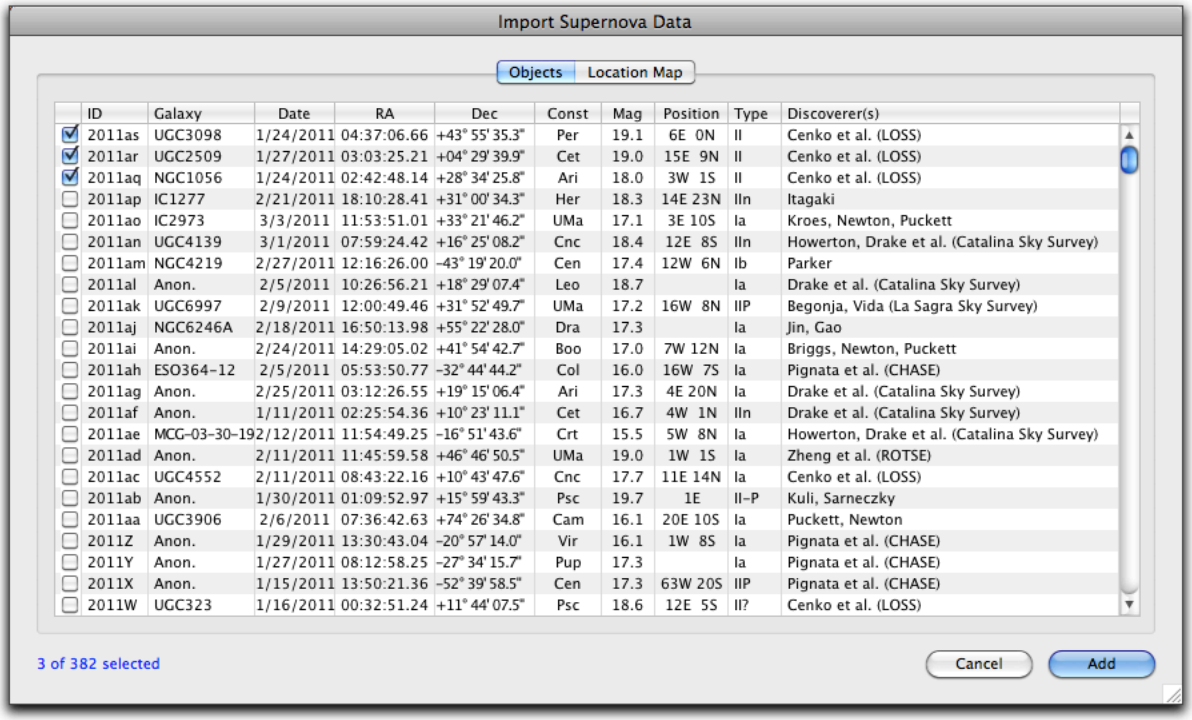


Figure 470: Select supernova data source

Both options download the latest data from the Internet (assuming you have a connection). If you have previously downloaded from a source, the **Use cached** checkbox will be enabled. Checking this will use the cached copy rather than requiring a download.

Once you've selected the source, and clicked ***OK***, you will be presented with a list of supernovae (Figure 471). Select one or more supernovae to be added to your plan by checking the checkbox to the left of the entry in the list.



	ID	Galaxy	Date	RA	Dec	Const	Mag	Position	Type	Discoverer(s)
☑	2011as	UGC3098	1/24/2011	04:37:06.66	+43° 55' 35.3"	Per	19.1	6E 0N	II	Cenko et al. (LOSS)
☑	2011ar	UGC2509	1/27/2011	03:03:25.21	+04° 29' 39.9"	Cet	19.0	15E 9N	II	Cenko et al. (LOSS)
☑	2011aq	NGC1056	1/24/2011	02:42:48.14	+28° 34' 25.8"	Ari	18.0	3W 1S	II	Cenko et al. (LOSS)
☐	2011ap	IC1277	2/21/2011	18:10:28.41	+31° 00' 34.3"	Her	18.3	14E 23N	IIn	Itagaki
☐	2011ao	IC2973	3/3/2011	11:53:51.01	+33° 21' 46.2"	UMa	17.1	3E 10S	Ia	Kroes, Newton, Puckett
☐	2011an	UGC4139	3/1/2011	07:59:24.42	+16° 25' 08.2"	Cnc	18.4	12E 8S	IIn	Howerton, Drake et al. (Catalina Sky Survey)
☐	2011am	NGC4219	2/27/2011	12:16:26.00	-43° 19' 20.0"	Cen	17.4	12W 6N	Ib	Parker
☐	2011al	Anon.	2/5/2011	10:26:56.21	+18° 29' 07.4"	Leo	18.7		Ia	Drake et al. (Catalina Sky Survey)
☐	2011ak	UGC6997	2/9/2011	12:00:49.46	+31° 52' 49.7"	UMa	17.2	16W 8N	IIP	Begonja, Vida (La Sagra Sky Survey)
☐	2011aj	NGC6246A	2/18/2011	16:50:13.98	+55° 22' 28.0"	Dra	17.3		Ia	Jin, Gao
☐	2011ai	Anon.	2/24/2011	14:29:05.02	+41° 54' 42.7"	Boo	17.0	7W 12N	Ia	Briggs, Newton, Puckett
☐	2011ah	ESO364-12	2/5/2011	05:53:50.77	-32° 44' 44.2"	Col	16.0	16W 7S	Ia	Pignata et al. (CHASE)
☐	2011ag	Anon.	2/25/2011	03:12:26.55	+19° 15' 06.4"	Ari	17.3	4E 20N	Ia	Drake et al. (Catalina Sky Survey)
☐	2011af	Anon.	1/11/2011	02:25:54.36	+10° 23' 11.1"	Cet	16.7	4W 1N	IIn	Drake et al. (Catalina Sky Survey)
☐	2011ae	MCG-03-30-192	12/2011	11:54:49.25	-16° 51' 43.6"	Crt	15.5	5W 8N	Ia	Howerton, Drake et al. (Catalina Sky Survey)
☐	2011ad	Anon.	2/11/2011	11:45:59.58	+46° 46' 50.5"	UMa	19.0	1W 1S	Ia	Zheng et al. (ROTSE)
☐	2011ac	UGC4552	2/11/2011	08:43:22.16	+10° 43' 47.6"	Cnc	17.7	11E 14N	Ia	Cenko et al. (LOSS)
☐	2011ab	Anon.	1/30/2011	01:09:52.97	+15° 59' 43.3"	Psc	19.7	1E	II-P	Kuli, Sarneczky
☐	2011aa	UGC3906	2/6/2011	07:36:42.63	+74° 26' 34.8"	Cam	16.1	20E 10S	Ia	Puckett, Newton
☐	2011Z	Anon.	1/29/2011	13:30:43.04	-20° 57' 14.0"	Vir	16.1	1W 8S	Ia	Pignata et al. (CHASE)
☐	2011Y	Anon.	1/27/2011	08:12:58.25	-27° 34' 15.7"	Pup	17.3		Ia	Pignata et al. (CHASE)
☐	2011X	Anon.	1/15/2011	13:50:21.36	-52° 39' 58.5"	Cen	17.3	63W 20S	IIP	Pignata et al. (CHASE)
☐	2011W	UGC323	1/16/2011	00:32:51.24	+11° 44' 07.5"	Psc	18.6	12E 5S	II?	Cenko et al. (LOSS)

Figure 471: Import supernova data dialog

The **Location Map** tab shows all supernovae on an all-sky map, with any selected supernovae circled in red. Double-clicking a supernova on the chart will select that line in the list.

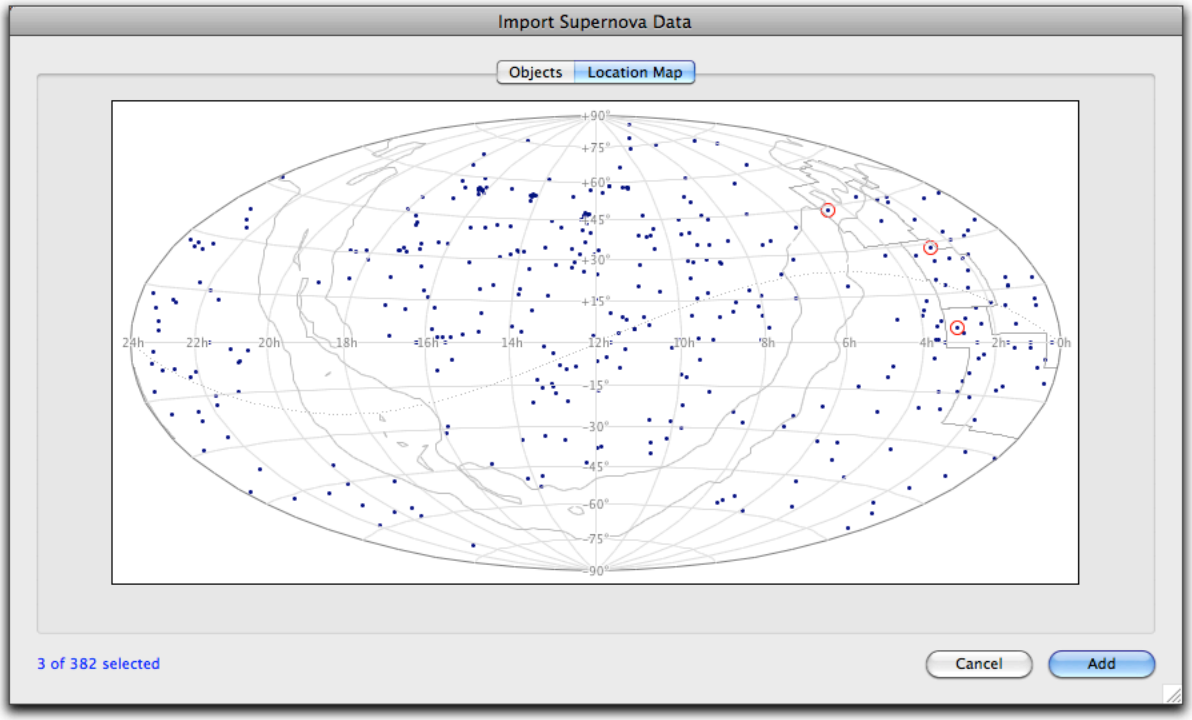


Figure 472: Supernova location map

26.1.5 Gamma Ray Burst (GRB) data

Use the ***File > Import > Gamma Ray Burst Data...*** menu command to retrieve gamma ray burst data. The dialog lets you choose the source of the data to import (currently only one).

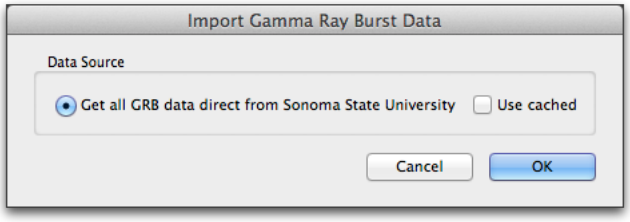


Figure 473: Select GRB data source

The latest data is downloaded from the Internet (assuming you have a connection). If you have previously downloaded from a source, the **Use cached** checkbox will be enabled. Checking this will use the cached copy rather than requiring a download.

Once you've selected the source, and clicked ***OK***, you will be presented with a list of gamma ray burst candidates (Figure 474). Select one or more of these to be added to your plan by checking the checkbox to the left of the entry in the list.

New items since the last time you used this feature are marked in red (or green if they are currently visible from your observing site). If the item is *never* visible from your observing site (i.e. always below the theoretical horizon), it is coloured grey.

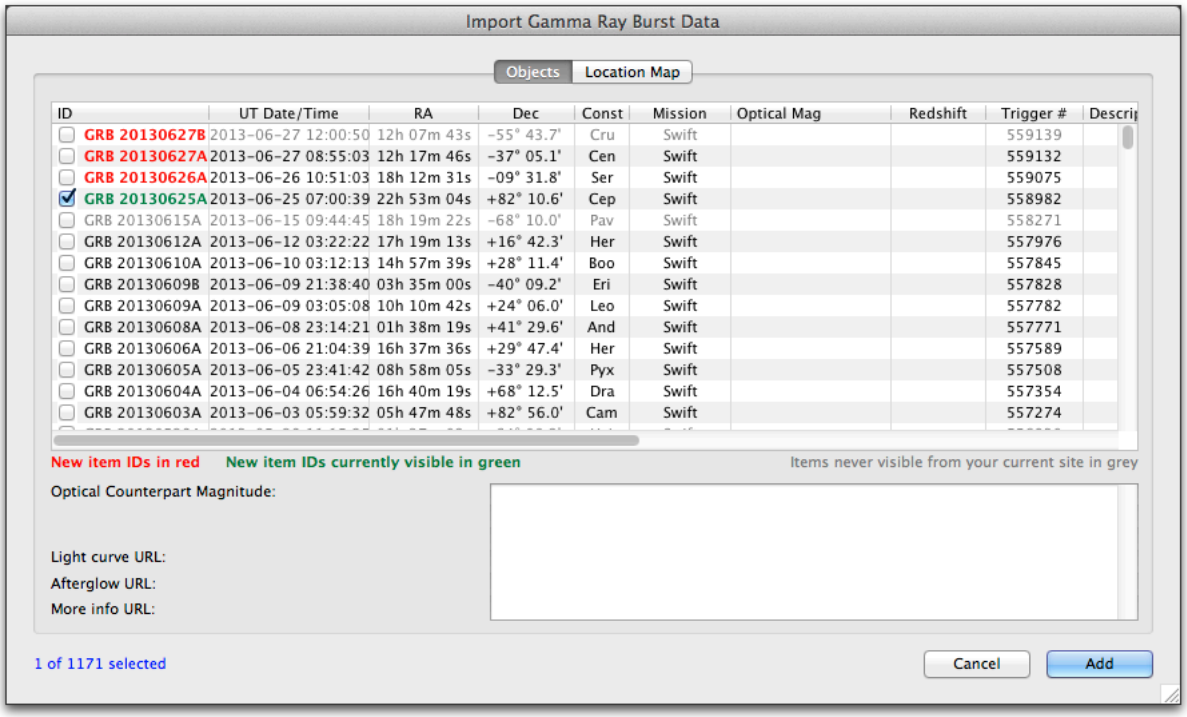


Figure 474: Import GRB data dialog

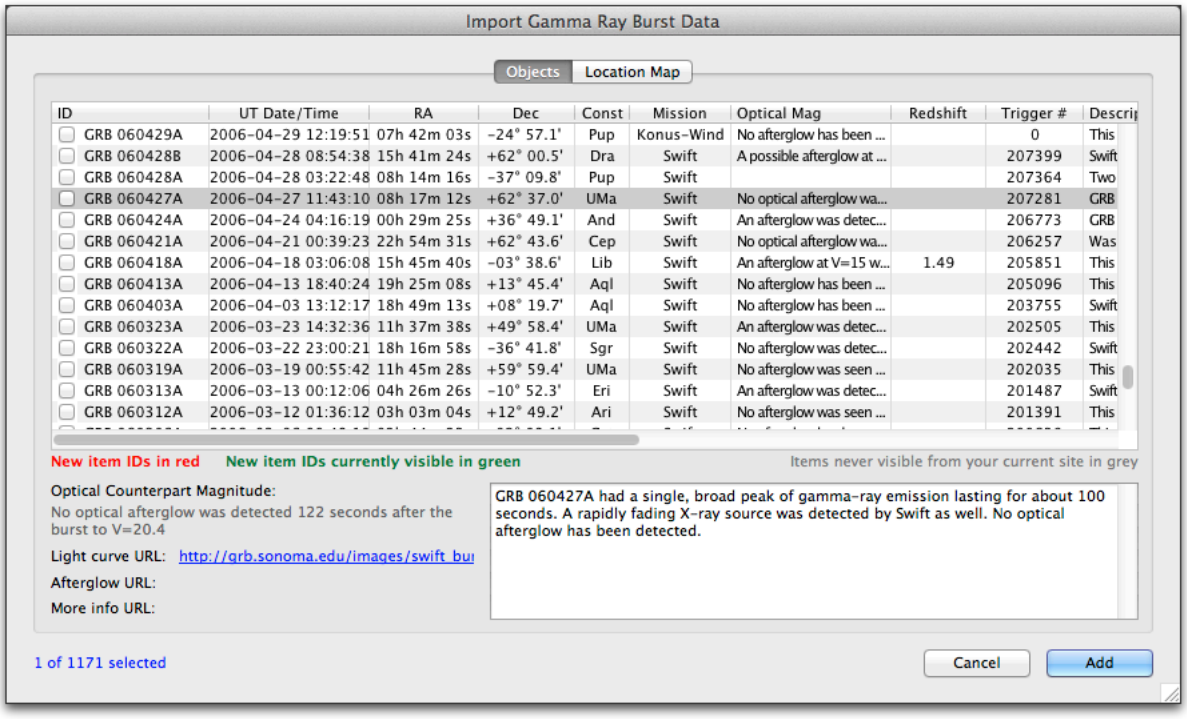


Figure 475: Selecting older items with additional data

The **Location Map** tab shows all GRB sources on an all-sky map, with any selected entries circled in red. Double-clicking a GRB source on the chart will select that line in the list.

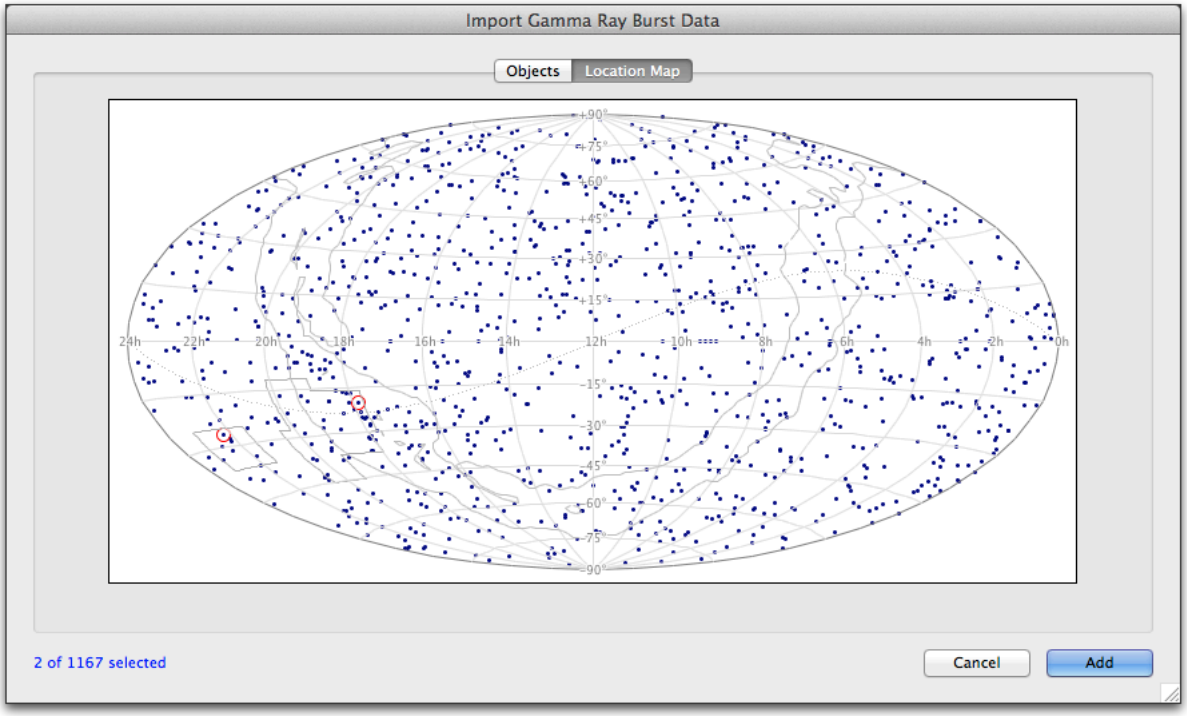


Figure 476: GRB location map

26.1.6 Exoplanet data

Use the ***File > Import > Exoplanet Data...*** menu command to retrieve exoplanet data. The dialog lets you choose the source of the data to import (currently only one).

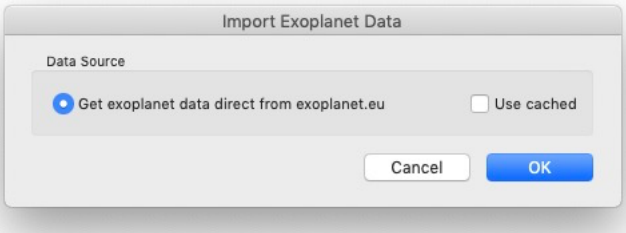


Figure 477: Select exoplanet data source

The latest data is downloaded from the Internet (assuming you have a connection). If you have previously downloaded from a source, the **Use cached** checkbox will be enabled. Checking this will use the cached copy rather than requiring a download.

Once you've selected the source, and clicked ***OK***, you will be presented with a list of exoplanet discoveries. Select one or more of these to be added to your plan by checking the checkbox to the left of the entry in the list.

New items since the last time you used this feature are marked in red (or green if they are currently visible from your observing site). If the item is *never* visible from your observing site (i.e. always below the theoretical horizon), it is coloured grey.

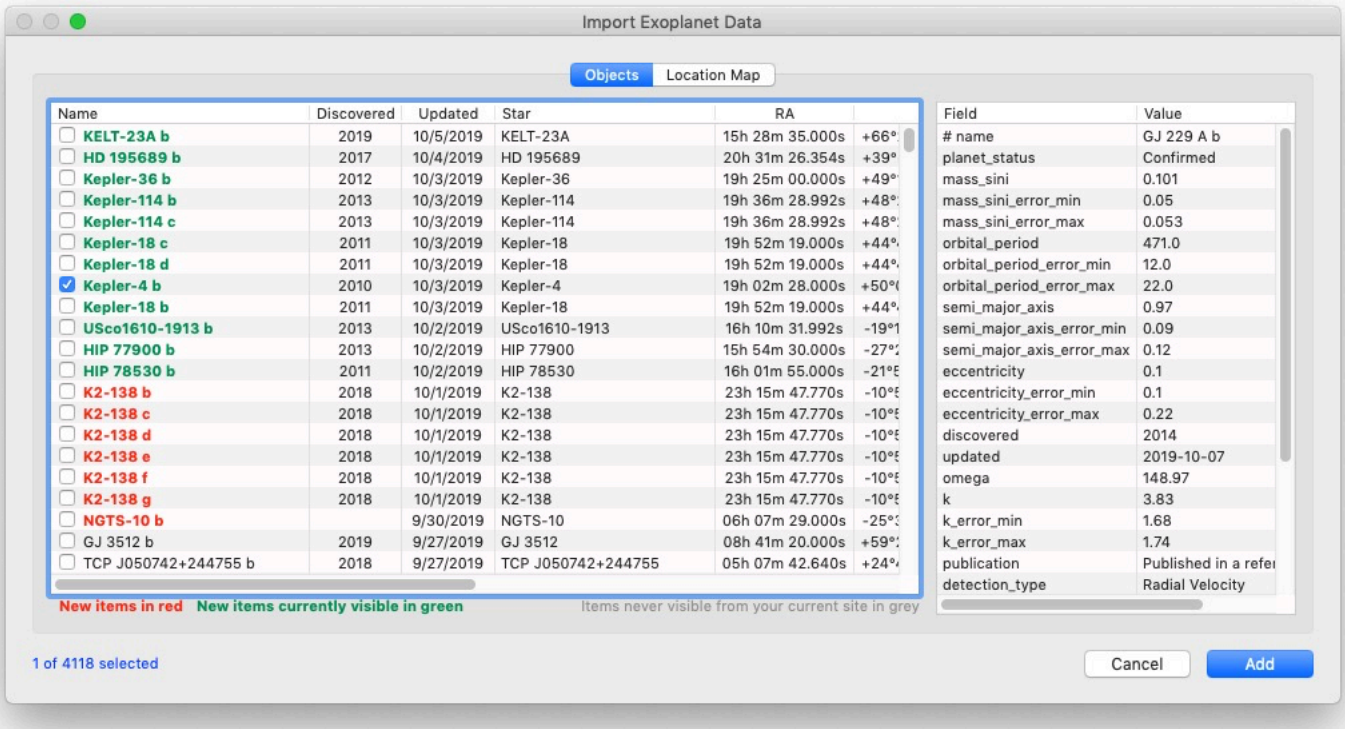


Figure 478: Select exoplanet data

26.1.7 Observations/Sessions

Use ***File > Import > Observations/Sessions...*** to import observations and sessions into the observation database from a file previously exported from another installation of AstroPlanner. This is useful for moving recent observation information from, say, a field laptop to an office desktop computer. See Section 26.2.10 on page 365 for the corresponding exporting information.

26.1.8 Sky Commander catalogues

Use ***File > Import > Sky Commander Catalogue...*** to import a Sky Commander catalogue file (.s37 extension).

26.1.9 SkySafari observing lists

Use ***File > Import > SkySafari observing list...*** to import a SkySafari observing list file (.skylist extension). If the list contains observations made in SkySafari, then you'll be prompted to import those observations as well (optionally).

26.1.10 EQTour observing lists

Use ***File > Import > EQTour observing list...*** to import an EQTour observing list file (.lst extension).

26.1.11 Cartes du Ciel observing lists

Use ***File > Import > Cartes du Ciel observing list...*** to import an Cartes du Ciel observing list file (.txt extension).

26.2 Export

26.2.1 Generic text files

AstroPlanner includes a very flexible way to export object and observation data in the form of plain text files. Use ***File > Export > Generic Text, Excel, XML or JSON...*** to do this.

The exported text file has one *line* per exported *entity* (object, etc.). Each line consists of a fixed number of *fields*, with each field representing the value of some *parameter* of the entity (e.g. ID, RA, Notes, etc.).

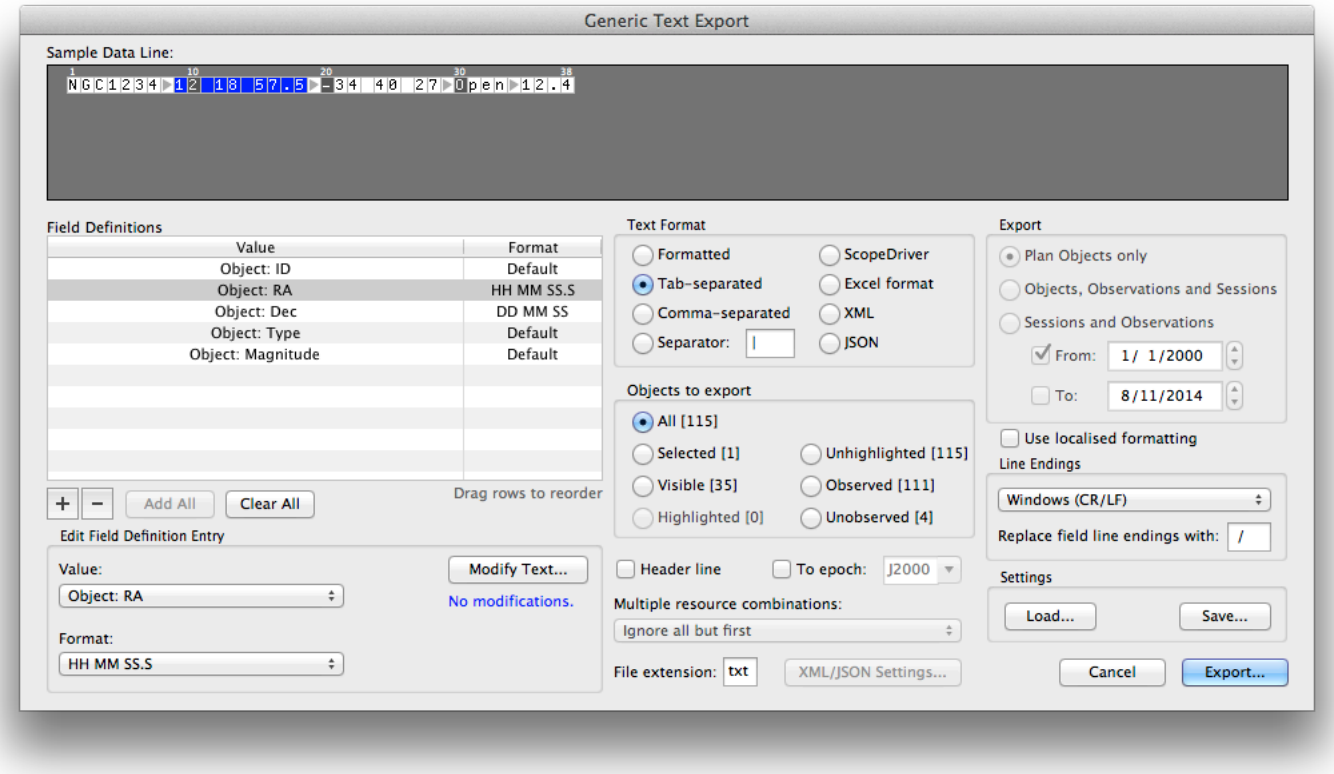


Figure 479: Generic text export dialog

- **Sample Data Line**. This area displays a sample of what will be exported to a line of the text file, and will change as you change the settings within the dialog.
- **Field Definitions**. This list contains an entry for each exported field, and the list represents all the fields in a single line of text data. Entity parameters are exported in the same order as the rows of the list. You can add and delete entries from the list using the **+** and **-** buttons, and the list can be reordered by dragging the rows around. The ***Clear All*** button deletes all entries, and the ***Add All*** button adds all possible fields to the list. You can edit a new or existing entry by selecting it and changing the parameters in the **Edit Field Definition Entry** section.
- **Edit Field Definition Entry**. This changes the currently-selected entry in the **Field Definitions** list. The **Value** popup is the entity parameter you want to export, and is typically a parameter of an object, session or observation. There's also an *<empty>* choice that can be used to output an empty field if necessary. The **Format** popup is the way you want to format the Value. Typically

you'd use the *Default* format in most cases, but some parameter types specify various formats (e.g. R.A. can be formatted in hours or degrees, as a decimal, or in the form hh:mm:ss, etc.). If you have chosen the **Text Format** to be Formatted then there will also be **Column From** and **Column To** entries. You can also specify text to be prefixed and/or suffixed to the formatted field data, as well as various other text substitutions, etc. by using the **Modify Text...** button.

- **Text Format**. The Formatted option allows you to specify the column range for each field (e.g. ID in columns 1 through 6, RA in columns 7 through 15, etc. Tab-separated, comma-separated and arbitrary-character-string-separated options put the requisite character string between fields of each output line. The Comma-separated option also makes sure that fields containing commas are enclosed in quotes, etc. Excel, XML and JSON are covered in the next sections.
- **Objects to export**. Specifies which objects to export, unless you are exporting Sessions and Observations.
- **Header line**. This option will output a single header line before the data with appropriate field headings, in the same Text Format as the data.
- **To epoch**. The object data is exported with the same epoch as shown in the object list (i.e. J2000.0). This option lets you convert the coordinates to another epoch (in particular, JNow, which represents the epoch of the current date).
- **Multiple resource combinations**. If you are exporting observations, this option specifies what to do with multiple resource combinations (i.e. you made observations with more than one telescope/eyepiece/etc. combination). You can elect to **Ignore all but first** in which case a single observation line is output, using only the first resource combination. Alternatively, **Duplicate record for each** will output a duplicate record/line for each combination (i.e. the lines will be identical except for the resource combination fields - telescope, eyepiece, etc.).
- **File extension**. The file name extension to use by default.
- **Export**. Specifies what is to be exported. **Plan Objects only** will consider only objects in your object list and output a line for each. **Objects, Observations and Sessions** will consider each object in your object list and output a line for each session/observation associated with it. Any object parameters specified will be duplicated in each observation line. **Sessions and Observations** ignores objects and looks at all observation Sessions included in the specified date range, and all observations associated with those sessions. The checkboxes allow you to specify "open-ended" ranges.
- **Use localised formatting**. If this option is checked, date, times and numbers will be exported in the local format as specified by the operating system (e.g. decimal comma in Europe, etc.). If it is unchecked then the standard (U.S.?) formatting is used.
- **Line Endings**. Specify whether each line end with a carriage return (Macintosh), a line feed (Unix), or both (Windows). You can also specify a character string to replace any line endings within a field. This is useful when you export, say, Notes fields with multiple lines/paragraphs.
- **Settings**. Once you've set up the dialog, the ***Save...*** button allows you to save the settings to a file, which can be later retrieved using the ***Load...*** button. This is useful if you are juggling multiple export formats.

26.2.2 XML

Largely the same as described in Section 26.2.1 on page 359, with some minor additional features. Choose the XML option under **Text Format**. Some of the items are no longer applicable and are dis-

abled (e.g. line endings, header line, etc.). Export is done to an XML text file, using default XML settings and styles. These can be changed by clicking the ***XML/JSON Settings...*** button.

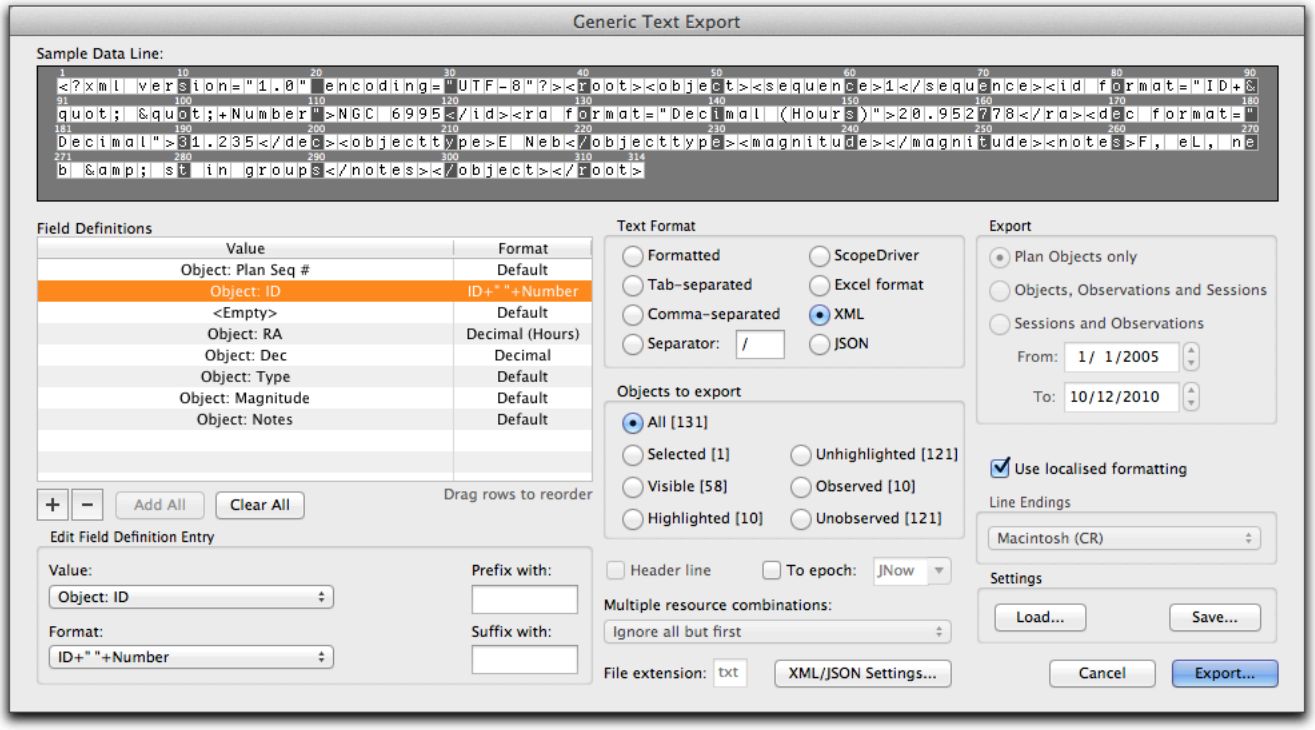


Figure 480: XML option in the Generic text export dialog

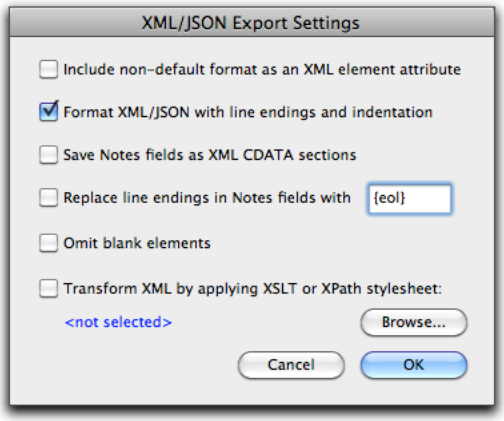


Figure 481: XML/JSON Export Settings dialog

The XML/JSON Settings are:

- **Include non-default format as an XML element attribute**. If a field has a format that is not "Default", then this option adds a "format" attribute for the element. e.g. If the ID file has the "Number only" format, then the field will be exported as <id format="Number only">1234</id>.
- **Format XML/JSON with line endings and indentation**. If this option is unchecked, the XML is output without whitespace or line endings (which are not relevant in XML). If it is checked then the XML will have line endings and whitespace indentation to make the file more human-readable.

- **Save Notes fields as XML CDATA sections**. This option will save the Notes fields as CDATA (a sort-of encoded format that retains non-ASCII characters, line endings, etc.). However, not all applications reading this data will understand it.
- **Replace line endings in Notes fields with**. If you don't use CDATA for the Notes fields, you can convert any line endings into a short string (otherwise they will be ignored or converted into whitespace).
- **Omit blank elements**. If an element is blank, leave it out. e.g. if an object has no Size parameter, then normally this will be added as <size></size>. Checking this option leaves out the empty element altogether.
- **Transform XML by applying XSLT or XPath stylesheet**. If you have an XSLT or XPath stylesheet, you can apply it to the exported XML. Use the ***Browse...*** button to select the file to use.

26.2.3 JSON

Largely the same as XML export. See Section 26.2.2 on page 360 for details. Choose the JSON option under **Text Format**.

26.2.4 Excel

Largely the same as described in Section 26.2.1 on page 359. Choose the Excel option under **Text Format**.

26.2.5 Argo Navis user catalogues

This exports objects from the object list to a text file suitable for downloading to an Argo Navis telescope controller.

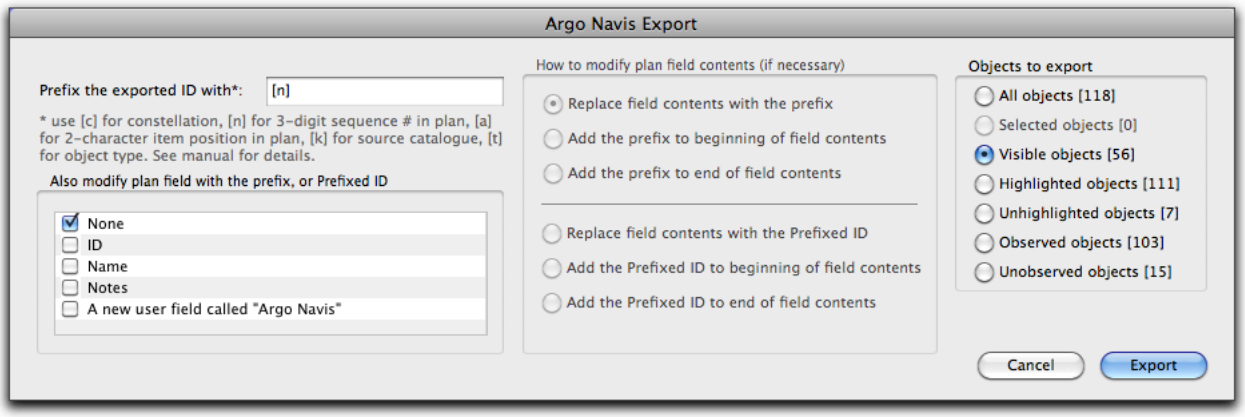


Figure 482: Argo Navis export dialog

You can specify a prefix to be added to the exported object text for reference/sorting purposes. In addition to adding a prefix to the exported objects, you can also modify the source plan document to match those downloaded objects. You specify which field is to be modified (ID, Name, etc.) and how it will be modified.

26.2.6 Autostar tours

You can export the objects in your object list to a text file in the Meade *Autostar* Tour format. This file can then be uploaded to your *Autostar* controller via the (sadly) Windows-only Meade ASU application.

Use the ***File > Export > Autostar Tour...*** menu command.

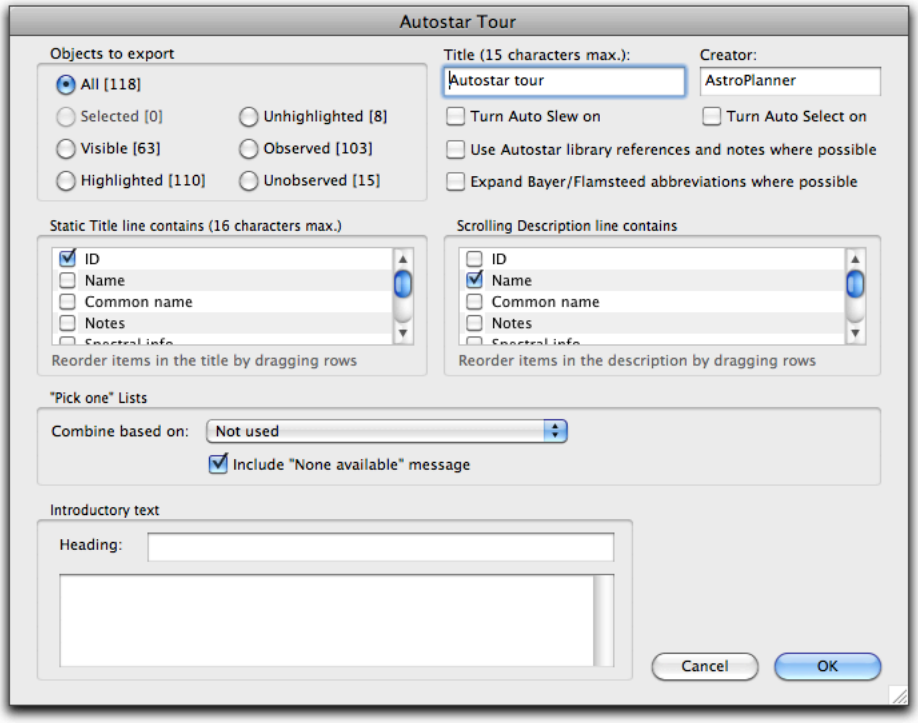


Figure 483: Autostar tour export dialog

The **Turn Auto Slew on** and **Turn Auto Select on** parameters are described in the *Autostar* Tour creation manual, available from the Meade Instruments web site.

The **Use Autostar library references and notes where possible** setting will use the built-in *Autostar* data where possible. If you have an object that should be present in the controller database (e.g. M31, NGC 6177, etc.) then it will be used instead of the data in your plan document.

Expand Bayer/Flamsteed abbreviations where possible will convert abbreviations such as bet UMa to Beta Ursa Major.

The *Autostar* handbox displays two lines of text. Typically the top line (16 characters) remains static, while the bottom line scrolls. The **Static Title line contains** option defines what is shown in the top line of the handbox display. Note that this will be truncated to 16 characters if necessary. The **Scrolling Description line contains** option does the same for the bottom line. e.g. If you are observing double stars you might want magnitude and separation, but not size. You can reorder the lists by dragging their entries if necessary.

If you choose a setting from **"Pick one" Lists** then the objects will be grouped according to the chosen combination. The tour will then let the user select one from each group. If the **Include "None available" message** is set then the user will get a message if none of the objects in a group is visible.

The **Introductory text** is displayed at the start of a tour. Here is a sample listing of a (very short) generated file:

```
////////////////////////////////////////////////////////////
// Tour created: Monday, March 14, 2011 at 10:19:14
// by: AstroPlanner
//
// Generated by AstroPlanner
// http://www.ilangainc.com/astroplanner/
// Copyright (c) 2002-11 iLanga, Inc.
```

```
//////////////////////////////////////////////////////////
TITLE "Autostar tour"
AUTO SLEW ON
AUTO SELECT TEXT "M1" "Crab Nebula"
AUTO SELECT MESSIER 1
AUTO SELECT MESSIER 2
AUTO SELECT MESSIER 3
AUTO SELECT TEXT "M4" "Cat's Eye"
AUTO SELECT MESSIER 4
AUTO SLEW OFF
#END
```

26.2.7 NexRemote tours

Use ***File > Export > NexRemote Tour...*** is used to export object data into a file suitable for importing into the *NexRemote* application for controlling Celestron telescopes. You get to select which objects get exported. Note that there is a maximum of 200 objects in the exported file.

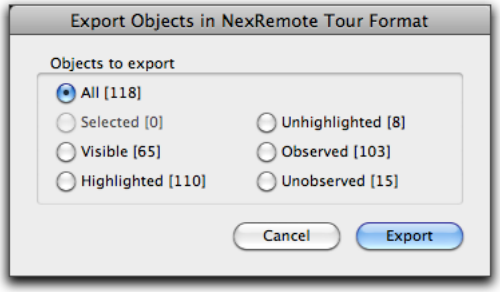


Figure 484: NexRemote tour export dialog

26.2.8 EQTour observing list

Use ***File > Export > EQTour Observing List...*** is used to export object data into a file suitable for importing into the *EQTour* application for controlling ASCOM telescopes. You get to select which objects get exported.

Figure 485: EQTour export dialog

26.2.9 SkySafari observing lists

Use ***File > Export > SkySafari Observing List...*** is used to export object data into a file suitable for importing into the *SkySafari* planetarium application (Mac and iOS). You get to select which objects get exported. Note that SkySafari may not import all of the exported objects, since it requires them to match up with its own internal catalogues.

Figure 486: SkySafari observing list export dialog

26.2.10 Observations/Sessions

Use ***File > Export > Observations/Sessions...*** to export selected observations and sessions from the observation database to a file in a format for re-importation into another installation of AstroPlanner. This is useful for moving recent observation information from, say, a field laptop to an office desktop computer. See Section 26.1.7 on page 358 for the corresponding importing information.

Figure 487: Export Observations/Sessions dialog

You can choose to export all sessions/observations from the database, sessions/observations made since the last export, sessions/observations dated after a given date, or sessions/observations dated in a range. The information will be saved in a file with a .obs extension.

26.2.11 Sky Commander catalogues

The ***Sky Commander XP4*** allows catalogues of objects to be added to firmware uploads. AstroPlanner can create such catalogues ready for uploading.

The ***File > Export > Sky Commander Catalogue...*** command lets you firstly select an AstroPlanner catalogue to convert.

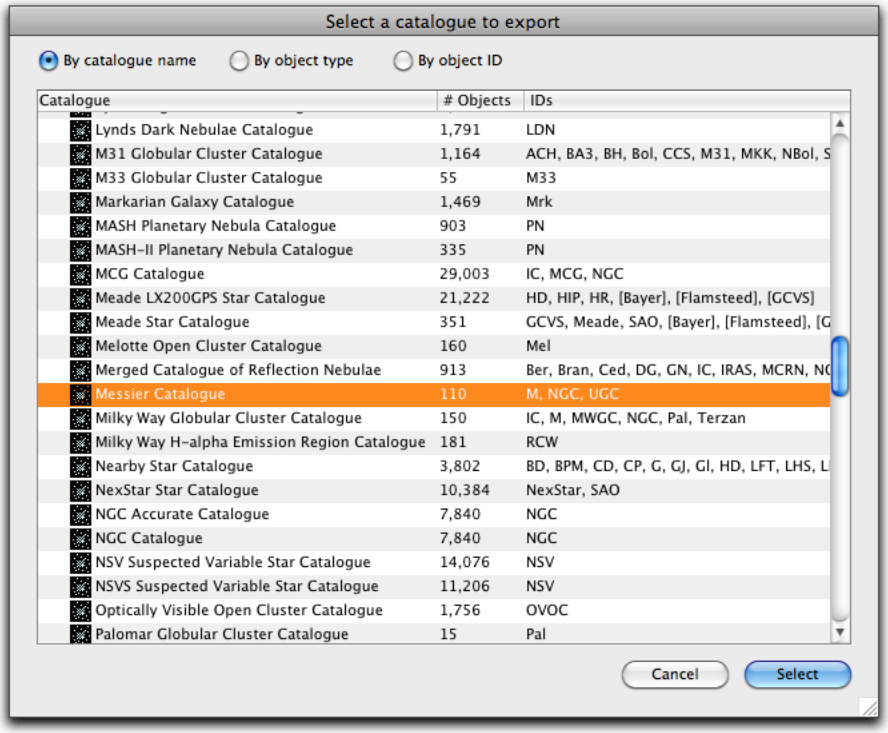


Figure 488: Selecting a catalogue to export

Since many of these catalogues are too large for the *Sky Commander* to handle, a dialog is presented that allows you to control which objects from the catalogue are to be included.

You select which object types, which ID is to be used, and possibly restrict the objects by RA, Dec, Magnitude, Separation (double stars), constellation and/or Spectral type (stars).

You can also specify that the Name field should be used rather than ID (useful for double stars in the WDS, for example).

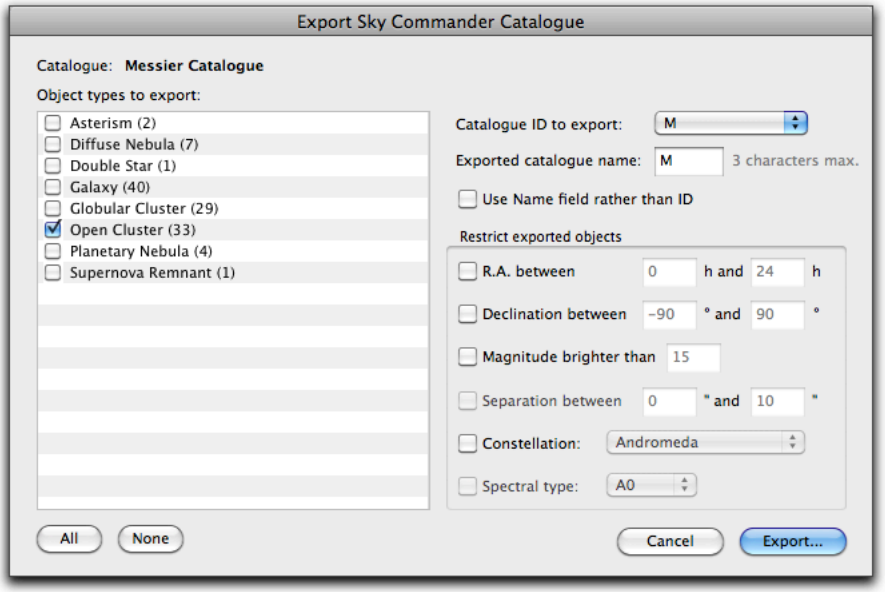


Figure 489: Sky Commander catalogue export dialog

26.2.12 Plan to Sky Commander Catalogue

The ***File > Export > Plan to Sky Commander Catalogue...*** command will export the current plan document objects as a *Sky Commander* catalogue. You can select all objects or just highlighted objects, and whether to use the Name field rather than the ID field.

Figure 490: Plan to Sky Commander export dialog

26.2.13 Cartes du Ciel observing lists

Use ***File > Export > Cartes du Ciel Observing List...*** to export the plan document contents to a file (.txt extension) that can be read by Cartes du Ciel V3.10 or later.

26.2.14 Sequence Generator Pro Target List

Use ***File > Export > Sequence Generator Pro Target List...*** to export the plan document contents to a file that can be read by Sequence Generator Pro.

26.3 Scripted solutions

It is possible to write a script to import or export objects, observations, etc. This is covered in more detail in the Scripting manual. You can check the inventory of user-contributed scripts and see if a script exists that will do the job, or that might be modified to fit the bill. See Section 27.2 on page 371 for more details.

27 Scripting

Scripting is a method of extending the capabilities of AstroPlanner using a built-in scripting language (an object-oriented language similar to Visual Basic). In particular it is possible to construct scripts to extend the following application features:

- General scripts that run to perform a single task (e.g. import data, construct an observing calendar, etc.). These are the most common types of scripts.
- Scripts that compute a value for a user-defined field.
- Scripts that extend or complement the printing mechanism for printing object or observation lists.
- Scripts that implement telescope drivers.

Writing a script does require a moderate understanding of computer programming. However, those folk with such knowledge can also upload their scripts to an on-line repository that's available to all users. Downloading and using a user-contributed script is easy, and does not require any programming ability (unless you want to modify it for your own uses, that is).

The actual scripting language, the software framework that allows you to communicate with the application, and other details (all the geeky stuff) are contained in a separate scripting manual. The rest of this chapter discusses how to use the scripting system, not how to program it.

27.1 Editing and managing scripts

All (or most) script operations occur in the ***Script*** menu. The menu is in two parts.

The first part is a list of scripts that you have specified to appear in the menu (identifiable by the script icon on the left of each item). Selecting any of these scripts will execute the script immediately. Initially there will be no scripts in this menu.

The second part of the menu are various script-related commands.

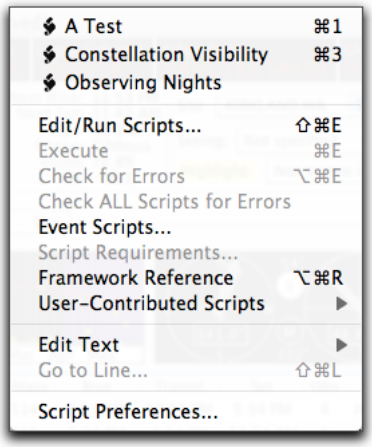


Figure 491: ***Script*** menu

Using the ***Script > Edit/Run Scripts...*** command opens the script editor window. This is where management and editing of scripts is done. On the left side of the window is a list of installed scripts, selecting one of these loads the script into the editor on the right side of the window.

You can then edit the script if desired, save the changes using the ***Save*** button (or ***File > Save***), and execute the script using the ***Execute*** button (or ***Script > Execute***).

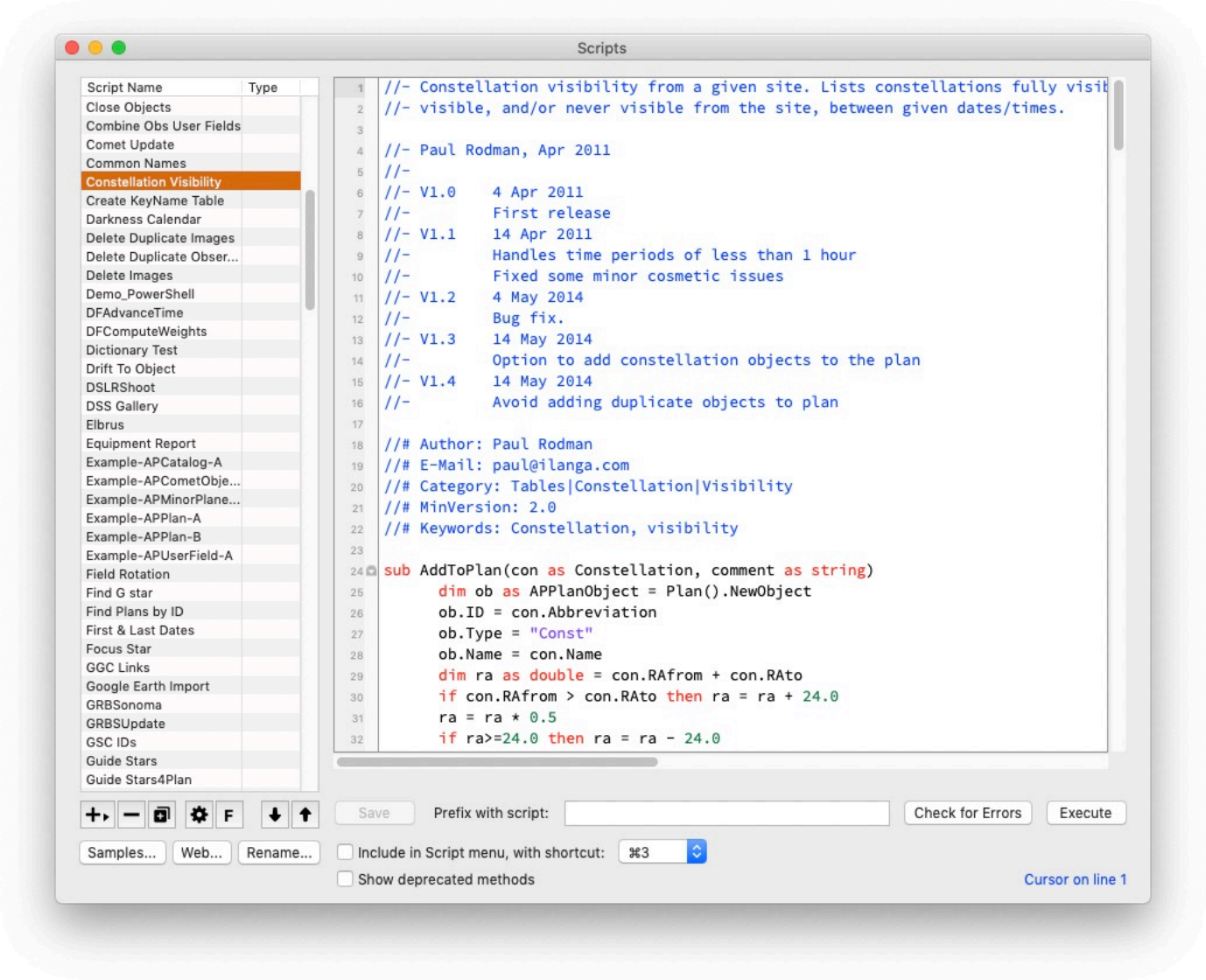


Figure 492: Script editor window

The row of buttons underneath the script list have the following functionality, from left to right:

- **Add new script**. Add a new script to the list. The submenu lists the various types of script that can be created. The most common being the "General" script. A new script file is created given a name you specify (which must be unique).
- **Delete selected script**. Delete the selected script. This cannot be undone.
- **Duplicate selected script**. Make a duplicate copy of the selected script.
- **Open script preferences**. Open the script preferences window (see Section 20.11 on page 316)
- **Open a framework reference window**. Open a new Framework Reference window (see Section 27.5 on page 374).

- **Download user-contributed scripts**. Open the user-contributed script download dialog in order to download a script and add it to your inventory (see Section 27.2 on page 371).
- **Upload a user-contributed script**. Open the user-contributed script upload dialog and prepare to upload the selected script to the on-line inventory (see Section 27.7 on page 377).

You can rename an existing script by selecting it and clicking the ***Rename...*** button.

You can examine and use various included sample scripts (some of which are mentioned in the scripting manual), by clicking the ***Samples...*** button. Selecting a sample script will copy it into a new script in your list, which you can then try, edit, etc.

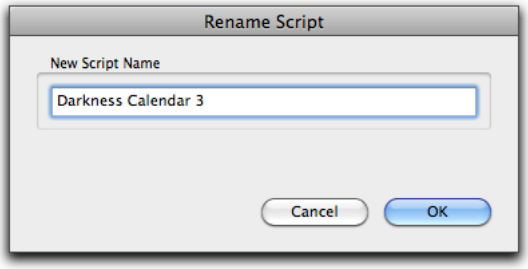


Figure 493: Renaming a script

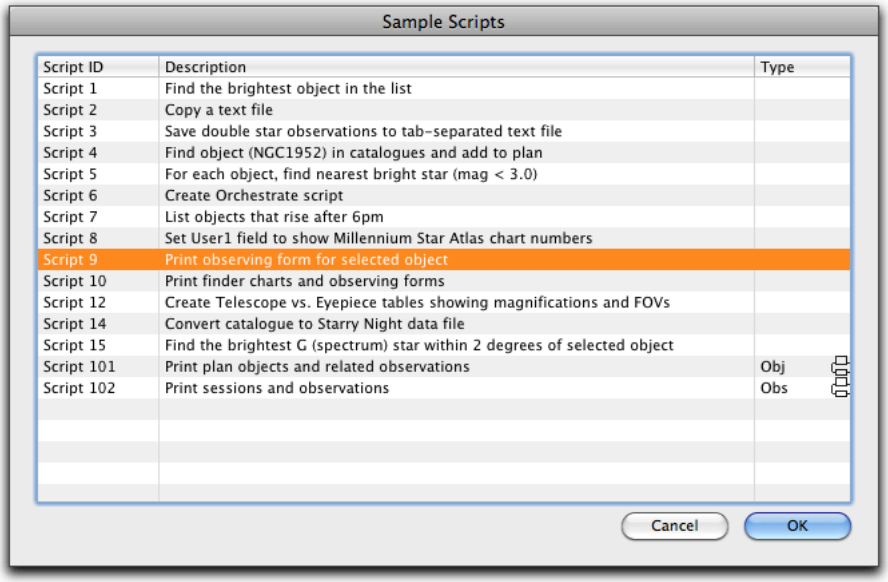


Figure 494: Sample script dialog

The ***Check for Errors*** button (and ***Script > Check for Errors***) compiles and checks your script for syntax errors without actually running it. The ***Execute*** button compiles the script if necessary (if this is the first time you have used it, or if you have made changes), and executes it.

There is also a ***Script > Check ALL Scripts for Errors*** menu command. This will run through all scripts in your list and check each one for errors. Note that if a script is compiled and has syntax errors, it is designated by a red dot in the script list.

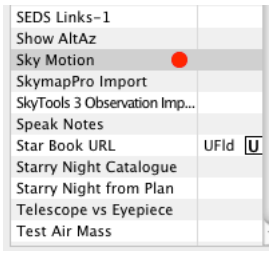


Figure 495: Script list showing script with syntax error

Use the **Include in Script menu** checkbox if you want to include the script at the top of the ***Script*** menu for faster access. You can also add a keyboard shortcut to that menu item for even faster access.

The **Show deprecated methods** checkbox detects any use of older framework calls from Astro-Planner V1.x that have been deprecated (i.e. replaced by newer methods). It is recommended that you replace any deprecated method calls by their newer replacements, since the older code will probably disappear in future versions of the application. After the script has run, a window containing a list of deprecated method calls and the new method to use, is displayed.

The **Prefix with script** field allows you to prefix your script with the contents of another script file before executing (allowing you to include common libraries, etc.). You can specify several script prefix files by separating their names with semicolons (;).

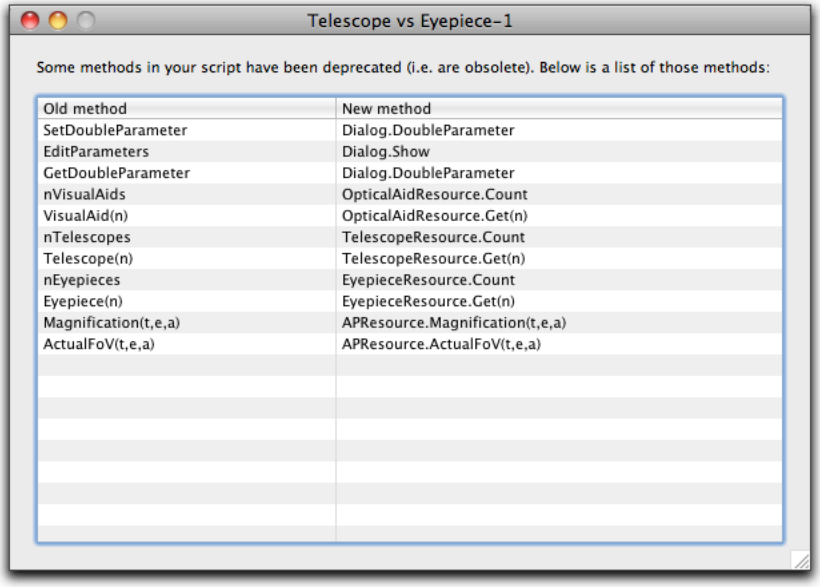


Figure 496: Deprecated methods window

27.2 Downloading a user-contributed script

You download a user-contributed script via the ***Script > User-Contributed Scripts > Download...*** menu command, or via the download button underneath the script list in the script editor window (see above). This feature is only available if you have an active Internet connection.

The current inventory of user-contributed scripts is downloaded from the Internet and displayed in a hierarchical fashion in a dialog.

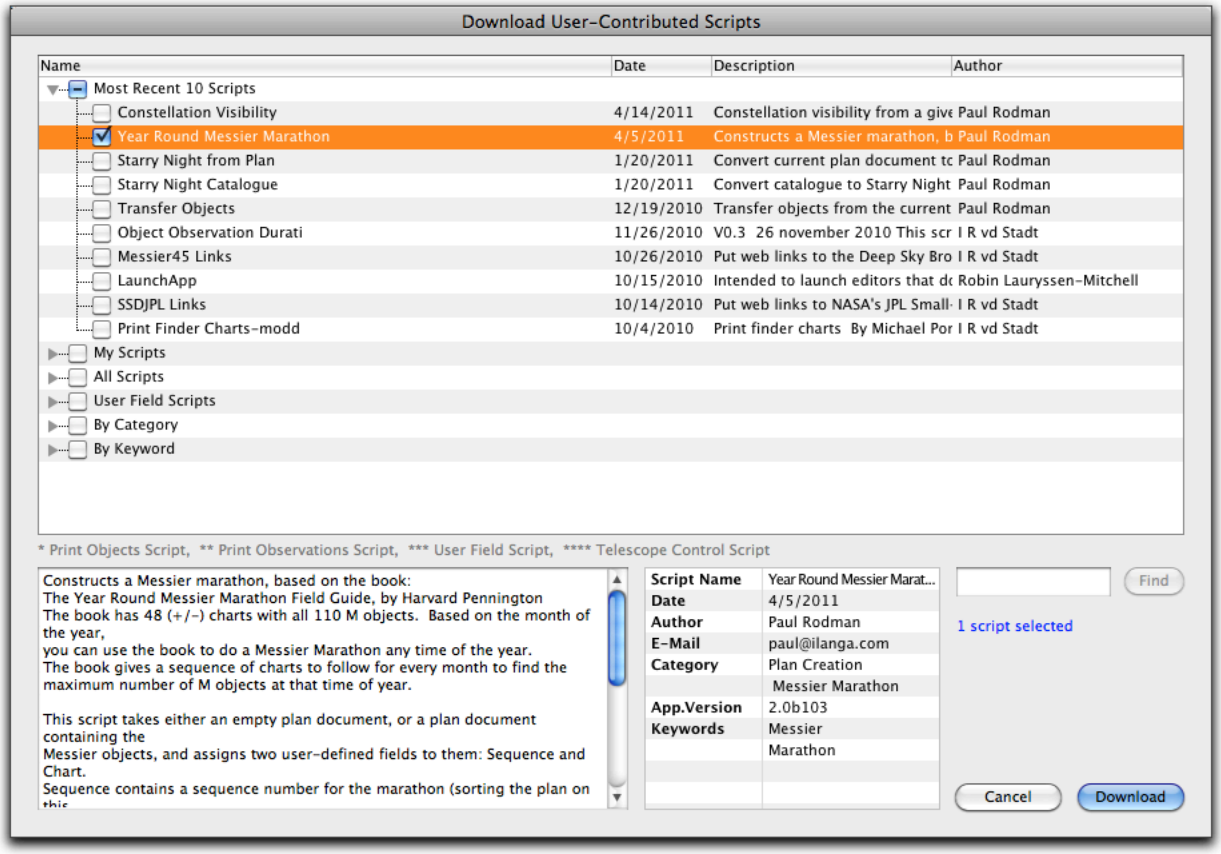


Figure 497: User-contributed scripts download dialog

The dialog displays the available scripts in various ways:

- **Most Recent 10 Scripts**. The ten most-recently uploaded scripts are displayed first. These are usually the ones you will be most interested in.

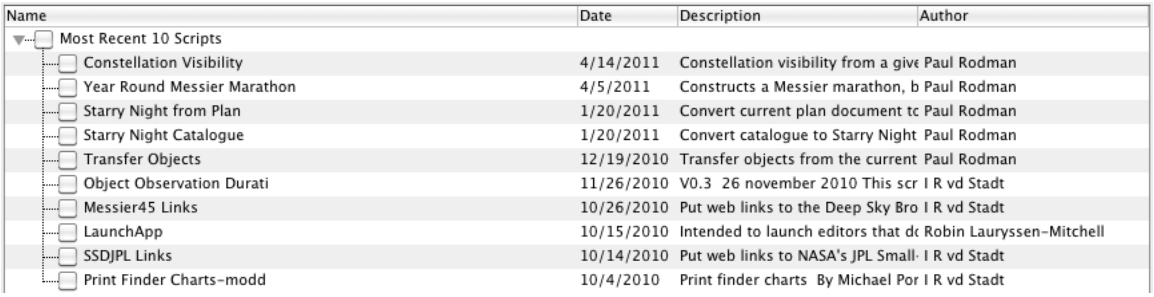


Figure 498: Most recent 10 scripts

- **My Scripts**. All of the scripts created and uploaded by you (if applicable) are listed here.

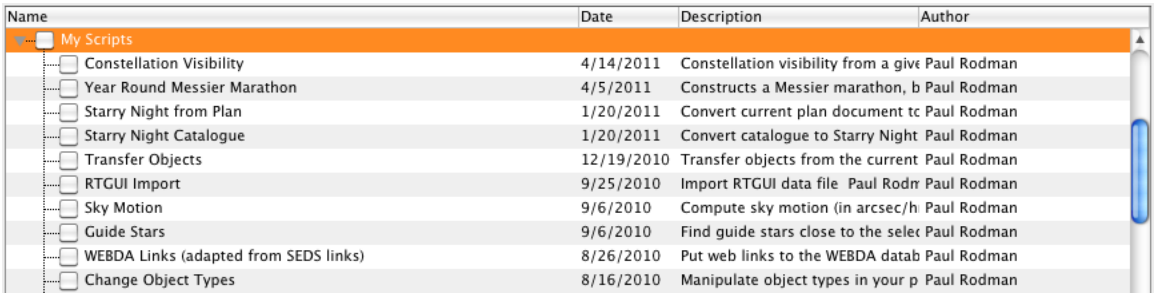


Figure 499: My scripts

- **All Scripts**. Lists of all scripts, with subsections by Date, by Name, and By Author.

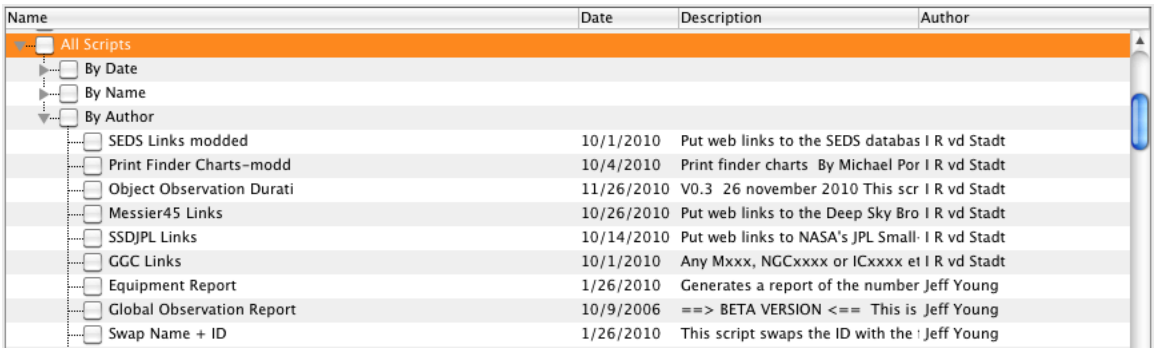


Figure 500: All scripts

- **Printing Scripts**. All printing-related scripts (if applicable).
- **User Field Scripts**. All user field scripts (if applicable).
- **Telescope Control Scripts**. All telescope control scripts (if applicable).
- **By Category**. All scripts, by category.
- **By Keyword**. All scripts, by keyword.

27.3 Deleting user-contributed scripts

Once you have uploaded a user-contributed script, only you can delete that script from the server. To delete one or more of your contributed scripts, use ***Script > User-Contributed Scripts > Delete...*** Select the script/s you want to delete using the checkboxes, and click ***Delete*** to remove them (sorry, no undo possible).

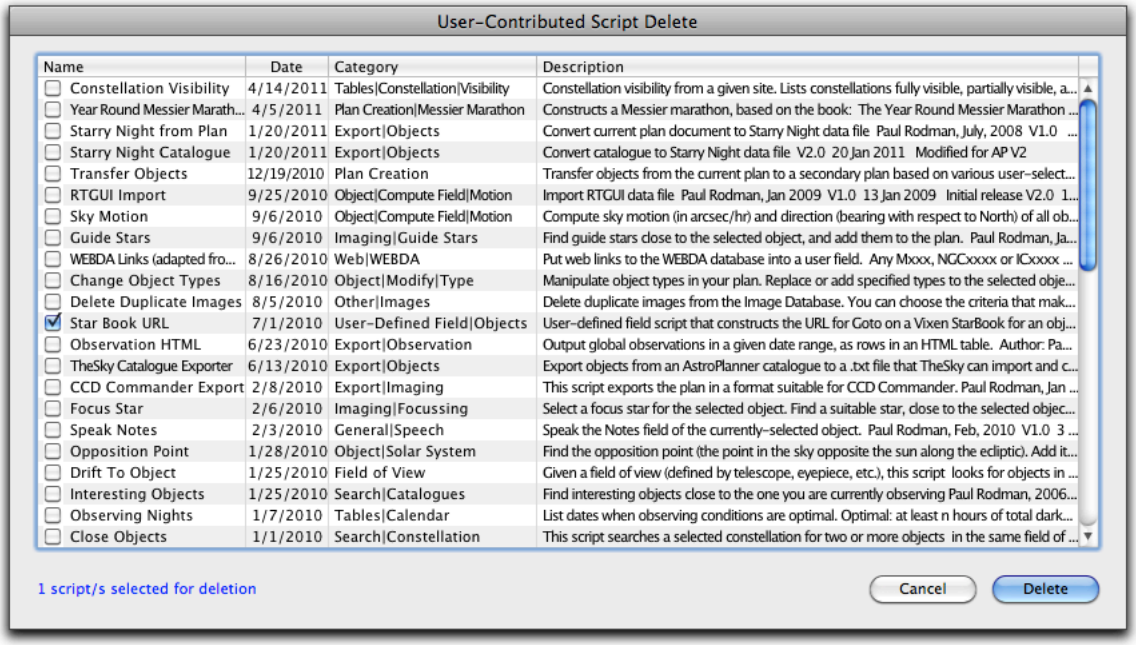


Figure 501: Deleting user-contributed scripts

27.4 Running scripts

Running General scripts is typically done by opening the editor using ***Script > Edit/Run Scripts...***, selecting the required script in the list and clicking ***Execute***.

If you are running a script regularly you can arrange for the script to appear in the ***Script*** menu (See page 371) where selecting it will start its execution.

Note that a plan document must be open in order to run a script.

27.5 Using the Framework Reference

There is a built-in feature that displays graphically the contents of the AstroPlanner scripting framework. The scripting framework is a collection of methods, functions and classes that can be used when writing your scripts. The framework reference is designed to be used as a convenient reference while you are constructing scripts or trying to understand existing script code.

To open a new Framework Reference window (you can open as many as you like):

- Use the ***Script > Framework Reference*** menu command.
- Use the "F" button under the script list in the script editor window.

There is a Key at the top of the hierarchical listing. This defines the meaning of the various coloured icons (Figure 503).

Selecting an entry displays the definition of the item in the bottom pane.

You can use the ***Find*** field and button to search the framework for a search string. The results are added to the top of the hierarchy (Figure 504). You can clear Find results by right-clicking and selecting ***Clear Find results***.

Deprecated items[1] are not shown by default. Right-click and use **Show deprecated items** if you wish to see those items.

The **Show changes for version...** popup adds a section showing what was changed in the framework in a particular version of the application.

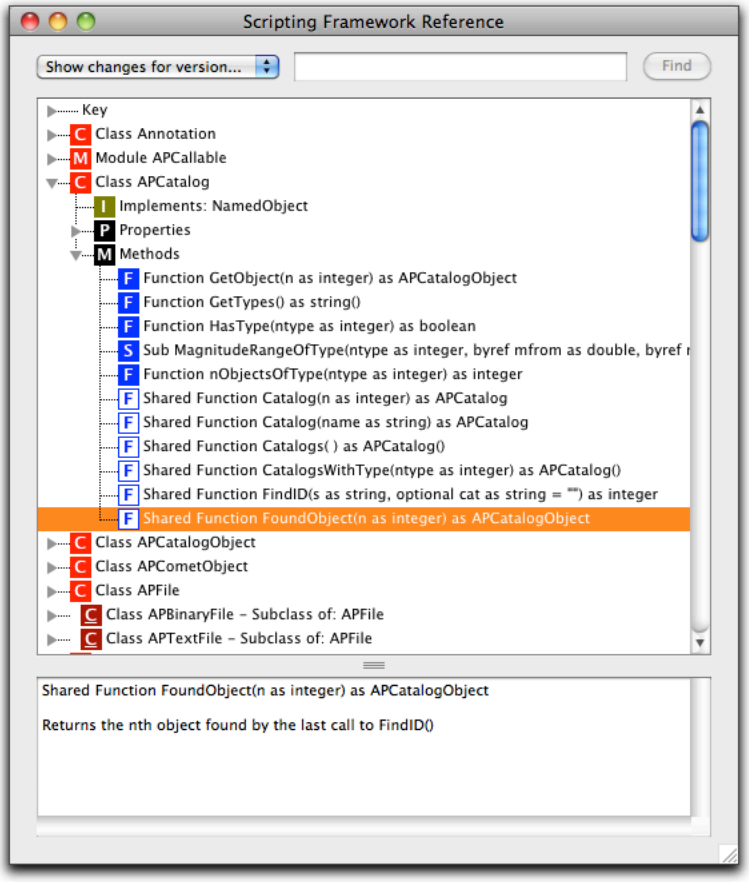


Figure 502: Framework reference window

1. A deprecated item is a class, method call, property, etc. that is no longer necessary, or has been replaced by another item. They are still part of the framework so that older scripts can still function, but will be dropped from the framework at a future time.

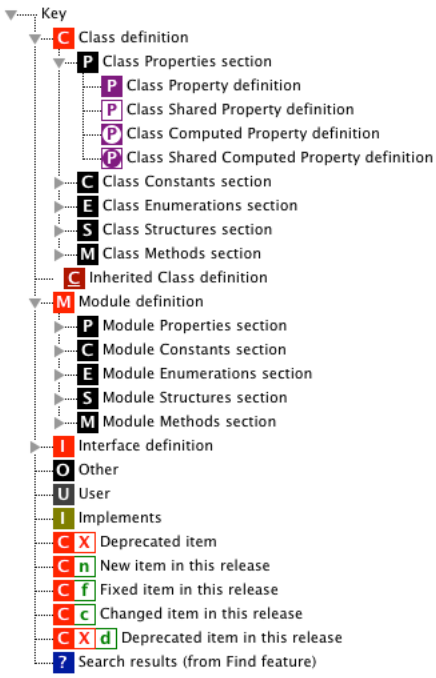


Figure 503: Framework reference key

When the script editor is open, double-clicking an entry will paste a "template" of the method or function into the script editor.

It is possible to add your own entries into the Framework reference. This is detailed in the scripting manual.

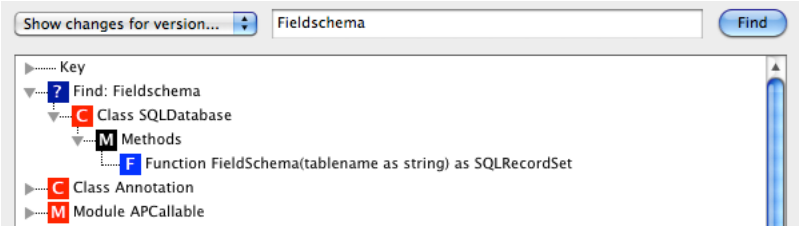


Figure 504: Find results

27.6 Script requirements

Normally a script will run as long as a plan document window is open. However, the script might have certain requirements (e.g. at least one plan object, certain catalogues, installed, etc.). You can check for these items in your script programmatically, e.g.

```
if Plan().nObjects<=0 then
   Print "Must have at least one object in your plan!"
   return
end if
```

However, these is tedious. You can set requirements using ***Script > Script Requirements...*** with your script selected in the editor. This allows you to specify requirements for the script to be runnable. For example, in Figure 505, the script must have at least 2 plan objects, all plan objects must be double stars, the All-Sky Compiled Catalogue must be present, at least 1 telescope resource must be present, and V2.0 of the AstroPlanner application is required.

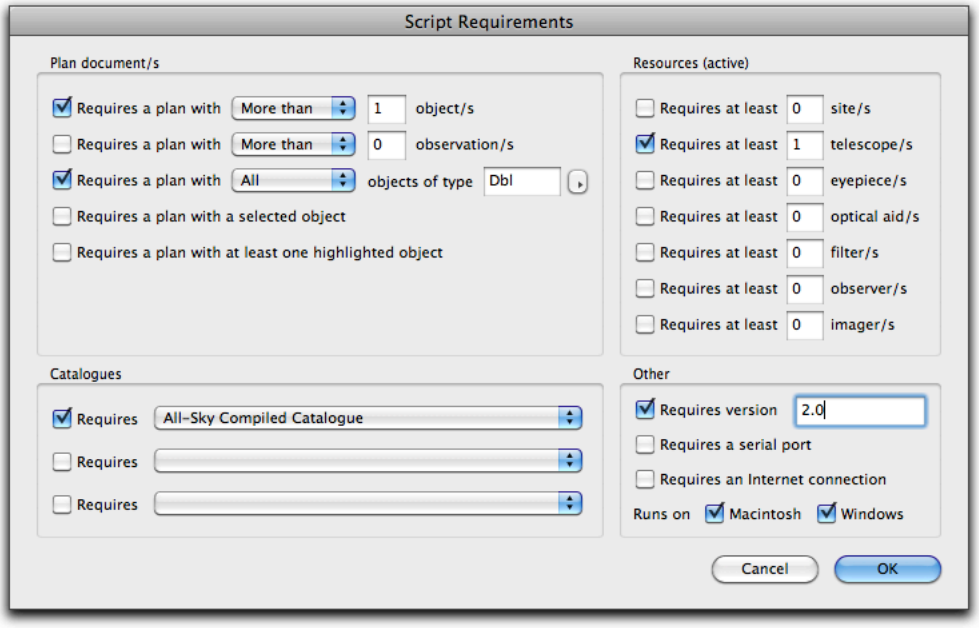


Figure 505: Script requirements dialog

When you run a script with such restrictions, and the script does not comply with a requirement, an alert message is displayed and the script is not run.

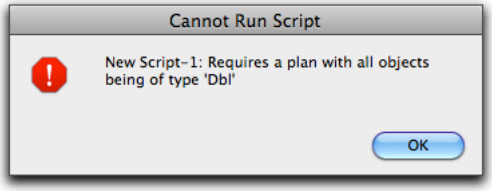


Figure 506: Script non-compliance message

27.7 Uploading a user-contributed script

Uploading a (user-contributed) script is done from the script editor, using the upload button underneath the script list. The currently-selected script will be uploaded.

The upload dialog is "pre-populated" with data from the script, as much as possible[1].

1. Create a new script in order to see an example of the use of "special" comments to help populate the dialog.

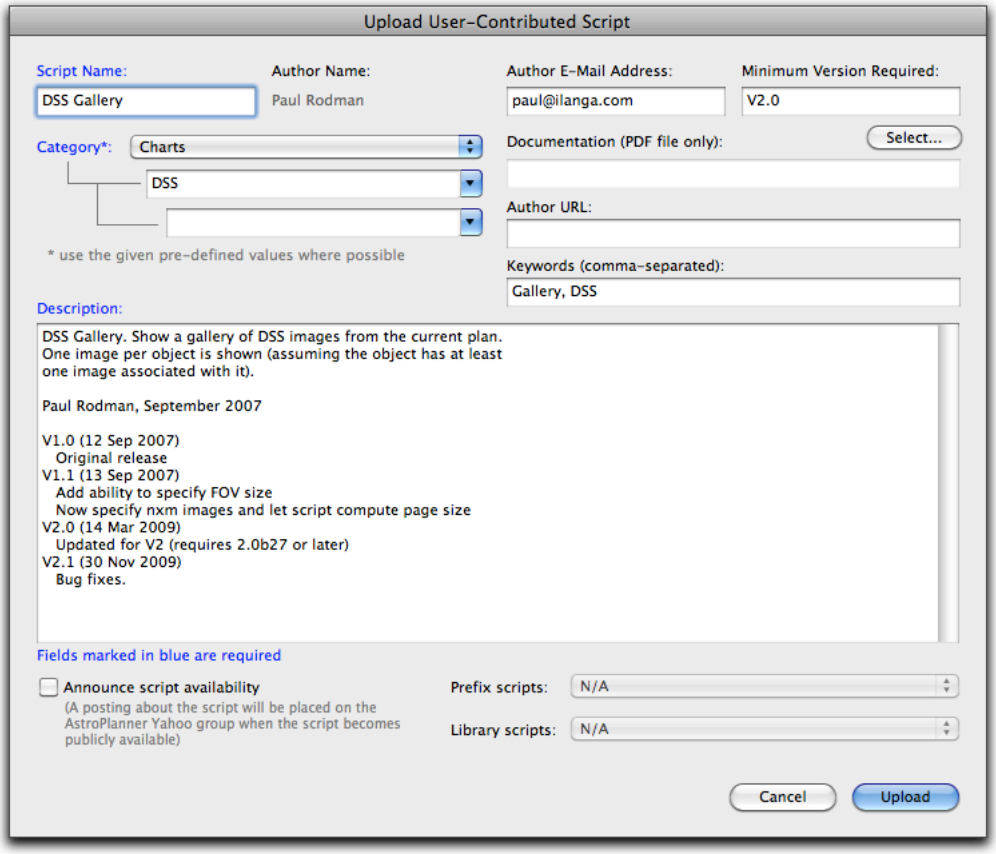


Figure 507: Script upload dialog

You can announce the upload on the Yahoo group automatically using the checkbox at the lower left. If you have library or prefix scripts defined, you can elect to have them included in the upload.

If you already have a script uploaded with the same name, it will be overwritten by the new upload. If someone else has uploaded a script with the same name, you will not be allowed to upload.

27.8 Event scripts

You can elect to run a General script each time a particular event occurs. To do this, a plan document window must be at the front.

Use ***Script > Event Scripts...*** to open the event script dialog. The dialog shows a list of possible events. Each event can be enabled Locally (i.e. for the current plan document only) or Globally (for all plan documents). The popup list in the Enabled column lets you choose. The popup list in the Script column lets you choose one of your installed scripts.

In the example shown, when the current plan document is opened in the future, the "Add Sequence Number" script will run (once). For *all* plan documents, just before printing, the "NSOG Ratings" script will be run.

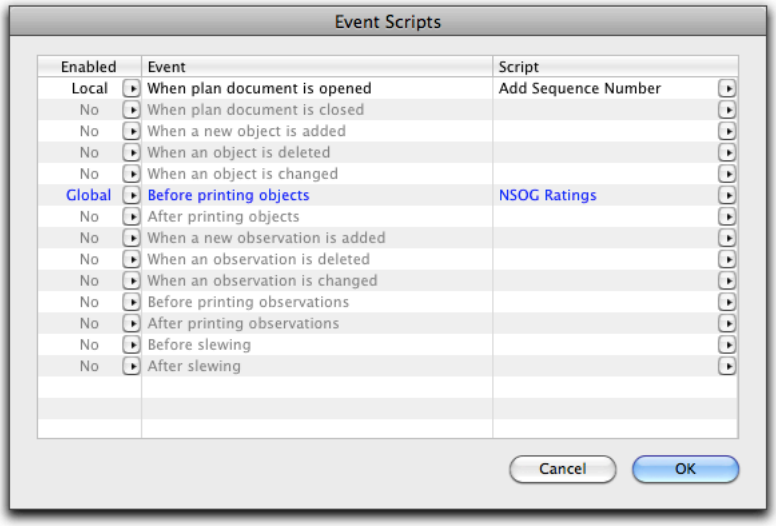


Figure 508: Event Script dialog

27.9 Printing scripts

Printing scripts are special scripts that drive the printing process for the object list and observation database. Creating these is detailed in the scripting manual (and is not for the faint of heart).

When you print from the object list or observation database window, the print dialog has a **Printing script** popup menu that includes the Default printing script (built-in) and any other printing scripts you might have installed.

27.10 Web Services management

The **Web...** button on the script editor window allows you to access a remote or local AstroPlanner application running web services (you can even access this instance of AstroPlanner, for testing purposes, if you have Web Services running. See Web Preferences). You can send commands to the remote AstroPlanner client in order to manage it.

You specify the IP address and port number of the remote AstroPlanner client running Web Services, as well as its authentication string where needed. Then you can perform certain commands from the various tabs on the window (such as sending a local script to the remote client, retrieving a script from the client, getting a list of scripts available on the remote client, etc.).

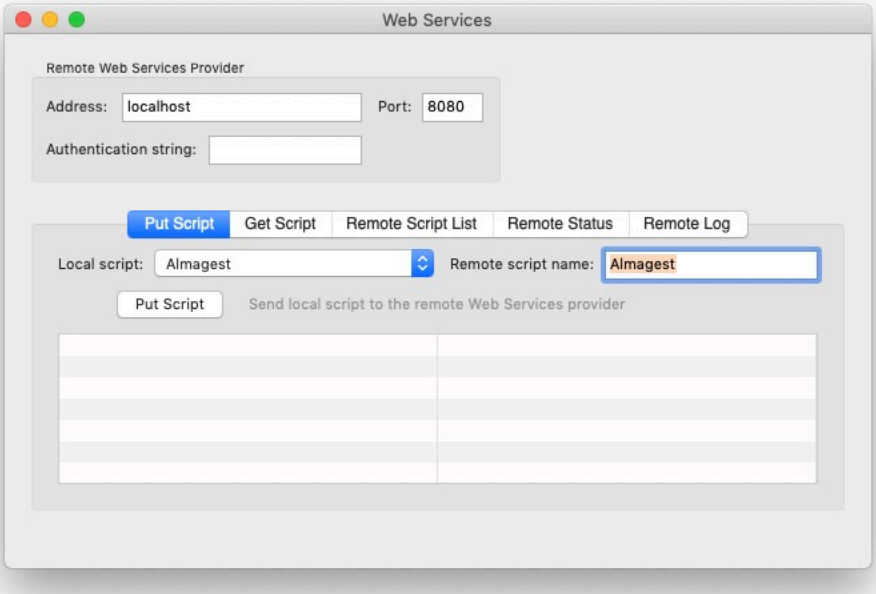


Figure 509: Web services access

28 Troubleshooting

This chapter covers strategies to use when the application crashes, when you don't know why something has happened, or you just wish that AstroPlanner could do something it doesn't.

28.1 Getting help

This was covered in Chapter 6 on page 38. You should use the following resources, in order of preference:

- Search the user manual.
- See if the issue appears in the FAQ.
- Search on the Yahoo Group and see if the issue has been raised.
- Contact AstroPlanner support.

28.2 Reporting bugs

The best way to report a bug is to use the built-in bug reporter[1], ***Help > Report a Bug...***

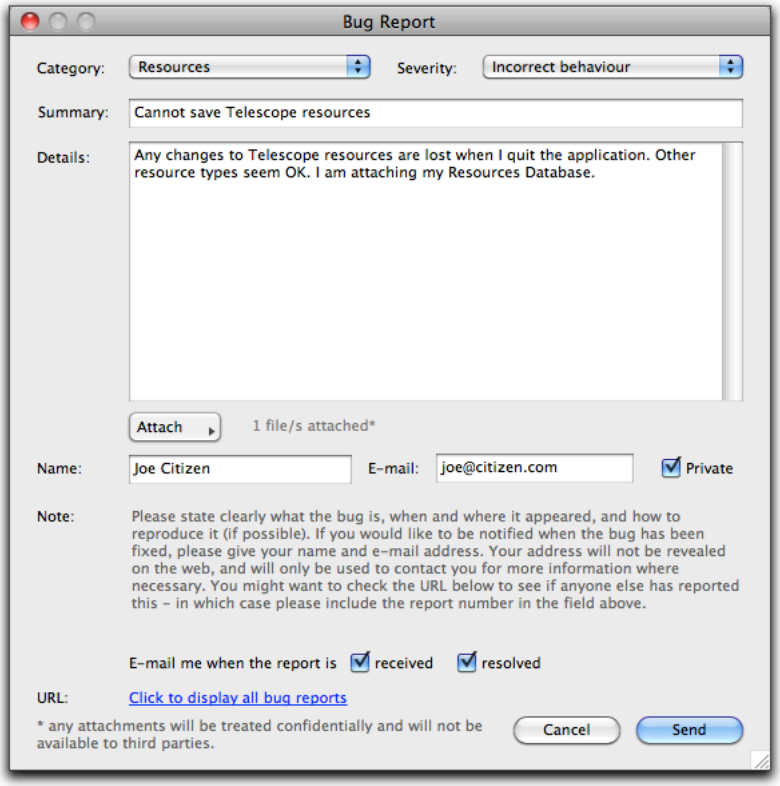


Figure 510: Bug Report dialog

Using this method of reporting bugs has several advantages:

1. Note that this feature requires an Internet connection.

- You can do it directly from the application.
- The bug report goes straight into the bug database and is therefore more likely to get resolved.
- There's a convenient way to attach commonly needed files without having to go looking for them.
- The report will automatically include the application version in use, your platform OS information, screen size, etc.

Of course, if the application will not run, or it crashes before or when (!) you use the bug reporting feature, then you should send an e-mail report of the bug to support@astroplanner.net.

There are some important things to know about reporting bugs. Proper bug reporting is critical to getting the application bug free (or as near to it as is reasonably possible).

28.2.1 Why report bugs?

Surely the person who is developing the application is aware of all the bugs? After all, isn't he/she responsible for all the code?

In a perfect world this would be the case. However, it's not a perfect world. The application is an extremely complex beast with many parts that interact with one another. The bugs often occur in those interactions. For the developer to be aware of all bugs, he would have to test every possible interaction with every possible input data value, on all platforms, with all operating systems, etc. This is not feasible. Hence, you will find bugs that have never been seen before. It's important that the developer is made aware of those problems so that they can be fixed.

28.2.2 What is a bug?

A bug can be any of the following (typically in descending order of nastiness):

- A crashing bug that causes the application to quit unexpectedly.
- An unhandled exception. These are error conditions that are not being handled by the application code, but should be.
- Bad results (e.g. an altitude reported as 95°, an RA of -2.5 hours, 12 items reported deleted when only 11 are in the list, etc.). These do not cause a crash or exception, but are nonetheless incorrect.
- Unexpected side-effects. (e.g. when you open a preferences window another window is resized, etc.)
- Cosmetic problems (e.g. overlapping text, controls that are not redrawn properly, incorrect tabbing order, spelling typos, flickering controls,etc.). These do not affect the operation of the application, but are annoying or irritating.
- Documentation problems (e.g. diagram in manual does not correspond with the actual application, etc.).

28.2.3 When to report bugs

As soon as any bug appears, it should be reported, unless you have already done so for the exact same bug and don't have anything different to say about it. That is the case for any of the above bug types. Anything you consider an anomaly is probably a bug and should be reported. Just because you can work around a bug does not mean it is not worth reporting.

Even if you do something completely outrageous, like pasting the entire works of Shakespeare into an object's Notes field, or making 20,000 observations of NGC1234, it should not cause an exception or any other kind of bug, but should fail with a suitable error message or warning. If a bug does occur - report it.

28.2.4 What to include in a bug report

The quality of your bug report is critical to getting the bug fixed. A good report should include the following (where applicable):

- The version of the application you are testing (e.g. 2.0b53)[1].
- The platform and operating system you are using (e.g. Windows XP SP3, Mac OS X 10.5.8)[1].
- What you were doing when the bug occurred. Please try and use correct terminology to make your description more understandable. (e.g. **Bad:** "the eyepiece picture isn't always there" vs. **Good:** "The chart on the Field of View tab often doesn't redraw properly when you first select that tab").
- Whether you are able to reproduce to bug when you tried a second time. Reproducible bugs are much easier to find and fix.
- Any error messages reported.
- Attach any error log files from your desktop.
- Attach screen shots (images) showing the bug occurring, if possible. This is *really important and useful* for the developer, especially if English is not your first language. Remember that "a picture is worth a thousand words." I have fixed many bugs almost instantly based on a screenshot, where the user has struggled to describe the problem adequately in words.
- If you wish, you can attach copies of the plan document you were working on when the bug occurred.

28.3 Feature requests

If AstroPlanner does not have a particular feature that you feel would benefit yourself and others, no matter how trivial or major, please feel free to request that it be added. While doing this is no guarantee that it will be implemented in the future, many (if not the majority) of new features in successive releases of AstroPlanner have been requested by users.

The probability of a feature being implemented depends on several factors:

- **Applicability**. If the feature is applicable to AstroPlanner (e.g. better finder charts) then it is more likely to be implemented than a feature that is not (e.g. image acquisition and processing).
- **Generality**. A feature that is likely to appeal to many users (e.g. a built-in star atlas) is more likely to get attention than a feature that is specific to a few users (e.g. a telescope mount driver for the 200" telescope at Mt Palomar).
- **Ease of implementation**. A feature that can be implemented and integrated fairly easily (e.g. a new scripting command, a new catalogue) has a better chance of seeing the light of day than one that requires a lot of developer effort (e.g. built-in 3D planetarium).

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1. You don't have to include these if you are using the built-in bug reporter - it will include that information automatically.

- **Developer expertise**. A feature that the developer knows how to implement without too much research is more like to be implemented than one that the developer would need to spend a lot of time researching.
- **Cost**. A feature that has additional monetary cost associated with it (e.g. licencing fees, software libraries, etc.) would not be implemented unless there is a general desire for it (and possibly an increase in product cost to offset).
- **Popularity**. If multiple users request the same feature, it is more likely to be implemented than one requested by a single user.

All that being said: feel free to request any feature you like. The request will be added to the database. There are currently hundreds of requests - enough for many future revisions of the application.

The best way to file a feature request is to use the built-in request mechanism[1], ***Help > File a Feature Request...***

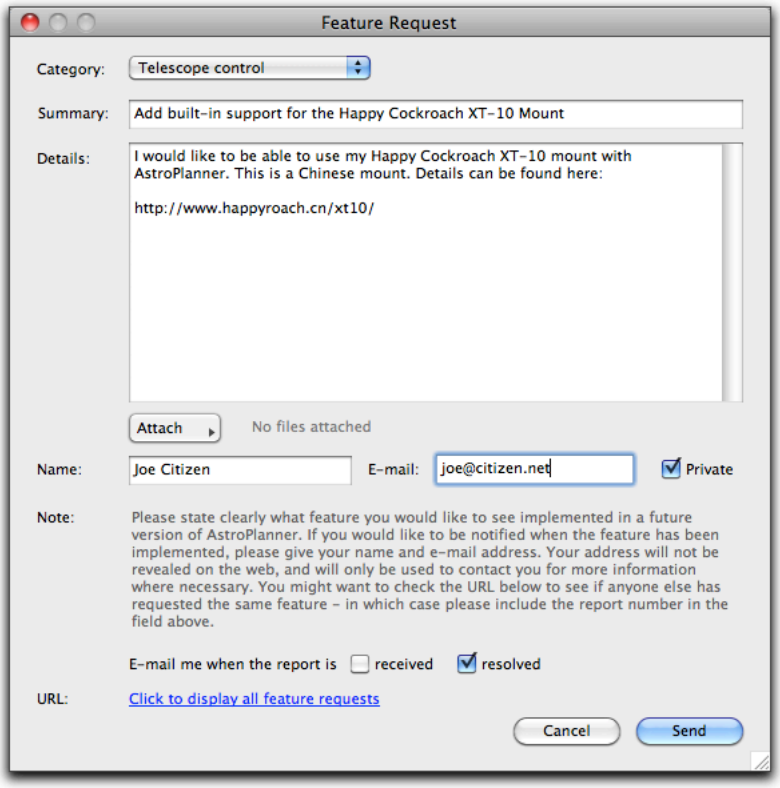

Figure 511: Feature request dialog

28.4 Built-in tools

AstroPlanner has a few built-in tools to help with debugging. Under normal circumstances you won't need to use these, but if you have an issue they might prove handy to have.

1. Note that this feature requires an Internet connection.

28.4.1 Where's my stuff?

AstroPlanner keeps its support files, databases, etc. is places that are "approved" by the operating system. Sometimes these files and folders are difficult to locate. The ***Help > Where's my Stuff?*** menu command tells you where most of the important files are.

If you select an item in the list, clicking the ***Reveal*** button will open and show the file/folder in the Finder (Mac OS) or Windows Explorer (Windows).

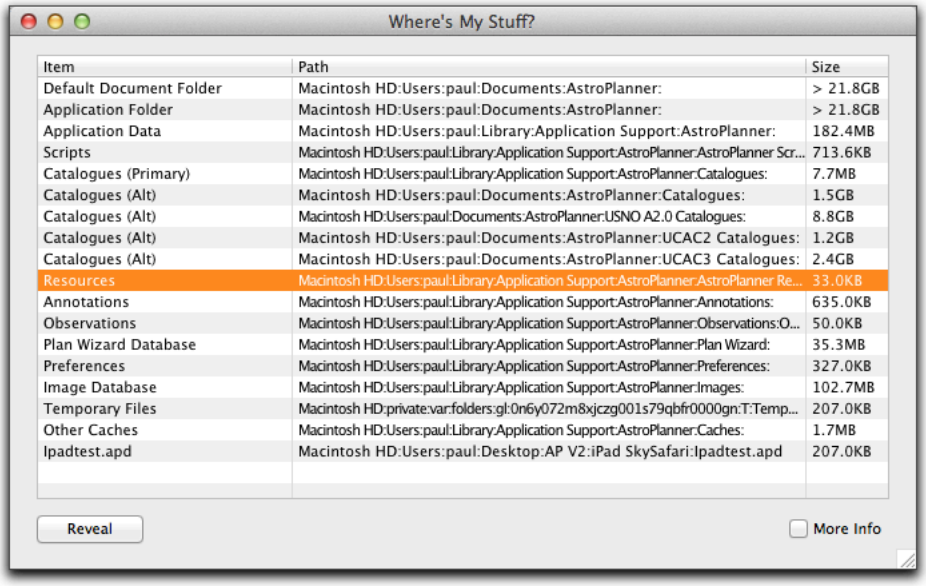

Figure 512: Where's my stuff?

The **More info** checkbox reveals additional information about the items (see Figure 513). The **F** column specifies if the item is a folder (Y) or a file (N). The **E** column specifies whether or not the item exists. The **P** column shows the permissions (octal) for the item. The **R** column specifies if the item is readable, the **W** column specifies if the item is writeable. The **Owner** column shows the owner of the folder/file.

Note that several of these additional columns only apply to Mac OS.

If a particular item is in a problematic state, it will be coloured red.

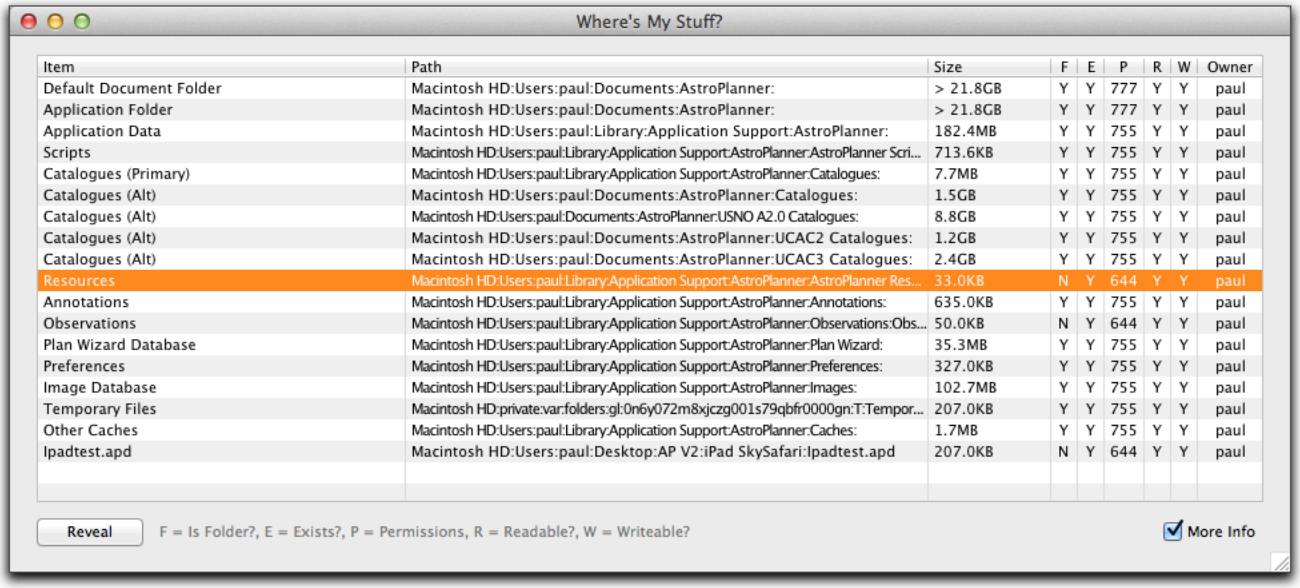

Figure 513: Where's My Stuff? with addition info displayed

28.4.2 Tracking threads

AstroPlanner V2 is a multi-threaded application. A *thread* is a piece of code that runs concurrently with the main application (i.e. runs in the background). This is done to make the application more responsive and to allow tedious processes to run in the background rather than making you have to go and find coffee.

If you find that the application is running sluggishly for no apparent reason, it could be that one of more background threads are causing the issue.

The ***Help > Track Threads*** menu command opens a window that lets you see what background threads are running.

Note that, if you have a plan document window open there will always be at least one "TimeUpdateThread" and one "Visibility Thread" running (even though they spend most of the time asleep).

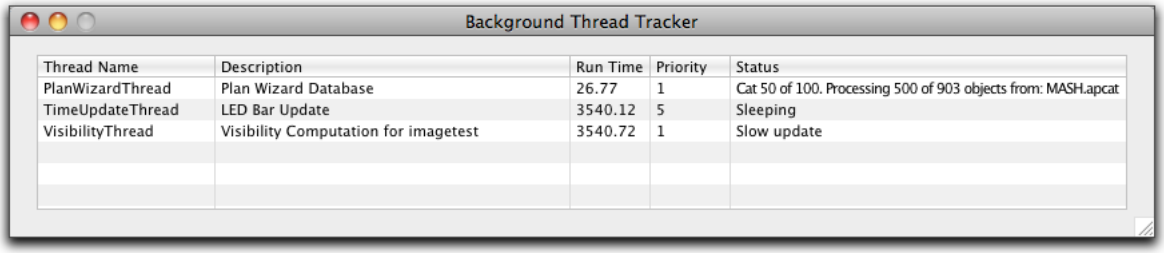

Figure 514: Tracking threads

28.4.3 Forcing plan document closure

Sometimes a bad or corrupted plan document can cause the application to crash or freeze when starting up (since, by default, the application tries to re-open any plan documents that were open when the application last quit). You can force the application to ignore any previously-open plan documents when you start up by holding down the **Ctrl** key as you start the application.

28.4.4 Archiving & resetting preferences

A fairly common problem that causes assorted issues happens when a preference setting gets corrupted. If you suspect that this is the case, or would like to eliminate this suspicion, then you can reset the preferences back to "factory settings".

This is done by restarting the application while holding down the **Shift** key. This causes the Preferences Management dialog to appear.

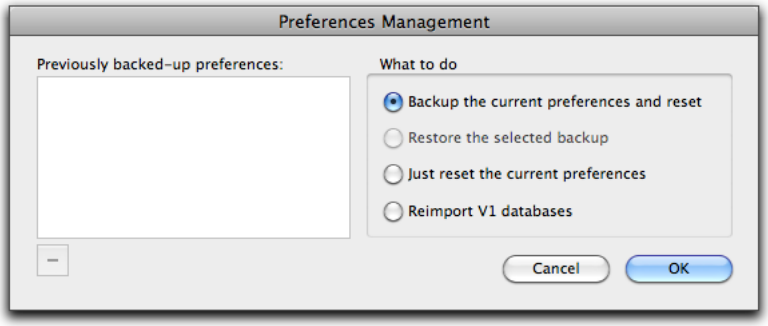

Figure 515: Resetting preferences - the first time

You can choose to backup the current preferences before resetting (a good idea, in case the resetting doesn't resolve the issue and you want to revert back to the old preferences), or you can just reset the preferences without making a backup if you want to live dangerously.

If you backup the preferences and subsequently use this feature again, then you'll be able to choose to restore the backed-up preferences.

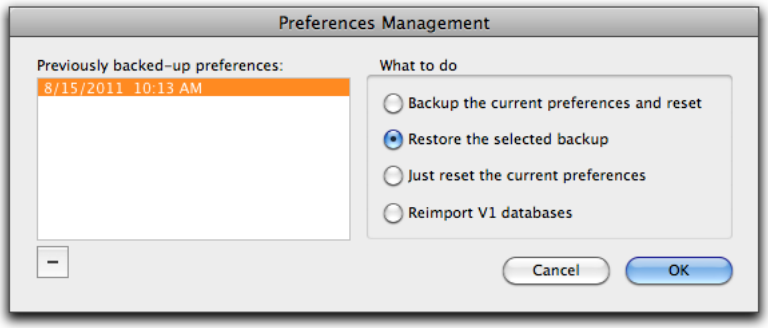

Figure 516: Restoring preferences

The **Re-import V1 databases** option will trigger the process that imports your observation database, etc. from a V1 installation (see Section #.# on page #). This might be useful if you run V2 for a while before deciding to move your V1 data across.

28.4.5 Test telescope communication

If your telescope won't connect, and you're sure you have the right cables, etc. Then this feature might prove useful for debugging the connection.

The details are covered in Section 13.12.1 on page 211.

29 Glossary

This chapter defines some terms you might not be familiar with.

Age, Moon. The age of the moon in days from the time of new moon. i.e. New Moon = 0 days, First Quarter = 7 days, Full Moon = 14 days, etc.

Air Mass. A number that represents the thickness of the atmosphere in the direction of the object being observed. At the ***zenith*** it has the value 1.00 and becomes larger as the object nears the ***horizon***. This is of use in determining ***atmospheric extinction***.

Alignment, Mount. Computerised telescope mounts, when initialised, need to be calibrated with the sky so that the mount can figure out where it is pointing. This process is called alignment, and typically requires the user to point the telescope at one or more known stars.

Alignment, Polar. A telescope that is polar mounted must be physically aligned so that its main ***RA*** axis points towards the north or south pole. This is done by using a polar alignment scope, or various other alignment techniques designed to minimise the error.

Alignment Stars. Computerised telescopes generally have a fixed set of bright stars that their software can choose to align the mount.

Alt/Az. This usually refers to a telescope that is mounted so that its main axis points towards the ***zenith*** point and the other axis is parallel with the ***horizon***.

Altitude. The angle of an object above the ***horizon***. An object on the horizon would be at 0° altitude and an object at the ***zenith*** point would be at 90° altitude. Note: in AstroPlanner there is also an altitude setting associated with Site resources - in this case altitude refers to the distance in metres above sea level.

Aperture. The diameter of the main mirror or main lens of a telescope. Typically measured in mm or inches. The larger the aperture of a telescope, the more light is collected (allowing dimmer objects to be seen) and the greater the resolution (objects close together can be differentiated).

Apparent Magnitude. The ***magnitude*** of an object is specified as if it was at the ***zenith*** (***air mass*** = 1). The apparent magnitude takes into account ***atmospheric extinction*** as the object is observed close to the ***horizon*** (the object appears to get dimmer as it approaches the horizon).

Arcminute. An angular measure. One arcminute = 1/60 degree = 60 ***arcseconds***

Arcsecond. An angular measure. One arcsecond = 1/60 **arcminute** = 1/3600 degree.

ASCOM. (AStronomy Common Object Model) is a group that supplies an open-source software product that provides a generic method of driving telescope mounts. Currently Windows-only. http://ascom-standards.org/

Asterism. A collection of stars that forms a pattern, but the stars that it is composed of are otherwise unrelated (e.g. the Big Dipper in the ***constellation*** Ursa Major, or Orion's Belt in the constellation Orion).

Asteroid. See ***Minor Planet***.

Astrometric. Refers to the exact measurement of star positions, and sometimes the measurement of double star ***separation*** and ***position angle***.

Atmospheric Extinction. The dimming of light by its passing through the atmosphere. At the ***zenith*** the extinction is minimum, and increases as you approach the ***horizon***.

Atmospheric Refraction. The atmosphere acts as a lens, especially near the ***horizon***, and can bend incoming light. This leads to the apparent ***altitude*** of objects near the horizon being greater than expected, and objects appear to rise above the horizon before they physically do so.

Azimuth. The horizontal angle of an object with respect to true north. This is usually measured through east. i.e. North = 0° azimuth, East = 90°, South = 180°, West = 270°.

Barlow Lens. A lens that is used between an eyepiece and a telescope to increase the effective ***focal length*** of the telescope. e.g. if you use a 2X Barlow with a 2000mm focal length telescope, it effectively turns the telescope into a 4000mm focal length telescope.

Best Pair. An algorithm (developed by Jim Burrows) specifically to choose the best ***alignment stars*** for a Meade LX200 Classic telescope on an ***alt/az*** mount. Although the algorithm was designed around the shortcomings of the LX200 Classic mount, many have found it works well with other alt-az-mounted telescopes.

Binocular. In AstroPlanner this refers to a binocular or monocular device, and not a device that allows two eyepieces to be used on a telescope. Binoculars are typically defined with the **magnification** and **aperture** (in mm) of the optical system (e.g. 10x70 binoculars have a magnification of 10X and a main objective lens 70mm in diameter).

Bolide. A very large **meteor** that typically leaves a long and bright trail that takes several seconds or more to dissipate.

Bright Star Catalogue. The Yale Bright Star Catalogue is a ***catalogue*** containing several thousand of the brightest stars in the sky. It is used as a base catalogue by AstroPlanner for many different purposes (e.g. the Sky chart, etc.).

Cardinal Points. The directions of the N-S-E-W points. e.g. the North cardinal point is the direction of the north pole, etc.

Catalogue. A collection of related astronomical objects, usually observed and published by professional astronomers. Probably the most famous (and oldest) is the ***Messier catalogue***.

Celestial Equator. An imaginary line on the celestial sphere that is equidistant from the north and south ***celestial poles***. It is the line in ***equatorial coordinates*** with ***Declination*** = 0°.

Celestial Poles. The points at which the earth's rotational axis intersects the celestial sphere.

Cluster, Open. A cluster of randomly distributed stars that are associated (i.e. they are at a similar distance from the sun, typically share similar properties and typically have similar ***proper motions***).

Cluster, Globular. A cluster of associated stars that are collected in a spherical or globular shape by gravity.

Comet. An icy body in the solar system that forms a tail as it approaches the sun. These may pass by the sun once only, or may be periodic (e.g. Halley's comet).

Constellation. A collection of bright stars that cover a region of the sky and purport to form mythical and other figures (e.g. Orion the Hunter, Ursa Major the Great Bear, etc.). The boundaries of

the constellations are accurately defined and any object that falls within that boundary is part of the constellation (e.g. the star Sirius is in the constellation of Canis Major).

Dec. *See* ***Declination***.

Declination. One of the two coordinates (together with ***Right Ascension***) used to specify the position of an astronomical object. It is the angular distance north or south of the celestial equator measured in degrees. The north ***celestial pole*** has Declination +90° and the south celestial pole has Declination -90°. It is similar to latitude on the Earth.

Deep Sky object (DSO). Generally this is any astronomical object outside the solar system. In AstroPlanner this generally means any non-***stellar object*** outside the solar system. AstroPlanner does not consider stars to be DSOs.

Difficulty Index. A computed measure for double stars, dependent on their ***separation*** and relative ***magnitude***, that gives an indication of how difficult it would be to "split" the double in a telescope.

Digital Setting Circles (DSC). A computerised mount that only reports the pointing coordinates of the telescope. i.e. does not have a motorised go-to feature. Also known as "push-to" telescope mounts.

Digital Sky Survey (DSS). A photographic survey of the entire sky done at the Palomar Observatory. Two such surveys were done, the 1st generation survey was done at a much lower ***resolution*** than the 2nd generation survey. Both surveys were done through red and blue ***filters***.

Ecliptic. The plane of the earth's orbit around the sun, projected onto the celestial sphere. It is tilted at about 23° with respect to the ***celestial equator***. The planets and the moon all revolve in pretty much the same orbit.

Epoch. The earth, as it rotates, acts like a spinning top or gyroscope, and its axis slowly traces a path through the heavens. This means that the north and south ***celestial poles*** are constantly moving with respect to the celestial sphere. This means that the ***equatorial coordinates*** of objects are also changing with time. Because of this, one needs to know the epoch or date and time that the coordinates were measured. To avoid confusion, certain standard epochs are used. Epoch B1950.0 concerns coordinates (effectively) measured on 1/1/1950. AstroPlanner, and most other astronomical software assumes coordinates are for Epoch J2000.0 (1/1/2000). AstroPlanner has features to convert coordinates between coordinate epochs.

Equatorial Coordinates. The ***Right Ascension*** and ***Declination*** of an object. This is a fixed position with respect to the celestial sphere.

Equatorial Grid. A grid of lines imposed on the celestial sphere showing lines of intersection of **RA** and **Dec**. The lines of RA intersect at the ***celestial poles*** (*a la* geographical longitude lines), and the lines of Dec are parallel (*a la* geographical latitude lines).

Field of View. What you see when you look through an optical instrument. It can also refer to the angular diameter of that field of view.

Field of View, Apparent. This is a property of an eyepiece and refers to the apparent angular size of the view through the eyepiece. e.g. Televue Nagler eyepieces have an apparent field of view of 82°.

Field of View, Actual. When you attach an eyepiece to a telescope the actual field of view is the ***apparent field of view*** of the eyepiece divided by the magnification of the system.

Filter. A transparent or partially transparent film of a particular colour that is placed in the optical path of a telescope in order to emphasise aspects of the object being observed.

Focal Length. The distance between the main lens or mirror of a telescope or eyepiece and the point at which it focusses light.

Focal Ratio. The ratio of the ***aperture*** of a telescope and its ***focal length***. Usually designated f/xxx, where xxx is the ratio. e.g. a telescope of aperture 200mm and focal length 2000mm will have a focal ratio of f/10.

Focal Reducer. An optical device that, when placed in the optical path of a telescope, effectively reduces the ***focal length*** of the telescope.

Galactic Equator. An imaginary line (great circle) that (attempts to) bisect our own galaxy (the ***Milky Way***)

Galaxy. A distant collection of (typically) billions of stars that form "island universes" like our own ***Milky Way***. They come in various flavours: elliptical, spiral, etc.

GMT Offset. The number of hours **local time** is ahead (+ve) or behind (-ve) **Greenwich Mean Time**.

Greenwich Mean Sidereal Time (GMST). The current (local) **sidereal time** at Greenwich (longitude = 0°). Daylight saving time is not considered.

Greenwich Mean Time (GMT). The standard time at Greenwich (longitude = 0°). Daylight saving time is not considered.

Heliocentric Julian Date (HJD). The ***Julian date*** is geocentric (i.e. measured w.r.t the earth). Since the earth revolves around the sun, the distance to an astronomical object differs by up to 16 minutes (light travel time). For this reason, when measuring actual event times the HJD is measured w.r.t. the sun and hence offers an event time that is independent of where the earth is in its orbit.

Horizon. This typically refers to any point on the celestial sphere where the observer is looking exactly horizontally (altitude = 0°).

Hour Angle. The difference between the ***RA*** of an object and the RA of the ***meridian*** (or any point on the meridian).

Illumination, Moon. The percentage of the visible moon's surface that is illuminated by the sun. Varies between 0% (new moon) and 100% (full moon).

Imager. A digital camera used for astro-imaging.

Julian Date. A number representing the number of days (and fractions of a day) since January 1, 4713 BCE, at Greenwich. This is often used as a standard way to represent date/time universally (see, however, ***Heliocentric Julian Date***)

Light Dome. A dome of light thrown onto the night sky by a distance city or other bright light source.

Local Time. The local clock time at your site. It will differ from ***GMT*** by the ***GMT offset***, and might be further modified by daylight saving time rules.

Local Sidereal Time. *See* ***Sidereal Time***.

Log Object Contrast. A measure of the contrast of a deep-sky object against the background sky.

Lord's Rating. This is a measure applicable only to double star objects and is based on the work of Christopher Lord (see the article "Enjoying Unequal Double Stars" in Sky and Telescope, Jan 2002, Page 118-121). The value is based on telescope **aperture**, central obstruction (if any) and **seeing** conditions. The ratings are: "F" = one or both stars are too faint to see through the selected telescope, "UN" = double is unresolvable, "XD" = exceedingly difficult, "ED" = extremely difficult, "VD" = very difficult, "D" = difficult, "MD" = moderately difficult, "ND" = not difficult, "E" = easy.

Magnitude. A number associated with an astronomical object that indicates its relative brightness w.r.t. other objects. The magnitude used in AstroPlanner is usually assumed to be a visual magnitude (as opposed to a photographic magnitude, which depends on filters, etc.).

Meridian. An imaginary line (of ***RA***) that passes through the north and south ***celestial poles*** and the ***zenith*** point.

Messier Catalogue. A ***catalogue*** of 110 "fuzzy blobs" that Messier catalogued to avoid them being mistaken for comets. They consist of open and globular clusters, bright galaxies, planetary nebulae, etc.

Meteor Show Radiant. Meteors appear either sporadically (randomly) or as a shower. Such showers appear to arrive from a point in the sky, radiating outwards. The shower radiants are typically named for the constellation from whence they "radiate". e.g. Leonids, Capricornids, Perseids, etc.

Milky Way. Our home galaxy. Appears (in a dark sky) as a bright glow circling the sky.

Minor Planet, Asteroid. A rocky object orbiting the sun that is not otherwise considered a ***planet*** (e.g. Vesta)

Naked Eye Limiting Magnitude (NELM). The limiting ***magnitude*** of a star (i.e. the dimmest visible star) as seen by the naked eye. Depends on light pollution, visual accuity, etc.

Observability. This is a computed value that runs from 0 (object is below the horizon) to 100 (absolute best for observing the object, no moon, near the meridian, dark sky, etc.). This doesn't mean that you will be able to observe the object (your telescope might not be up to the task for dim objects, or be able to split double stars, etc.). It just means that the higher the value, the better chance you have of observing or imaging the object.

Optical Aid. AstroPlanner terminology: any optical device used with a telescope that changes the effective ***focal length*** of the telescope (e.g. a ***Barlow lens***, ***focal reducer***, etc.)

Optimum Detection Magnification (ODM). A computed magnification required to detect a diffuse ***DSO*** in a telescope. Depends on the telescope ***aperture***, the ***surface brightness*** of the DSO in question, and the brightness of the background sky.

OTA. Optical Tube Assembly. The part of the telescope containing the optics (i.e. not the mount or tripod).

Period. Usually refers the period over which a variable star pulsates.

Phase, Moon. The relative stage of illumination of the moon. e.g. full, new, crescent, gibbous, etc.

Planet. Major solar system bodies that revolve in orbit around the sun. AstroPlanner still thinks that Pluto is a planet.

Polar. With reference to the ***celestial poles***.

Position Angle, Pos. Angle. The angle that the major axis of a ***galaxy*** makes w.r.t. the north ***celestial pole***. Also the angle that the secondary star of a double star system makes with the primary star (w.r.t. the north celestial pole).

Proper Motion. The actual motion of a star against the celestial sphere. This is typically very small and can be ignored. However some closer stars move several ***arcseconds*** per year.

RA, **R.A.** *See* ***Right Ascension***.

Resolution. The amount of detail one can see through a telescope. This is usually proportional to the aperture of the telescope.

Reticle, Reticule. Cross hairs, or scales etched onto glass, at the focus of an eyepiece. Sometimes illuminated to make them show up against a dark sky.

Rigel Quickfinder. A unit magnification (i.e. 1x magnification) device like a gun site that effectively projects circular lines onto the sky.

Right Ascension. One of the two coordinates (together with ***Declination***) used to specify the position of an astronomical object. It is the angular distance along the celestial equator measured from the ***vernal equinox***. It is usually measured in hours (where 1 hour = 15°). It is similar to longitude on the Earth.

Rising Time. The time at which an object rises above the ***horizon***.

Seeing. A measure of the stability of atmosphere for observing. Bad seeing implies the atmosphere is causing images to be blurred and in constant motion. Good seeing implies steady and unblurred images.

Separation. The angular distance between the stars in a double (or multiple) star system. Typically measured in ***arcseconds***.

Setting Time. The time at which an object falls below the ***horizon***.

Sidereal. Refers to the rotation rate of the earth (23 hours 56 minutes per rotation, give or take. It is the time between transits of the same star on two successive nights).

Sidereal Time. A system of time based on the ***hour angle*** of the ***vernal equinox*** (i.e. ***RA***=0, ***Dec***=0).

Site Horizon. In AstroPlanner this refers to a user-defined horizon (i.e. objects blocking the real horizon such as trees, buildings, etc.).

Size, Angular. The angular size of an object in the sky. Usually measured in arcminutes, it is of the form AxB, where A is the longer dimension, and B the shorter.

Sloan Digital Sky Survey (SDSS). A colour photographic survey of the sky. It only covers part of the sky.

Solar System object. Any object in the solar system (i.e. the sun, the planets and their moons, minor planets and comets).

Spectral (Class). The class into which the object falls, based on its measured spectrum.

Surface Brightness. The overall brightness of a diffuse object measured in magnitudes per square ***arcsecond***. Objects with low surface brightness are more difficult to see, especially if there is light pollution.

Stellar object. A star (apart from the sun).

Telrad. A unit magnification (i.e. 1x magnification) device like a gun site that effectively projects circular lines onto the sky.

Transit. When an object reaches its highest ***altitude*** in the sky during the passage of a day.

Transit Altitude. The highest ***altitude*** achieved by an object as it ***transits***. This depends directly on the object's ***declination*** and the site's latitude.

Transit Time. The time at which an object ***transits***.

Transparency. A measure of the clarity of the atmosphere.

Twilight. The period between sunset and total darkness, and again before the sun rises. When the sun's **altitude** is between 0° and -6°, this is known as Civil twilight. When the sun's **altitude** is between -6° and -12°, this is known as Nautical twilight. When the sun's **altitude** is between -12° and -18°, this is known as Astronomical twilight. When the sun's altitude is below -18°, it is considered to be astronomically dark.

Universal Time (UT). See ***Greenwich Mean Time***.

Vernal Equinox. The point where the ***ecliptic*** crosses the ***celestial equator***.

Zenith. The point immediately above the observer's head. equidistant from all points on the ***horizon***. It has, by definition, ***altitude*** = 90°.

30 Revision Notes

30.1 V2.0.1

V2.0.1 includes many fixes to problems in V2.0. They are *not* listed here. You can use ***Help > Revision Notes*** to see details of bug fixes and enhancements.

Note that there might be slight changes in the illustrations (the V2.0 manual was illustrated using screen shots from Mac OS X 10.6, while the V2.0.1 changes were illustrated using screen shots from Mac OS X 10.7).

The following list enumerates all non-trivial changes and improvements between V2.0 and V2.0.1, and where you can find them in this manual.

- You can now print catalogue Annotations for observations (assuming the observation has a valid ID). The Annotations entry is included in the Observation fields list. See page 242.
- The Field of View chart now has a Display Option: ***Display > Show constellation sub-chart***. This places a small chart of the constellation where the chart is centred at the bottom right of the main chart. See page 128.
- The Field of View chart now has a Display Option: ***Display > Show Date/Time if date fixed***. If this option is on and the date is fixed, then the date/time is shown at the bottom of the main chart as a warning. See page 128.
- The Field of View chart now has a Display Option: ***Display > Current telescope position***. This allows the telescope position to be turned off. See page 127.
- The Field of View chart now has a Display Option: ***Display > Plan object at chart centre only***. If this option is on then any plan objects that are in the field of view, but not at the centre coordinates of the field of view, will not be displayed. See page 128.
- A Visibility graphic is displayed that shows the altitude and azimuth of an observed object at the time of an observation. This is present on the Observations tab of the plan document window (see page 117), and also in the Observation database window (see page 185).
- The Lord's Rating settings in the Object List Preferences have been removed, since they were mainly used for debugging, and interest only to one user (possibly).
- The Object List preferences now has a setting to display alert badges next to objects if they are close to bright objects (sun, moon, etc.). See page 296.
- You can now import SkySafari observing lists. See page 358.
- Up and Down buttons on Field of View and Sky charts. Up/down buttons to the right of the field of view chart (see page 140) and sky chart (see page 158) allow you to navigate through the objects in the object list without needing to swap between tabs.
- The list of catalogues in the Catalogue Manager window now has a **S** column (signifying that the catalogue contains spectral info) and a **P** column (signifying that the catalogue contains proper motion info). See page 327.
- The Catalogue Manager window now includes a Plan Creation Wizard tab that summarises which catalogues are contributing to the Plan Creation Wizard's database, and allowing others to be installed where necessary. See page 331.

- Added a Catalogue preference to transfer other field information (e.g. proper motion) to plan objects. See page 308.
- ***Load...*** and ***Save...*** buttons added to the user-defined field editor so that sets of definitions can be transferred. See page 278.
- ***Load...*** and ***Save...*** buttons added to the custom highlighting editor so that sets of highlighting scenarios can be transferred between plan documents. See page 274.
- Changed the Observer resource to use Year of Birth instead of Age (which requires updating annually). See page 71.
- Image preferences now has a way to recreate the image index/cache file if there is an issue with missing or mismatched images. See page 315.
- Double-clicking the Constellation indicator in the Objects tab causes the application to switch to the Field of View tab and draw the entire constellation in the Field of View chart. See page 110.
- Generic text export now includes session info when exporting object and observation data. See page 359.
- You can choose XON/XOFF and/or Data Terminal Ready (DTR) flow control if your telescope mount demands it. See page 199.
- If your site defines a user horizon, it will be displayed in the telescope mimic window. See page 198.
- You can search for multiple IDs using the "..." range notation. See page 160.
- The **Obs** column in the object list has been changed: if one or more observations were made from the current plan document, the number is circled. If any of those observations were made in the past 12 hours, the circle is inverted. See page 95.
- The fix date preset options popup menu now contains ***Date of Next Full Moon*** and ***Date of Next New Moon***. See page 94.
- Plan document window title now contains the number of highlighted objects (in addition to the total number and number selected).
- In the search results window, you can right-click an object row and use the ***Find Synonyms*** command (or alternately, use the ***Object > Search > Find Synonyms*** menu command).
- The **Where's My Stuff?** window now has the ability to show additional info. See page 385.

30.2 V2.1

V2.1 includes many fixes to problems in V2.0 and V2.0.1. They are *not* listed here. You can use ***Help > Revision Notes*** to see details of bug fixes and enhancements.

Note that there might be slight changes in the illustrations (the V2.0.1 manual was illustrated using screen shots from Mac OS X 10.6 and Mac OS X 10.7, while the V2.1 changes were illustrated using screen shots from Mac OS X 10.8).

The following list enumerates all non-trivial changes and improvements between V2.0.1 and V2.1, and where you can find them in this manual.

- The Field of View chart Display Options now have entries to turn On/Off the display of solar system objects. See page 137. Note: these options also appear for the Finder Charts printing feature.

- **Observability**. Introduced the concept of observability (see page 392). This is available as an object list column (see page 101), and on the short-term visibility indicator (see page 106). Also available as an object list column is the **Best Time** (which is the time of the highest observability in the next 24 hours) (see page 97).
- Added a section to the manual that describes each available object list column value (see page 97).
- Added an **Example** button to the Image Preferences window to help get an idea what the effects of saving images at different qualities would be (see page 314).
- Added the ability to import plan objects (page 358) from and export plan objects (page 364) to a file in EQTour format.
- Constellations are now valid object types, with Type = Const, and ID = the constellation abbreviation. You can add them using the "+" button under the object list (see page 75), or use the **Add Special** popup (see page 82).
- Perform a global search for plan documents containing a given search term (see page 164).
- If you use the Plan Creation Wizard to choose objects by constellation, you can now limit the constellations to those visible or partially visible at a site, possibly at a given date/time (see Figure Figure 112 on page 86).
- Added **Computer Time**, **Computer Date**, and **Local - Computer** entries to the "LED" displays (see page 91).
- Outgoing e-mail settings now allows for SSL/TLS. Also added a **GMail** button to make the settings easy (see page 290).
- Added a **Parallactic Angle** column to the object list (see page 101).
- Added a **Plan Creation Wizard Level** column to the object list (see page 100).
- The catalogue manager now has a right-click menu that allows you to select all catalogues that are uninstalled, deprecated, etc. Additionally you can find catalogues that contain specific ID prefixes and install them where necessary (see page 328).
- Deprecated items in the scripting framework window are now hidden by default. They can be made visible again by right-clicking (see page 375).
- Hovering the cursor over the sun/moon widgets on the plan document window shows additional information (see page 93).
- Handle the UCAC4 external catalogue (see page 304).
- The telescope tracking can be toggled on/off via Telescope > Toggle Tracking, where applicable (only some computerised mounts can do this) (see page 204).
- Quick observation logging. A fast method of logging that an observation was made, without messing with notes, dates, etc (see page 180).
- Native driver support for Gemini mount controller.
- After slewing, a text caption under the **Slew** button reports the ID of the last object slewed to.
- Added object list columns for **Ecliptic Latitude** and **Ecliptic Longitude**, and **Galactic Latitude** and **Galactic Longitude** (see page 99).

- Added columns for ecliptic latitude and longitude to the comet and minor planet selection dialogs, and allow restrictions based on those values (see page 339, for example).
- Added an option to Catalogue Preferences: **Include objects with no magnitude in magnitude-range searches**. If this is set, then searching using a magnitude range will include catalogue objects with no specified magnitude (see page 307).
- Added an option to Catalogue Preferences: **Ignore objects with no coordinates (RA = Dec = 0)**. If this is set, then any searches will ignore such objects (see page 307).
- The Wiki has been discontinued and removed from the **Help** menu.
- When you lookup a DSO, you can also search on common names.
- Added Chart # support for the recent one-volume Uranometria atlas.
- Previously, the **At Site** option for non-Site resources in the Resources window allowed you to specify that a resource was located at a particular Site. That is now extended to a resource being available at multiple sites (see page 51).
- Off-axis guider support. Custom reticles have been modified to allow for off-axis guiders. i.e. (a) custom Round reticles now have an (optional) offset, and (b) for Round or Rectangular reticles you can now give the units in degrees, % of the FoV diameter, or % of the FoV radius. This will allow you to define a custom reticle, with an offset, that remains in constant proportion to the FoV (see page 140). Also, the custom reticle editor now includes a sample field graphic that allows you to get a feel for what you are designing.
- The menu revealed by right-clicking the object list now has a **Chart/s** submenu that allows you to select all selected charts/atlases, or any one of them (if more than one has been checked) (see page 297). Note also that the Object List preferences window now places the Chart# atlas list on a separate tab (see page 297).
- Added **Meridian** as a Display Options line option for the Sky chart (see page 149).
- Added the **Rotate Chart** display option to the Sky Chart (see page 151).
- Implemented **Telescope > Slew to Sky Flat Position...** to slew to a suitable position to take sky flats for astrophotography (see page 215).
- Added Deep Sky Atlas chart number support.
- Can now specify the search radius used by **Find Closest Object** (see page #).
- The ODM/Eyepiece info for an object is now available without having to make an observation first (see page 88).
- The Nexus wireless device for connecting wirelessly to telescope mounts (http://www.astrodevices.com/products/Nexus/Nexus.html) is now supported in the mount options. The mount options have been changed to allow for other devices as well (see page 199).
- There is now a **Script > User-Contributed Scripts > Upload...** menu command. Previously it was only available as a button in the script editor window.
- Added **Date of Opposition** column to the object list (see page 101).
- The **Capabilities...** button in the mount editor now works for ASCOM mounts (see page 202).
- Added **Best Eyepiece** and **Best Magnification** object list columns (see page 97).

- Added **Splitability** and **Splitability Aperture** columns to the object list. This uses an enhanced algorithm developed by Dr Wilfried Knapp to decide whether or not you will be able to split double stars with a specific telescope (see page 103).
- Added the ability to sync AstroPlanner's files between two or more computers using a common folder (see page 319).
- Implemented the **Dark Start**, **Dark End**, and **Dark Duration** object list columns (see page 98). These columns make use of the Dark Time object list preferences (see page 297).
- Added **Object Properties vs. Time** feature that allows you to chart changes in value of certain object properties over time. See page 172.
- Journal. A simple journal/diary feature has been added. See page 252.
- Import of Gamma Ray Burst (GRB) data. See page 355.

30.3 V2.2

V2.2 includes many fixes to problems in V2.0 and V2.1. They are *not* listed here. You can use ***Help > Revision Notes*** to see details of bug fixes and enhancements.

Note that there might be slight changes in the illustrations (the V2 manual was illustrated using screen shots from Mac OS X 10.6 and Mac OS X 10.7, V2.1 was illustrated with Mac OS X 10.8, while the V2.2 changes were illustrated using screen shots from Mac OS X 10.9).

The following list enumerates all non-trivial changes and improvements between V2.1 and V2.2, and where you can find them in this manual. They are in no particular order.

- SkySafari observation import. You can now (optionally) import observations from SkySafari observation lists. See Section 26.1.9 on page 358.
- You can add a fixed text prefix to imported fields in the Generic Text import feature. e.g. you might wish to add the prefix "NGC" to a field containing only the NGC catalogue number. Generic text import and export now have a Text Modifications feature on each field that allows prefixes, suffixes, substitutions, etc. See page 350.
- You can now have fixed text import fields. e.g. if you are importing a file of double stars, you might want to force the Type field to "Dbl". Generic text import and export now have a Text Modifications feature on each field that allows prefixes, suffixes, substitutions, etc. See page 350.
- Double star orbits. Computes double star orbits, given elements embedded in select double star catalogues (currently the WDS catalogues). See Section 25.1 on page 347.
- The Mag-7 Star Atlas (http://www.cloudynights.com/item.php?item_id=1052) is supported as a chart numbering target.
- You can now import non-ASCII text (i.e. with text encodings such as UTF8, UTF-16, etc.), and retain any non-ASCII characters (e.g. Greek).
- Enabled axis movement commands in ASCOM.
- When exporting sessions/observations to a text file, etc., you no longer need to specify the start and end dates. Those dates are now optional so that it's easy to export, say, all observations, all

observations starting on a given date, etc. See page 360.

- If you export a field containing line endings (e.g. the Notes field) to a text file, extra lines are created. A new setting in the export dialog substitutes given text (default = " / ") for any line endings found in a text field.

- User-defined field formatting. You can now optionally define a user field to display in **bold**, *italic* and/or underlined. Additionally, user-defined field scripts can override the display style individually. See Section 19.3 on page 277.

- Added buttons to the Date/Time controls that allow you to step forwards or backwards through time, with a variable step size (from 1 second to 1 year). See page 94.

- You can now use an USB flash drive, instead of a DVD-ROM, for loading catalogues.

- Added the facility to list/search catalogues for objects nearby (within user specified angular distance) from current telescope position or current selected object. **Object > Search > Find Objects Within Radius...**. See page 165.

- Added the ability to add more than one constellation object at a time from the **Add Special** popup menu.

- You can now right-click the list of alignment stars in the Sky tab and select: **Add alignment stars to plan...** See page 155.

- When a constellation object is selected in the object list, and the Field of View tab is selected, the FoV chart is made to fit the whole constellation by setting the FoV diameter.

- Allow multiple Object Types in custom highlighting.

- Added "**Ignore All Rules**" to the custom highlighting rule set popup. This gives a quick way to disable a rule set temporarily. See page 273.

- You can now import and export Cartes du Ciel (V3.10 or after) observing lists. **File > Import > Cartes du Ciel Observing List...** and **File > Export > Cartes du Ciel Observing List...** See pages 358 and 367.

- Field of View Display Options now has **Reticles/FoVs > Crosshairs/Grid...** This allows you to add cross hairs or a grid to the chart. Double-clicking lets you choose the grid spacing or crosshairs. See page 136.

- Each Telescope resource can optionally create and use a custom alignment star set. This alignment star set will be used even if the resource defines a telescope mount with built-in alignment stars. Any star in the Bright Star catalogue can be used. You can also upload/download to a user-contributed library of alignment star sets. See page 59.

- The dialog that lets you select multiple new objects now has the guide for double star identifiers and greek letters. See page 161.

- **Edit > Copy IDs** copies the ID column of the object list to the clipboard. You can then paste it into a text file of your own choosing. See Section 11.6.21 on page 176.

- **Observation > 7Timer Chart** shows an observing conditions chart based on data from 7timer.com. This works internationally (apparently). See page 120.

- Off-axis Guider support in the Field of View chart. Custom reticles now have three choices for rotation: Rotate with the Reticle Rotation slider, rotate with the FoV Angle slider, or no rotation. If you make your main imager reticle have "No rotation" and the pickoff mirror reticle have "Reticle rotation" then the pickoff mirror will be adjusted w.r.t. the imager using the Reticle Rotation slider. The FoV Rotation slider can be used to rotate the FoV under the main imager reticle for framing. See page 143.

- When adding a user image you can now specify the size, centre coordinates, and orientation w.r.t. North of the image. See page 176. Any such user image will be displayable in the FoV. Also, if you select the user image in the Image Manager then you can edit the attributes where necessary.

- **Synonym** checkbox added to the New Object dialog. If this is checked and the **All...** button used then IDs will be searched as well as synonyms based on the object's coordinates. See page 76.

- Added the ability to create your own Chart# definitions (for the Chart# column). You can also upload and download as user-contributed definitions. In the Chart# tab of the Object List preferences window. See page 297.

- Improvements to the **Help > Revision Notes** window: Show the list for all releases, show bugs-only, etc.

- **Object List preferences > Sorting > Show groupings after sorting a column**. If this option is set then whenever you sort the object list, a black line will appear between groupings (e.g. sort on Constellation - the line appears between constellation changes; sort on R.A. - the line appears on every hour change, etc.). See page 295.

- Added **Load...** and **Save...** buttons to the catalogue search dialog. This allows you to save and reload complex search parameters. See page 82.

- Added a "**Set plan date/time**" checkbox option to the visibility section of the catalogue search dialog. Setting this option will set the plan's date/time to the beginning of the specified period when the search is done (regardless of the search results). See page 82.

- Added a right-click menu to any date fields, containing relevant entries, e.g. sunrise, moonset, etc. This is a convenient way to set the date/time to often-used values. See page 48.

- The tally of observations in now displayed in the top of the Observation Database window as the "total # of observations for # of objects".

- The Site Status window now allows the local time to be fixed to allow for future planning, shows the current moon altitude and the time of the next rise/set, and has a keyboard shortcut. Additionally, clicking the "Site:" label next to the current site popup on the plan document window

will open the Site Status window. See page 121.

- On most (but not all) list widgets in the application, including the observation database window lists, object list, etc. you can right-click and select **Appearance...** On the Appearance dialog there's now a **Columns** tab that allows you set the style separately for each column in the list: **bold**, italic, underline, the colour of the text, and the colour of the background. See page 45.

- A new "**Components**" field has been added for objects in order to deal with double star components in a more consistent fashion, rather than just being embedded in the Notes field. New versions of the WDS will populate this field automatically. See page 98.

- The magnitude limits for particular catalogues being displayed in the Field of View chart can be set via **File > Catalogue Manager > Settings and Coverage** (change the **FoV Min Mag** and **FoV Max Mag** columns). See page 329. Once set, those limits can be used via the FoV Display option: **Display > Obey catalogue min/max magnitudes**. In the FoV catalogue list, any catalogues with limits will have a suitable icon displayed to the left of the catalogue name. See page 128.

- Movement commands (NESW) have been implemented for the ServoCAT and Ultima 2000 telescope mounts. Using the arrow keys in **Telescope > Telescope Control Palette** will use a combination of slew and cancel-slew commands to move the mount.

- Added a "**Selected object/s**" option separate from the "**Objects**" option in the Sky chart Display Options.

- Added a **Scale Factor** setting in **Preferences > Printing**. This is typically left to the default value of 1, but can be changed if your printer driver is printing at an incorrect size. See Section 20.2.4 on page 289.

- Right-clicking the user-defined fields listbox shows "**Show Column: xxxx**" or "**Hide Column: xxxx**" (for defined fields xxxx). Selecting one of these toggles the column's visibility in the object list. Note that it doesn't change the position of the column - to do that you'll still need to go to **Edit > List Columns...** See Section 19.5 on page 284.

- Added a **Reset** option in **Catalogue Manager > Preferences**. This will reset all "used" Plan Creation Wizard objects so that they can be chosen again. See Section 20.8.8 on page 308.

- Added a **Catalogue Notes** field to objects and renamed the existing Notes field to **User Notes**. This separates notes derived from the source catalogue from user-entered notes. Particularly useful when you refresh the catalogue notes - i.e. the user notes are left untouched. See page 98.

- Modified the **Refresh Objects from Catalogues** feature and revised the code. You now have more control over how objects are updated. See page 169.

- All objects in the object list now have a corresponding constellation map displayed to the right of the object list (available in the list of images under the image display). The constellation is displayed with borders, figure, and naked-eye stars, as well as the position of the object (and any other objects in the plan that are located in that constellation). The generation of this map can be

turned off in the Object List preferences. See page 104.

- **Statistics** tab has been added to the observation database window. (Note that **Observation > Statistics...** has been removed). This tab shows one (or more, depending on the window size) tables and associated pie charts showing various statistics of the observations in your database. See Section 12.2.17 on page 190.

30.4 V2.3

V2.3 includes many fixes to problems V2.2 and before. They are *not* listed here. You can use ***Help > Revision Notes*** to see details of bug fixes and enhancements.

Note that there might be slight changes in the illustrations (the V2 manual was illustrated using screen shots from Mac OS X 10.6 and Mac OS X 10.7, V2.1 was illustrated with Mac OS X 10.8, V2.2 changes were illustrated using screen shots from Mac OS X 10.9, while V2.3 changes are illustrated using macOS 10.14).

The following list enumerates all non-trivial changes and improvements between V2.2 and V2.3, and where you can find them in this manual. They are in no particular order.

- The macOS version is now a **64-bit Cocoa** application (previously a 32-bit Carbon application) which corrects many UI issues (and probably introduces new ones) and is compatible with all macOS versions from 10.10.5 onwards. The application is also **Retina-aware** when used on a Retina screen.
- The Windows version is now a **32-bit/64-bit application** that is **HiDPI-aware**, and runs on all Windows systems from Windows 7 SP1 onwards.
- **Apparent Magnitude at Best Time**. Object list column. See page 97.
- Eyepiece resource field of view can be selected as either the Apparent FoV (as before) or the **Field Stop Diameter.** See page 63.
- **Reproduce Observation in Field of View Chart**. Added ability to set the date, time, RA, Dec, and resources for the FoV chart to reproduce what the field of view would have been for the observation. Right-click on an observation in the Observations tab of a plan document, or on an observation in the observation database window.
- **Date/time qualifiers in custom highlighting rules**. You can now select special qualifiers for any date/time properties. e.g. sunset, end of civil twilight, etc. See Section 18.1.3 on page 272 for more details.
- Optionally **force constellation view in the DSS/User image on the objects page**. Object List Preferences > Constellation Chart Display. See page 295.
- **Increase number of shown columns in the object list**. Previously this was limited to 62. Now it is 254.
- **Arrows on the Sky chart Time offset slider**. Helps with one hour increments.
- **Adding "excess" IDs from catalogue searches as separate user-defined field values**. File > Catalogue Manager > Preferences > Add additional IDs to > Separate User Fields.
- **Show star Type when hovering the cursor on a star in the Sky chart**.

- **Show APASS catalogue V magnitudes option to UCAC4 external catalogue**. Field of View Preferences > External Catalogues > UCAC4
- **Optionally show the moon altitude in the long-term visibility indicator**. Right-clicking reveals the option.
- **Display the object sequence in the Field of View chart, c.f. the Sky chart**. Display Options > Display > Plan object sequence. Line colour can be selected in the FoV preferences.
- **Cmd-Shift-U keyboard shortcut for Edit > Adjust all list columns**.
- **Allow import of PNG-formatted image files** (in addition to JPEG files).
- **The Alt/Az indicator on the Objects tab now has a right-click option to rotate the cardinal directions by 90 degrees**.
- **Object > Search > Find Objects Within Radius... now has an option to search plan objects (as well as catalogues)**.
- ***Reset Criteria* button added to *Catalogue Manager > Preferences*.** The ***Rebuild...*** button no longer resets the criteria.
- **Added "Show object in catalogue" item to right-click menu for the object list**.
- **Changed telescope mount option to "Use Wifi-to-Serial adapter or TCP/IP",** and added a "Direct TCP/IP" option to that just to make things clear.
- **All date selector widgets in the UI now have calendar selection on macOS**.
- **Added iOptron V2 mount protocol support**.
- **User-defined boolean fields can now use a blank for the negative case**.
- **Transit Altitude column in Object list now has an option to append N or S to the value**, depending on whether the object transits N or S of the zenith from the user's location.
- **The Observation Database window now has a "# Obs" column for each observation**, showing the total number of observations of the object in the database.
- **RA/Dec grid option for the Field of View chart** (Display Options > Display > RA/Dec Grid).
- **Ability to Auto-merge any observation sessions less than n hours apart**. Right-click the Sessions list in the Observation Database window and select Auto-Merge Sessions...
- **File > Export > Sequence Generator Pro Target List**. See page 367.
- **Improved Excel export**. Now exports properly-formatted .xlsx files.
- **Cartes du Ciel V4 external application support**.
- If you try and **save changes to a locked (read-only) plan file**, the Save As... dialog is presented.
- **Sun and Moon Info widgets now include current azimuth**.
- **The Delete... popup under the object list now has a All Unselected Objects option**.
- ***File > Import > Exoplanet Data...*** allows **import of recent exoplanet discovery data**. See page 357.
- The Add Special popup under the object list now has options to **add meteor shower radiant info to the plan**.

- Added new standard object type: **Galaxy Group**.
- Can now **Fix the date/time to the rise/transit/set time of the currently selected object** (using the popup on the right of the Fix date checkbox.
- Removed obsolete support for Planetarium, Astromist, and Palm DSC (Palm Pilot apps).
- Removed obsolete support for V1 document conversion.
- Added **text encoding support** for generic text import and export.
- Removed obsolete ScopeDriver support (Mac classic app).
- Removed obsolete EquinoX support.
- **Resources now appear in the same order in popup menus as they do in the Resources window** (where they can be re-ordered by dragging). Previously they were in alphabetic order.
- The application now **supports HTTPS and HTTP 1.1** online data sources.
- Redundant **HTTP Web Proxy settings removed** from Web preferences.
- If one or more objects in the object list have the same ID then the window title will reveal the **number of unique IDs** as well as the total number.
- **Added Session > Site to custom highlighting rules**.
- Added the ability to **custom highlight objects that were observed during a particular session, or at a particular site**.
- **Edit > Find on the object list presents a checkbox list of columns to search** (default: all of them).
- Can now **copy and paste rows** from one object list to another.
- Field of View chart magnitude limit values now have **up/down arrows** that increment the value by 0.1 magnitude.
- A popup menu in the image download window lets you **choose the types of object** you want to download images for.
- A right-click menu item on the object list lets you **lookup information on an object's ID or Name in Wikipedia**.
- **Removed the "user_" prefix when exporting XML data**.
- **Scripting now supports JSON import and export** of data.
- Added **Web Services feature**, allowing the app to act as a simple server, and responding to certain incoming commands. Includes scripting support, logging. Setting up in Web Preferences is covered on page 291. Testing and managing a remote AstroPlanner application running web services is covered in Section 27.9.10 on page 379.
- **Plan document event scripts** (Script > Event Scripts) can now be run every 15, 30 or 60 minutes, or once a day.
- **Colour user-defined fields**. You can now add a user-defined field with a colour value.
- **Scripting support for Python**. You can run Python scripts, or Python code, from an AstroPlanner script.

- **Tabular data support for observations**. Includes scripting support. See Section 12.2.9 on page 186.
- Removed support for user-field and telescope scripts (they were very unreliable).
- **Separate colour in Sky Preferences for constellation boundaries**.
- **Added scripting support to access missing plan object computed properties**: Observability, HJD, ParallacticAngle, BestEyepiece, DarkTimeStart, DarkTimeEnd, DarkTimeDuration, BestMagnification, DateofOpposition, SplittableAperture, Splitability, BestTime, BestTimeApparentMagnitude, TransitAltitude.
- **Observation list (Observations tab) now includes site and equipment**.