Astromist 2.3
User Guide

1. Introduction

1.1. Objectives

Most high-end telescopes ("scopes") sold today come with computer-controlled motor-drives that allow you to point to thousands of objects in the night sky. Although quite intuitive, their output is limited and, due to the small screen display, the user interface is rarely easy to use. This configuration makes the thousands of objects found in the telescope's database especially difficult to sort, choose or identify.
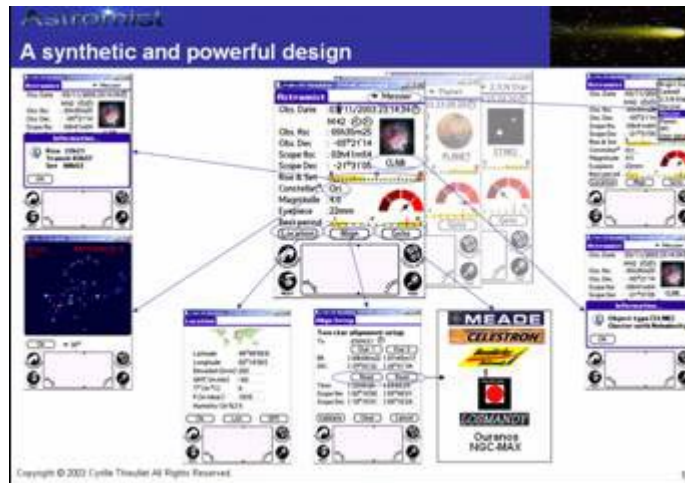
In order to simplify telescope use, various PC software programs exists that allow an enthusiast to view powerful interactive "sky charts" and then select an object simply by clicking on it. Most of these software applications (apps) are designed to zoom in and out on the sky map and filter objects by their visibility to avoid confusion on the displayed map. However few of these apps help you answer very simple questions that all astronomers commonly have:

- I want to look at M57; what is the best eyepiece to use with my telescope to see it?

- Can I see this object tonight? If not, when is the best time of year to observe it?

- Which galaxies are visible tonight with my telescope?

- Tonight I am planning an observation session of one hour. What objects can I see during this time frame?

- Are these objects easy to see or not?

- Which objects will be visible higher in the sky tonight considering that I have a mountain on my horizon?

- What are the easiest objects to observe tonight? The most difficult?

- How can I find an object if my mount is not aligned?

- What objects can I see easily with a 10-mm Plössl eyepiece in my telescope?

- During the next hour I would like to point my telescope at all the nebulae visible inside the constellation Uma and view them using my 20-mm Nagler eyepiece.

Astromist was designed to help provide a simple, but complete list of objects to observe for beginning and serious astronomers, plus powerful sky charts. It can also indicate the best time and date to see an object and recommend what eyepiece might give the best view. All astronomers, regardless of their level of experience, will be amazed by Astromist and how it can calculate the accurate position of objects, including

corrections for precession, nutation, refraction and light aberration. Astromist can also correct for telescope-mount errors using several advanced pointing models and can pinpoint your observing location using an auxiliary GPS system, which your may already own and use for sailing, hiking or traveling in your car. Finally, Astromist will enable some advanced users to wirelessly control their telescopes via Bluetooth communications.

"*Everything in a few taps*" was the guiding principle behind the design of Astromist.

1.2. Main features

Astromist provides a great set of features unmatched by other Personal Digital Assistant (PDA) software applications:

- Bluetooth (and infrared) control of a telescope (a special rebate is available for Astromist's registered users for the complete Bluetooth hardware solution).

- Up to 2.5 million stars and 18,400 deep sky objects using full catalogs.

- A library of more than 9,000 images (all NGC, Moon atlas, Mars atlas, etc.)

- High-resolution screen support displays beautiful and comprehensive sky charts (four variations available) with the following features:

  - 320x320, 320x480 or 480x320 resolution modes

  - Dynamic scroll

  - Chart rotation

  - Object size, shape and orientation

  - Stars colors and sizes

  - Optional eyepiece field of view

  - Optional CCD field of view

  - Several zoom levels

  - Grid with fine graduations

  - Star magnitude legend

  - Optional Telrad overlay

  - Several telescope utilities to control GoTo, improve pointing, etc.

- Supports a wide variety of telescope drivers including LX200, Autostar, NexStar, Losmandy, Takahashi, as well as most of the Dobsonian DSC's on the market (Intelliscope, DaveEk, Ouranos, NGC-Max, SiderealTechnology, etc.) using dedicated encoder boxes.

- GPS compatible for retrieving observer position and elevation using cradle or Bluetooth port.

- PlanetAssistant displays the planet's path on the sky for long periods, including heliocentric view, quick sky planet positioning, detailed information tables, etc.

- CometAssistant allows you to plot a comet's (or asteroid's) position in the solar system (3-D view), plan observations (ephemeris and sky path for an extended period) or adjust the comet's data.

- EclipseAssistant helps you prepare your trip or just find the best place from which to observe (data includes best place, globe view, simulation, etc.)

- SatelliteAssistant locates the positions made-made Earth satellites in the sky and helps you plan observations (ephemeris and current visible satellite) or adjust data for satellites.

- Image Viewer lets you add and display your own images or just browse through the included image library.

- Dreyers descriptions of more than 14,000 deep sky objects, including a translation of the Dreyers codes.

- TwilightAssistant helps you to determine the best period throughout the year to observe an object or a planet.

- ScopeAssistant helps control your telescope using a Palm handheld.

- MarsAssistant simulates the positions of the planet's satellites, views of the planet and a map of the surface, including more than 900 features.

- JupiterAssistant shows the rotation of the Great Red Spot, the planet's satellites and satellite events ephemerides (i.e., shadows, eclipse, etc.)

- SaturnAssistant simulates ring evolutions and satellite positions.

- Built-in date and time functions generate information specifically for astronomers, including Moon phase per day, local, UT or JD times, a broader year range than is normally available with your Palm handheld, etc.

- AlignmentAssistant helps you to align your equatorial mount.

- CCDAssistant computes your CCD field of view and displays it inside Sky Charts.

- CheckListAssistant (based on the SAC checklist) helps you remember to bring everything with you when you head out for observing.

- LocationAssistant enables you to enter up to three preferred location settings.

- FinderAssistant allows easy browsing of objects.

- High-precision computation algorithms based on the famous Novas library, correct for refraction and topographic position (Earth aberration, precession and nutation) and also take into consideration temperature and atmospheric pressure.

- 2-star alignment enables quick GoTo to an object even if you don't polar align your mount.

- N-stars alignment enables telescope pointing better than one arc minute resolution.

- A large selection of Messier and planet photos.

- More than seven selection criteria to sort and select sky objects within the provided databases (Messier, Caldwell, Herschel, SAC, SAO, IC, NGC, Planets, Bright Stars, and user defined).

- A multiple-stage selection process helps refine your selected-objects list.

- Visual charts show rise and set times.

- A visual chart showing the best observation period during the year.

- A visual scale showing if an object is easy or difficult to see, considering its size and magnitude and telescope dimensions and sky brightness.

- Rise, transit and set times are calculated with adjustable horizon constraints.

- Displayed data includes magnitude, object type and constellation for planets and deep-sky objects.

- Planet and object positions are given in equatorial and alt-azimuth cooridinates.

- The handheld display brightness can be controlled with multiple night modes.

- And much more!

1.3. Limitations

1.3.1. Scope drives

Meade (LX200), Celestron (4GT, CGE, new GT and GPS) and Takahashi telescope drives have been certified for full telescope control using Astromist as a virtual hand controller. NexStar 5 and 8 drives are also certified but currently do not allow telescope control.

Furthermore most of the current Dobsonian DSC encoder boxes available are supported. Like DaveEk, Ouranos, NgcMax, SkyCommander and SiderealTechnology.

Other available telescopes drives have been tested using simulators only so if you have trouble with them, please contact me at contact@astromist.com. I will work to fix them.

1.3.2. Photos

Messier objects and the planets have "real" photos, but Caldwell, Herschel, SAC and Multiple-Stars have images that only represent the "type" of the object. These photos are extracted from Messier catalog photos.

All the NGC images and part of the IC object photos are available for registered users as well as a library of 900 Mars features and a library of 1200 Moon feature images.

These libraries are available in two resolutions:

- 319x319 pixels for high-resolution Palms

- 150x150 pixels for earlier Palm models.

Note: *The low resolution set of images will reduce the memory space required and speed up the display of the images.*

You can add any additional images that you want provided you follow these rules for naming the image so that Astromist can find it:

- Name of the object/planet/feature + .jpg. As an example, an image of M31 should be named "M31.jpg" or an image of crater Copernicus on the Moon should be named "copernicus.jpg".

To display an image from the ObjectChooser, SkyChart, NightTripper, FinderAssistant or MarsAssistant, just click on the camera icon and the image will be displayed full screen.

2. Installation

2.1. Prerequisites

2.1.1. Operating system

Astromist has been developed for the Palm Operating System (OS) version 4.0 or higher using 256 colors. A 4.0 upgraded Palm IIIc is not supported.

Using Astromist on older Palm OS versions will cause Fatal Errors.

It is recommended that you use a recent High Resolution Palm model to benefit from the latest features and graphics.

Owners of handhelds with wide-screen support (480x320 or 320x480) will see added benefits on many of the new screens.

2.1.2. Hardware

Astromist was developed and has been tested on a Palm 505c, Tungsten T3 and T5 model PDAs. It has been also tested on Sony handhelds, the now discontinued Tapwave Zodiac series and on the Treo series (600 and 650).

A serial cable or a Bluetooth-to-serial converter is required to connect telescope drives to the handheld that you use.

Note: Infrared support is included for experimental purposes only. If you want to do serious wireless control choose Bluetooth instead. Infrared has been tested with an Actisys 1000SL infrared-to-serial converter. This converter is the only one found at an affordable price for enabling serial protocol management over infrared.

Note: WiFi is not currently supported because the cost of a serial-to-WiFi converter and handheld power usage is greater than for Bluetooth. In addition most of the time you will be controlling your telescope from a close distance and the amount of data to transmitted is very small, which also favors Bluetooth.

To install all the provided Astromist add-ons you will need a memory card, unless you are using the Palm LifeDrive model:

- 256Mb is the minimum for a PalmOs 5.0 handheld to be able to use the current high resolution image libraries.

- 128Mb is the minimum for a PalmOs 4.0 handheld to be able to use the low resolution set of images.

2.1.3. Required "Plug-Ins"

2.1.3.1. MathLib

Astromist uses double precision computations that depend on the Mathlib library. MathLib is a shared library that includes a complete set of IEEE754 double-precision math functions available for use with any Palm handheld application. This library is free software covered by the GNU Library General Public License.

If this library is not present on your Palm, you can download it at the following address:

- http://www.probe.net/~rhuebner/mathlib.html

- ftp://ftp.rahul.net/pub/rhn/mathlib11.zip

2.1.3.2. Jpeg libraries

The internal image viewer uses optional jpeg libraries to load an external image. These libraries are free software covered by the GNU Library General Public License.

They are both provided in the default Astromist package.

You need to choose and install only one depending your OS version or your processor type (ARM or not).

- JpegLib must be used on all PDA's with Palm OS 4.x and if you don't know the type of your processor.

- PnoJpegLib can be used on PDA's with Palm OS 5.x and an Arm processor. This library provides real time upload of image and is far faster than JpegLib.

2.2. Free and Registered Version

The Astromist free version has the following limitations:

- Only five selectable objects at a time.

- Only the first 1000 database objects are available.

- Only the last 100 Moon craters are available (clicking on the map will jump to the closest known crater, not necessarily the one you want).

- Only Dreyer descriptions for the Messier objects are available.

- Limited stellar catalog of 1600 stars.

- Preference settings can not be saved.

- No date modification on several panels.

- No Bluetooth support.

- No comet list modifications.

Registered user benefits include:

- None of the obove restrictions.

- Multiple stellar catalogs to choose from.

- More image libraries including photos for all NGC objects and 900 photos of Mars features.

- Several tools to create custom catalogs, including object, satellite, comet, asteroid, eyepiece and observing locations.

2.3. Minimum package

Astromist's minimum package is composed of the following files:

- **astromist.prc** – the program,

- **astromist_obj_1k.pdb** – the default object catalog. It contains Messier, Caldwell, Herschel and the Best SAC objects.

- **astromist_default_stars.pdb** – the default stellar catalog. It contains the 1600 brightest stars up to magnitude 5.

- **astromist_constellation.pdb** – the constellation lines database.

- **mathlib.prc** – the external library required to do the precision math computations.

These files need to be synchronized to your handheld using your usual procedure (2.2Mb of memory is required to install this minimum version).

As several dedicated catalogs are missing in the "Minimum package" configuration, some of Astromist's Assistants will not be fully usable:

- CometAssistant (requires astromist_comet.pdb)

- MarsAssistant (requires astromist_mars.pdb)

- SatelliteAssistant (requires astromist_satellite.pdb)

- Moon Map, Feature Assistant and Terminator Assistant (requires astromist_moon.pdb).

2.4. Full package

Registered users can install the more complete catalogs, depending on the amount of PDA RAM they can allocate or the size of the expansion card being used.

2.4.1. Stellar catalog

Several catalogs are provided to registered users to enable them to more easily manage Astromist memory requirements if they are not using an expansion card to store Astromist catalogs and images.

The following catalogs are provided:

- astromist_brightstar.pdb – This catalog contains 200 named stars. It requires 12K of memory.

- astromist_hr.pdb – Yale catalog with stellar magnitudes up to 7.0 (9100 stars). This catalog requires 120K of memory.

- astromist_hr_idx.pdb – This catalog contains shortcuts to retrieve HR stars by their identifier.

- astromist_hip_16k.pdb – Hipparchos catalog with stellar magnitudes between 5 and 7.2 (16,680 stars). This catalog requires 230K of memory.

- astromist_hip_32k.pdb – Hipparchos catalog with stellar magnitudes between 5 and 7.8 (31,600 stars). This catalog requires 410K of memory.

- astromist_hip_64k.pdb – Hipparchos catalog with stellar magnitudes between 5 and 8.6 magnitude (63,300 stars). This catalog requires 900K of memory.

- astromist_hip_110k.pdb – The full Hipparchos catalog (118,000 stars). This catalog requires 1,600K of memory.

- astromist_hip_110k_idx.pdb – This catalog contains shortcuts to retrieve Hipparchos stars by their identifier.

- astromist_tycho_390K.pdb – All stars in the Tycho catalog up to 10.1 magnitude (390,000 stars). This catalog requires 5,000K of memory.

- astromist_tycho_2500K.pdb – All stars in the Tycho catalog up to 13 magnitude (2.5 million stars). This catalog requires 30,000K of memory.

- astromist_tycho_idx.pdb – This catalog contains shortcuts to retrieve tycho stars by their identifier.

> *Note :*   *Users with an expansion card must put all theses catalogs in the /PALM/Programs/Astromist/ path on the card; each time a detailed sky view is demanded, the program will dynamically select the best catalog.*

2.4.2. Other catalogs

Other catalogs are provided. These catalogs must replace the small ones provided with the basic package of the free version:

- astromist_comet.pdb – the full comet&asteroid data catalog. This catalog requires 30K of memory.

- astromist_eyepiece.pdb – the default Astromist eyepiece catalog. This catalog requires 33K of memory and can be modified to match your own list of eyepieces using the Astromist catalog tools.

- astromist_location.pdb – the default Astromist location catalog. This catalog requires 33K of memory and should be modified to match your own list of preferred observing locations using the Astromist catalog tools.

- astromist_mars.pdb – the full Mars features catalog. This catalog requires 44K of memory.

- astromist_moon.pdb – the full Moon craters catalog (900 craters). This catalog requires 92K of memory.

- astromist_obj_18k.pdb – the full object catalog (more than 18,000 objects). This catalog requires 830K of memory.

- astromist_obj_1k_idx.pdb – This catalog contains shortcuts to retrieve the 1000 brightest objects (up to magnitude 10) of the object catalog. This index can be used with obj_18k or obj_1k object catalogs installed.

- astromist_obj_2k_idx.pdb – This catalog contains shortcuts to retrieve the 2000 brightest objects (up to magnitude 12) of the object catalog. This index can be used only with obj_18k catalog installed.

- astromist_obj_18k_idx.pdb – This catalog contains shortcuts to retrieve all object of the object catalog. This index can be used only with obj_18k object catalog installed.

- astromist_obj_18k_desc.pdb – the full Dreyer's description catalog. This catalog requires 875K of memory.

- astromist_satellite.pdb – the default Earth (man-made) satellite catalog (100's of the brightest). This catalog requires 28K of memory.

- Optional astromist_user_object.pdb – a custom-made catalog of deep sky objects. The size of this catalog depends of the number of objects included (100 objects = 10Kb). The default custom catalog provided contains the 50 most well known sky objects and their common names. It requires 5Kb of memory.

> *Note:*   *Users can add any user-made catalogs to their expansion cards and select between them using Astromist.*

2.5. Configuration

> *Note:*   *For a new installation of the registered package you **must** remove the demo version installed on your Palm.*
>
>   *To do this:*
>
>   *- Use the Palm Delete function to delete Astromist,*

*- Do a **HotSync** to be sure nothing remains on your computer and,*

- Then start the installation of the full Astromist package.

2.5.1.   Full configuration without a memory card

For an installation without a memory card, hotsync in your Palm:

- Astromist_23.prc or astromist_23_reg.prc for registered users,

- astromist_comet.pdb,

- astromist_constellation.pdb,

- astromist_default_stars.pdb,

- astromist_eyepiece.pdb,

- astromist_hr.pdb for registered users,

- astromist_hr_idx.pdb for registered users,

- astromist_location.pdb,

- astromist_moon.pdb,

- astromist_mars.pdb for registered users,

- astromist_obj_1k.pdb or astromist_object_18k.pdb for registered users,

- astromist_obj_1k.pdb or astromist_obj_2k_idx.pdb for registered users,

- astromist_obj_18k_desc.pdb for registered users,

- astromist_satellite.pdb,

- astromist_user_object.pdb for registered users

- if your are registered user, **ONLY ONE** of the additional stellar catalogs depending the free memory you have.

2.5.2.   Configuration with a memory card

➲   IMPORTANT:

DUE TO THE SIZE OF THE OVERALL ASTROMIST PACKAGE AN EXPANSION CARD OF 256MB IS THE MINIMUM IF YOU WANT TO BE ABLE TO USE THE HIGH RESOLUTION IMAGES (A 128MB CARD IS ENOUGH IF YOU WANT TO USE THE LOW RESOLUTION IMAGE SET).

Due to the numerous Astromist external files and the huge number of photos available, the best solution is to use an external card reader plugged into your computer to install all the extensions.

Note: LifeDrive and T5 users can use the internal DriveMode.

All the full catalog files can be stored on an expansion card. You have to put them in the /PALM/Programs/Astromist/ path.

Once installed you will be able to select in Astromist's Preference Panel 3/5 the biggest stellar catalog you would like to use to draw a detailed view. The best way is to select the 2.5-million stellars catalog and let Astromist select the best smaller catalog when displaying a wide field chart.

Note: Please note that performance of your expansion card has a major impact on the usability of the catalogs stored in this way. Memory cards at x66 speed or 9Mb/s provide good performance.

Using this setup you will be able to activate upon request the Tycho catalog to get the maximum number of stars.

In this configuration, you have to hotsync only astromist_23.prc or astromist_23_reg.prc and put all other files on your card.
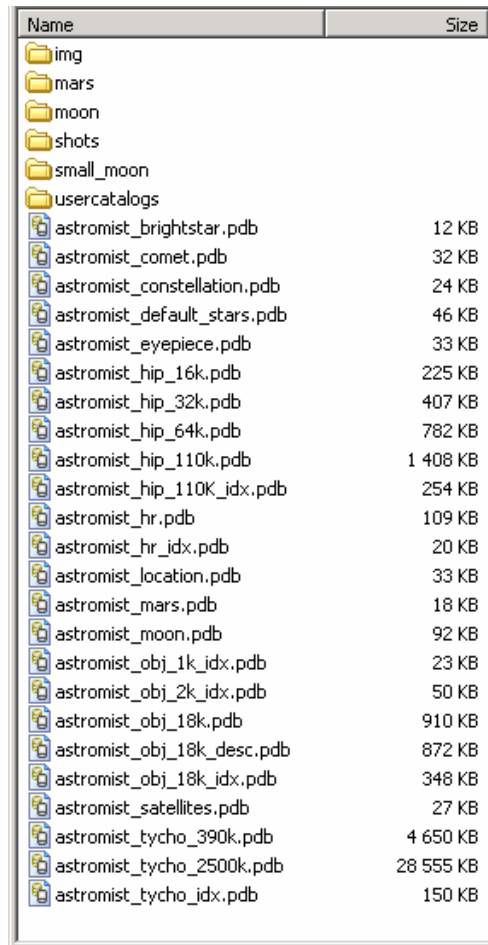
To do this:

- Put the card in your external card reader linked to your computer,

- Open it from your desktop,

- Create PALM folder if it doesn't exist at the root of your card,

- Open PALM folder,

- Create Programs folder if it doesn't exist at the root of your card,

- Open Programs folder,

- Create Astromist folder,

- Open Astromist folder,

- Then copy all the astromist databases (all the .pdb files) in Astromist folder.

- Once the copy is complete, remove astromist_obj_1k.pdb if present.

Now create and install all the image libraries. Under Astromist folder:

- Create img folder and copy inside all jpeg images of NGC, IC and messier objects as well as planets images,

- Create mars folder and copy all jpeg mars images inside,

- Create moon folder and copy all full jpeg moon images insides,

- Create shots folder. This folder is used to link images to your observation logs.

- Create small_moon folder and copy all small_moon jpeg images inside.

- Create usercatalogs folder and copy your object catalogs if any or the default astromist one astromist_userobject.pdb which contains named deep sky objects.

Your Astromist folder must look like this:

Name	Size
📁 img	
📁 mars	
📁 moon	
📁 shots	
📁 small_moon	
📁 usercatalogs	
astromist_brightstar.pdb	12 KB
astromist_comet.pdb	32 KB
astromist_constellation.pdb	24 KB
astromist_default_stars.pdb	46 KB
astromist_eyepiece.pdb	33 KB
astromist_hip_16k.pdb	225 KB
astromist_hip_32k.pdb	407 KB
astromist_hip_64k.pdb	782 KB
astromist_hip_110k.pdb	1 408 KB
astromist_hip_110K_idx.pdb	254 KB
astromist_hr.pdb	109 KB
astromist_hr_idx.pdb	20 KB
astromist_location.pdb	33 KB
astromist_mars.pdb	18 KB
astromist_moon.pdb	92 KB
astromist_obj_1k_idx.pdb	23 KB
astromist_obj_2k_idx.pdb	50 KB
astromist_obj_18k.pdb	910 KB
astromist_obj_18k_desc.pdb	872 KB
astromist_obj_18k_idx.pdb	348 KB
astromist_satellites.pdb	27 KB
astromist_tycho_390k.pdb	4 650 KB
astromist_tycho_2500k.pdb	28 555 KB
astromist_tycho_idx.pdb	150 KB

2.6. Upgrades

At each major release a mailing is done to registered users explaining how to upgrade to the new version. All previous upgrades were free.

After each major release, minor releases are done to fix any issues that were not detected for the major release. In this case registered users have to download again the same registered program and reinstall the .prc file.

3. Functionalities

3.1. Principles

Astromist provides a great set of functionalities split into several domains:

- Object seeking and information gathering.

- Sky charts and planetarium views.

- Forecasts and simulations.

- Ephemeris and object positions.

- Telescope control.

Each domain is covered by major tools and assistants.
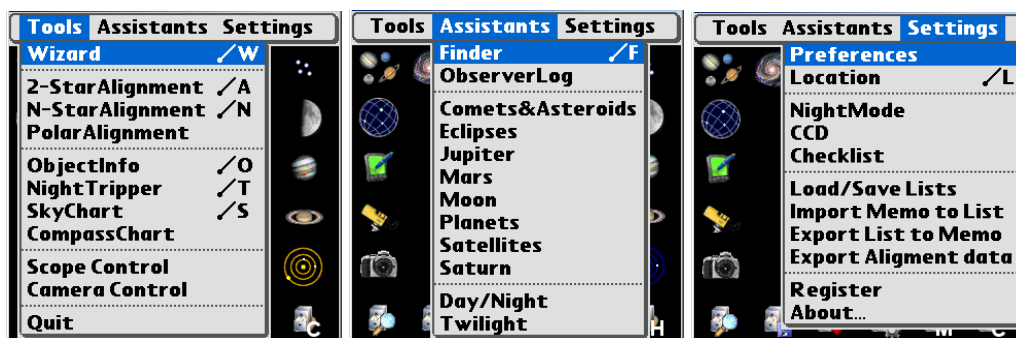
Astromist menus

Major **Tools** constitute the heart of Astromist:

- **Astromist Wizard** is the central point and gathers in one place the major tools and assistants. Its goal is to provide access, in one tap, to the most used functions or objects.

- **Alignment tools** let you align your mount using several different scenarios (polar align, usual two-star alignment and multiple star alignment to correct mount errors).

- **ObjectChooser** lets you browse the most common objects in the sky and easily learn their positions and characteristics.

- **NightTripper** is a unique and powerful tool that lets you prepare in advance for your observing sessions. Numerous selection criteria are available as well as unique object selection.

- **SkyChart** provides detailed sky maps and planetarium views to help you to observe and learn the sky.

- **CompassChart** provides a compass view where the objects are displayed. It helps you to locate North with the Sun to quickly see where an object is or to find when the object will be higher in the sky.

- **Scope Control** helps you control your telescope using a serial or wireless link.

- **Camera Control** will control a Canon DSLR using a serial or wireless link.

- **Quit** exits Astromist on Palm T|X models that have no Home icon in their tool bars.

For a deeper analysis of the sky, **Assistants** provide visual as well as detailed information on a variety of topics:

- **Finder** Assistant easily browses the huge object catalog (more than 18000 objects provided).

- **ObserverLog** lets you preserve all the thoughts that come during an observing session.

- **Comet&Satellite** Assistant simulates and forecasts a comet's trip across the sky and solar system.

- **Eclipse** Assistant simulates and forecasts all solar eclipse events.

- **Jupiter** Assistant simulates and forecasts all of Jupiter's events.

- **Mars** Assistant simulates and forecasts Mars' events.

- **Moon** Assistant provides a Moon phase calendar, Moon map, rise and set ephemerides, darkest hours planning or browsing through images of features (more than 1500 included).

- **Planet** Assistant anticipates all events (eclipses, conjunctions, oppositions, etc), shows a planet's relative position in the solar system, illustrates planet movements across the sky during a particular period, provides ephemerides and more.

- **Satellite** Assistant simulates and forecasts Earth (man-made) satellite positions and visibilities.

- **Saturn** Assistant simulates and forecasts Saturn's satellite positions as well as ring orientation.

- **Day/Night** Assistant visualizes day and night on Earth as well as day length depending on your location.

- **Twilight** Assistant forecasts the best periods to observe an object or a planet over the course of a year.

Finally, the **Settings** section provides:

- **Preferences** tool to let you adjust all of Astromist's settings.

- **Location** tool lets you set your position on Earth and specify the characteristics of your observing sites to enable the powerful Astromist forecast algorithms (visibility of the object, best eyepiece to use, etc.)

- **NightMode selector** is a facility to select the best night mode that fits your current conditions. Three levels of after dark screen illumination are provided.

- **CCD** Assistant computes some useful values linked to your CCD and shows your CCD's field of view inside sky charts and the planetarium.

- **Checklist** Assistant help you remember to take everything you need the next time you go on an observing trip.

- **Load/Save List** Assistant lets you save or load an object list as well user object catalogs that you created using Astromist. This is very handy when you decide to prepare for an observing trip or if you what to have multiple object lists prepared ahead of time.

- **Import Memo to List** Assistant lets you import the data from a Palm text memo and create an Astromist list. This tool is useful if you want to prepare lists that do not include Astromist objects but objects from an external source.

- **Export List to Memo** Assistant lets you export your current list of objects into one or several Palm text memos.

- **Export Alignment Data** lets you export your current aligment data into one Palm text memo. This function must be used if you have aligment issues and would like some support to help you.

On top all theses functions and to help the end user be more comfortable with Astromist, numerous setup panels are available as well as local help at the top of each screen (use the information icon to read the main tips for each screen).

Finally, landscape mode is available on applicable models and each screen has been designed to benefit from this functionality.

320x480	*480x320*

3.2. Overall screen control using Palm Keys

Because using your stylus in the dark is not always easy, Astromist has been designed to avoid, as much as possible, stylus inputs and to promote predefined lists. This feature lets you control almost all panels and screens within Astromist without a stylus, even including tapping on a button, activating a popup or selecting an object from a list.

This is possible by using the right side buttons of your Palm. The first button lets you jump from one button, list or checkbox to another. In each case a red box will highlight the control to let you see where the focus is.

The right-most button lets you activate the control, specifically:

- a button – you will execute the action of the button,

- a list – you will select the item,

- a popup list – you will open the popup to let you browse this list,

- a checkbox – checks or unchecks the box.

The other buttons (left ones, up and down and navigation pad) link to panel related functions. The left-most button usually simulates the OK button, even in message popups, to avoid your having to use the stylus.

3.3. Astromist Wizard

Note: *To ensure accurate computations, you need to fill in your location information first.*

The Astromist wizard allows you to easily access Astromist's advanced features with just a single tap.

*Wizard on HiRes and lowRes Screens*

Various information is provided on this panel's display:

- The location.

- The current date.

- The current time used in Astromist, which can be changed by tapping on the clock icon.

- Information about Sun rise, set and the time when the darkest part of the night starts (all displayed in local time).

- Information about the Moon (rise, set and phase) and an icon that represents the current phase of the Moon for the date selected.

Available buttons on the wizard allow you to quickly access some of the powerful Assistants within Astromist:

Remark: *Depending your SkyChart type (visible view of the sky or whole sky) either only visible objects form your location and depending the date and time either all of them are selected up to the size limit of you object list.*

- Selects planets.

- Selects galaxies.

- Selects nebulae.

- Selects globular clusters.

- Selects comets and asteroids.

- Selects bright stars.

- Launches the MoonAssistant to let you see ephemeris, map, etc.

- Launches the JupiterAssistant.

- Launches the SaturnAssistant.

- Launches the PlanetAssistant.

- Selects Caldwell objects.

- Selects Messier objects.

- Launches nigthtripper.

- Selects objects of your preferred custom objects database.

- Loads and saves custom object lists, select your defaut custom database.

- Launches the FinderAssistant.

- Launches CameraControl Assistant to control your Canon DSLR camera over a serial or Bluetooth link.

- Launches ScopeAssistant to control your telescope over a serial, Bluetooth or infrared link.

- Launches the ObserverAssistant to type an observation log for a specific object.

- Launches SkyChart Assistant that will display the sky using your location and current date and time. If no object selection was done before, the planets are selected by default. Else, the current object list is reused.
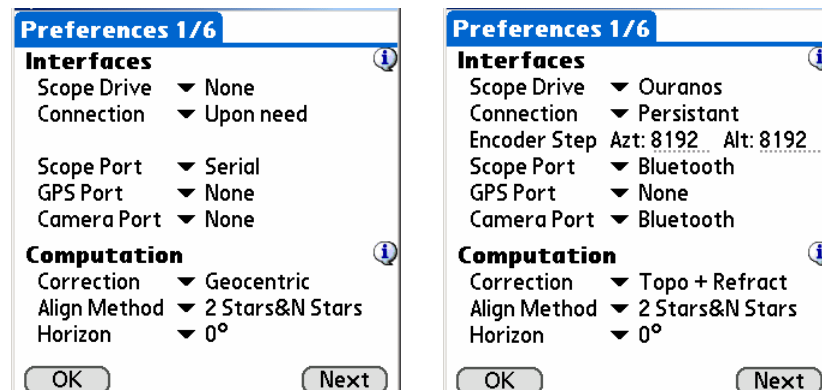
3.4. General Set-up

Astromist has a broad set of configuration options.

Each time you press the OK, Next or Prev buttons, the values of that panel are saved.

Each panel's information buttons provide you with localized help information.

3.4.1. Preferences 1/6

3.4.1.1. Interfaces

Before you connect Astromist to your telescope, you will need to adjust the following settings:

- **Scope drive** – choose the model of your telescope. Interfaces includ the serial port of your Palm (default setting). Astromist will handle all serial initialization processes.

Note: *Astrophysics, Losmandy or SkySensor users must use the LX200 telescope drive mode.*

- **Connection** – choose the type of serial connection management: either Astromist activated as needed or a persistant connection initiated once per session. This last mode is useful for Bluetooth users as it avoids the launch of the connection dialog at each telescope command.

- **Encoder step** is required only for encoder (Digital Setting Circle) users. Unless you are using NGC-Max or AAM Sky Vector (which have this value hard-coded or manually entered in these boxes), you need to input encoder precision. If your encoder is installed in reverse add a minus sign to the value reflect this.

Note: *If you are not using an encoder drive you will not see this field.*

- **Drive port** could be set to "Serial, Infrared or Bluetooth" if you plan to connect your telescope to Astromist. *Infrared control is experimental and requires RFCOM protocol.*

- **GPS port** could be set to "None, Serial, Infrared or Bluetooth" if you plan to connect your telescope to Astromist. *Infrared control is experimental and implements RFCOM protocol.*

- **Camera port** could be set to "None, Serial, Infrared or Bluetooth" if you plan to connect your Canon DSLR Camera to Astromist. *Infrared control is experimental and implements RFCOM protocol.*

Note: *You can have your GPS, Camera and Telescope controlled using Bluetooth at the same time.*

3.4.1.2. Computation

This part of the set-up allows you to define the kind of correction you would like to apply to computations.

- **Correction**: By default Astromist computes geocentric positions of planets, stars and comets including precession and nutation corrections. Astromist also allows refraction and topographic position corrections. Calculations are done using NOVAS algorithms that are very precise. They involve location information such as temperature and pressure.

- **Align Method**: Astromist provides two kinds of star alignment processes. The first one is able to obtain a pointing precision of better than 15 arcminutes with two-star alignment by compensating for construction and set-up mount errors. In this case there is no need of polar alignment. The second N-star process (where "n" equals any number of stars greater than two) allows you to correct for polar alignment, mount and telescope errors (like collimation) to obtain a precision of better than 7 arcminutes:

  - If you have a Dobsonian and/or are using axis encoders, select "Astromist 2 stars" method.

  - If you have a computerized mount with internal aligment, use external mode. Even in this case you can still benefit from the N-Stars aligment procedure.

Note: *Telescope tube flexure correction has not been added into the N-star polar alignment model. A special version of Astromist can be developed for registered users that have a long telescope and encounter this kind of pointing error. In this case, more stars will be required during alignment process (at least 10).*

- **Horizon:** this information is used to compute the rising and setting of objects. The higher this value the later the object rises and the sooner it sets. Set this value to 0° if you want to get results similar to other programs.

3.4.2. Preferences 2/6
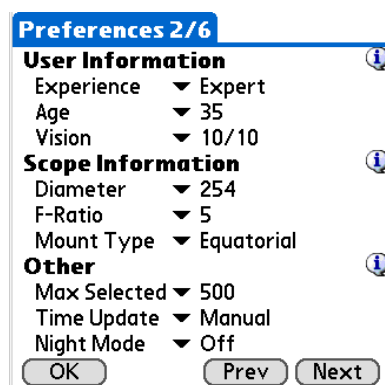
3.4.2.1. User Information

Astromist is able to estimate what objects you can see with the naked eye depending on the presence of the Moon, the Sun and the following three parameters:

- **Experience**: A Beginner who doesn't know the technique to see dimmer deep-sky objects and is not familiar with night vision. As an example, a beginner could see only four stars inside the Pleiades, while a hobbyist has more experience and can see about seven. An Expert may see more than ten stars inside the Pleiades.

- **Age:** depending on age, eyes are less sensitive to light. This is used along with other information to compute your naked eye visual limit magnitude

- **Vision**: If your acuteness of vision is 2/10 in each eye without your glasses on it will be more difficult to detect faint objects :-)).

> *Note:*   *The mathematical model used inside Astromist is similar to the one defined to represent human eye capabilities over time.*

> *Note:*   *This calculation doesn't take into account the light behind you and thus is more effective when observing in the countryside.*

> *Note:*   *10/10 in European rankings is equivalent to 20/20 in the US.*

3.4.2.2. Scope Information

The following information is used to compute telescope magnitude limit, field of view available with a specific eyepiece and the best eyepiece to use to view an object:

- **Diameter** is the diameter in millimeters of your telescope.

> *Tip:*   *If you have the diameter in inches, multiply it by 25.375 to obtain the measure in millimeters. Then choose the diameter from the menu that is the closest to the product of this multiplication.*

- **Focal** is the focal ratio (f-stop) of your telescope.

> *Tip:*   *If you only have the focal length of your telescope, you can estimate focal ratio by dividing this length by your telescope diameter (in millimeters). Then choose the focal ratio from the menu that is the closest to your estimation.*

- **Mount Type** is the type of your telescope mount, Equatorial or Azimuthal.

> *Remark:*   *If you are using Astromist 2 stars aligment method this value must be correct.*

3.4.2.3. Other

- **Max selected** is used to manage the maximum number of objects that Astromist can select at a time in an object list. 150 is a good value which lets you select all the Messier objects and enable you to add some personnal objects.

> *Note:*   *Freeware version of Astromist is limited to five objects at a time.*

- **Time Update** is used to indicate if you prefer that Astromist manages time updates or if you want to be able to manually control the time updates. This value is managed automatically using DateTime Assistant: if you press "**now**" the automatic mode is activated, otherwise manual mode is selected.

- **Night Mode:** Allows you to switch Astromist's display to red to preserve night vision using red. Three night mode are available. This value is managed using NightMode Assistant. The keyboard illumination on Treo models is disabled as well. Keyboard illumination can be re-enabled after exiting Astromist by using the Treo's screen illumination slider control.

Astromist with Night Mod, Bright, Medium and Dark

3.4.3.　Preferences 3/6

This preference panel lets you adjust the main SkyChart setup values.
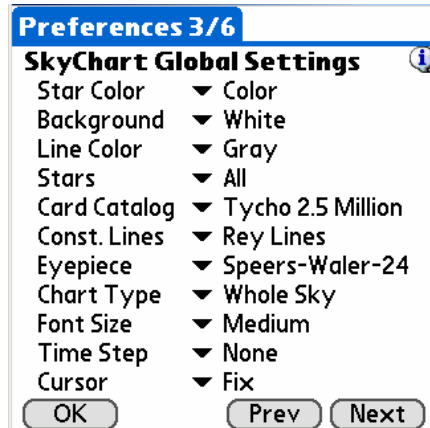
- **Star Color** lets you select the color of stars (colored or back and white)

- **Background** lets you select the background color of the sky chart. Depending the background selected you might have to adjust the line color.

Tips:　　*White background and Star color set to Color is a good starting set.*

- **Line Color** lets you select the color of the constellation lines.

- **Stars** lets you select the option to display only constellation stars or default ones. This may improve display update speed.

- **Card Catalog** lets you select which files stored on your expansion card you want to use as the more detailed one. For example if you select Hipparchos 110K, 16K, 32K and 64K will be used too and must be there on your card (else an error message will be displayed) but none of the Tycho Catalog even at the lower field of view will be used. Remember that files must be stored on the card in the /PALM/Programs/Astromist/ path with their original names. If you don't want to use an external catalog just set this value to no expansion card and put the full catalog you want to use in Palm memory. Astromist will use the stellar database stored in memory.

Note: Only one stellar catalog may be installed at a time in memory.

- **Const. Lines** lets you choose what kind of constellation lines are displayed:

    - **Classic** representation,

    - **Rey lines** which are more recent and try to represent better each constellation. Rey lines are more detailed and can take more time to display on slower CPU's.
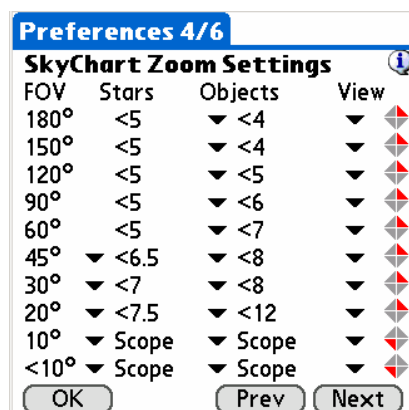

Leo constellation: Classic lines　　　　*Leo constellation: Rey Lines*

- **Eyepiece** lets you select your current eyepiece to display its field of view inside sky chart. The list displayed can be adjusted to reflect your collection using the eyepiecedb.exe tool.

- **Chart Type** lets you select the kind of SkyChart:

  - SkyMap provides a planar view of the visible sky within a circle: like the view you have in most of astronomy magazines. Only objects above horizon can be viewed in this mode.

  - Horizon view displays the visible horizon. The chart is distorted for altitude above of 60°. Only objects above horizon can be viewed in this mode.

  - Whole Sky displays the sky as a sphere. This mode lets you locate any object (visible or not.)

  - Visible Sky displays half of the sky sphere (only the visible part.)

  - Equatorial Sky displays the sky as a sphere but without any rotation to reflect your position on the earth or your current date and time.

- **Font Size** lets you choose the size of the object-label font used in sky chart. Medium is a good setting. Small requires good eyes. Large can be useful at night.

- **Time Step** lets you choose a time step increment to add to the current time of the chart if you press the left keys under skychart. If one selected, the step will be added using the left palm keys.

  ➲ THIS STEP IS NOT LINKED TO THE AUTOMATIC REFRESH RATE OF THE SKY MAP WHICH IS 5 MIN.

- **Cursor** lets you control if the cursor of the charts blinks or not. Blinking mode can be useful at night because the entire screen is red colored.

3.4.4. Preferences 4/6

This preference panel lets you adjust the magnitude limit at each zoom level for objects and stars. Star magnitudes are adjustable from 45° to 5°. Above the 45° field of view, only default stars brighter than magnitude 5 are displayed (this is due to rendering speed issues).

You can select your eye's magnitude limit, the telescope's limit or a fixed value.

| FOV	Stars	Objects	View
180°	<5	<4	
150°	<5	<4	
120°	<5	<5	
90°	<5	<6	
60°	<5	<7	
45°	<6.5	<8	
30°	<7	<8	
20°	<7.5	<12	
10°	Scope	Scope	
<10°	Scope	Scope	

Objects magnitude limit applies to the object list you created and to objects dynamically loaded upon you zoom level (drill down function.)

The View column lets you adjust the sky-view orientation to match the type of telescope you are using. So, you can decide to have sky views like you see naked eye for a wide fields of view or sky views reversed like you see through your eyepiece with smaller fields of view. In any case, this last setting can be adjusted using a specific button inside the sky chart view.

3.4.5. Preferences 5/6

This panel lets you select those features you want displayed in the sky chart and planetarium views. Each item that is checked displays the corresponding information in the sky chart and planetarium views.
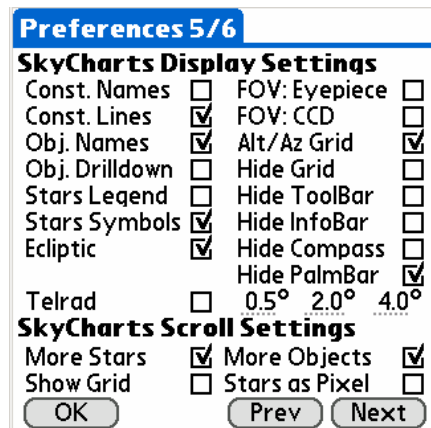
3.4.5.1. SkyCharts Display Settings

This section lets you adjust you display preferences when you use SkyCharts.

- **Const. Names** displays the abbreviated name in the middle of each constellation.

- **Const. Line** displays the constellation lines.

- **Obj. Name** displays the object name, except names are not displayed for widest field of view settings (180° and 150°).

- **Obj. Drill down** activates the dynamic selection of objects within skycharts. The more you zoom the more objects you will discover.

- **Star Legend** displays, at the left of the chart, star sizes and equivalent magnitudes. This legend doesn't take into account the star colors on the chart.

- **Star Symbol** displays the Bayer Greek letter designations, if they exist, of bright stars. For fields of view wider than 45°, only Alpha and Beta are displayed. For fields of view equal to or narrower than 30° all symbols are displayed. Star Symbols are disabled on low resolution PDA's.

Notes: *Numbers associated to the Bayer or Flamsteed codes are not displayed, but are available, if they exist, when you tap on the star.*

- **Telrad** displays the circle of a Telrad around the selected object. The default settings for the three circles displayed are 4°, 2° and 0.5°, but can be changed to match other zero-power finder brands.

Note: *Due to some internal limitation, the Telrad display is not currently moved when you select another object or star in the chart and the chart is not redrawn.*

- **Ecliptic** displays a circle that represents the path of the planets in the sky.

- **FOV: Eyepiece** displays a circle that represents the field of view of your currently selected eyepiece. This feature uses the scope information you input in preferences. To use this feature you need to select an eyepiece in the 3/5 preferences panel.

- **FOV: CCD** displays a rectangle that represents the field of view of your current CCD description (see CCD Assistant).

- **Az/Alt Grid** displays a circle to represent the particular altitude in the Global SkyChart. This grid is much faster to draw than the equatorial one. This option has no effect in the Horizon SkyChart. If you activate Alt/Az Grid, RA and Dec position will be replaced by Altitude and Azimuth in the information bar.

- **Hide Grid** hides, if checked, the grid on top of the SkyChart.

- **Hide ToolBar** hides, if checked, the toolbar on topof the SkyChart.

- **Hide InfoBar** hides, if checked, the current position and time on top of the SkyChart.

- **Hide Compass** hides, if checked, the small compass at the bottom left of the screen. If you hide the compass you will no longer be able to switch to the compass view by tapping on it.

- **Hide PalmBar** lets you decide to display or not the Palm status bar thus allowing you to get wider chart displays in the SkyChart Screen.

Note: *The **Hide Status Bar** currently only works with Palm models with a wide screen (320x480).*

3.4.5.2. SkyCharts Scroll Settings

Scroll settings allow the user to selectively reduce the number of details displayed during scrolling thus allowing those with slower or older handhelds to keep chart rendering times short:

- **More Stars –** check this if you want to display all the default stars during scrolling. If unchecked constellation stars will be displayed using simple bitmap circles.

- **More Objects –** check this if you want to display all the objects found by the drilldown feature.

- **Show Grid –** once checked, lets you display the sky grid during scrolling. This option only works with the Local Sky and Equatorial views as other views do not display grids.

- **Stars as Pixel–** check this to display the stars as colored pixels instead of colored bitmaps. This improves rendering speeds on slower Palm models.

As an example, Palm 505 users could activate Pixel Stars (display stars as pixels instead of bitmaps) and uncheck More Stars, More Objects and Grid.

T5, LifeDrive and Zodiac users can activate all the checkboxes and still be able to rotate and drag the sky views in real time.

3.4.6.   Preferences 6/6

This preference page groups some of the constants used by Astromist's algorithms and allows the user to define output formats used.
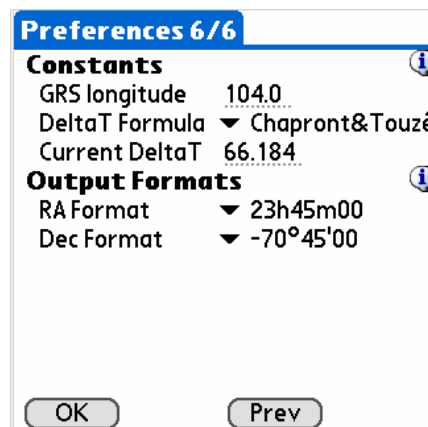
3.4.6.1. Constants

- **GRS Longitude** allows you to adjust the longitude of Jupiter's Great Red Spot. The current value (June 2006) is about 104°.

Note: To compute this value for the present, use the JupiterAssistant.

- **DeltaT Formula** (difference between terrestrial time TT and universal time UT), lets you select the approximation formula to estimate DeltaT in the past (before 1600) or in the future. Chapront & Touzé use a more recent approximation; JPL Horizon is the model used by NASA for eclipse computation.

- **Current DeltaT** (difference between terrestrial time TT and universal time UT), required to adjust the annual value of delta T. This value provided by astronomical almanacs is used to compute arc second precision for object topographic positions as well as planet and Moon positions. The value of this filed is used for the current year.

3.4.6.2. Output Format

- **RA format** allows you to specify how right ascension information (RA) is displayed inside of Astromist.

- **Dec format** allows you to specify how declination information (Dec) is displayed inside of Astromist.

3.5. Location Set-up

Location setup lets you save information for up to three different observing sites. If you need more locations, a custom location database can be created.

Location default screen

The following fields need to be populated:

- **Latitude –** the latitude of your observing location. Values between -90° and 90° are accepted. Positive value indicates North latitude and negative indicates South.

- **Longitude –** the longitude of your observing location. Values between -180° and 180° are accepted. Positive value indicates West longitude, negative indicates East.

Note: This information is mandatory to obtain accurate position data.

- **Type –** Sky brightness of your location. This value is used to compute values displayed with the object visibility indicators available in the ObjectChooser and NightTripper. The brighter your sky the more difficult it will be to see faint objects.

Note: The Moon's brightness is added on top of this value and is computed using Moon Phase. There is no need to calculate it further. Only set a value that describes your overall sky condition and let Astromist do the rest.

*Note: The **List** button allows you to select your own locations from a pre-defined list. Registered users can create their own location catalog.*

Tip: If your town is not in the list, select the closest one and then adjust latitude and longitude.

- **GMT** is the minutes difference between Universal Time (Greenwich Time) and your local Time Zone. This number could be positive ("East" for India) or negative ("West" for a US location). Values between -720 and 720 are accepted. When you tap on it a search box will be displayed to let you select your time zone. Once done the field will automatically be updated.

Note: The GPS button will automatically populate the three previous fields when a GPS receiver is properly attached.

- **DayLight** lets you indicate whether you are using Daylight Savings Time (a checked box) or not.

- **T°** is the temperature at the time of your observing session in degrees Celsius (°C). This information is used to compute accurate refraction correction. Values between -60°C and 50°C are accepted.

- **P** is the pressure at the time of your observing session in millibars. This information is used to compute accurate refraction correction. Values between 900 and 1100 millibars are accepted. If you input a default value, topographic algorithms take care of altitude to correct this pressure and to enable accurate refraction compensation.

Tip: Generally when the sky is clear, sea level pressure is around 1010 mb.

- **Humidity** is the percent concentration of water vapor in the air during your observing session. This information is used to compute the naked-eye visual magnitude limit. Values between 0 and 100 are accepted.

Tip: *You can use a portable weather station that can be attached to your mount plate to get all of this information.*

Once all these informations are set, press OK to validate your inputs or cancel to go back to the previous values.

Other actions can be done using the buttons at the bottom of the screen:

- **List** button lets you access to the location database. Registered users can create their own database with their preferred observation sites. You have to select a location from the list and then press OK to go back to the main screen.
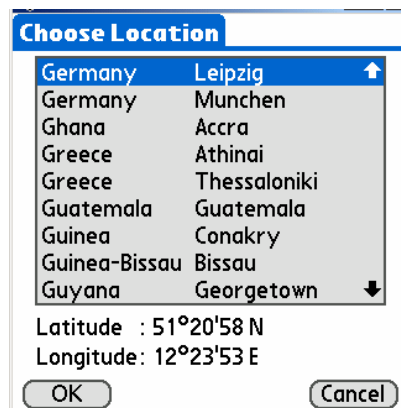
Location database explorer

- **GPS** button starts to read your GPS data to gather your position information (Longitude, latitude, elevation, gmt).

➲ ATTENTION: YOU NEED TO SET **GPS** PORT IN PREFERENCE **1/6** TO THE CORRECT VALUE BEFORE USING THIS FEATURE.

- **Map** button lets you locate you position on the earth without a GPS with a precision better than one degrees in longitude or latitude. You can drag the map to move to the country where you are, then tap on the screen to get the longitude and latitude of the point you selected on the earth. Once the selected value is correct press OK. Use Cancel to go back to the initial lication values.
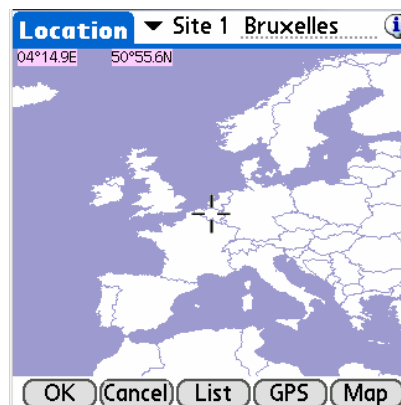
Extended worl map to find your location

Note: *The map tools do not set the GMT. You need to adjust it manually after going back on the main screen.*

3.6. Pointing Set-up

Note: *If you have a GoTo mount, it is recommended that you perform your usual mount alignment setup even if Astromist is able to supersede it. In both cases, once done, you can use N-Star Alignment to improve pointing accuracy.*

3.6.1. 2-Star Alignment

Note: *The method described here is relevant regardless of your mount type.*

Note: *Astromist's formulae for two-stars alignment is based on the excellent work of M. Toshimi Taki (http://www.asahi-net.or.jp/~zs3t-tk/)*

Two-stars alignment enables you to point to any object within a very short time without leveling your mount to perform an accurate polar alignment. This method works for equatorial or azimuthal mount types.

You can expect with this method, without mount error compensation, a pointing precision between 0.5° and 1° depending on your mounts fabrication precision and/or your encoder resolution. If you don't want to do N-stars alignment refinement, you should use a wide field eyepiece (greater than 25 mm) to find the alignment stars.

Mount error compensation, involving several stars, may allow you to obtain a pointing precision of 7 arcminutes.

➲ **ATTENTION:** **P**EOPLE USING ENCODERS NEED TO TAKE CARE OF THE SPEED OF SLEW OF THEIR TELESCOPE WHEN THEY GO FROM ONE STAR TO ANOTHER OR JUST DO A GOTO. **I**F YOU SLEW YOUR TELESCOPE MANUALLY BUT TOO FAST, SOME ENCODER BOX**ES** CAN LOS**E** ENCODER TICKS AND THE POINTING RESULT COULD BE WRONG.

3.6.1.1. 2-star alignment method description

Two-stars alignment process is quite simple:

- You have to choose two bright stars using the **Star1** and **Star2** buttons (first Star1 then star2); then the sky chart with the current visible bright stars is displayed. Tap on the star you want, move your telescope and center it at the middle of your eyepiece then tap OK. You will go back to alignment screen and your current telescope position will be updated.

Note: *You can manually input the telescope positioning information from the setting circles of your mount.*

Note: *You can read again telescope information by clicking on **Read** button under position information. If Astromist is connected, it will read the position from your telescope. If not, you will have to input manually the star positions by reading your encoder or setting circles.*

- Once two stars have been selected, you can proceed with the alignment process by clicking on **Align**.

Some tips on choosing the two stars:

- Avoid stars lower than about 25° elevation because atmospheric refraction will distort their real position.

- Don't choose a star that is higher than 70° in elevation.

- The two stars should ideally be about 90° apart in Azimuth.

After your two-stars alignment is complete you can choose to add more stars to the process with an N-star alignment set-up to get more accurate pointing.

3.6.2. Polar Alignment

Polar alignment will be required if you want to do accurate object following on an equatorial mount. Many polar alignment procedures are available and described in books and on the Internet. Use the procedure provided with your mount documentation first. Once complete, Astromist will help you to obtain greater pointing precision using several stars.

3.6.2.1. Quick Alignment Assistant

To help you polar align your telescope use the AlignmentAssistant. This assistant shows you how Polaris should look in you mount's polar finder scope, if it has one. Several different alignments for different times are displayed representing about a three hour period. This assists you in adjusting your mount while taking into account the movement of Polaris around the NGC (North Galactic Pole).
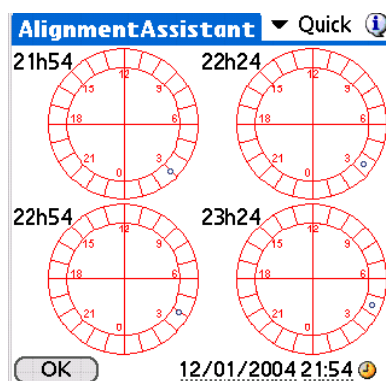
3.6.2.2. King Alignment Assistant

This assistant enables you to align your equatorial mount to the refracted pole position with a precision better than one arc minute. Using the King method you should be able to do a precise polar alignment in less than 30 minutes. This is useful for astrophotographers.
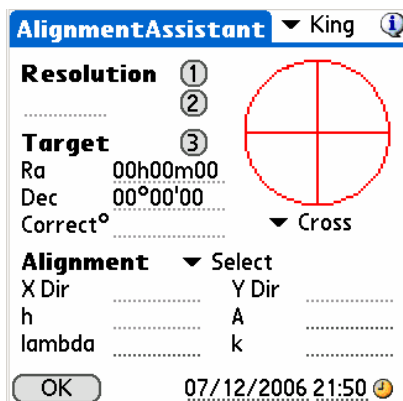
King Assistant main screen

3.6.2.3. Rambaut Alignment Assistant
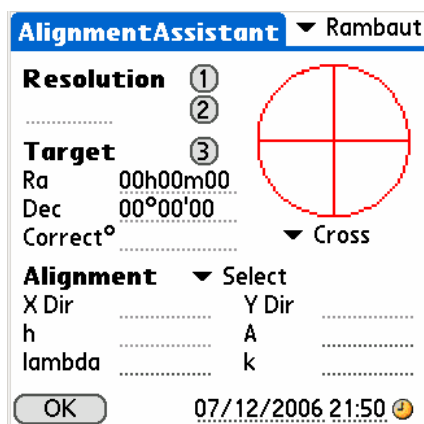
Rambaut Assistant

➲ CAUTION: THIS PART OF THE PROGRAM IS STILL IN THE ALPHA STAGE OF DEVELOPMENT.

This assistant enables you to align your equatorial mount to the refracted pole position with a precision better than one arcminute. Using the King method you should be able to do a precision polar alignment in less than 30 minutes.

3.6.3. N-Star Alignment

Astromist implements two methods to do multiple star alignments. The first one is linked to the two-stars alignment procedure and relies on M. Toshimi Taki's work. The second method uses a mathematical model to correct for your mount's errors. In both cases the look and feel remains the same. Only the algorithms behind the methods differ.

3.6.3.1. First Method

Drawings from M. Toshimi Taki show three mount-error types, which need to be compensated for with the two-stars alignment method:
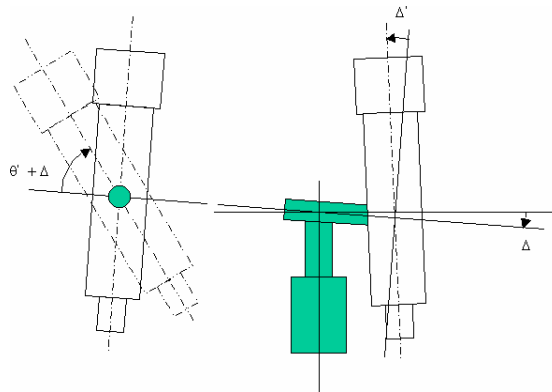
Mount error to be compensated

To estimate these errors, Astromist needs the position information for several stars with their computed and real positions. An example extracted from Mr. Toshimi Taki's Excel file points out that precision was around 2 degrees before correction; after correction the remaining error was approximately 3 arcminutes.
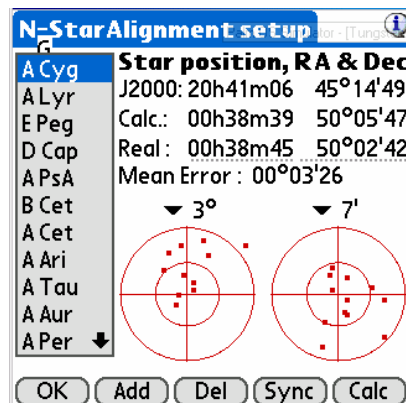
N stars correction map for 2 stars alignment.

Computed positions are calculated automatically once the two-stars alignment procedure is complete. Real positions may be obtained from the telescope's drive (read information) or manually entered after reading setting circle information from the mount. The procedure to add a star is as follows:

- Choose a bright star from the sky chart using the **Add button** (elevation between 15° and 70°, do not reuse 2-Star algiment stars),

- If Astromist is connected to your telescope, use the GoTo menu time to center the star in the field of your eyepiece, then adjust it or center it manually using the ScopeAssistant.

- Press OK button, then Astromist will go back to N-Star panel and will read the current position of your telescope.

Tip: *If you want to remove a star (or more than one) that is not relevant, just select the star by clicking on it and press the **Del button**.*

> *Tip:* *Use of an illuminated reticle eyepiece will simplify the alignment process considerably.*

You will have to repeat this procedure for a minimum of four stars to obtain any significant improvement. Best results can be obtained with a minimum of eight stars.

> *Tip:* *To obtain good pointing precision throughout the sky, you need to choose bright stars from all over the sky and not just from a single region.*

> *Tip:* *If you plan to explore objects from a specific constellation (Ursa Major for example, which contains many galaxies), do this procedure with the main stars of the constellation. You will obtain very good pointing precision using just a few stars, but only within this region of the sky.*

Once enough stars have been added, press the **Calc button** and Astromist will estimate the mount compensation errors.

> *Note:* *This estimation is CPU intensive and may take more than 3 minutes on slower Palm handheld units. Astromist is able to find errors between -5° and 5° on each axis.*

> *Note:* *Astromist's results are similar to the those obtained with M. Toshimi Taki's Excel spreadsheet.*

Once compensation is completed, you will have the remaining **mean error** after the correction indicated. For example, in the screen shot below (that takes an example extracted from M. Toshimi Taki) final precision pointing accuracy with correction is around 3 ardminutes, which is very good. The two pointing circles enable you to see this improvement graphically. The left one shows pointing precision before compensation, the right one after compensation.

> *Note:* *You can adjust the scale of each circle to better see where the stars you used during the alignment process are in relation to each other.*

> *Note:* *By clicking on a star or using the **up** and **down buttons to cycle through the stars in the list**, you can see the before and after correction positions for each star.*

Later, you can do the following to synchronize your telescope's position with Astromist either using a direct connection (Serial or Bluetooth) or manually:

- Press the **Sync button** if Astromist is linked to your telescope mount. This will cause your telescope to send its positioning information to Astromist.
- Input your mount's positioning information by hand into Astromist's **Real field** position and press the **Sync button.**

3.6.3.2. Second method

Astromist also implements standard correction models like those used in most professional observatories. It is based on a number of compensation parameters.
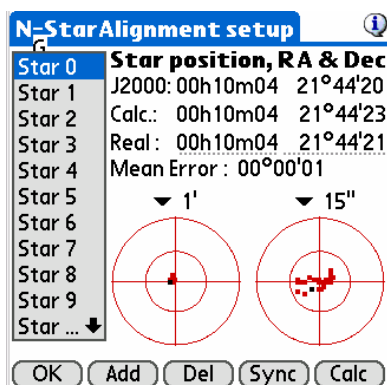
Note: Astromist implements an equatorial model similar to TPoint, which is the reference model most commonly used today.

Astromist takes into account the following parameters for equatorial pointing accuracy:

Right Ascension Pointing Terms		
TPOINT Term	**Functional Form**	**Physical Meaning**
IH	1	ra index error
CH	Sec(Dec)	Collimation error
NP	Tan(Dec)	Ra/Dec non perpendicularity
-MA	Cos(Ra)Tan(Dec)	Polar axis left-right misalignment
ME	Sin(Ra)Tan(Dec)	Polar axis vertical misalignment

Declinaison Pointing Terms		
TPOINT Term	**Functional Form**	**Physical Meaning**
ID	1	dec index error
MA	Sin(Ra)	polar axis left-right misalignment
ME	Cos(Ra)	polar axis vertical misalignment

Depending on the quality of your mount, precision better than 1 arcminute can be obtained.

Note: During tests, the reuse of sample data from an observatory resulted in pointing precision better than 10 arcseconds after correction.

The procedure to add a star and compute compensation in this model is similar to the one described in the first method.

As this method is fast to compute, real time error correction computation is done each time a star is added.

Finally, this algorithm enables pointing accuracy improvement from the very first star.

3.7. ObjectInfo

The ObjectInfo lets you access well known objects, stars, constellations or even comets. Objects are available through a drop down list where you can easily select those that interest you.
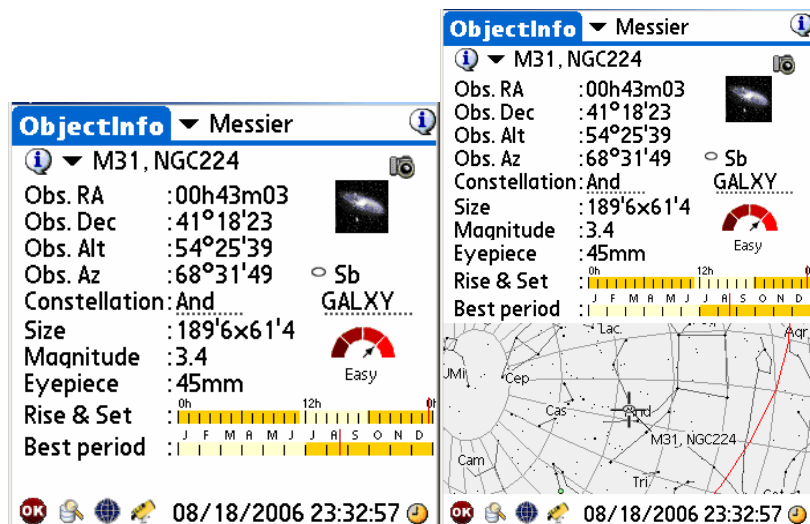
ObjectChooser sample screens in 320x320 and 320x480 resolutions

An abundance of information and links are available from this panel:

- At the upper right of the screen an object filter allows you to select the kind of objects you want to browse. By default the Messier catalog is selected.

- Selecting the Information icon button beside the object name provides the Dreyer description of the object,

- **Obs RA** is the right ascension of the object including corrections selected in the Preferences menu settings (Computation/Correction); the J2000 position is adjusted with the chosen correction. If no correction is selected, the J2000 position is displayed.

- **Obs Dec** is the declination of the object. Management rules are similar to those for **Obs RA**.

- **Obs. Alt** and **Obs. Az.** Same as previous, but for Altitude and Azimuth of the object.

- Under the photo there is the object type. Tap on it and you will have a readable description.

Note: *Actual photos are only available for planets and Messier objects. All other objects have photos of similar Messier objects that are representative of the same type of object, if any.*

- **Constellation** is the constellation of the object. Tap on it to open the sky chart with the constellation with its stars and a red cross where the object is located.

- **Object type** is the type of the object. The icon used in the sky chart is displayed.

- **Size** is the size of the object in arcminutes.

- **Magnitude** is the magnitude of the object. Magnitudes of planets are also computed except for Pluto, which is fixed. The magnitude of the Moon depends on its phase.

- **Eyepiece** is the eyepiece recommendation for seeing the object while taking into consideration your telescope's diameter, focal length, the object dimension, sky brightness and a default field of view of the eyepiece that is approximately 60°.

- **Object visibility chart** is dynamically calculated and takes into account object size and magnitude as well your telescope size and your location's sky brightness.

- **Rise&Set** is a bar graph showing the period of visibility of the object (in orange) during 24 hours. Tap on it for more detailed information on rise, transit and set times for the given object.

- **Best period** is a bar graph that displays the best dates during the year to observe an object at the beginning of night.

Tips: *To get a twilight view of the current selected object, just tap on the best period chart.*

Note: *This information is not relevant for the Sun and Moon.*

- On handhelds that support wide displays, a sky view centered on the object is displayed at the bottom or at the right (while in landscape mode),

- **Ok** button will send you to the previous screen.

- **Find** button vallows you to easily locate an object inside Astromist's database using its catalog number.

- **Sky** button adds the current object in the object list and allows you to access the sky chart.

- **Goto** button takes telescope-position field information calculated by Astromist and sends that to the telescope.

Note: *If you wait a long time before using this button, you should refresh telescope position information by clicking on the clock button near Obs date.*

- At the bottom, the **Date** field displays the date and time. This information is dependent on the Preferences menu setting (Other/Time update.) Just tap on this value to open the Date/Time selector.

3.8. NightTripper

NightTripper is a great Astromist feature that helps you to quickly select observing objects using multiple criteria.

3.8.1. Selection Process

The NightTripper selection tool allows you to create, modify and view lists of objects according to various criteria.
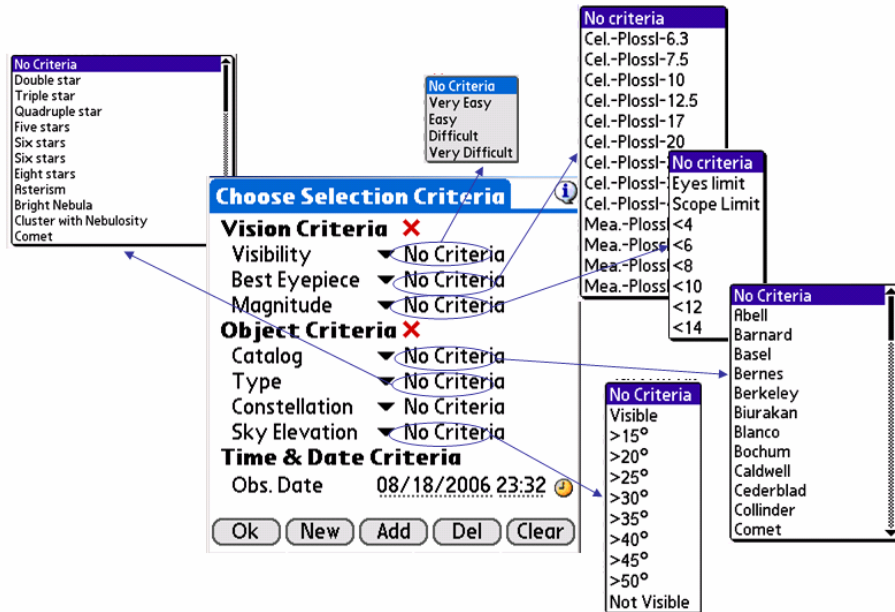
Astromist NightTripper Object Selection Map

Selection criteria are split into three categories:

- Vision Criteria:
  - **Visibility** allows you to select objects based on their visibility. This criterion is dynamically computed for each object considering its size, brightness, your location's sky brightness and your telescope's characteristics.
  - **Best eyepiece** allows you to select all objects that will optimally fit within your favorite eyepiece's field of view. In this case, objects are selected if their dimensions fit the apparent field of view obtained with your eyepiece and your telescope while taking into consideration your telescope's diameter and focal length as defined in the Preference settings.
  - **Magnitude** allows you to select objects based on their magnitude or the magnitude limit of your telescope. If you use Astromist in a stand-alone mode, while camping without your telescope for example, you will able to select only objects you are able to see with the naked eye based on your age, experience, air humidity, acuteness of vision and the brightness of the sky based on the positions of the Moon or Sun.

Note: Naked Eye limit is not reliable inside cities or near urban lights.

- Objects Criteria:
  - **Catalog** allows you to select objects based on catalogs. Depending on the installed catalogs, the list can vary.
  - **Type** allows you to select objects based on their type (e.g., galaxy, nebula, cluster, etc.)

- **Constellation** allows you to select objects visible inside a selected constellation.

Note: *Only constellation abbreviations are available.*

- **Sky elevation** allows you to filter objects based on their elevation in the sky. By default, if no criterion is selected, default horizon values defined in the Preferences are used to calculate the elevation of the object. At the observing time, a calculation is then made to determine if the object is visible or not. Other values may supersede this default value. This is particularly useful if you have trees, houses or mountains blocking your view.

Tip: *To estimate elevation (in degrees) you can use your thumb width (2°) or hand width (5°).*

Tip: *Use **not visible** if you want to remove from a list all the objects that are not visible. It is very useful, for example, if you build a list of the easier objects visible with your telescope and site (takes time to compute) then save it. Later load the list to see only the objects visible at the moment.*

- Time and Date Criteria:

  - **Obs Date** is managed according to the mode defined in the Preferences. This information is updated automatically or you may edit it if, for example, you want to repeat your session.

Once all criteria have been defined you can:

- See the list you built using the **Ok button**,

- Create a new list based only on your criteria using the **New button**,

- Add to a previous list made with other selection criteria the objects selected by your new criteria and that are not in the previous one using the **Add button**,

- Remove all the objects that match your present criteria inside a previous list using the **Del button**,

Finally, red crosses ✖ are there to help you to reset parts of the selection criteria.

3.8.2. List and user catalogs manager

Registered users are able to save and load lists they create as well as select their preferred custom object catalog. As an example, you can prepare a list for your next night's observing in advance then just load the list in the field after you arrive. You can also create lists of the easiest visible objects of a specific type to quickly create tours for when you have little time to observe. Finally, you can manage up to 100 external user catalogs. Once a particular catalog is selected and loaded you can access to its contents using a dedicated icon on the wizard or by FinderAssistant.
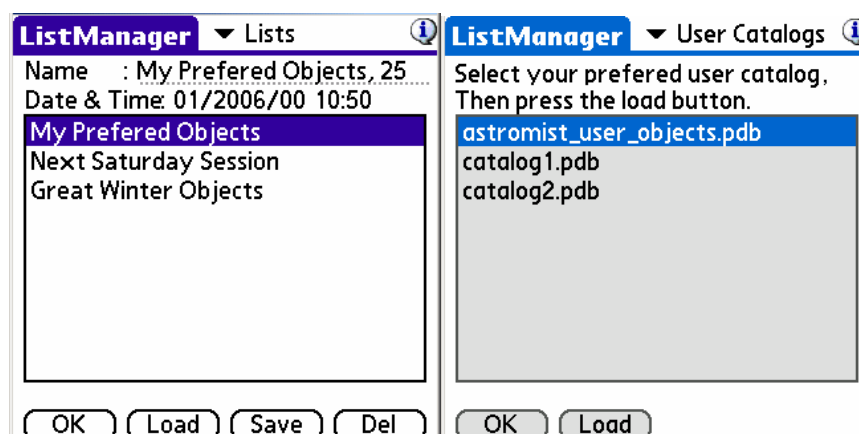
Specific fields for this panel follow:

- **Name** lets you give a name to your new list or just maintain the name of the list you selected. The number of objects in the list is displayed at the end.

- **Date & Time** shows you the date and time of the list's creation.

- **Load** replaces the current list with the one you have selected.

- **Save** permanently stores the current list.

- **Del** allows you to remove a list that is no longer useful to you.

Note: *Up to 100 lists can be displayed at a given time.*

3.8.3. NightTripper main screen

Astromist's NightTripper panel is designed to access, in as few taps as possible, the objects you select; it can then slew your telescope to them. A second level of filtering is also available to better facilitate the management of long lists.

To select an object, just tap on its name. You can also use the up and down Palm Keys to go from one object to another.
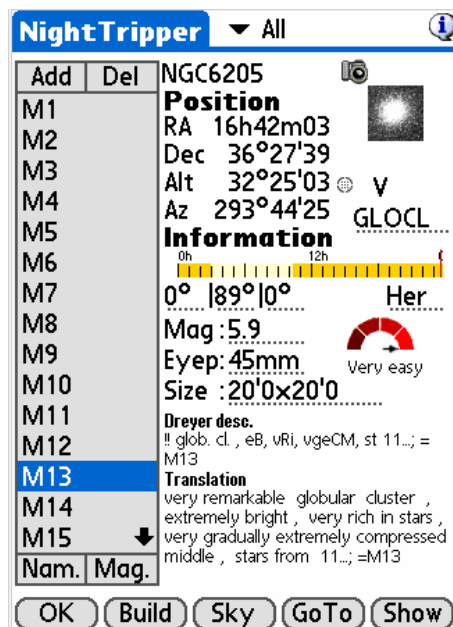
Most of the information available in this panel is the same as that in the ObjectChooser panel. The configuration rules are also the same. To get more information see §3.7 "Object".

Specific fields for this panel are:

- **Add** and **Del** let you add a new item in the list or suppress the one selected.

- **Filter** allows you to do a second level of selection on your list. It is useful if you want to see Messier galaxies and nebulae, for example, without doing two separate selection processes.

- **Object rise, transit and set elevation** give you information about the elevation.

Note: *This filter will keep all the objects in list.*

- **Build** allows you to go back to the Selection panel so you can modify your current list of objects or to load a previous one.

- **Show** allows you see the images of the objects of the list. To quit the show, press the left most key of your palm. To go back or next, use you palm keys or tap on the screen to go to next one.

3.9. Sky charts

3.9.1. Principles

Astromist's sky chart is able to display stars based on their brightness and spectral type.

Sky chart needs to be initialized to run at full speed. This initialization could take some time depending on the number of objects you select and where you store object catalogs (expansion card or main memory). Sky chart is refreshed each time you change the list of objects using NightTripper or every five minutes if no interaction occurs. At any moment you can change the date of observation by just tapping on the clock icon.

3.9.2. Five Sky views available

Several kinds of charts are available:

| Visible Sky Map | Horizon View |
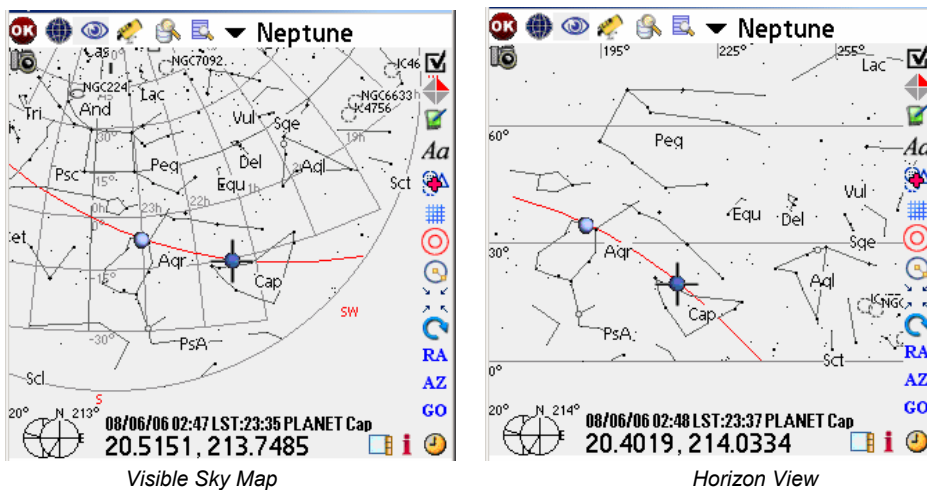
- Sky Map lets you see your entire current sky, considering your location, date and time. This view is like the one you see in astronomy magazines. The edge of the map represents the horizon while the center of the map represents the zenith.

  Depending on the Tap Response mode you selected (Object Information or Center Object) in the 3/6 preference panel, Astromist will automatically rotate the sky map to align the object and the sky chart as they are over your location. This will avoid you having to rotate the map to place objects and stars as they are in the sky. Once done, you will be able to adjust the placement of the horizon using the right-side Palm keys. Each key click rotates the sky a small amount. Continue until the direction heading on the map matches that of the direction you are facing.

- Horizon view helps you see the horizon and up to 60° above it easily.

- ➔ THESE TWO FIRST VIEWS ARE SPECIFICALLY DESIGNED TO ENABLE REAL TIME SCROLLING EVEN ON SLOWER CPUS OR OLDER MODEL PALM HANDHELDS.

Whole Sky
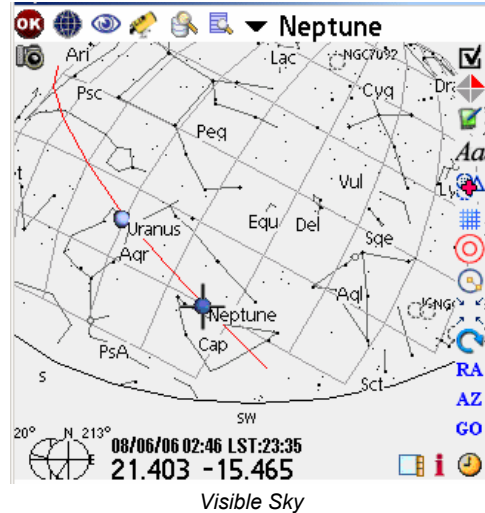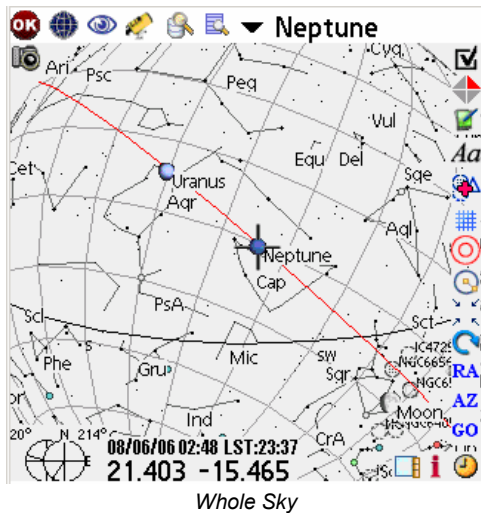
Visible Sky

- Whole Sky is designed to let you locate any object at any time. You can quickly see if an object is close to the horizon or not.

- Visible Sky should be your preferred view for real time observation. It displays the visible sky as it looks from your location at the specified date and time. The yellow line represents the horizon all objects and stars above this line are above the horizon and visible from your location.

- Finally, the Equatorial sky display is rendered from an equatorial position and operates with the same behavior as an equatorially mounted telescope. This mode is ideal for learning purposes.

3.9.3. Common behaviors

The object you are looking for is always indicated by a red cross and each object is represented by a descriptive symbol:

- ⬯ Galaxy,

- ⬭ Open Cluster,

- ⊕ Globular Cluster.

- ▢ Nebula

- △ Planetary Nebula

- ⚭ Multiple stars

To locate an object in the list (M51 or M81 in this example), just select it. Astromist will then center the sky chart on the object. You may also use a filter to reduce the number of objects displayed (this will improve rendering speed as well).

Numerous display options are available from the display setting menu (Preference 5/6 panel). Just adjust them to get the most comfortable view for you. Several additional shortcuts are available for your convenience:

🌐 The SkyChart Menu allows you to access to the display settings panel as well change the kind of the sky chart.

 Allows you to zoom the sky chart from a 180° to 1° field of view. Hipparchos and Tycho stars are displayed for fields of view between 1° and 45°. Object size and orientation are displayed for fields of view between 1° and 10°.

 Provides several telescope control features. For example If you want your telescope to GoTo an object, tap on this icon and select "Goto Object". If you are connected, Astromist will send positioning data including correction information (topographic, refraction, N-stars alignment) to your telescope. If not, the objects position will be displayed only on the screen including any corrections.

- "Get telescope RA&Dec" centers the sky chart to the current telescope position.

- "ScopeAssistant" launches the ScopeControl Assistant.

- "Skychart Control" lets you follow in real time the position of your telescope over the sky. This feature is particularly usefull for Dobsonian users who can point to any object in a minute just by moving there Dobsonian until the red cross is centered on the desired object.

- "Improve Pointing" adds the current object positions (theorical and those read from the telescope) into N-Star Alignment module to improve the pointing model. If you are using the Astromist 2 star aligment, update of the pointing model must to be done manually by pressing the Calc button (from the N-Star Aligment module) once enough stars/objects has been added else it is done automatically.

- "Change Scope" lets Bluetooth users select between several telescopes and select a different one to control. It can be useful if you are managing an astronomy outreach session and want to switch control from one telescope to another.

- "Sync Coord" lets the user synchronize the current position of the sky chart with the one of the telescope. It only works for Meade LX telescopes.

 Launches the Finder Assistant to let you select a particular object and view it in the skychart.

 Enables you to filter the current object list according some common critieria (Cluster, Planet, Star, etc.)

- "ClearList" erases your current list and only loads the planets

- "Edit List" launches the NightTripper module and lets you adjust the list or create a new one.

- "Load/Save List" lets you select a predefined list you created ans saved previously.

- "Load Catalog" lets you load the contents of one of your custom catalogs.

 Enables you to open the main panel settings of the sky chart.

 Launches the ObserverLog tools to let you create a observation log about the current selected object.

 Lets you flip the sky chart to reflect what you see through your telescope. This setting can be adjusted for each zoom level.

 Lets you control the display of object names.

 Lets you activate or deactivate the object drill down feature.

 Lets you turn the grid and constellation lines in the sky charts on and off.

Lets you turn the Virtual Telrad included in Astromist on and off. The diameters of the circles can be set in Preference 5/6 panel.

Lets you control the angular mesure mode. The angular separation is displayed on the right of the cross. To estimate the angular separation between two objects, click on the first, then on the second. The angular separation will be displayed.

Lets you center the sky chart on the current red cross position. This feature is most useful if you set "Tap Response" to "Select Object" in Preference 3/6 panel.

RA and AZ let you input a particular position (equatorial or azimuthal position) to center the sky chart on. A mnemonic can be given to retrieve this position later in the current object list.

Lets you rotate the chart in a particular direction.

GO Commands your telescope to go to the current selected object and opens the ScopeControl assistant. For Dobsonian users, this button actives or deactivates the "SkyChart Control" mode to follow the moves of the telescope over the sky with your PDA.

Launches the Date&Time selector to let you change the date and time of the sky chart.

Opens ObjectChooser on the selected object to give you more details about it.

Furthermore at any time you can drag the chart using a stylus or even your fingernail. Alternatively you may use the Palm keys to center an object, scroll the sky display or zoom in/out.

Enables you to hide or show the tools bar.

Displays to you the current altitude and azimuth. If you tap on this diagram once an object is selected, it opens the CompassAssistant on this object. You can hide this diagram using the display settings.
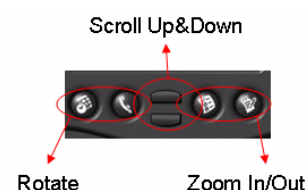
Key Control on classic Palms   *Key Control using Navigation Pad*
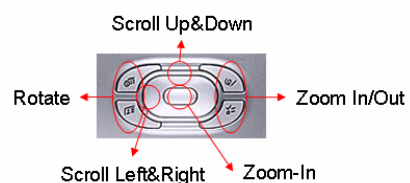
Finally, if you want to know the position of a star or the constellation it belongs to, just tap on it. The Position information will be displayed at the bottom of the screen and if you tap on the constellation's code you will access its complete name.

3.10. CompassChart

This module lets you see the position of a particular object in the sky using a compass and an elevation slider. Any of the objects of your current objects list as well as new ones (using FinderAssistant) can be **displayed.**

On 320x480 handhelds, the altitude of the selected object in the coming hours is displayed too.
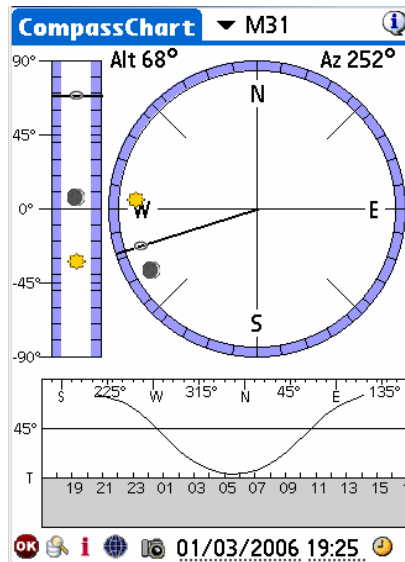
Finally, this tool can be used to find North:

- During the day, put your pen vertically on the sun icon and align the shadow with the black line that crosses the center by rotating you palm and/or your body. Once done, N direction indicates North.

- At night if you do not see Polaris, by selecting a visible star or planet and by rotating your palm and/or body to point to one of the objects of the CompassChart in the same direction as the sky position where you are observing it. North can be found immediately.

3.11. Camera Control

This tool lets you control Canon DSLRs. It was created at the request of John Burt and Anat Ruangrassamee in the Yahoo PalmAstro forum. They also beta tested PalmDSLR, the free version of this tool. Many thanks to them.
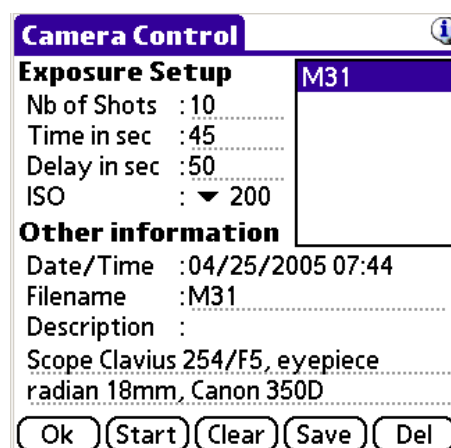
Camera Control screen

To connect your Canon to your handheld, you will need to build a dedicated cable and connect it to your PDA using a serial cable or by using a Bluetooth converter.

You can:

- Buy the cable already made. Several providers are available but I recommend Hap Griffin's (which are certified to work with Astromist, PalmDslr and Palm PDA's) see http://www.hapg.org/astrocables.htm. In this case you will have to add a null modem adaptor between your Palm serial cable and Hap's cable. When using this cable with your PC, no null modem adaptor is required.

- Do–it-yourself (DIY); you can find full details at http://www.stek.ch/users/stefano/html/dslr_serial_cable.html if you want to build a cable compatible with your PC. You will either need a null modem adaptor or "roll" the signal pins to connect it to your Palm.

Computer Remote Control Serial Cable for DSLR Canon 300D — By Stefano: stek666@stek.ch
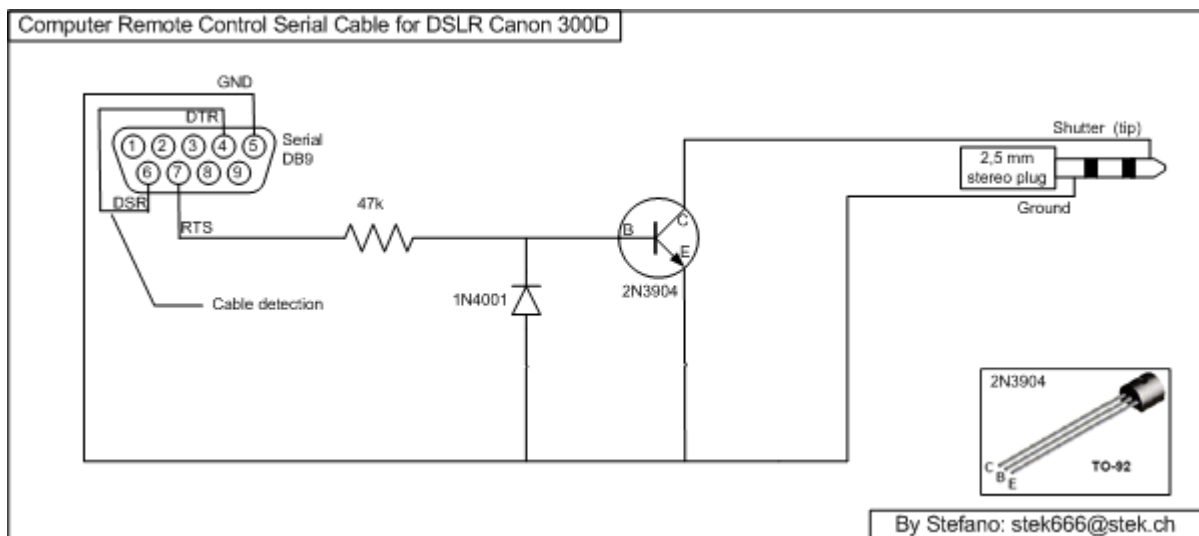
- You can also use John's plan (the best for Palm handhelds) which includes an opto-circuit to isolate the camera from your handheld (more secure). In this case we chose to avoid using a null modem adaptor; we used the eighth pin instead of the connector so you can plug this cable directly into your Palm serial cable. You will need a null modem adaptor if you want to use this cable with your PC.
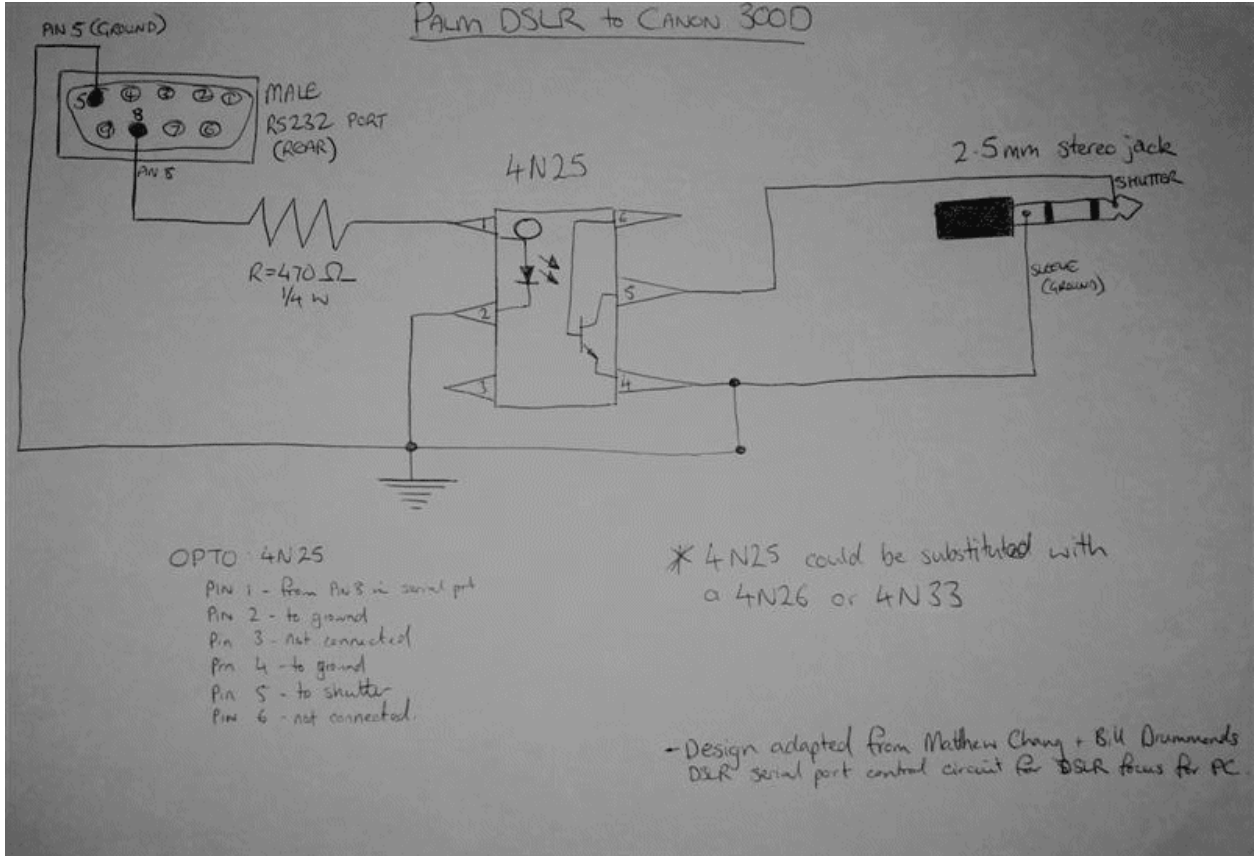
Wiring plan involving an opto-circuit
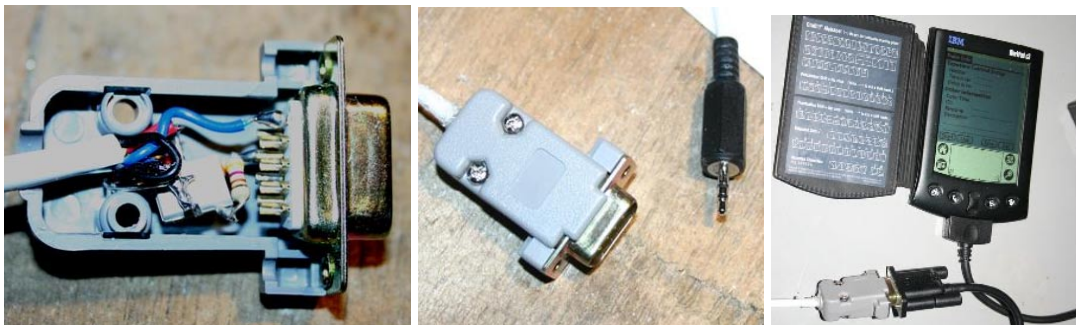
Sample shots of John's DIY cable

Results with a Canon 300D! These images are copyrighted John Burt.

3.12. FinderAssistant

This assistant enables you to quickly find any object inside Astromist's Catalogs.
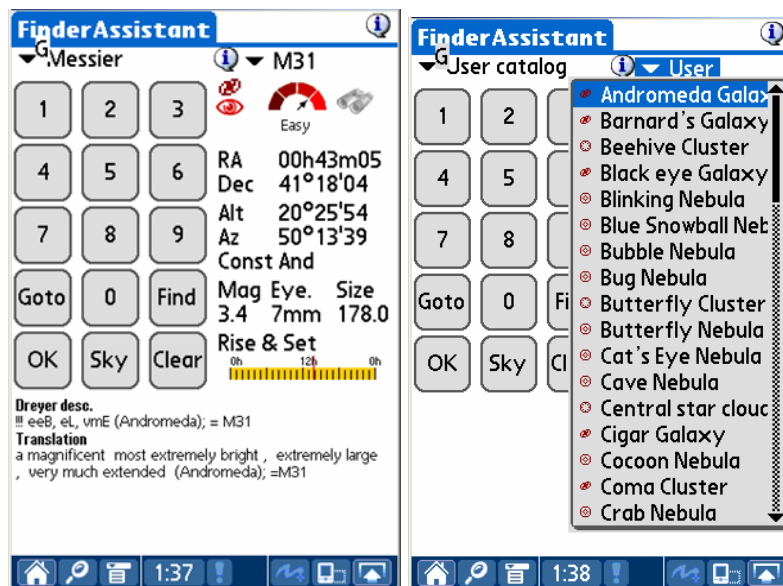
The list of available catalogs depends of the catalogs you have installed. Especially:

- HR (the Yale bright star catalog) is available only if astromist_hr.pdb is installed.

- Hiparchos catalog is available only if astromist_hip_110K.pdb is installed.

- Tycho catalog is available only if astromist_tycho_2500k.pdb **AND** astromist_tycho_index.pdb are installed.

- Comet catalog is available only if astromist_comet.pdb is installed.

- User Catalog is available only if the preferred User Catalog selected with ListManager is found.

To get the full list of catalogs, an expansion card (Or LifeDrive) is mandatory due to the overall space required.

To find a particular object just select the catalog of your object, then type in the object ID using the numeric keypad and press **Find**. Otherwise you can just browse the object list and select the item you are looking for.

Once done, the icon will be displayed to indicate if the selected object is above the horizon.

A camera icon is displayed if an object image is available in the /PALM/Programs/Astromist/img folder. Tapping on this icon will load and display the object's image full screen. Tapping the screen again will return you to the previous screen.

On 160x160 or 320x320 resolution handhelds, the Dreyer description of the object and its translation are available using the information icon beside the object's name (e.g., M31 in the previous screen shot). On handhelds that support 320x480 resolution, this description is displayed by default.

Sky button will open SkyChart. If an object is not visible then the Local Sky view will be selected as default. If the object is visible then the end user's preferred sky view (set in preference 3/6) will be used.

Goto button lets you send the object's position information to your telescope to slew it to the desired position.

Finally, the **Clear** button clears all the data displayed.

3.13.   ObserverLog

This assistant helps you create and manage your observation logs.

It is split into two parts:

•   The first part lets you manage your logs.

•   The second lets you fill your logs with notes and even link your own images to the logs. Images to be linked must be placed in the /PALM/Programs/Astromist/Shots/ folder. Just tap on the camera icon to get the required filename of the image you wish to link to.

3.13.1. ObserverLog management

This panel lets you manage your observer logs.

Main ObserverLog screen

Once you have selected a log you can:

•   Create a new log using the **New** button.

•   **Edit** an existing log to modify or adjust it.

•   Delete an existing log. In this case, just select the log and press the **Del** button.

Finally, Astromist lets you save your logs as Palm **Memo** files. First a dialog will warn you that all the logs will be exported in memos. As a Palm memo can not contain more than 32Kb of text, several memos will be created if needed.

First step of the export process	*Final step of the export process*
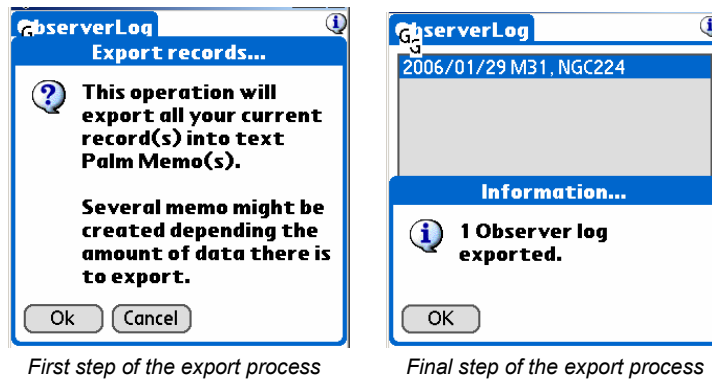
Cancel will stop the export process. **OK** will create the memo.

The number of observer logs exported will be displayed at the end.

To see the result, just open the Palm Memo tool. The new memos will have been added at the end of the list.
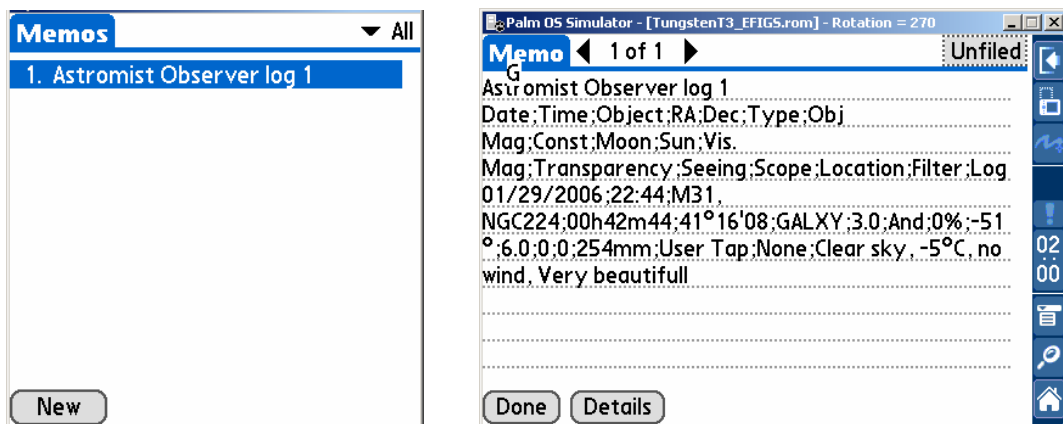
The format of the export is as follows:

- First line – the name of the saved file (Astromist Observer Log 1)

- Second line – the CSV format. Each column is separated by a comma. You will retreive all the information of the Edit Log screen.

- Third line and all others – one line per log.

To save this information on your computer, just **HotSync** your handheld.

Once done, **open the Palm Desktop application**. You will be able to edit the memo with your computer and then do a copy/paste of the exported data to place it in your prefered spreadsheet application. People syncing with Outlook will be able to find their memos in the usual Outlook Memos folder.
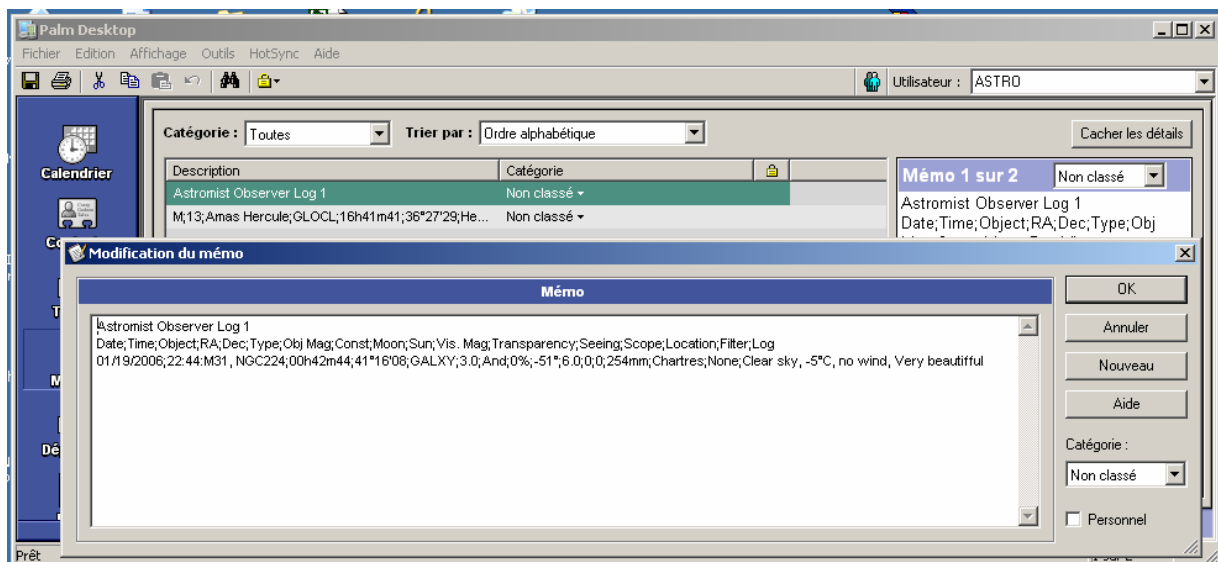
Result under PalmDestop

3.13.2. Edit ObserverLog

This Panel lets you input log information. Several fields are provided to easily track such specifics as Moon phase, Sun position, estimated visual magnitude limit, location, etc. You can then type any notes to remind you about the obeservation or object.

ObserverLog input screen

Date&Time displays the log's date of creation. You can either set the date by tapping on the text field to open the Date and Time selector or tap on the clock to grab the current date and time.

Location contains by default your current location, but you can modify it if desired.

Transparency lets you describe the Transparency conditions during your observation. By default transparency is set to excellent.

Seeing lets you describe your seeing conditions. By default this selector is adjusted according to the Sun's position and the Moon phase.

Visual Limit contains the visual limit computed according to your site information as well as the Sun and Moon positions.

Filter lets you type the name of any light filter you may have been using during your observation.

Scope contains the telescope's diameter set in Preferences.

Object/Event enables you to grab an object name from Astromist's catalogs or lets you fill in an object using a description of your own choosing.

Comments lets you describe your observation or input any useful information like exposure, number of shots, etc. This is a good way to track the shots you are taking with your astronomical camera.
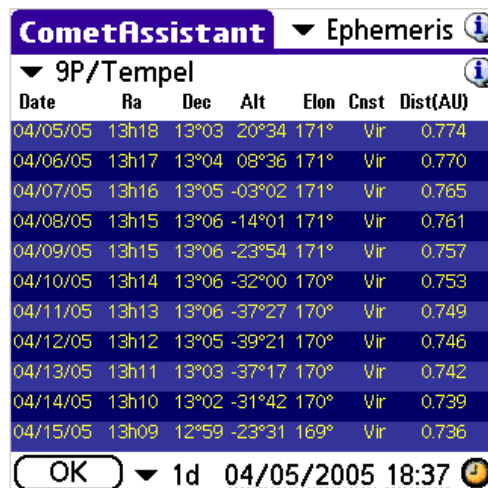
3.14. Comet and Asteroid Assistant

This assistant is designed to provide comprehensive data and graphical views that allow you to understand a comet's (or Asteroid's) position in the sky or its position in the solar system.

Registered users receive a dedicated tool (see cometdb.exe) that can be used to create a custom comet/asteroid database as well as a way to sort and manipulate the list as they like. Finally, registered users can edit the comet and asteroid list and customize as they see fit.

3.14.1. Ephemeris

The Ephemeris provides useful data to help organize an observing session or just provides info for a quick glance at a comet.

- The information button to the right of the comet name takes you to the ObjectChooser. Once there you can elect to do a GoTo with your telescope or just add the comet into your current list of objects.

- Several ranges of dates can be obtained by manipulating the day range selector.

- Dates can also be changed using the date field of the clock button.

- Finally, depending on the time of the observation (in the evening for example), you are able to display the date when the comet will be at its highest point in the sky.

3.14.2. Solar 3-D View

This screen presents a three-dimensional view of the solar system, with planets and their orbits; comets/asteroids and their orbits are displayed against this backdrop, thus allowing the user to see positioning info in direct relation to the solar system.
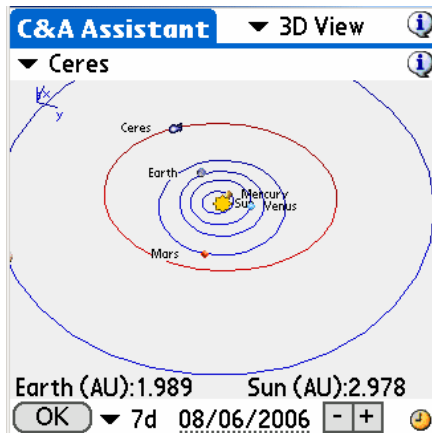
- Earth and Sun distance for the current date are displayed at the bottom.

- Move your stylus on the chart to rotate it and adjust the view to see the data from different view points.

- Pressing the left Palm key will increment the current date by the number of days selected in the drop down menu. By using the left and right keys you may animate the comet/asteroid through its orbit, simultaneously the planets will change their positions around the Sun as well. The Earth and Sun distance to the comet/asteroid is displayed in astronomical units and will change to reflect the new distance for that day. Using this feature you can find the best day to observe the comet/asteroid (i.e., when its distance to the Earth or Sun is the shortest).

- **Minus** and **Plus** buttons let you zoom your view in and out of the solar system.

- Tap on the **Date Field** to change the date.

- Tapping the **Clock Icon** will set the date to the handheld's current date and time.

3.14.3. SkyView

This view lets you see the different positions of the comet/asteroid for a specific period of time. A step selector lets you choose the increment of days the program will add between each displayed comet/asteroid position.
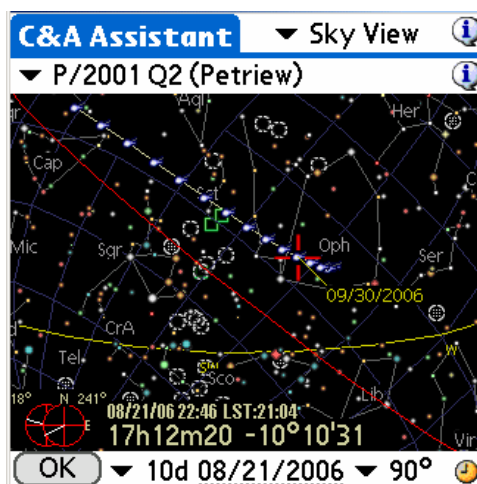
- Move your stylus on the chart to rotate it and adjust the view to be more comfortable for you. When the red cross passes over any comet/asteroid position, its date and time information are displayed.

- **Minus** and **Plus** buttons let you zoom in and out of the chart.

- You can change the date of the chart using the clock button or by tapping in the date field to open the date-time selector.

Finally, you can scroll the chart using your stylus or the Palm keys.

3.14.4. Data

This view lets you browse the comet/asteroid database; registered users may also edit it.

➲   CURRENTLY, ASTROMIST USES ONLY J2000 ORBITAL ELEMENTS FOR COMETS.

Once you have finished modifying comet/asteroid information, use the save button, *otherwise your modifications will be lost!*.

3.14.5. Update the whole comet and Asteroid database

The organization responsible for coordinating new comet discoveries and producing authoritative orbital elements is the Central Bureau for Astronomical Telegrams (http://cfa-www.harvard.edu/cfa/ps/cbat.html).

They make these element sets available in a format directly suitable for use by a number of different astronomy programs. Astromist uses the MPC format available at:

- http://cfa-www.harvard.edu/cfa/ps/Ephemerides/Comets/SoftwareComets.html   for the comet,

- http://cfa-www.harvard.edu/iau/Ephemerides/Distant/SoftwareDistant.html   for the asteroids.
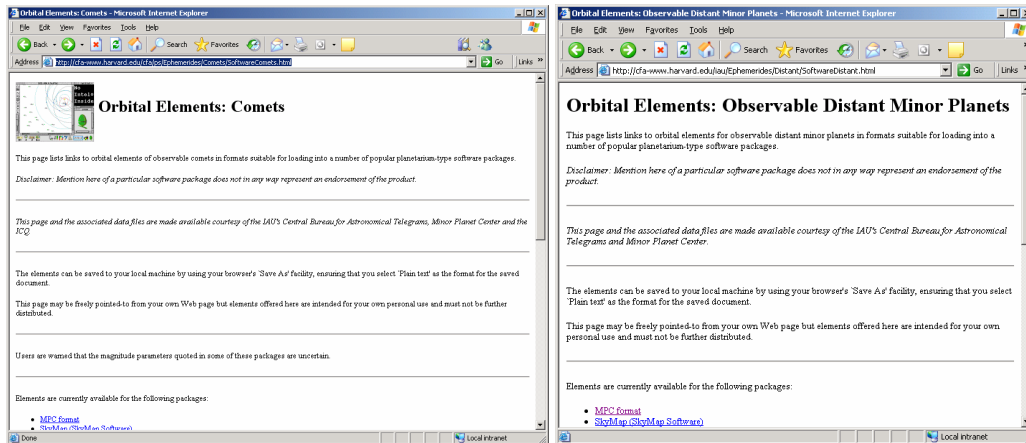
To create a new comet database follow these procedures:

- Using this link for the comet

http://cfa-www.harvard.edu/cfa/ps/Ephemerides/Comets/Soft00Cmt.txt

- Using this link for the asteroids

http://cfa-www.harvard.edu/iau/Ephemerides/Bright/2006/Soft00Bright.txt

- Concatenate the files as plain text under the name comet_list.txt in the cometdb.exe folder.
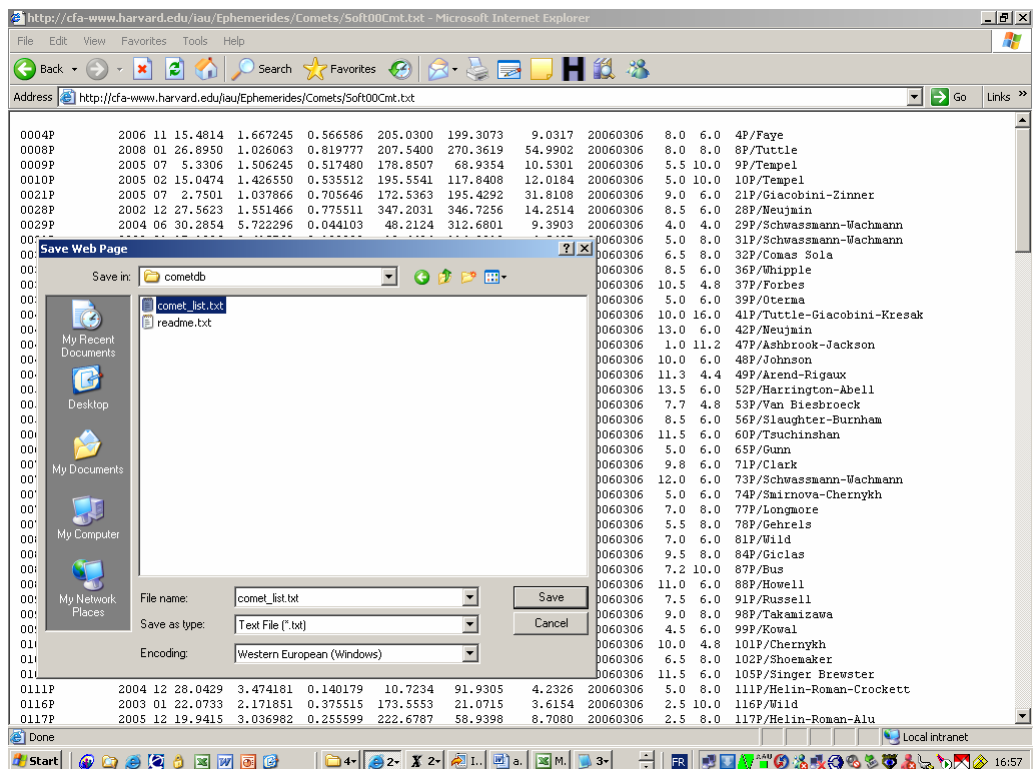
- If you want to remove some lines, add new ones, sort some lines, edit the file using your preferred text editor.

- Open a DOS session and change the current directory to that of the program CometDB.exe.
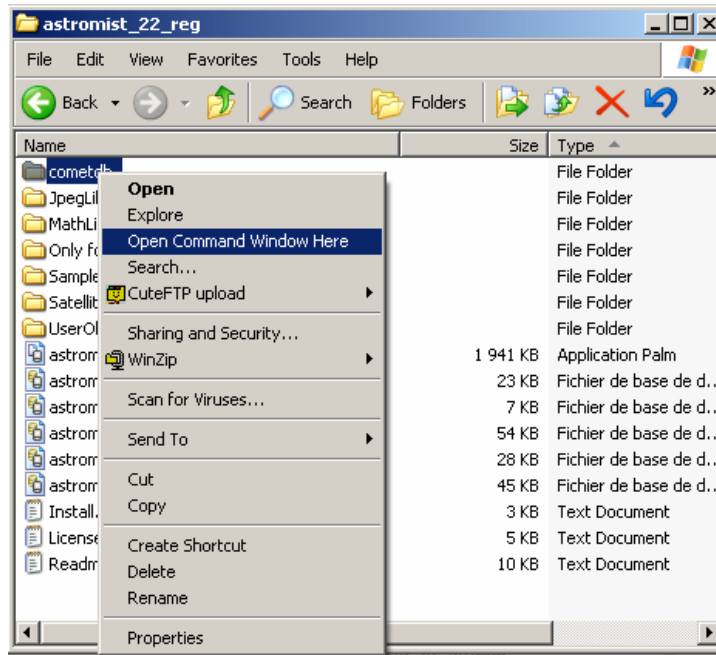
- Run CometDB.exe to create the new database.
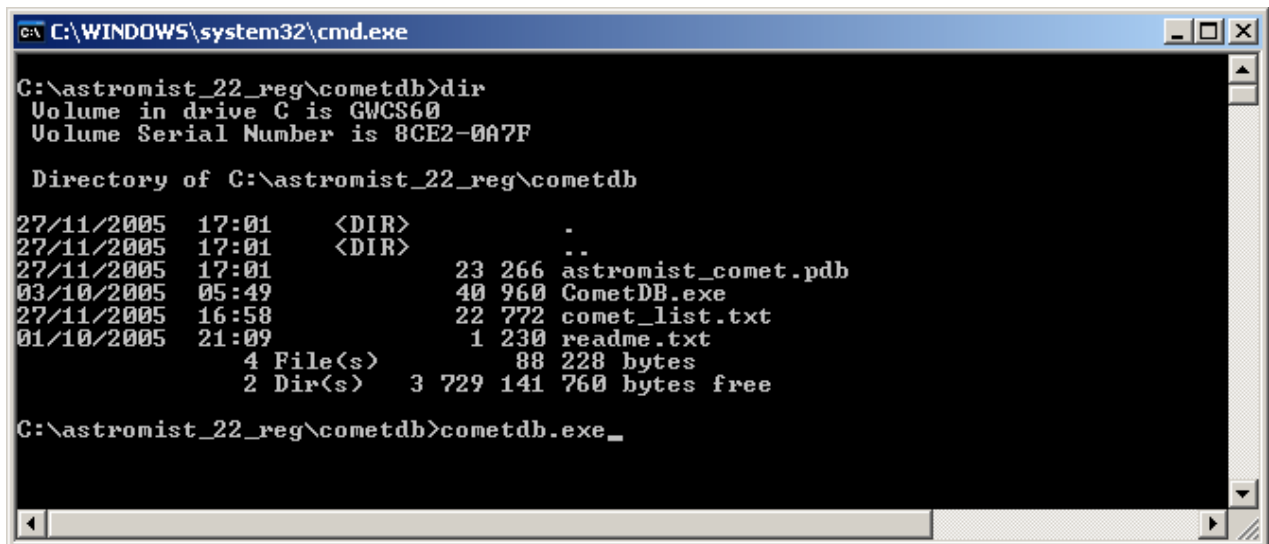
- The file astromist_comet.pdb will be created in the same folder.

Simply install this file into your Palm via a **HotSync** or copy the file to the Astromist folder of your memory card.

3.15. EclipseAssistant

Note: All times displayed in this assistant are Universal Time.

Eclipse Assistant is designed to help you to prepare a trip to see a Solar Eclipse. You will be able to easily find the best location around the world to be there at the right time.

Two methods have been used to get this result for solar eclipse:

- A geometric one, developed by Franck Bouquerel that gives excellent and accurate results.
- A more classic one, based on Bessel elements, obtains very good accuracy, but faster results. The main difference between this custom astromist method and

other Eclipse software is that the Bessel elements and approximations are fully computed inside Astromist instead of being provided by external sources.

- Lunar eclipse computation algorithm has been developed only for Astromist and has good accuracy. No external data are required.

Using these three methods any Solar and Lunar eclipses accessible using the date and time selector can be studied.

Some information about the accuracy:

- Moon and Sun positions are accurate to better than one second for our current period (the next 40 years). Geocentric error is up to 4s for the sun and the moon far into the past. The main driver for accuracy is DeltaT estimation. In the past, depending the model you choose (Chapron&Touzé or JPL in preference 6/6) you get a result close to the NASA result but based on the old JPL model or you will get a result using the more recent Delta T estimation model.

- Location computations for the central line of solar eclipse are usually better than 8km for our current period.

- Times of greatest eclipse are correct to the second for the next two upcoming eclipses. Difference may be larger for very old eclipses depending the DeltaT estimation model you selected.

- Finally, please note that currently, paths of Austral solar eclipses are wrong due to Algorithm convergence issues. This will be addressed in a future release.

FIGURE 1: ORTHOGRAPHIC PROJECTION MAP OF THE ECLIPSE PATH

Total Solar Eclipse of 2006 Mar 29

NASA 2006 Eclipse Bulletin (F. Espenak & J. Anderson)

2006 March 29 Total Solar Eclipse. Nasa and Astromist results

2007 March 03 Total Lunar Eclipse. Nasa and Astromist results

3.15.1. List

This screen lists the next 12 eclipses starting the year defined at the bottom. For each eclipse its date and type are indicated. At the eclipse's maximum, the data provided includes the best place to observe, duration and Sun-Moon angular separation. The best place to observe is also indicated by a cross on the map.

Note: *For lunar eclipse the best place to observe is broad and represented by the visible part of the world.*

- All EclipseAssistant functions are available using the drop down list at the top of the screen.

- Shortcut buttons are available at the bottom of the screen for access to other EclipseAssistant functions.

- To update the list of eclipses, just tap on the Year field at the bottom of the screen and then choose the year from which you want the search to start.

- The clock icon will reset the list to the current year.

3.15.2. Information

3.15.2.1. Solar Eclipse

This screen allows you to compute local parameters of the eclipse in two ways: by time or by location.

- The time approach lets you compute the best location to be at to see the central eclipse. In this case inputs the universal time requested and presses the set button on the same line.

- The location approach gives you the best time to observe the eclipse from this location. In this case input the location (longitude then latitude) and press the set button on the same line. This approach takes more time to compute than the first method.

- On wide displays (320x480 and 480x320) a map is available at the bottom or at the right to display the shape of the eclipse's umbra at the requested or computed time
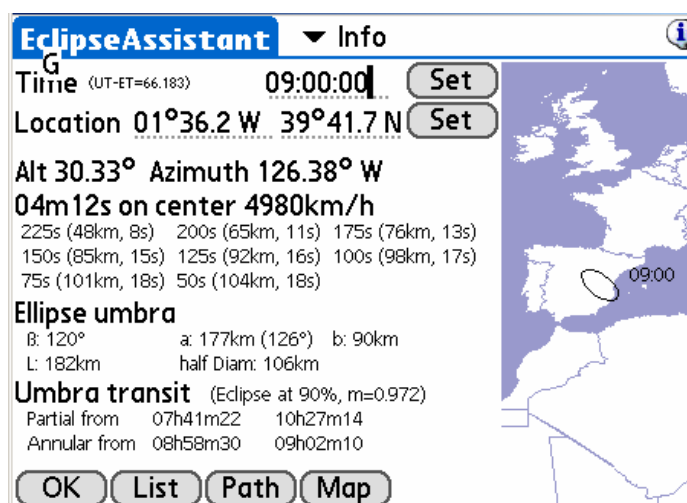
Once the calculation is finished, several aspects of the eclipse are available:

- The altitude and azimuth of the Sun at this time,

- The duration of the central eclipse (4m12s in the above example) at this time and location,

- The speed of the umbra across the ground (4980km/h in the above example), and

- The duration of the central eclipse if you go away from the selected location. In the above example, the central eclipse event takes 200s at 65km away from the central point. We see the event takes only 18s at 104km from the central point. This distance is close to half diameter of the eclipse (106km) where the central eclipse can no longer be seen.

Details about the umbra are provided as well:

- The angle of the shadow to the Earth (120°)

- The semi axis of the shadow of the eclipse (177km and 90km) as well as the orientation of the shadow on the ground (126°)

- The length of the shadow on the ground (182km)

- The half diameter of the eclipse (106km) that represents the largest distance (in latitude) from the central point where the central eclipse can be seen. Away, only a partial eclipse is visible. This information lets you know how accurate your final location should be to observe the eclipse. The smaller it is, the more difficult it will be to find the eclipse.

And last, Umbra transit information is provided:

- The coverage of the Sun by the Moon:

  - Always 100% for a total eclipse on the center line (the Moon's apparent diameter is bigger than the Sun's.)

  - Always less than 100% in the case of an Annular eclipse on the center line (90% in the above example, even on the center line.)

  - Under the coverage of the center line for locations where the eclipse is partial.

- The magnitude of the eclipse (0.972)

- The start and the end of the partial eclipse phase at this location.

- The start and the end of the central eclipse (if any) at this location.

3.15.2.2. Lunar Eclipse

This screen allows you to compute some parameters of a Lunar Eclipse:

- The current moon and earth shadow position depending the time and/or location.

- The visual angular separation from the center of the moon to the center of the shadow.

- Penumbral and Umbra Magnitude as well as Penumbra and Umbra radius.

- for each key events of the eclipse (P1, U1, thru U4, P4), its time, the altitude and the aztimuth of the moon at this time.
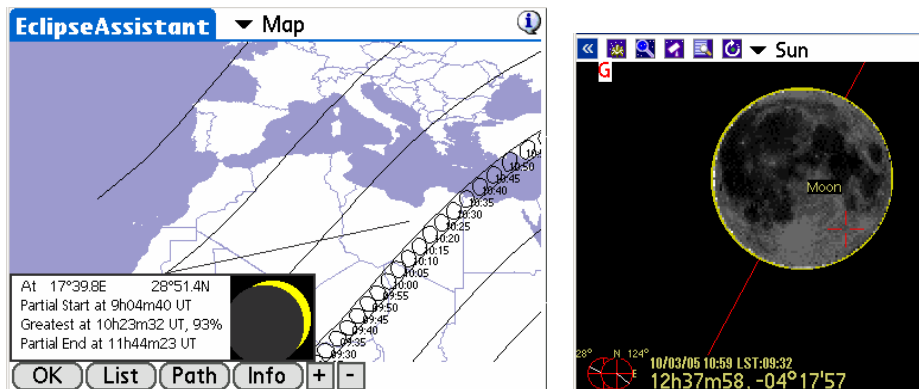
3.15.3. Map view

Note: This module works only for Solar Eclipse.

Note: Due to extensive computations, the first display of this screen for a particular solar eclipse takes a long time to calculate.

This screen lets you find for any location:

- The start and end of the eclipse.

- The best time to observe the eclipse.

- The coverage of the Sun by the Moon at the best time.

2005 October 3 Annular eclipse Map in wide screen mode (480x320) and the corresponding skychart view at the same time

- To get this information, tap with your stylus on the map. A line will be drawn to point out the location and the information will be displayed at the bottom of the screen. The relative position of the Moon and Sun at greatest totality will be displayed.

- The **Info** button will bring you to the Info panel to get more detailed information of the local circumstances of the eclipse.

- On high resolution handhelds, + and – buttons let you zoom in and out of the map. Only two levels of zoom are provided.

3.15.4. Diagram view

3.15.4.1. Solar Eclipse

This screen shows the projection of the eclipse shadow on the Earth during the eclipse phenomenon. The red lines represent the central eclipse path.

Each grey line represents a decrease of 25% in the darkness of the eclipse. To speed up the computation, only 75%, 50%, 25% and 0% (limits of the penumbra on the Earth) are computed.
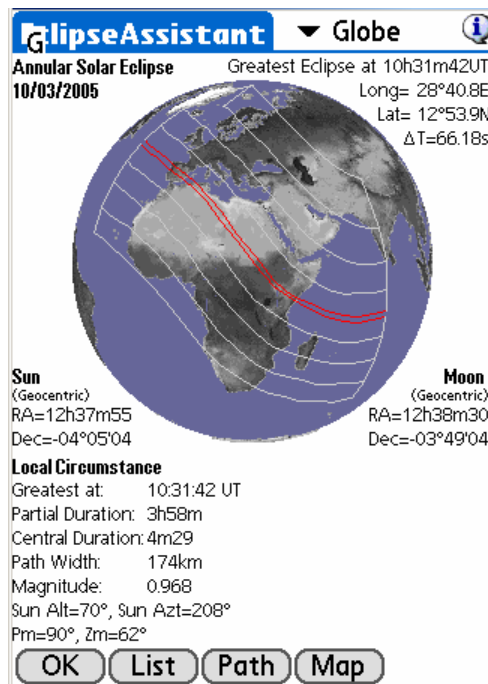
- To rotate the globe just move your stylus on the screen to find the angle of view you would like.

- Most of the information available is shown in the information section.

3.15.4.2. Lunar Eclipse

This screen shows the path of the moon through the earth's shadow. The different points of contact (P1, U1, … U4, P4) and the inclination of the moon path is displayed.

For each point of contact the time (universal time) of the event is displayed. Accuracy is about 1 or 2 minutes due to the approximation of earth shadow size (shape of the earth, atmospheric refraction, etc.) Regarding the duration of this kind of eclipse this has a few consequences for observation.

Other information available:

- The radius of the penumbra (P. Radius) in degrees.

- The radius of the umbra (U. Radius) in degrees.

- The value of DeltaT used for the computation.

- The geocentric position of the moon and the sun.

At the bottom of the screen on 320x480 handhelds, the P1, U1 thru U4, P4 zone of visibility on the earth are displayed.
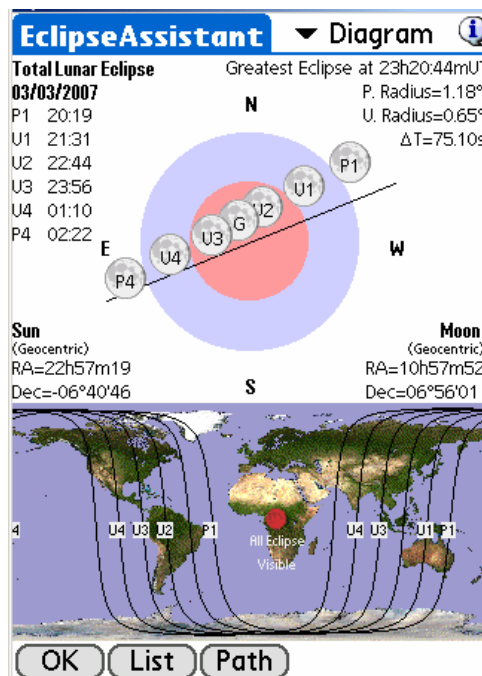
3.16.   MarsAssistant

This assistant has been designed to help the observer locate the most prominent features of Mars as well as finding the best period to observe this planet.

3.16.1. Satellites

This screen is similar to the JupiterAssistant. It displays Mars satellite positions during a period of time as well as the Earth-facing side of the planet.

The duration of the period can be changed using the bottom popup list from one day to "n" days, depending on the size of your screen.

Mars Satellite view
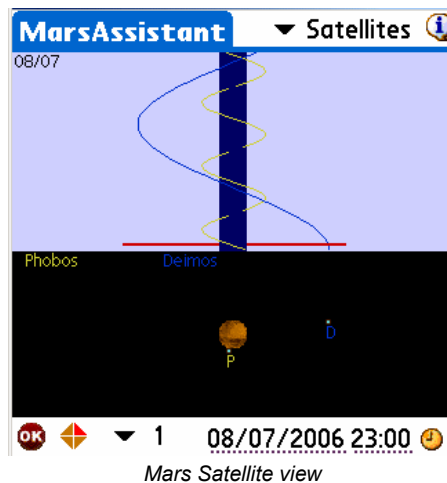
- A particular date of observation can be selected using the date and time selector. In this case, tap the date (or time) field. Once done, the display will be updated accordingly.

- Drag your stylus on the blue line to see the movement of the satellites as well as the rotation of Mars. Doing this will help you determine the best time to observe the Hellas and Syrtis Major features.

- Finally, the clock icon resets the date and time to the present.

3.16.2. View

This screen presents the view of Mars as seen from your location on the Earth. Satellite positions are displayed as a reminder as well as a wire-frame orientation of Mars.
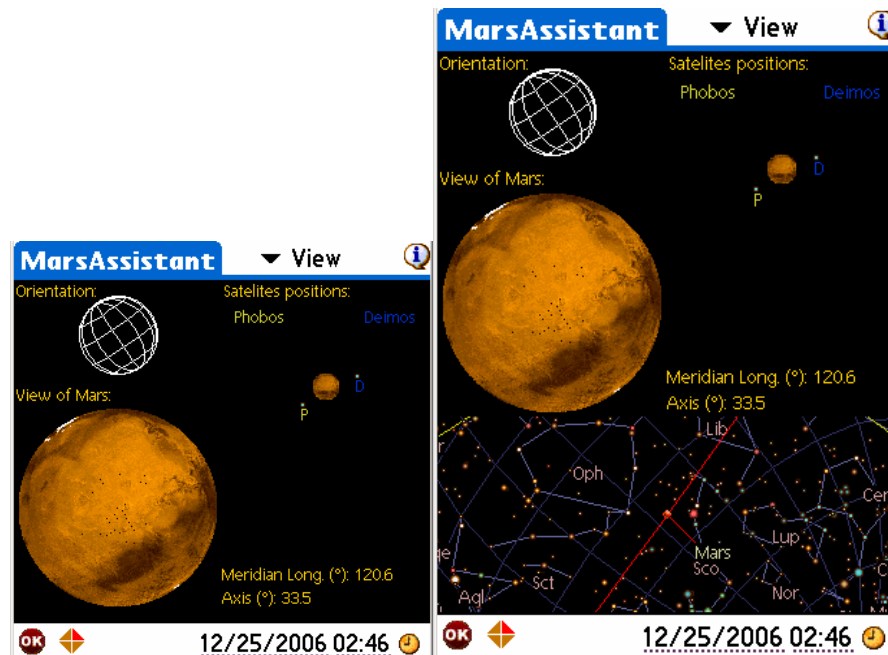

Mars view in 320x320 and 320x480 modes

- Using the bottom popup list, it is possible to reverse and flip the view to match the view in your telescope.

- The major Mars' features can be found on the Mars view. Just tap on a feature to highlight it.

- On wider displays, the position of Mars in the sky is also shown.

Tips: *To refresh the view without changing the date, you can press one of the left Palm keys.*

3.16.3. Map

This screen is a true Mars Atlas that lets you find features of Mars among a list of more than 950. Most of them have an associated picture, which can be displayed when the feature is selected.

The map can be scrolled in real time using your stylus.

Mars map in wide (480x320) mode
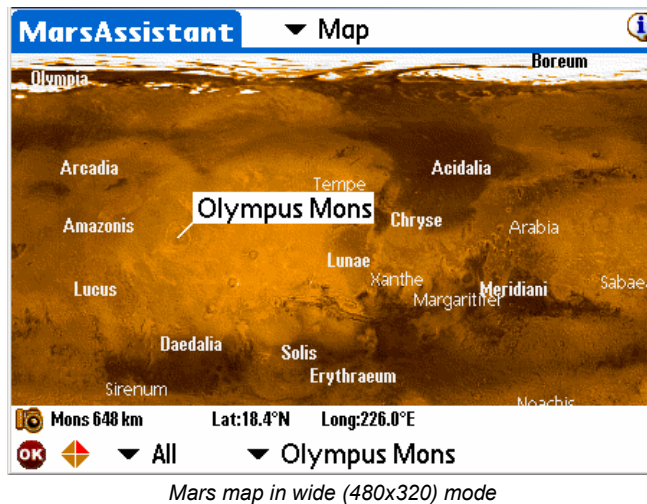
To locate a specific feature you can:

- Tap on the map to find its name, position, size and photo if any (a camera is displayed in this case).

- Browse the list to select a particular feature by name.

Tips: *To refresh the view once several features have been selected, use your stylus to scroll the display slightly.*

3.16.4. Size

This screen lets you find the best period during the year to observe Mars.

Drag your stylus on the screen to animate the wire sphere and see Mars' apparent diameter and orientation change over the selected period.
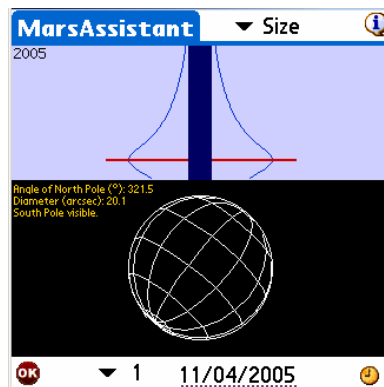
To see size and orientation for a particular date, tap on the date field and enter the date of interest. To reset the view to the current date press the clock icon.

3.17. PlanetAssistant

Planet assistants are designed to gather general information about the planets. For more detailed analysis, dedicated assistants are available for the Moon, Mars, Jupiter, Saturn, Eclipses, and Day/Night and Twilight for the Sun.

3.17.1. Ecliptic view

Sky View gives you Planet positions along the ecliptic. In wider displays (320x480) all planet positions are available.

Users can change observation date and time by tapping on the date or time fields.

To synchronize the date and time to local time, just tap on the clock Icon.
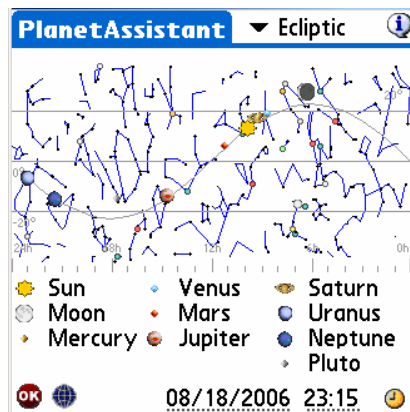

Note: *The Sun and Moon are included in the planet list only for ease of selection.*

Using the left Palm buttons (to increment the date), you are able to animate the chart and see upcoming or historical conjunctions of planets as well as Moon phases.

3.17.2. Sun View

Sun View displays the heliocentric planet positions for the next 30 days. This will allow you to determine the best time to observe a planet during the next thirty days. The date and time can be changed using the date and time selector.
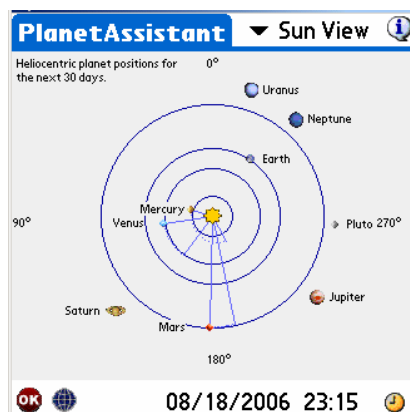
Using the left Palm buttons (to add or remove days), you are able to animate the chart and in this way find particular oppositions or conjunctions or just see how fast Mercury moves and Pluto doesn't, for example.

3.17.3. Position

The Position panel centralizes the positioning information of each planet while taking into consideration your location, date and time.

If you tap on the sky button, a sky chart of the selected date and time will be displayed.

Clock, date and time fields have the same behavior as in the previous panels.

Using the Palm left buttons (to add or remove days); you are able to update the list.

Note: eLon and eLat are Ecliptic longitude and Latitude. The Elongation (Elon) is provided in the Info panel.

3.17.4. Sky View

This view lets you see the different positions of a planet during a specific period of time. A step selector lets you choose the number of days the program must add between each planet's positions.
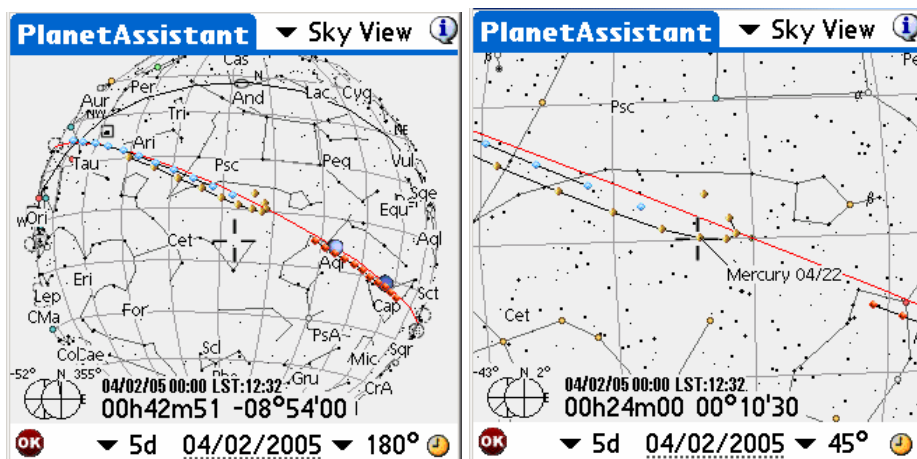
Planets' positions with a step of 5 days (wide 180° and zoomed to 45° views)

Only planets relevant to the dates selected will be displayed:

- **From 1-to-5 days per step**: Mercury, Venus and Mars positions are displayed. Other planets will be drawn only for a single position.

- **From 7-to-14 days per step**: Mars, Jupiter and Saturn. Other planets will be drawn only for a single position.

- **From 30-to-90 days per step**: Jupiter, Saturn, Uranus, Neptune and Pluto.

The field of view selector lets you zoom in and out on the charts.

You can change the date of the chart using the clock button or by tapping in the date field to open the date-time selector.

You can get the name of a particular object of the map by tapping on it.

Finally, you can scroll the chart using your stylus or the Palm keys.

3.17.5. Info

Info provides you the usual information about each planet.

3.17.6. Rise&Set

Rise&Set gives you the rise and set times for each planet on a particular day. The red line represents the selected time so you can quickly see which planets is visible and which ones are not.

To modify the date, tap on the date or time field.

To add or remove one day, use the left keys of the palm. This will refresh the display so you can find for example when the moon is not visible for a given time.

3.17.7. Charts

Charts let you see the evolution of different planet characteristics during the year (elongation, apparent diameter, Magnitude, Phase, Altitude). For each chart you can find the date of a particular event by dragging your stylus to move the vertical red line to any given date.

During the screen refresh, pressing any key will stop the computation.
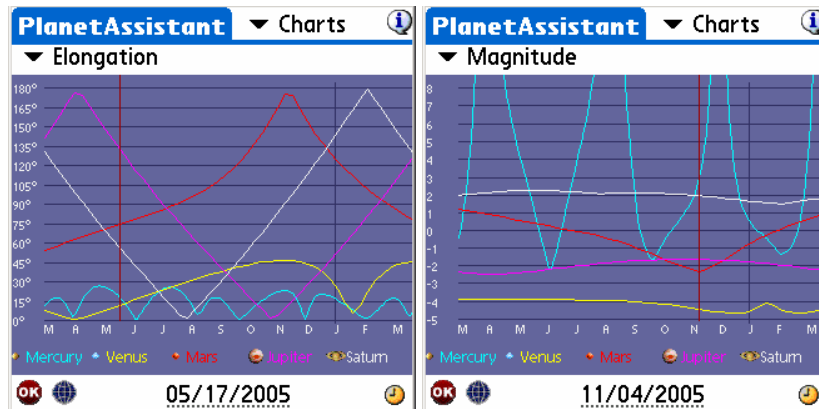
Finally, the start date of the chart can be changed using the date field or the clock button.

3.17.8. Events

This panel is able to forecast major astronomical events over a specified period of time.

None of the events are pre-computed and computations can take a long time on slower or older Palms. Once complete, you are able to filter the list to select only specific events such as conjunctions, lunar events, oppositions and eclipses.

When you select an event its date and time is displayed at the bottom of the screen.

Finally, you can select both the start date of the computation and its duration.

3.18.   MoonAssistant

3.18.1. Calendar

This assistant produces a Moon calendar to help you find the best night to observe. Moon phases are indicated and rise and set times can be obtained by tapping on the Moon image of a specific day. You can also tap on the sky button to set the current date to the selected date and open the Sky Chart to see any visible objects. To change the date, just tap on the month field or use the up and down Palm keys

Moon Calendar
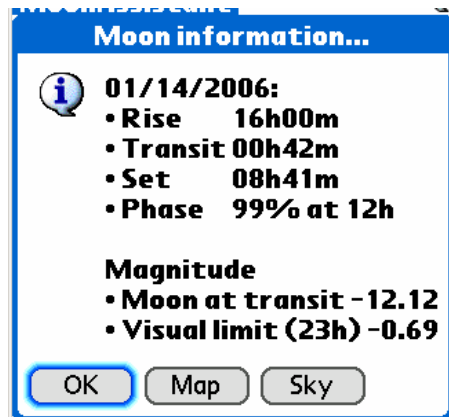
Moon Calendar Information for a particular day.

3.18.2. Map

The map lets you find Moon features among the 950 available with Astromist. The terminator (the line of the shadow on the moon) is represented as a black line. The shadowed part of the moon is darkened but you can still see features. For each feature selected, a circle will point it out. This circle depends of the size of the feature. For the smallest features, a default size is used.

To find features, you can either tap on the map and get the closest referenced feature or you can select the feature from the list.

Once done, the information Icon   will give you the feature position on the moon and its diameter in km.
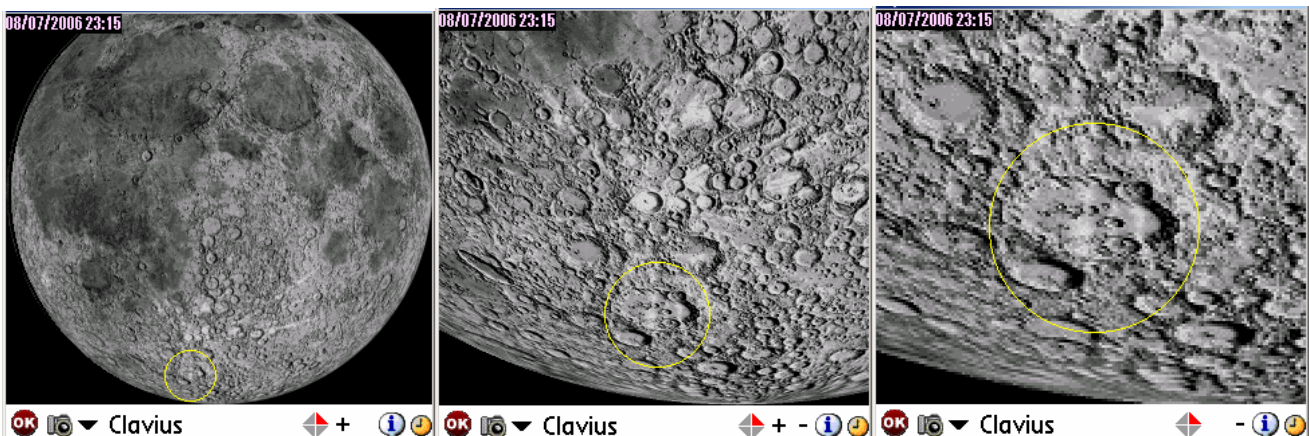
Moon map zoom level 1 to 3 on the Clavius crater

Three levels of zoom are available on Palms with large program heaps (2Megs required) like model T3 or other new Palm models. On older models, only the first level

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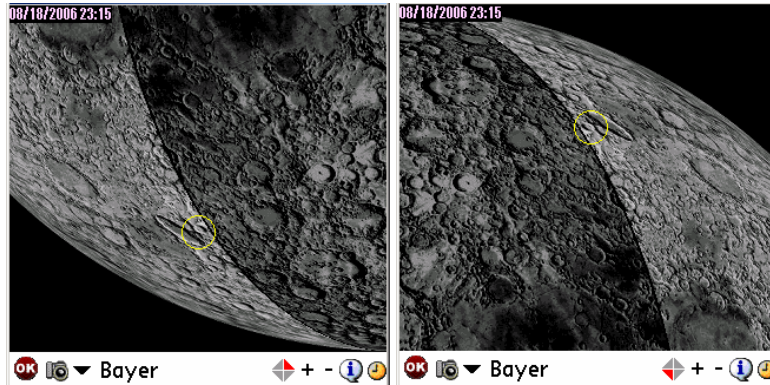of zoom will be available. The Moon's terminator display is available, depending on the date of the map, to help you locate the best area to observe. The + and – buttons are available to zoom the map in or out.

- Using the swap selector , the image can be swapped to figure out what you will see with your telescope (refractor, reflector, etc..).

- button indicates a picture is available for the selected crater. Tapping on it will display the picture of the feature.

- lets you change the date of the map.

3.18.3. Rise&Set

This panel lists the Moon's rise and set times for the coming days. Accuracy is close to one minute.

Dashes replace the time if rise or set do not occur during a particular day.

The dates of the last 3 days of each week are bolded to help you locate them.

Note: *Displayed time is local time. So, take care that DayLight Savings settings are correct from March through October as applicable for your location.*

Moon Rise&Set Assistant

Tap on the date field to change the period.

3.18.4. DarkHours

This panel is designed for deep-sky object observers. It gives you the darkest night hours for each day depending on the Sun's rise and set times as well as the Moon's rise and set times for your location on the Earth. Accuracy is close to one minute.

Note: *Astronomical sunset and rise are considered to be when the Sun is greater than 18° below the horizon*

Note: *Displayed time is local time. So take care that DayLight Savings settings are correct from March through October as applicable for your location.*

Moon DarkHours Assistant
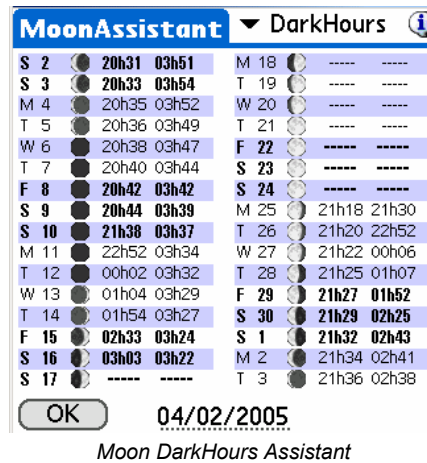
If no dark period will occur on a given date, dashes are displayed. Depending on your latitude, it could happen that no dark period occurs once or more in a month.

Finally, you can tap on the date field to change the period.

3.18.5. Features

On top of the Moon Map Assistant, Astromist provides the Features Assistant to determine the best date and time to observe a particular Moon feature (e.g., when the Sun will be low enough on the Moon's horizon so the shadow of selected features will be largest to let you see greater detail.) For each Moon cycle there are two periods where viewing is optimal:

- Just after sunrise (in the hours directly after or during the next day.)

- Just before sunset on the Moon.

Dates and times for both occurrences are provided. These times correspond as well to the moment when the Moon's terminator passes over a given feature.
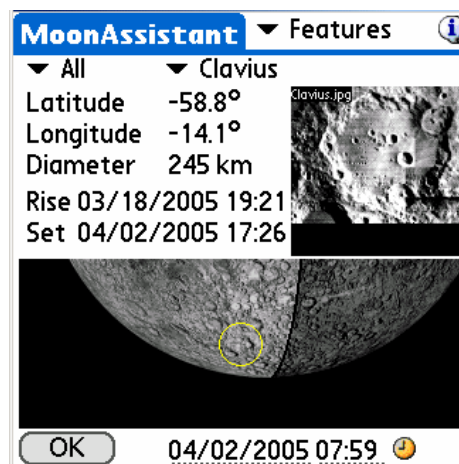
Moon Features Assistant

To browse the large number of features, categories are available to help you to make the list more manageable. You can use them to filter the main list.

Once the desired feature is found, its seleniographic position (latitude and longitude) is displayed as well as its diameter.

To help you quickly locate the region where a feature is located, a yellow circle is drawn on the Moon map to highlight its location.

Finally, if it is available under /PALM/Programs/Astromist/small_moon/, a small picture of each feature will be displayed instead of a zoom based on the map.

3.18.6. Terminator

Terminator Assistant helps you to find the Moon features close to the terminator (e.g., where the Sun will be rise or set on the Moon's horizon). These features are the best to observe for a particular date and time.

The final list can be sorted by Size of Feature, Name or Latitude (from the top to the bottom of the Moon). Furthermore you can filter the selected feature based on their size to keep only relevant ones considering you are using your telescope or binocular.
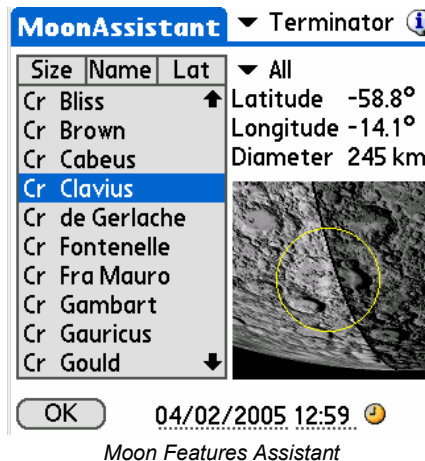
Moon Features Assistant

Once the desired feature is found, its seleniographic position (latitude and longitude) is displayed as well as its diameter.

Finally, to help you quickly locate the region where a feature is located, a yellow circle is drawn on the Moon map to highlight its location.

3.18.7. Visibility

This panel is designed for Moon observers. It gives you the days and local time when the Moon is higher than 20° in the sky for your selected location.

Note: *Displayed time is local time. So take care that DayLight Savings settings are correct from March through October as applicable for your location.*

Moon Visible Days Assistant
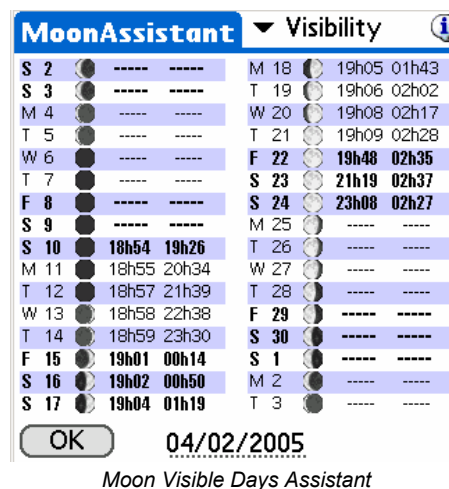
If no visible period will occur on a given date, dashes are displayed.

Finally, you can tap on the date field to change the period.

3.19. JupiterAssistant

This assistant lets you plan all kinds of observations of Jupiter.

3.19.1. Satellites Assistant

Satellites Assistant lets you see in real time the phenomena that can occur between the four main satellites of Jupiter and Jupiter's disk.

The following phenomena are displayed:

- Jupiter's rotation and Great Red Spot movement.

- Transits of satellites across Jupiter.

- Satellite shadows on Jupiter's disk.

- Eclipses of Jupiter's satellites.

- Occultations of Jupiter's satellites.

The horizontal red line represents the field of view of the image displayed below. The large vertical blue line represents Jupiter's disk size and the curved lines are the relative movements of Jupiter's satellites around Jupiter. A broken line means the satellite is not visible (eclipsed or occulted). All figures are displayed in proportion to actual distances between objects.

To detect events, do any of the following:

- Select a start date by tapping on the date field (November 9, 2001, for example).

- Select a period of days, from 1 to Max (10 days).

- Once the ephemeris is drawn, moving your stylus along the vertical bold blue line moves Jupiter's satellites in real time. Interesting times and dates are when multiple lines cross Jupiter's blue line. To see these events demonstrated move the horizontal red line to a region where you see that satellites are crossing in front of or behind Jupiter's blue line (March 28, 2004 or November 11, 2001 for example).

- Once centered, select the smallest period (one day) and then use the stylus to more accurately approximate the times of the phenomena.

- To get precise start and end times of each phenomenon just switch to the Events Assistant.

- You can swap the view to match you refractor or reflector using the ![icon] icon.
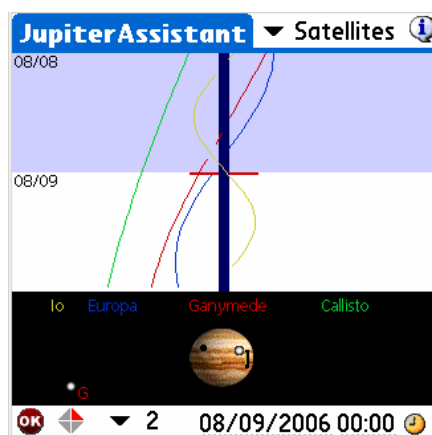
3.19.2. Great Red Spot (GRS) Assistant

This assistant displays for upcoming days the hours of transit of the GRS. Only hours displayed in red indicate visible transits. Times in other colors and the associated symbols explain the reason why these transits are not visible (i.e., Jupiter is below the horizon or the Sun is in the sky).

Just tap on the date field to change the start of the ephemeris.

As the GRS position (longitude) can change from year to year, Astromist enables you to compute this value by yourself:

- Observe Jupiter and record your local time of a transit.

- Gather the transit time from an official source (WEB, magazine, etc.)

Then use the adjust button to select the date of observation, time of transit (Local or UT time) and Astromist will estimate the GRS longitude and store it to enable you to again get accurate ephemerides.

Then predictions will be accurate to one minute around this date and as long as the GRS longitude will stay close to the computed value.

Note: This function can be use to compute past GRS longitude value based on observation.

3.19.3. Events Assistant

This assistant computes accurate start and end times of Jupiter's events on a particular day.

Sun and Jupiter rise-and-set times are displayed for your location. If you want to change the date of a simulation, just tap on the date field.

The following events are taken into account:

- **Transit –** a satellite is in front of Jupiter's disk,

- **Shadow –** the shadow of a satellite is visible on Jupiter's disk, but the satellite is not in front of it,

- **Transit+Shadow –** a satellite is in front of Jupiter and its shadow is visible on Jupiter's disk,

- **Eclipse –** a satellite is crossing through Jupiter's shadow and is no longer visible, and

- **Occultation –** a satellite is behind Jupiter's disk and is no longer visible.
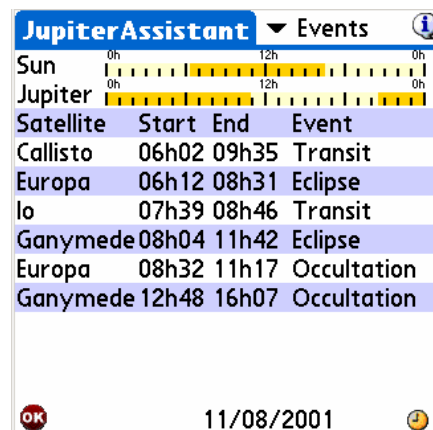
3.20. SatellitesAssistant

➲ **BEWARE THIS ASSISTANT DOES NOT WORK FOR GEOSATIONARY SATELLITES.**

Astromist provides a complete set of tools to observe man-made Earth satellites and predict their positions at any time. To achieve this, Astromist uses the usual two-line TLE format provided by several sites and the SGP4 algorithm to compute the satellite information and position.

Despite SGP4 being one of the most accurate algorithms currently available to compute satellite positions, the required elements need to be updated regularly to keep accurate results. An update frequency of once a month will guarantee accurate results. After several months the results provided will probably be meaningless.

The default satellite database is built using the information provided by the Celestrak site (http://www.celestrak.com/NORAD/elements/) on the 100 or so brightest satellites (http://www.celestrak.com/NORAD/elements/visual.txt). See § 3.20.6 Update Satellite Data for more details.

3.20.1. Info

This screen provides information to locate and track any satellite in the database. In addition it provides a visual map to quickly see where the satellite is above the Earth and what its current pass is.

This visual information lets you quickly determine if a satellite should be visible or not from your location in the upcoming time period. If this is the case, the black line should pass over or very close to your selected location.

Satellite Information
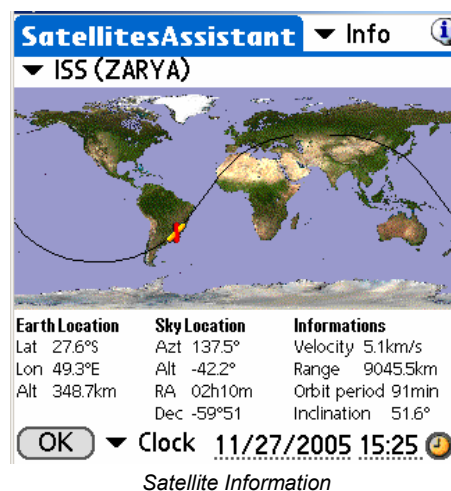
Several kinds of information are available:

- **Earth Location** updates the current latitude, longitude and altitude above sea level for the satellite. This position is represented by the satellite's icon on the map during the current satellite pass.

- **Sky Location** updates information to locate the satellite in the sky.

- **Information** gives common satellite information.

This information can either be computed for the date and time displayed at the bottom of the screen (Clock mode) or simulated using the proposed tracking mode. "Track" should be used if a real time refresh is wanted. Other values from +1' to 1° will add up to ten minutes to the current time at each refresh.

Note: *This mode is very CPU intensive and could consume a lot of battery power.*

To select a particular date and time, the user can tap in the date and time field. Finally by using the clock icon the user can synchronize the screen to the current Palm system time.

3.20.2. Sky

As a satellite moves very fast in the sky and the sky does not rotate a lot during a usual satellite orbital period (less than 2 hours.) This assistant can help you to predict with good accuracy where the satellite should pass in the sky during the next time interval. In particular the Moon and planets are displayed so you can roughly estimate if an occultation or conjunction could be visible from your location during this pass.
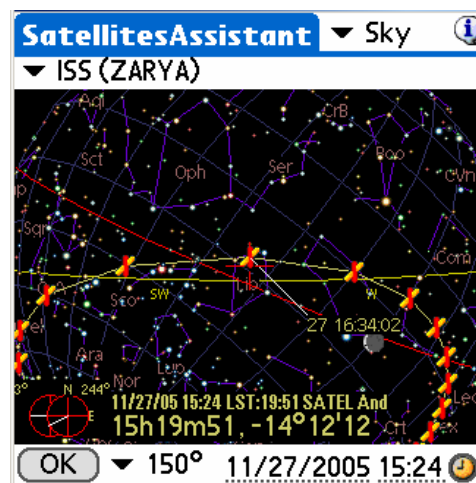

Satellite Sky View

To determine at what time the satellite will pass a particular position, roll the sky sphere and center the red cross on the satellite position. The time of the position will be displayed.

If you see a satellite and a particular sky object are going to pass close enough together, you can use the field of view selector to zoom in on the display of that position.

3.20.3. Pass

This part of the SatellitesAssistant gives you the date and time of the next pass of a particular satellite that will be visible from your location.

Note: *A maximum of 30 passes can be displayed at a time. If you need pass information for dates either before or after the displayed period, you should change the start date to calculate a new set of data for that time period.*
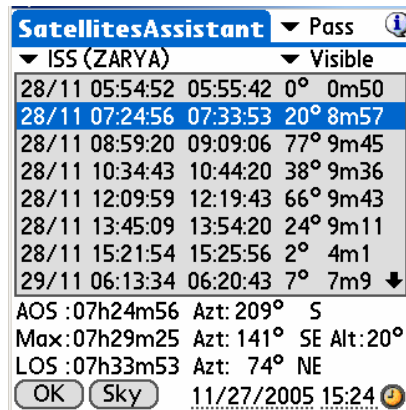
Satellite Passage Assistant

Depending on the **visibility criteria** you choose, it could take a long time to compute the whole list. So, at any time during the search you can stop the process by pressing any key. For example if instead of visible (altitude >=0°); you select >30°, only passes with an altitude higher than 30° will be selected.

Once your pass selection is complete you can access information like time of **AOS** (Acquisition Of Signal, i.e., when the satellite rises over the horizon) and time of **LOS** (Loss Of Signal, i.e., when the satellite sets below the horizon). In this case the azimuth of AOS and LOS are also given. Of course altitudes are 0° in both cases.

Max represents the time when the satellite will be at the highest point in the sky during this pass. In this case altitude is given as well.

Finally, for a particular pass you can tap the **Sky** button to load the sky and the satellite's positions for this pass. This will let you see the whole pass in the sky and quickly determine if during this pass the satellite will pass close to a particular sky object.

3.20.4. Next

This feature lets you determine upcoming visible satellites. Its behavior is very similar to the Pass screen except it is focused on the next hour only.
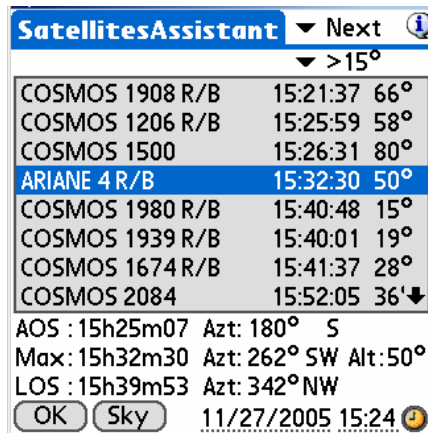
Next visible Satellites Assistant

Once the selection is over, the satellites are sorted by their date and time of pass from the soonest to the latest.

3.20.5. Globe

This feature lets you see the position of a satellite on the globe and in the sky. Tracking can be done but you need to have a fast handheld to make the best use of it.
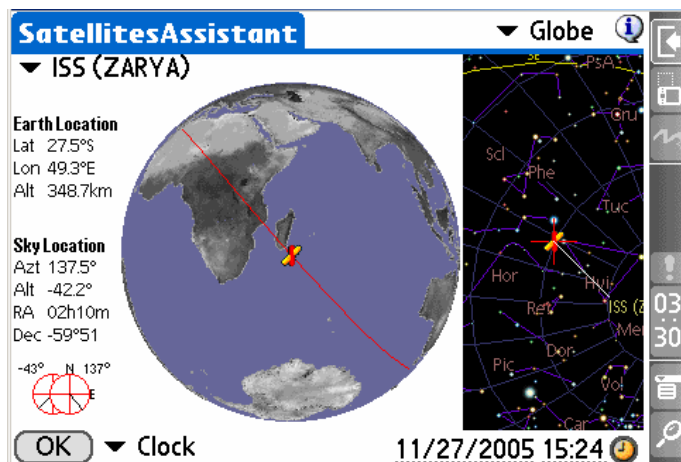
Satellite position on the Globe

The globe can be rolled using the stylus to get a better angle of view.

This information can be computed either for the date and time displayed at the bottom of the screen (Clock mode) or simulated using the proposed tracking mode. "Track" should be used if a real time refresh is wanted. Other values from +1' to 1° will add up to ten minutes to the current time at each refresh interval.

To select a particular date and time, the user can tap on the date and time field. Finally, by using the clock icon the user can synchronize the screen to the current Palm system time.

3.20.6. Update Satellite Data

Astromist provides two ways to update your satellite data:

- Create a new satellite database using the SatelliteDB.exe tool.

- Update or replace the current database using a Palm text memo.

3.20.6.1. SatelliteDB tools

Registered users benefit from the inclusion of the SatelliteDB.exe tool. This application is designed to create the Astromist satellite database using a standard TLE data file.

The following link http://celestrak.com/NORAD/elements/ provides several TLE lists.

To create a new satellite database follow the instructions below:

As an example using this link http://www.celestrak.com/NORAD/elements/visual.txt download the most recent satellite TLE file of visual satellites and save it as satellite_list.txt in the satellitedb folder.
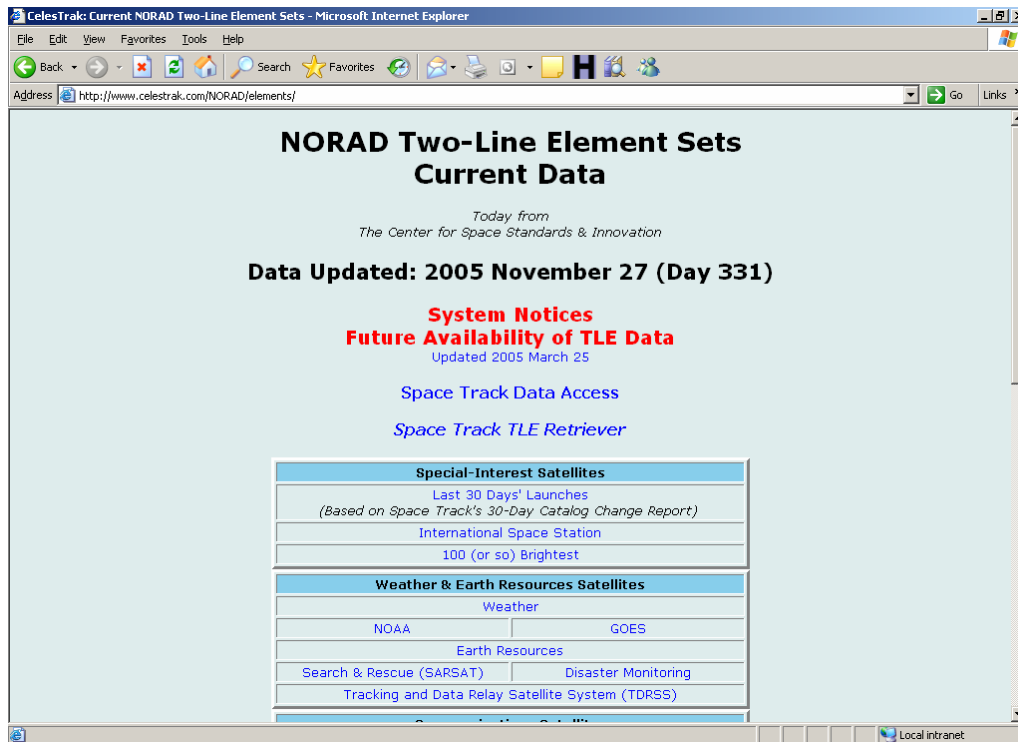
NORAD site which provides TLEs of the 100 (or so) brightest satellites used by Astromist
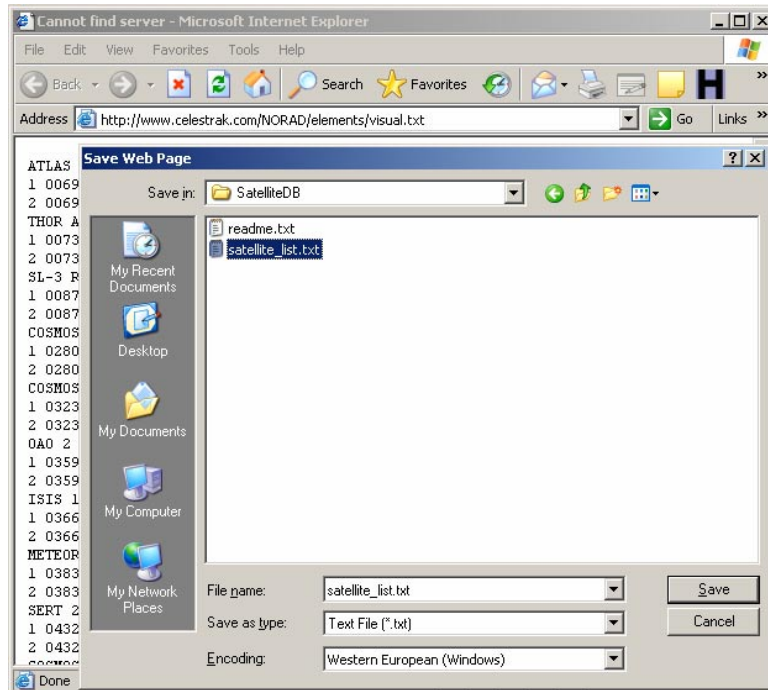
Save as the file in satellitedb folder

- If you want to remove some lines or add new ones, edit the file using your preferred text editor.

- Open a DOS session and change to the program's directory.
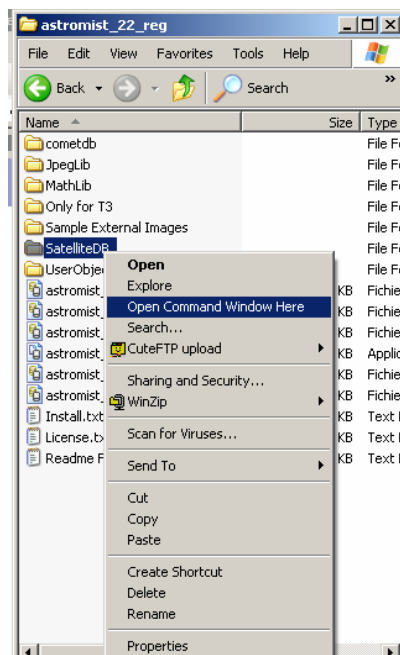
- Run SatelliteDB.exe to create the new database.
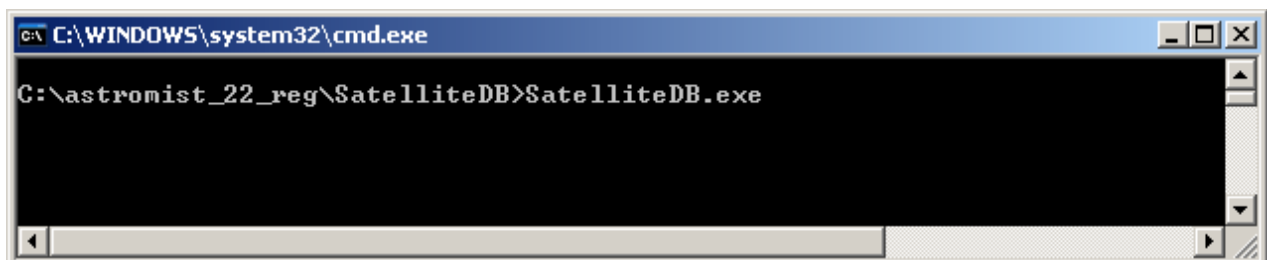
- The astromist_satellite.pdb file is created in the same folder.
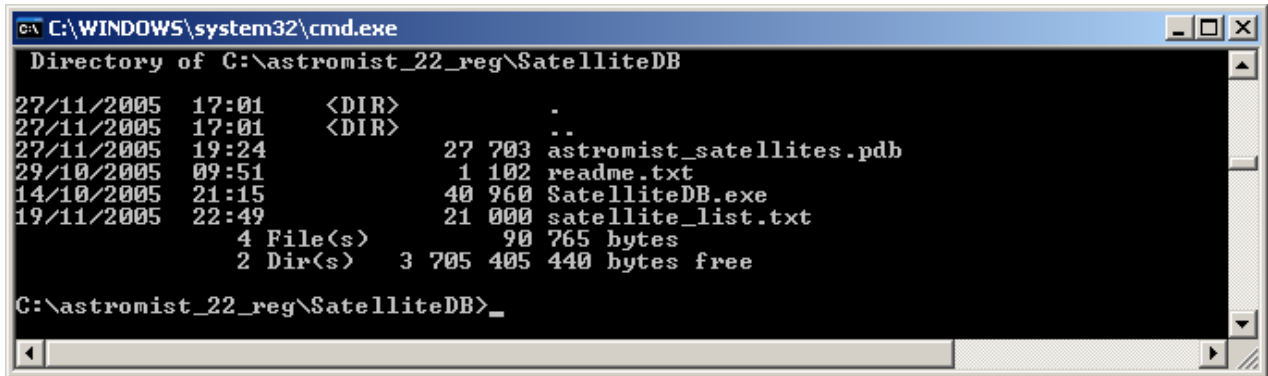
- Now you just have to install the new database file to your Palm.

3.20.6.2. Using the Palm Text memo

Using the satellite_list.txt file you uploaded and saved (see §3.20.6.1 SatelliteDB tools), you can import it and create a Palm memo using your PalmDesktop application.
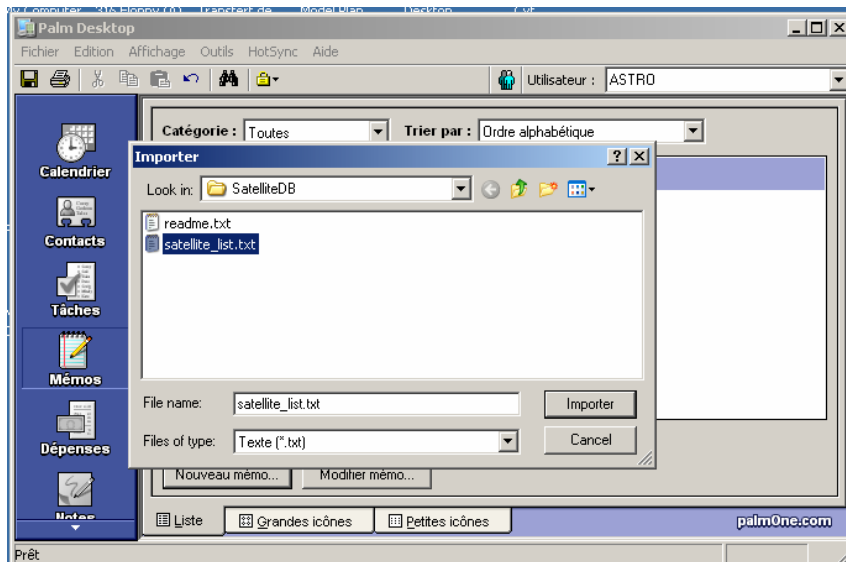
First Import the text file into a new memo
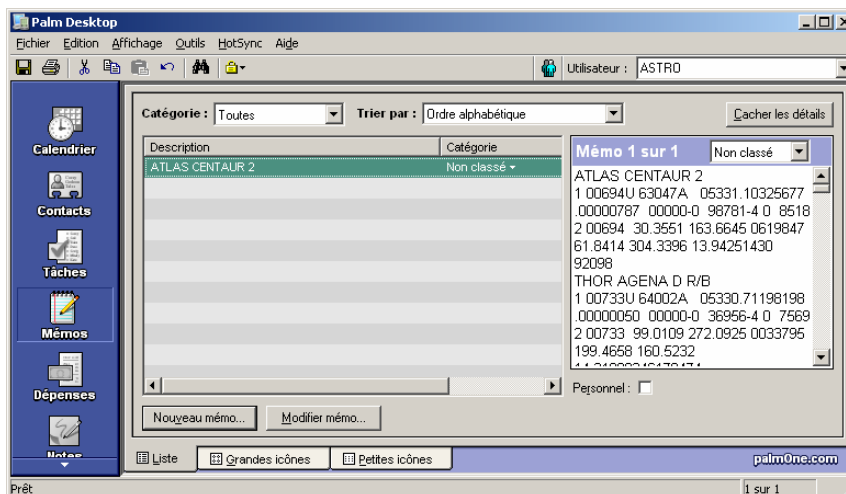
Once imported the new memo is available

- Then, do a **HotSync** to install this new memo into your Palm.

- Once done, launch Astromist and open SatellitesAssistant/Data section.
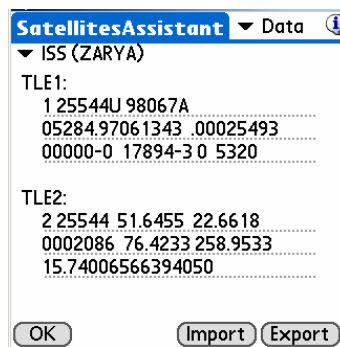
Astromist Satellite TLE Import/Export screen

- Press the Import button and decide if you will replace or just update your current list.

- Select the new memo then press import.

- The satellite database is updated or refreshed.

Note: *For Mac or Linux users, if you want to create a huge satellite database without the SatelliteDB.exe tools, create several memos. When you import the first one, choose replace and for all others select update.*

3.21.   SaturnAssistant

This assistant is similar to JupiterAssistant, but focuses on Saturn's events.

3.21.1. Satellites

Satellites lets you see in real time Saturn's satellites positions.
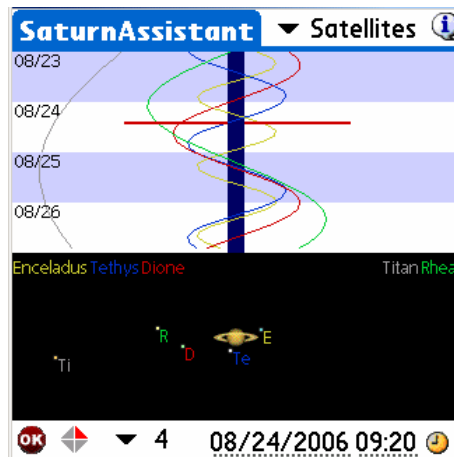
Just select a range of the chart and animate the chart moving your stylus on the screen to reach a particular configuration to find the date and time.

Date and time fields and clock button let you set the start date of the chart.

3.21.2. Rings

Rings lets you see Saturn's ring orientation over a long period.
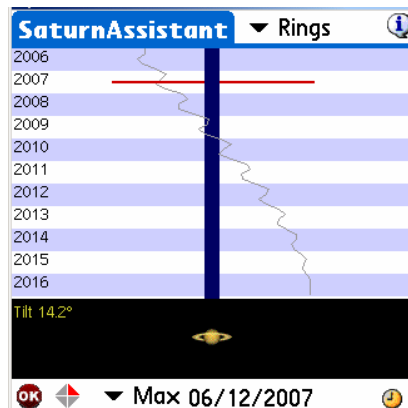
Just select the range of the observation (in years) and then move your stylus on the screen to reach a particular configuration.

Date and time field and clock button let you set the start date of the chart.

3.22. TwilightAssistant

TwilightAssistant lets you display the sky's darkness over the year to determine the best period to observe an object or planet. To do this, open the assistant and select the desired object or planet. The best period to view will be at the time on the chart where the area between the rise and set lines cross the dark area of the chart.
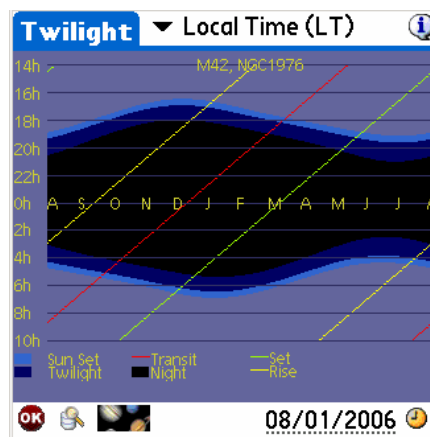
M42, Orion Nebula best observation period

You may display the Twilight data plot with the following considerations:

• your local time without taking into account Day Light savings time changes,

• your local time taking account Day Light savings time changes, or

• Universal Time.

As an example, for a location close to Greenwich, England, the Orion Nebula will be easy to see in the morning between September and December and easy to see in the evening from January to March. The best period to observe it in the evening will be at the end of February when its transit will be at the beginning of the evening.

3.23. Day/NightAssistant

Still a work in progress and will be completed in a future Astromist release.

3.24. CCDAssistant

This panel lets you configure your CCD information to enable Astromist to display your CCD field of view in the SkyChart.

Just select a predefined CCD camera or fill the information for your particular CCD.

3.25. ChecklistAssistant

CheckList Assistant helps you remember to bring all your equipment with you to an observing site. You can also add up to five additional items.

4.   Catalogs

4.1. Messier

A French astronomer named Charles Messier (1730 - 1817) compiled a list of approximately 100 diffuse objects inside a "Catalog of Nebulae and Star Clusters".

The Messier Catalog (110 objects) is well known as a collection of the most beautiful objects in the sky, including nebulae, star clusters and galaxies. Today's version of the catalog usually includes the addition of objects observed by Charles Messier and his friend and colleague, Pierre Méchain, but were not included in his original list.

Tip: *To get more information on Messier's Catalog visit the excellent site* *http://www.seds.org/messier/*

4.2. Caldwell

The Caldwell list (110 objects) is a recent one done by M. Moore and published by *Sky & Telescope*; it includes several objects in the southern hemisphere. These objects were not observed by Charles Messier, who lived in the Northern hemisphere.

4.3. Herschel

The Herschel catalog is a post-Messier list promoted by the Astronomical League, honoring the first true deep-sky observer, William Herschel, who discovered some 2,500 galaxies, nebulae and clusters. The Herschel catalog includes 400 objects.

4.4. SAC

This list was compiled and is used by members of the Saguaro Astronomy Club of Phoenix, Arizona. The best 110 NGC objects are included in this list.

4.5. Bright Stars

The following table lists bright stars and their numeric IDs as used by Astromist.

Id	Name	Mag
1	alAnd(Alpheratz)	2.06
2	al-1Cru(Acrux)	1.77
3	al-2Lib(Zubenelgen)	0.96
4	alAql(Altair)	1.25
5	alAri(Hamal)	2.00
6	alAur(Capella)	1.65
7	alBoo(Arcturus)	2.75
8	alCar(Canopus)	1.50
9	alCas(Schedar)	2.23
10	alCen(Rigil)	2.08
11	alCet(Menkar)	0.85
12	alCMa(Sirius)	0.38
13	alCMi(Procyon)	1.86
14	alCrB(Alphecca)	1.92
15	alCyg(Deneb)	1.74
16	alEri(Achernar)	0.46

Id	Name	Mag
17	alGru(Al_na'ir)	2.02
18	alHya(Alphard)	1.79
19	alLeo(Regulus)	2.14
20	alLyr(Vega)	0.77
21	alOph(Rasalhague)	1.85
22	alOri(Betelgeuse)	-1.46
23	alPav(Peacock)	2.39
24	alPeg(Markab)	4.12
25	alPer(Mirfak)	0.12
26	alPhe(Ankaa)	2.39
27	alPsA(Fomalhaut)	5.47
28	alSco(Antares)	2.43
29	alTau(Aldebara)	0.08
30	alTrA(Atria)	1.63
31	alUMa(Dubhe)	2.59
32	alUMi(Polaris)	3.42
33	alVir(Spica)	0.61
34	beCar(Miaplacidus)	1.35
35	beCen(Hadar)	-0.04
36	beCet(Diphda)	2.04
37	beGem(Pollux)	2.21
38	beLeo(Denebola)	1.58
39	beOri(Rigel)	1.64
40	beTau(Elnath)	0.50
41	beUMi(Kochab)	2.23
42	epCar(Avior)	1.68
43	epCMa(Adhara)	1.14
44	epOri(Alnilam)	-0.72
45	epPeg(Enif)	2.49
46	epSgr(Kaus_Aust.)	2.02
47	epUMa(Alioth)	1.86
48	etOph(Sabik)	2.08
49	etUMa(Alkaid)	2.06
50	gaCru(Gacrux)	0.97
51	gaCrv(Gienah)	1.63
52	gaDra(Eltanin)	0.03
53	gaOri(Bellatrix)	1.70
54	laSco(Shaula)	2.23
55	laVel(Suhail)	1.98
56	siOct	1.16
57	siSgr(Nunki)	1.94
58	th-1Eri(Acamar)	1.80
59	thCen(Menkent)	-0.01
60	thPer	2.53

4.6. Double Stars

160 double stars extracted from the SAO catalog have been integrated inside the Astromist catalog. The following list gives you Astromist's ID of the most well known double stars.

Id	SAO Id	Const.	Name
80	SAO216113	ERI	Acamar
38	SAO21732	CAS	Achird
55	SAO98267	CNC	Acubens
50	SAO172676	CMA	Adhara
66	SAO87301	CYG	Albireo
61	SAO157323	CRV	Algorab
29	SAO163422	CAP	Algredi
2	SAO37734	AND	Almach
42	SAO10057	CEP	Alphirk
149	SAO124068	SER	Alya
64	SAO63256	CVN	Cor Caroli
31	SAO163481	CAP	Dabih
161	SAO15384	UMA	Dubhe
134	SAO127029	PEG	Enif
147	SAO159682	SCO	Graffias
74	SAO30447	DRA	Kuma
45	SAO19827	CEP	Kurhah
13	SAO92680	ARI	Mesarthim
128	SAO132221	ORI	Mintaka
135	SAO23655	PER	Miram
162	SAO28737	UMA	Mizar/Alcor
130	SAO132323	ORI	Nair al Saif
163	SAO15384	UMI	Polaris
100	SAO98967	LEO	Regulus
126	SAO131907	ORI	Rigel
88	SAO84951	HER	Sarin
116	SAO67451	LYR	Sheliak
132	SAO132314	ORI	Trapezium

4.7. Customizable Catalogs

Astromist provides several ways to create your own user object catalogs or lists.

- First UserObjectDB.exe tool allows you to create your own catalogs of objects without the usual limitations of Palm Text memos (i.e. only few objects at a time). Furthermore an Excel spreadsheet is provided to help registered users to easily create catalogs and also build their own library of object catalogs. Unfortunatly it is a Windows based tool so Macintosh users will have to use one of the other methods or run a Windows emulator.

- Second, the import of Palm Text memos is supported as well. The Excel spreadsheet can be used to produce the object list. Doing it this way, only a limited number of objects can be added at a time (between 20 and 30) so several memos are required.

- Third, using the Astroplaner program. I made a special arrangement with Paul Rodman, the Author of this great program to let him integrate full Astromist object

catalog creation ability into his software. This is the easiest method and it works either on Windows or Macintosh.

4.7.1. Prepare the catalog

An Excel spreadsheet is designed to help you to create the text file required by the UserObjectDB.exe program to create your Astromist custom object database.

The following information is required:

Catalog	This column contains the Astromist code of the Catalog. Open Finder Assistant to find the short name to use. If no catalogs match, use the User catalog code.
ID	The id of your object within its catalog. If you are using the User catalog code, just input a unique id starting from 1.
Name	This field contains the name of the object. By default you can just concatenate the catalog code and the id code. For your own objects or if you are using User catalog codes, fill this field with a useful mnemonic.
Type	The type of the object.
Category	This field lets you enter detail about the object category. You can leave it blank if you do not have this information.
RA	The right ascension of the object. Astromist supports one arcsecond precision.
Dec	The declination of the object. Astromist supports one arcsecond precision.
Magnitude	The magnitude of the object. Only a dot is accepted as separator. Example: 8.1
a (width)	The width of the object in arcseconds. For star clusters only.
b (height)	The height of the object in arcseconds.
PA	The angle of the object against True North. This information is in degrees.
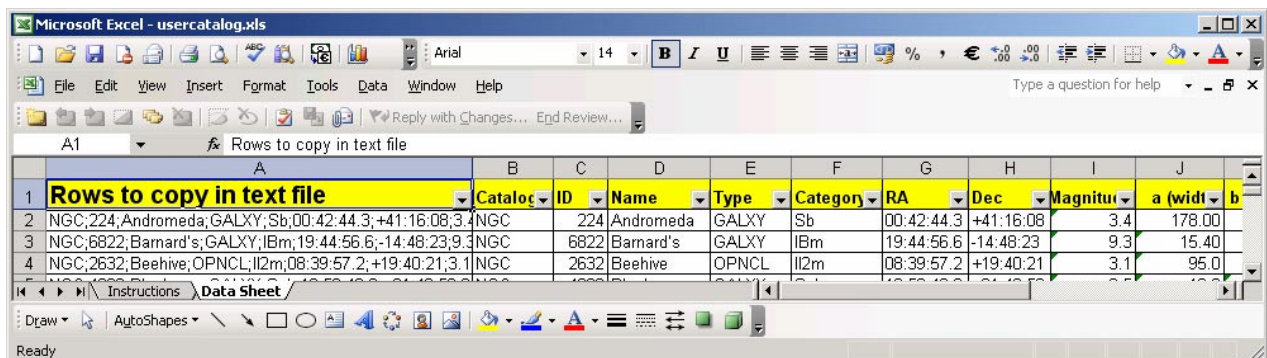
Once all the rows are filled, open the user_object.txt file using a text editor and just copy the first column of the data sheet and paste it to the text file then save it.
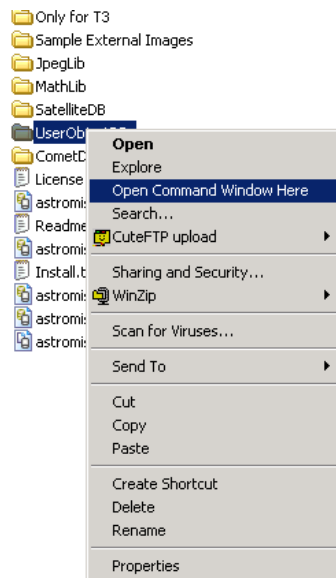
After that you can run the UserObjectDB.exe program or import the text file as a new memo to your palm.
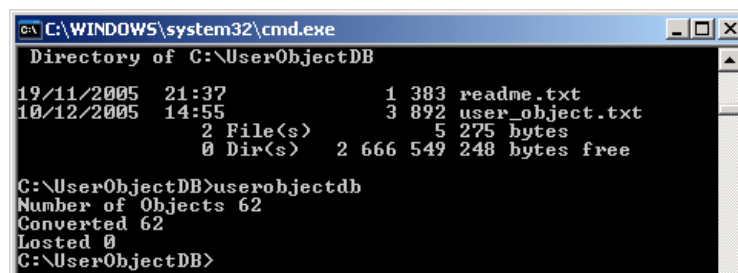
4.7.2. UserObjectDB

Using this tool you can create catalog of up to 32000 objects. To estimate the final size of your catalog you can use this rule: 100 objects=10Kb.

The procedure is as follows:

- Open a DOS session and change to the program's directory.

- Run UserObjectDB.exe to create the new database.

- The astromist_user_objects.pdb file is created in the same folder.
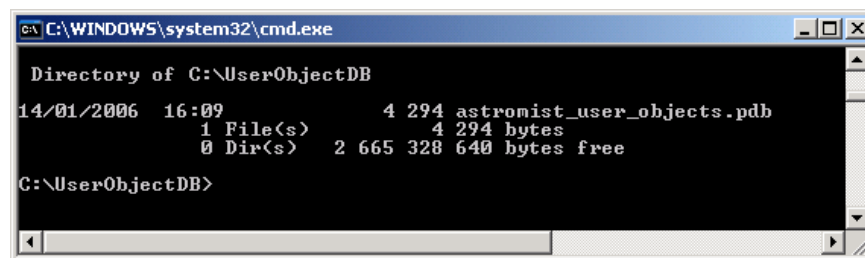
- Now you just have to install the new database file to your Palm. Two ways are possible:

  - Into Palm main memory. In this case only one custom catalog can be used

Into the Palm/Programs/Astromist/usercatalogs/ folder of your memory expansion card. In this case you can create as many catalogs as you want (up to 100) and browse them from the program to select the one you want to work with. Doing it this way you will have to rename the file to the name you want but don't change the .pdb extension. In this case in order select a particular catalog, use ListManager and choose User Catalogs filter. Then you will be able to select your prefered catalog. Furthermore you can switch as many times as you want between catalogs and by the way create step by

step (using NightTripper) a unique list of objects involving several different custom made catalogs. This list can be exported once created to create later a new catalog using UserObjectDB tool.

Finally the [icon] icons on the wizard will let you select your objects like other Astromist objects. They will be listed under the User Catalog.
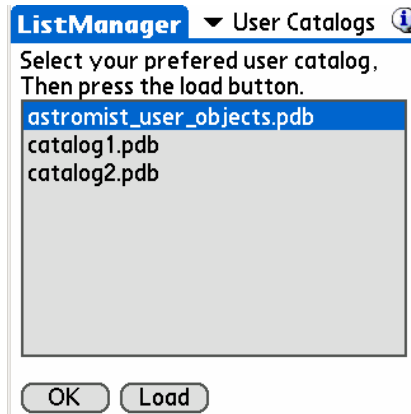
User catalogs management screen

4.7.3. Using the Palm Text memo

Using the user_object.txt file you created, you can import it and create a Palm memo using your PalmDesktop application.

➲ **BEWARE; SET THE FILE TYPE AS TEXT.**

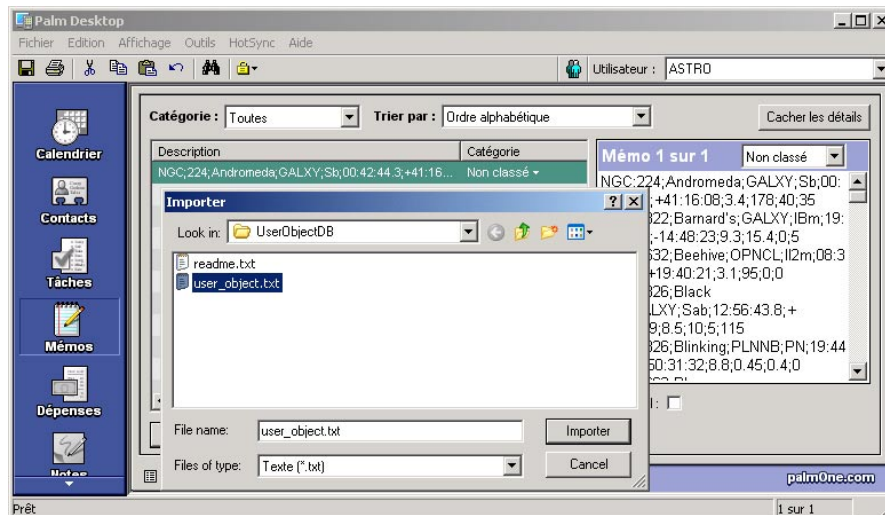*First Import the text file into a new memo*
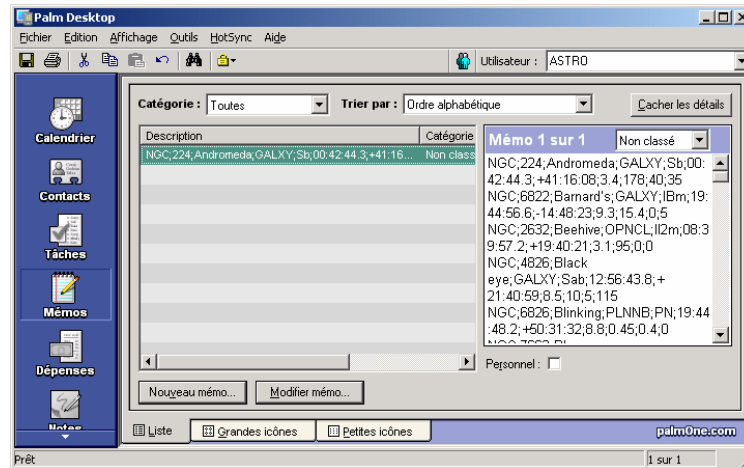
Once imported the new memo is available

- Now do a **HotSync** to install this new memo into your Palm.

- Once done, launch Astromist and open the Import to current List meu item.

Astromist User Object Import screens

- Tap on replace or Update considering the action you would like to do with your current object list.

- Now select the memo and press import.

- The current object list is then updated or refreshed.

Note: *For Mac or Linux users, if you want to create a large object list without the UserObjectDB.exe tools, create several memos. When you import the first one, choose replace and for all others select update. In this case pay attention before to set "Max Selected" setting in Preference 2/5 panel to the maximum value (500).*

4.7.4. Astroplanner

Note: *Please see Astroplanner user documentation for more information on this program.*

An arrangement has been made with Paul Rodman, the author of Astroplanner to add an Astromist export function to the program. Astroplanner is now able to produce ready-made astromist user object catalogs.

5.   Telescope control

Note: Many cable interfaces may be found at http://www.atozastro.com/

Before connecting your PDA to your mount you need to:

- Turn on the power on your mount.

- Proceed with initialization and set-up.

- Connect your Palm.

5.1. Telescope Interface

5.1.1.   Serial setup
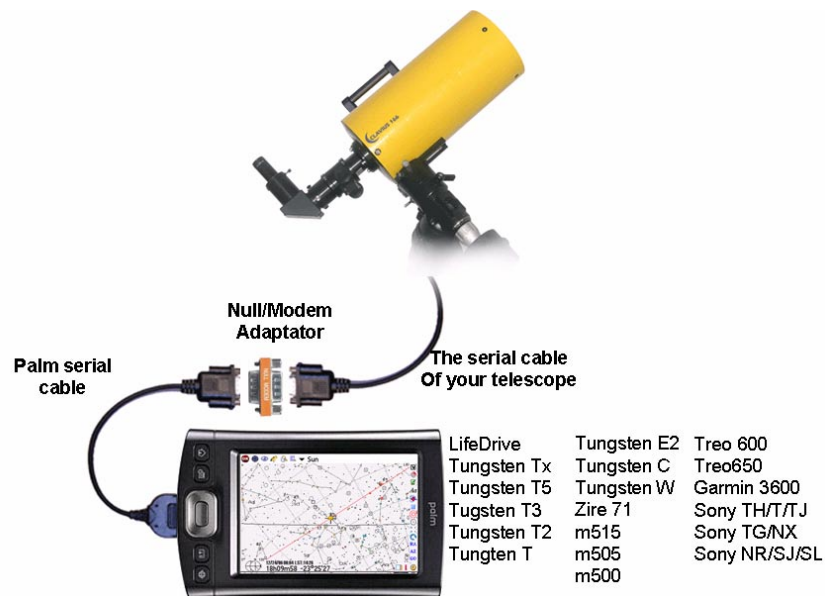
About the furniture:

- A serial cable for your palm: http://www.pcables.com . If you do not find a cable at this place, there is low chance elsewhere other one exists.

- A null/modem DB9 male/male adaptor:

http://www.cablewholesale.com/cgi-
bin/search.cgi?body=Search&text=mini+null+modem

- A serial cable compatible with your telescope mount. Ask to your usual reseller. On the internet many place are available to get such harware. Some of them:

  - For Celestron cables:
    http://www.atozastro.com/shop/scripts/prodList.asp?idCategory=27

  - For Meade cables:

    http://www.atozastro.com/shop/scripts/prodList.asp?idCategory=10

The overall cost is estimated to 85$ (60+5+20).

5.1.2. Bluetooth

About the furniture:

- A male Aircable adaptor+Null/Modem : http://www.aircable.net/serial.html .

Note: *Astromist registered users will get a special coupon, upon request, for a discount (US$10) on the Bluetooth-to-serial converter certified to work with Astromist. Wiring plans to build a connector from this device to Celestron and Meade telescopes will be provided as well.*

- An external 5V power source to be connected to the AirCable or a 9V battery plug with the correct jack.
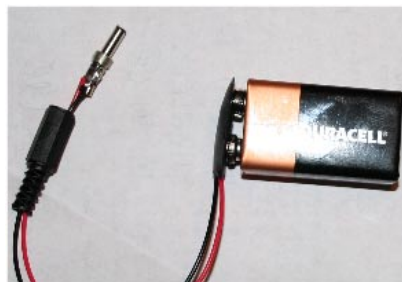
- A serial cable compatible with your telescope mount. Ask to your usual reseller. On the internet many place are available to get such hardware. Some of them:

  - For Celestron cables:
    http://www.atozastro.com/shop/scripts/prodList.asp?idCategory=27

  - For Meade cables:

    http://www.atozastro.com/shop/scripts/prodList.asp?idCategory=10

The overall cost is estimated to 85$ too (60+5+20).

Note: *Bluetooth is tested at each release with Palm T3 and T5 handhelds using a Celestron GT GoTo mount, a Meade ETX-70 and a Bluetooth GPS device.*

5.1.3. Infrared

Infrared protocol is still experimental. It as been basically tested using an Actisys 100M serial-to-infrared converter. The main disadvantage of this kind of link is that you are obliged to be in front of the IR sensor to succeed, which is not always convenient.

5.1.4. Manual mode

You can use Astromist to find objects even if you are not connected to a telescope. In this case you should select **none** for **scope drive** preference. Then Astromist will display object positions according to your type of mount. If you don't want to use positioning data at all, just use the sky chart and star hop to find your favorite objects.

5.2. ScopeAssistant

ScopeAssistant lets you control your telescope from your Palm. This functionality is available for the following telescope communication protocols:

- Meade LX200

- Meade Autostar

- Celestron Nexstar GPS, GT and CGE series

- Takahashi
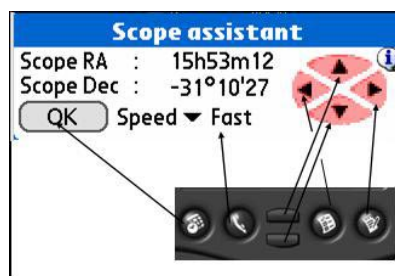
Scope Assistant for Computerized mounts
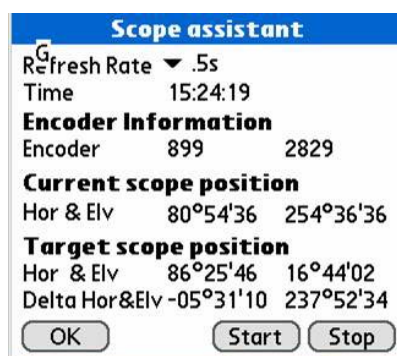
ScopeAssistant for mounts using Encoder Drive

Palm keys can be used instead of a stylus. On Tungsten series units the navigation pad is mapped to hand control keys.

Note: *ScopeAssistant is opened on each GoTo. Users can cancel a GoTo by tapping on the stop button or using the equivalent Palm key.*

5.3. Scope Drive

5.3.1. Meade

The following models are supported by the driver:

- Magelan I, this drive doesn't support GoTo.
- Magelan II
- Autostar (certified)
- LX200 (certified)

5.3.2. Celestron

The following models are supported by the driver:

- Old GT (certified)
- New GT (certified)
- Nexstar 5 and 8 (certified)
- Nexstar 8i (certified)
- Nexstar GPS (certified)

The same cable works for all NexStar models and you can order one from most Celestron dealers. Plans for Custom cables are available at the following address: http://www.nexstarsite.com/PCControl/RS232Cable.htm.

5.3.3. Losmandy

Losmandy supports LX200 protocol so you have to use the LX200 command set.

5.3.4. Astrophysics

Astrophysics mounts support LX200 protocol so you have to use the LX200 command set.

5.3.5. Takahashi

Temma protocol is implemented following the technical Takahashi specification. This driver is certified.

5.3.6. ServoCat

ArgoNavis ServoCat protocol is implemented. Only the Goto and Get position commands are supported.

5.3.7. Encoder interface

The following encoder protocols are supported:

- Ouranos
- NGC-MAX
- AAM SkyVector
- Dave Ek
- BBox

- SkyCommander

- Intelliscope

The encoder driver can only read information. It has no GoTo capabilities, but an EncoderAssistant screen is displayed to let the User figure out how far or close his telescope is in pointing to the object during a "Push-To" operation.
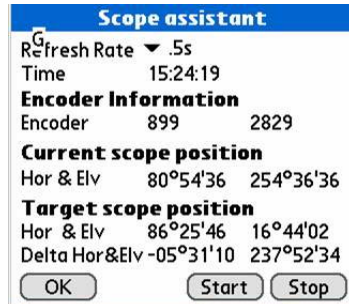
Encoder Assistant panel

5.3.8. GPS

Astromist supports GPS technology that uses the NMEA protocol. It has been tested with data coming from the following GPS systems:

- Garmin G12 sentences for version 4.57

- Garmin eTrex Summit

- Garmin eTrex Vista

- Garmin basic yellow eTrex, European version

- Magellan GPS Companion

- Magellan 315

- Raytheon RN300

- NavMan 3400

- Earthmate with SiRF chipset

- Evermore GM-305.

Bluetooth GPS's are compatible with Astromist as well as some integrated units (IQ3600 pda).

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