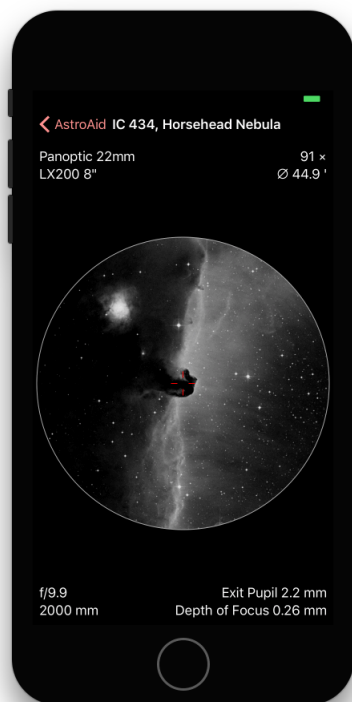


AstroAid

V3.5



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Introduction

What it's for

AstroAid is an iOS app for any iPad or iPhone running iOS 10 or after. It allows you to visualise what you can see through your telescope or camera lens, either via an eyepiece or an astro-imaging camera. Binoculars are also supported.

The app contains a larger database of commercially-available hardware resources to choose from, or you can specify your own.

The app also contains several catalogues of astronomical objects to choose from, with images for each downloadable online. The app shows how they will appear through your hardware.

Limitations

The images for each object are derived from monochrome plates originally taken with a 48" Schmidt camera. The images are not adjusted in any way to show magnitude changes depending on your hardware.

The images are also (currently) limited to $1^\circ \times 1^\circ$, so if your field of view is more than 1° , the image may not fit the entire field of view. However, background stars are shown.

The objects are limited to those in a set of astronomical catalogues (Messier, NGC, etc.). You cannot (currently) add your own.

Note that the images in this document were (mostly) taken from an iPhone. The app works identically on an iPad (better, in fact, since the field of view is bigger and always visible)

New features since V2

- The application has been *completely* redesigned for modern iOS versions.
- More deep sky & solar system objects (with associated images) and hardware resources are available.
- The object catalogues and hardware resources can be updated occasionally when new items are provided (without a new version of the app needing to be released).
- The app takes into account the user's current location in order to provide current altitude & azimuth information. This allows the current visibility of objects to be determined (e.g. are they below the horizon?).
- Custom & owned hardware resources are shared between multiple iOS devices via iCloud.

Main View

AstroAid	Night
Field of View Show the field of view for IC 434	>
Object IC 434 from Index Catalogue	>
Catalogues Catalogues of astronomical objects	>
Telescope Meade LX200 8"	>
Camera Lens No camera lens selected	>
Eyepiece Tele Vue Panoptic 22mm	>
Imager No imager selected	>
Optical Aid No optical aid selected	>
Binocular No binocular selected	>
Custom Hardware A list of all custom hardware	>
System Data Show data for the hardware and object	>
Settings Preference settings	>

This is the main view of the app, and clicking on each item will navigate you to the other views of the app. You can also switch Night mode on and off from here.

Field of View will take you to the field of view (mainly of use to iPhone users).

Object will navigate to the currently-selected object in its associated catalogue and optionally select another to look at in the field of view.

Catalogues will navigate to a list of catalogues and a list of objects with cached images (useful when you do not have access to the Internet). You can also search the catalogues via the search field at the top of the list.

Telescope will navigate to a list of commercial telescopes (and the ability to create your own), and let you select an instrument to use.

Camera Lens will navigate to a list of commercial camera lenses (and the ability to create your own), and let you select a lens to use.

Eyepiece will navigate to a list of commercial eyepieces (and the ability to create your own), and let you select an eyepiece to use.

Imager will navigate to a list of commercial astro-imaging cameras (and the ability to create your own), and let you select an imager to use.

Optical Aid will navigate to a list of commercial optical aids (e.g. Barlow lenses, focal reducers, etc.) (and the ability to create your own), and let you select an item to use (or None if you aren't using one).

Binocular will navigate to a list of commercial binoculars (and the ability to create your own), and let you select a binocular to use.

Custom Hardware will navigate to list of all your custom hardware items (telescopes, eyepieces, etc.)

System Data shows a list of informational data relevant to your chosen resources, such as data about your hardware, the chosen object, your location, etc.

Settings allows you to change some data that controls the operation of the application (and is saved between runs), such as your location, darkness of the night vision mode, and how much image data you wish to cache/save on the device.

Documentation (scrolled off the bottom in the above image) shows you... well you're looking at it!

Field of View

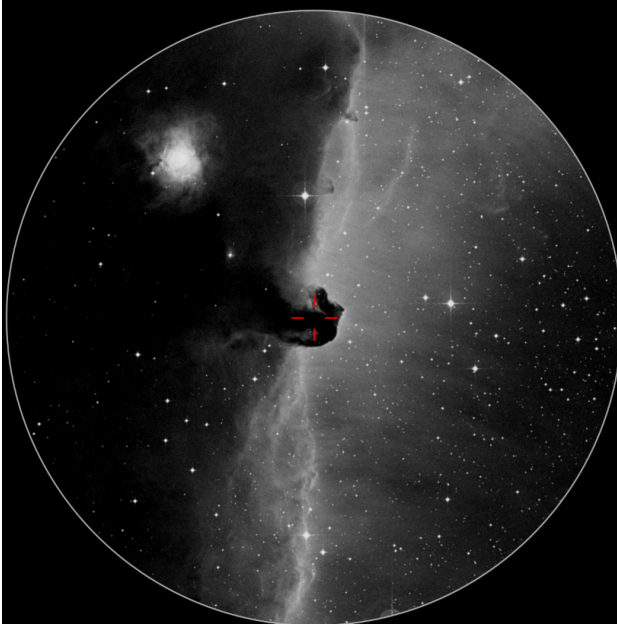
◀ AstroAid IC 434, Horsehead Nebula Hardware

Panoptic 22mm
LX200 8"

Magnitude Limit: +13.5

91 ×

Ø 44.9'



f/9.9
2000 mm

Exit Pupil 2.2 mm
Depth of Focus 0.26 mm

The main feature of the app is the Field of View. On an iPad (or a "Plus" sized iPhone in landscape orientation) this view is always visible on the right of the screen. On other devices you can get to it via the **Field of View** item on the main view. On an iPhone the **Hardware** button at the top right will take you directly to the Custom Hardware view for a quick change of hardware.

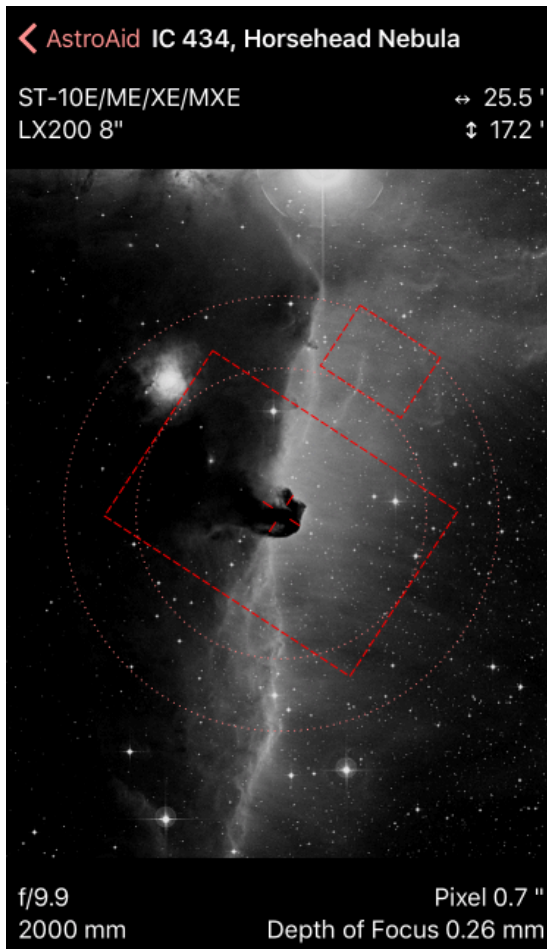
Visual

If you choose an eyepiece resource, this is what you will see. It shows a circular "portal" that represents what you should see through the eyepiece together with your chosen instrument and any (optional) optical aid. It is centred on the chosen object. You can move the background field "under" the portal by moving it with a

single finger. Double-tapping the screen will return the field to its original position.

- At the top is the ID of the object.
- At the top left is a list of the hardware resources in use.
- At the top right is the computed magnitude limit (based on current hardware), effective magnification and angular diameter of the field of view.
- At the bottom left is the effective focal ratio and focal length of the system.
- At the bottom right is the effective eyepiece exit pupil diameter, and the effective depth of focus.

Imaging

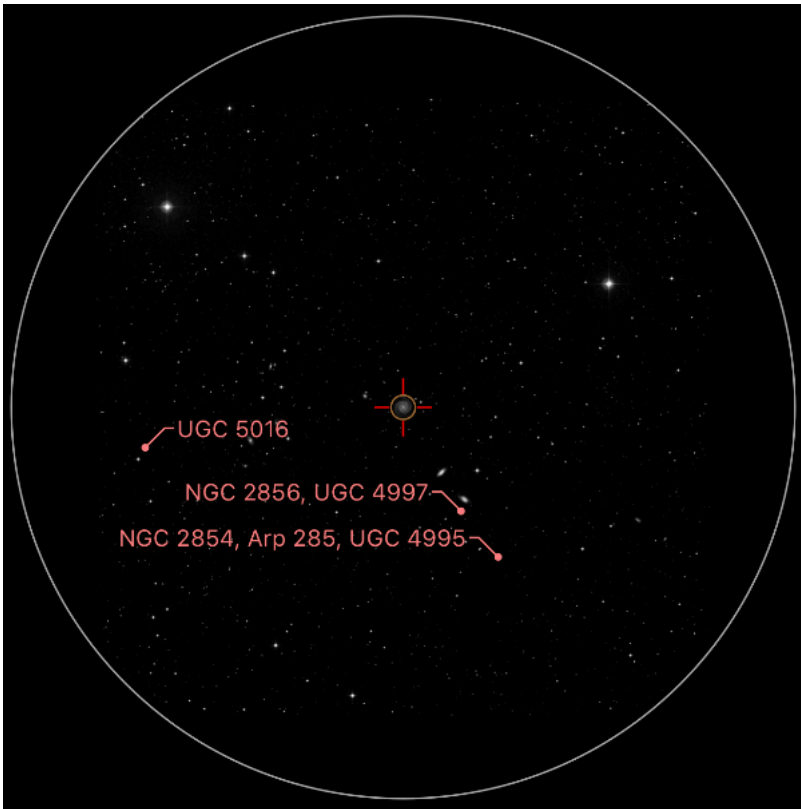


If you choose an imager resource, this is what your imager field of view would be. The imager field is shown as a red dotted rectangle, representing what your imager would see with

your chosen instrument and any (optional) optical aid. In order to do imager planning you can rotate the imager field (by applying two fingers in a rotating motion). You can also move the background field "under" the imager field by moving it with a single finger. Double-tapping the screen will return the field to its original position.

- At the top is the ID of the object.
- At the top left is a list of the hardware resources in use.
- At the top right is the effective horizontal and vertical angular size of the imager field of view.
- At the bottom left is the effective focal ratio and focal length of the system.
- At the bottom right is the effective angular pixel size, and the effective depth of focus.

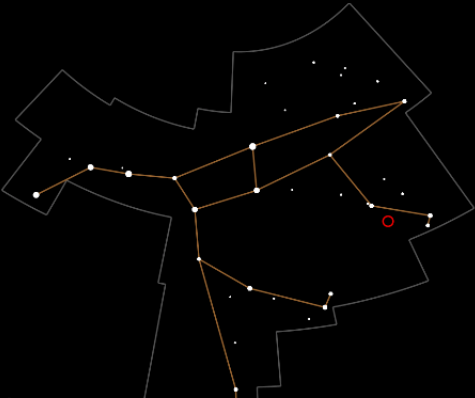
If the **Field of View > Show other objects** setting is on, the installed object catalogues will be searched and any other found objects in the field of view will be tagged and identified.



Pressing down on any of the identi-

fied objects will show the object information for that item. e.g. pressing on UGC 5016 above, will present the following information:

ID	UGC 5016
RA/Dec (J2000)	α 09:26.2 δ +49:18
Alt/Az	\uparrow 31° \curvearrowright 311°
Magnitude	+15.4
Type	Galaxy
Size	1.1' \times 0.6'
Position Angle	30°
Description	SBa
Constellation	Ursa Major

A star chart of the Ursa Major constellation is shown below the table. The constellation's outline is depicted with a light gray border. Its primary stars are connected by orange lines to form the constellation's pattern. A small red circle is placed on the right side of the chart, indicating the location of the galaxy UGC 5016.

Catalogues & Objects

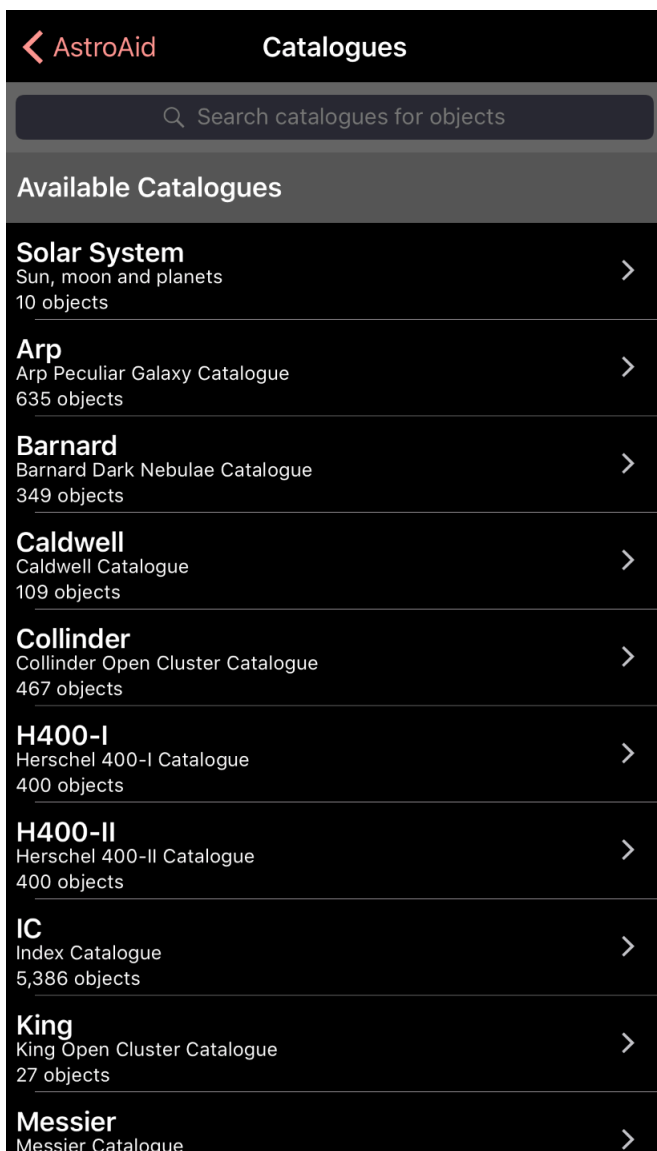
The astronomical objects you can use in the app (with downloadable images) are arranged in their original astronomical catalogues. At time of release, these catalogues were:

- Solar system objects (sun, moon, and planets)
- Abell Galaxy Cluster Catalogue (Abell)
- Abell Planetary Nebulae Catalogue (PN A66)
- Arp Peculiar Galaxy Catalogue (Arp)
- Barnard Dark Nebulae Catalogue (B)
- Caldwell Catalogue (C)
- Collinder Open Cluster Catalogue

(Cr)

- Herschel 400 I Catalogue (H1)
- Herschel 400 II Catalogue (H2)
- Index Catalogue (IC)
- King Open Cluster Catalogue (K)
- Messier Catalogue (M)
- New General Catalogue (NGC)
- Palomar Globular Cluster Catalogue (Pal)
- Sharpless Catalogue of HII Regions (Sh2)
- Trumpler Open Cluster Catalogue (Tr)
- Uppsala General Catalogue of Galaxies (UGC)

As others become available, you will be able to download them (when you start up the app, a check will be made and you'll optionally be able to download them).



By selecting **Catalogues** on the main screen you'll get to a list of the catalogues. Tapping one of these will take

you to a list of objects in the selected catalogue.

Objects

Catalogues

Messier

M 10 to M 19

M 10

α 16:57.2 δ -04:05 Oph

↓ -56°, ↗ 12°

Globular, Mag +7.5, Size 15.1'

NGC6254

i

M 11

α 18:51.1 δ -06:16 Sct

↓ -53°, ↗ 322°

Open, Mag +7.0, Size 14'

Wild Duck Cluster, Scutum Salt-and-Pepper Cluster

i

M 12

α 16:47.2 δ -01:56 Oph

↓ -54°, ↗ 16°

Globular, Mag +8.0, Size 14.5'

Gumball Globular

i

M 13

α 16:41.7 δ +36:27 Her

↓ -16°, ↗ 9°

Globular, Mag +7.0, Size 16.6'

Hercules Globular Cluster, Great Hercules Cluster

i

M 14

α 17:37.6 δ -03:14 Oph

↓ -56°, ↗ 354°

Globular, Mag +9.5, Size 11.7'

NGC6402

i

M 15

α 21:30.0 δ +12:10 Peg

↓ -14°, ↗ 298°

Globular, Mag +7.5, Size 12.3'

Great Pegasus Cluster

i

The list of objects for a catalogue in-

cludes, for each object, some information:

- The object ID
- The Right Ascension (α), Declination (δ), and constellation of the object.
- The current Altitude above the horizon (\uparrow or \downarrow) and Azimuth (\curvearrowright) of the object. If this is red then the object is below the horizon; blue if above the horizon.
- The type, magnitude, size and position angle (PA) of the object, where applicable.
- Common name/s of the object, where applicable.
- Other optional descriptive info about the object.

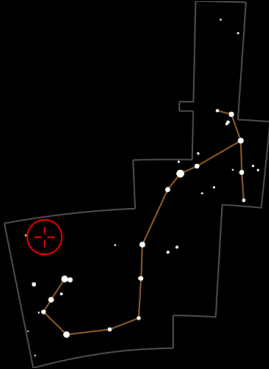
Clicking the item itself selects that object and will show its visualisation in the field of view.

Clicking the "information" icon at the

right reveals information about the object in a tabular form, and includes a constellation view with the position and current field of view shown in red.

< MessierM 6

ID	M 6
RA/Dec (J2000)	α 17:40.3 δ -32:15
Alt/Az	\uparrow 19° \curvearrowright 165°
Magnitude	+4.5
Type	Open Cluster
Size	15'
Name/s	Butterfly Cluster
Constellation	Scorpius

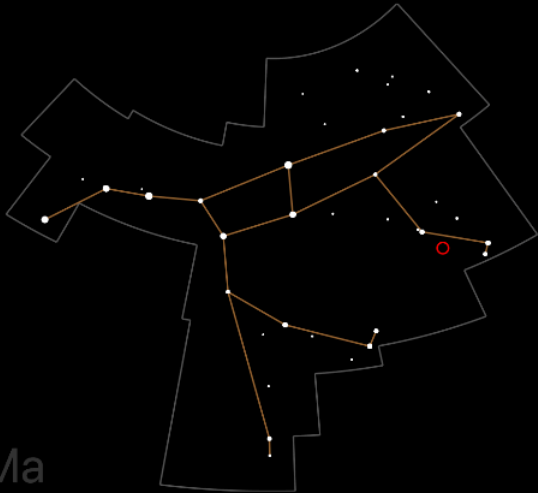


The image shows a star chart of the Scorpius constellation. The constellation is outlined in white, and its stars are represented by white dots of varying sizes. A red circle with a crosshair is placed over a star in the lower-left part of the constellation, indicating the position of M6. The label 'Sco' is visible in the bottom-left corner of the chart area.

If any Charts or Atlases are selected (see **Settings**), then a section will appear at the bottom that shows the page/chart numbers that contain the chart for the object.

Constellation

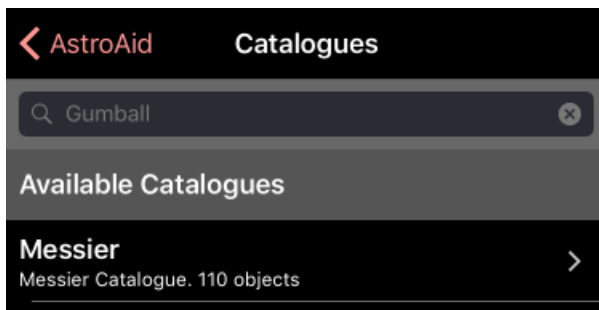
Ursa Major

A star chart of the Ursa Major constellation on a black background. The constellation's outline is shown in a light gray. The primary stars are connected by orange lines to form the Big Dipper asterism. A red circle highlights a specific star in the lower right portion of the constellation. The label 'UMa' is displayed in the bottom left corner of the chart area.

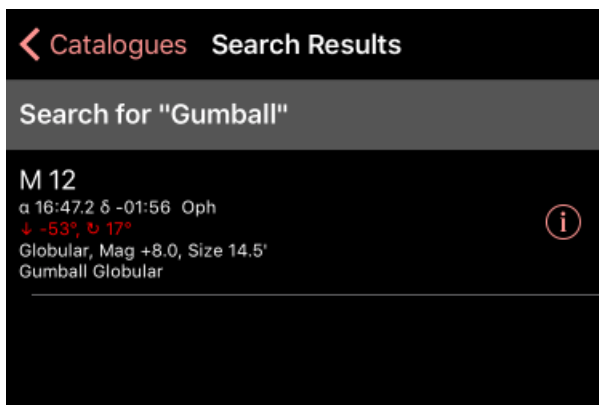
Charts & Atlases

Bright Star	5
Cambridge Star Atlas	4
Herald-Bobroff	C14
Norton's Star Atlas	7

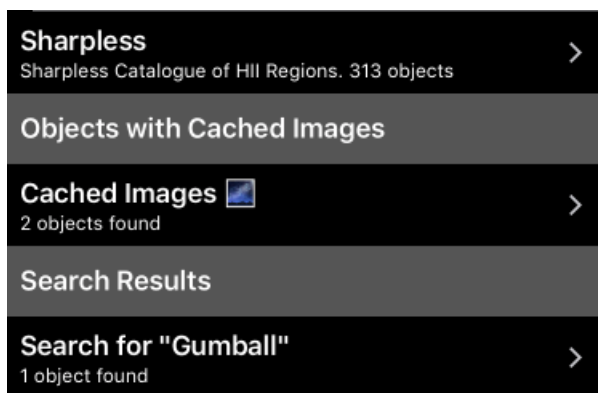
Searching



You can search all the available catalogues for text matches by typing into the search field at the top of the Catalogues list. This will produce a list of objects from all catalogues that match the search text.



The search results will also appear as an entry in the Catalogues list.



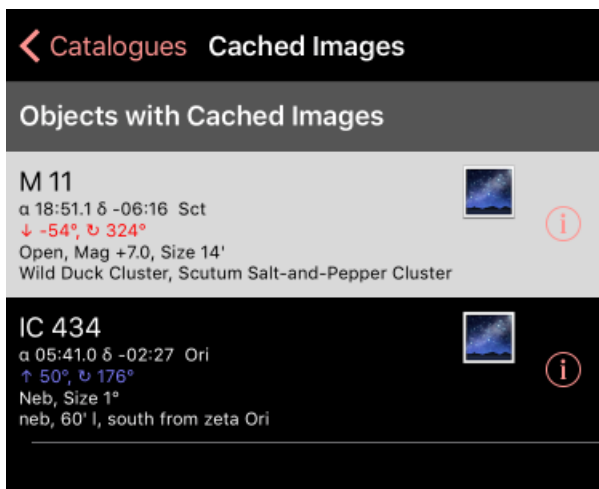
Cached images

If an object has an associated image already downloaded and cached internally, it is badged with a small picture icon at the upper right. Cached images are convenient if they are downloaded ahead of time when Internet access is available. They can then be used later when no Internet is available in the field.

If there are cached images (there should always be at least one) then there is a Cached Images entry under the catalogues list for your convenience.

Image caching and retention is controllable in the **Settings**.

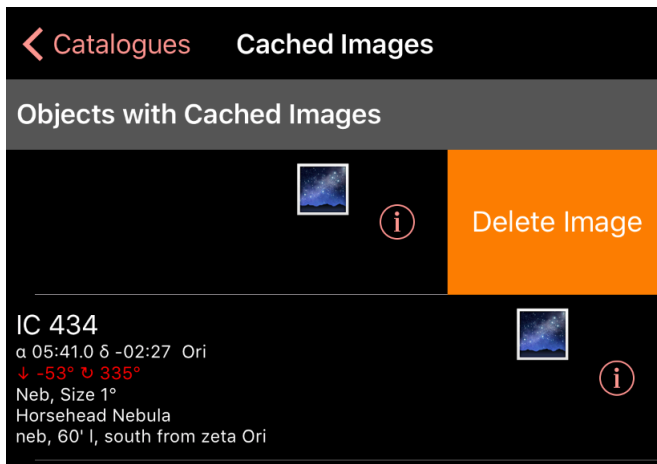
Note that all downloaded images are 1° by 1° in size. If your field of view is greater than 1° there may be an area of black around the image. Unfortunately this is a current limitation. However, a comprehensive star catalogue (2.5 million stars) is included and are appropriately shown behind the image.



For the solar system catalogue, images for the sun, moon, and planets are built into the app. When those im-

ages are displayed they are scaled to show you the size of the object as seen through your hardware.

If you want to delete a cached image for an object, you can navigate to the **Objects with Cached Images** view (from the **Catalogues** view), and swipe left on the appropriate object entry. You'll be able to select the **Delete Image** button.



Hardware Resources

Hardware resources are the items you use together to visualise an object.

The actual field of view of the eyepiece or imager is determined by the combination of telescope or camera lens, eyepiece or imager, and optional optical aid.

Note that you must specify *either* a telescope *or* a camera lens; *either* an eyepiece *or* an imager; or just a binocular.

Built-in

For each type of hardware resource there is a list of commercially available items.

As others become available, you will

be able to download them (when you start up the app, a check will be made and you'll optionally be able to download them).

AstroAid Eyepieces	
Takahashi - TMB	
Tele Vue Panoptic 22mm Focal Length: 22mm Apparent Field of View: 68°	i
Tele Vue Panoptic 24mm Focal Length: 24mm Apparent Field of View: 68°	i
Tele Vue Panoptic 27mm Focal Length: 27mm Apparent Field of View: 68°	i
Tele Vue Panoptic 35mm Focal Length: 35mm Apparent Field of View: 68°	i
Tele Vue Panoptic 41mm Focal Length: 41mm Apparent Field of View: 68°	i
Tele Vue Plossl 10.5mm Focal Length: 10.5mm Apparent Field of View: 50°	i
Tele Vue Plossl 11mm Focal Length: 11mm Apparent Field of View: 50°	i
Tele Vue Plossl 13mm Focal Length: 13mm Apparent Field of View: 50°	i
Tele Vue Plossl 15mm Focal Length: 15mm Apparent Field of View: 50°	i
Tele Vue Plossl 17mm Focal Length: 17mm Apparent Field of View: 50°	i
Tele Vue Plossl 20mm Focal Length: 20mm Apparent Field of View: 50°	i

When you click on the entry in the main view, that list will be presented to you.

Clicking on an entry will select that resource, and the field of view will change to reflect its use.

For Optical Aids, there is a special "None" entry at the top of the list that should be selected if you don't want any optical aid to be used. If you already have an optical aid selected, tapping it again will deselect it and choose the "None" entry.

If you click the "i" (information) button on the right of an entry, a table of useful additional information about that resource is revealed (e.g. magnification limits for telescopes, sensor dimensions for imagers, etc. Also, if you have compatible custom resources defined, the information will include sections showing the re-

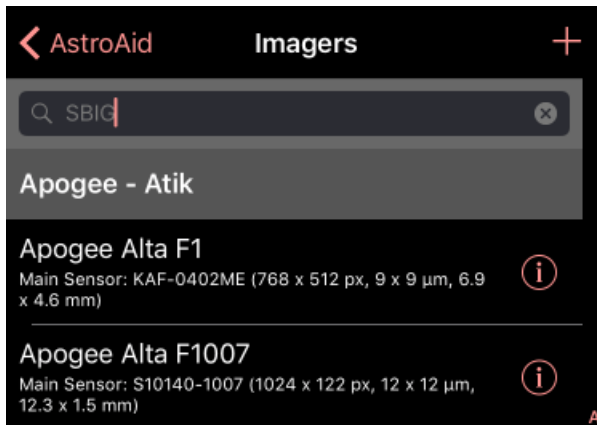
source in combination with those other resources.

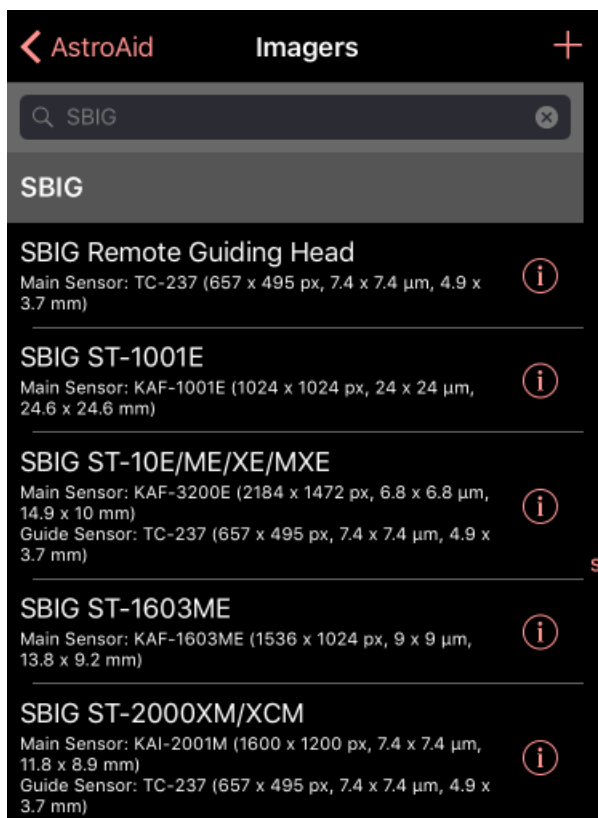
< Telescopes LX200 8"	
Name	Meade LX200 8"
Focal length	2000 mm
Aperture	203 mm
Focal ratio	f/9.9
Lower magnification limit	27 ×
Upper magnification limit	323 ×
Prime focus image scale	1.7 ' /mm
Field of acceptable definition	2 °
Minimum Airy disk diameter	1.3 "
FWHM (550nm)	1.1 "
Depth of focus (550nm)	0.26 mm
Optics	Schmidt-Cassegrain

Searching

You can search all the listed catalogues for text matches by typing into the search field at the top of the resources list. This will produce a list of resources of the given type that match the search text. e.g. Typing "SBIG" for imagers will provide a list

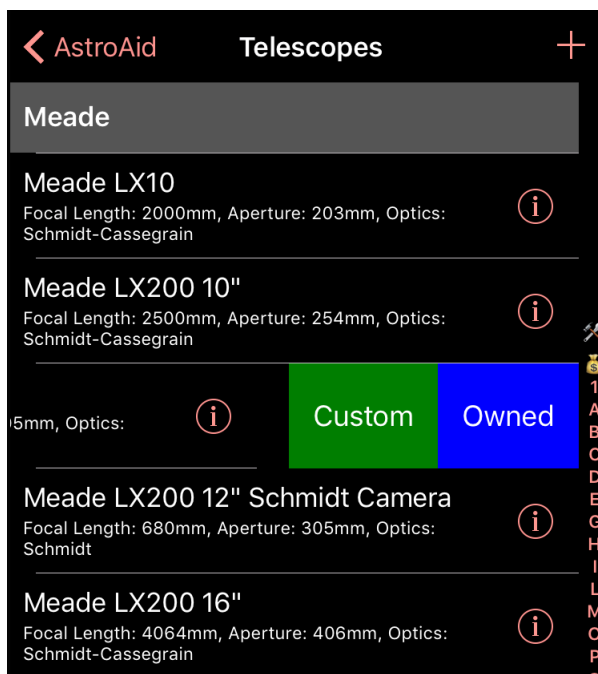
of all imagers from the SBIG company.



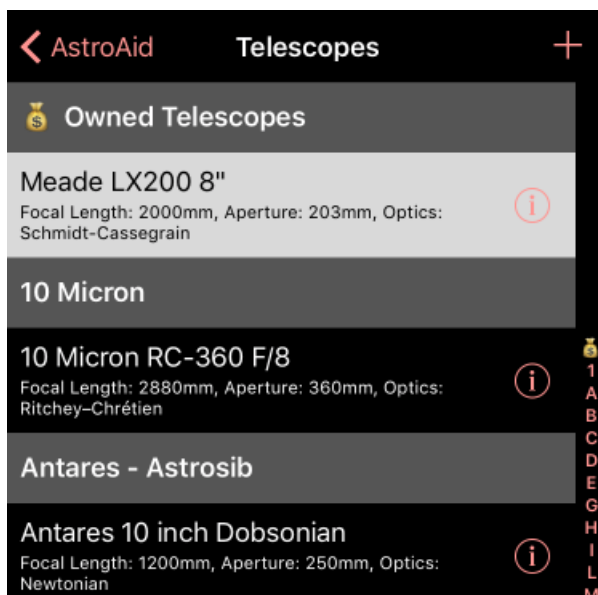


Owned Resources

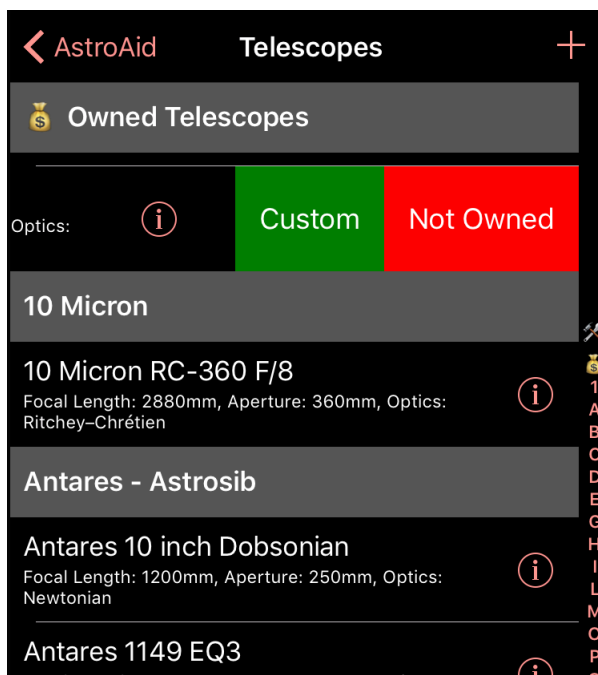
To make it more convenient to select from hardware you own or have access to, you can tag any resource as "Owned" by swiping the entry left and clicking the blue "Owned" button.



This moves the resource entry to the top of the list under an Owned section where it can be located more easily.



You can remove such owned entries from that status by swiping left again and clicking the red "Not Owned" button.



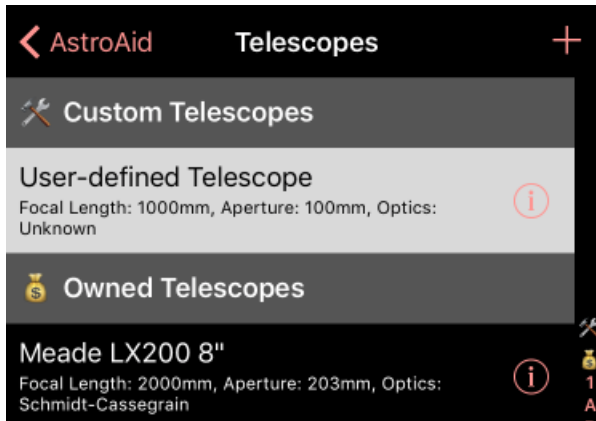
The owned status of your hardware resources will be synced between your iOS devices via iCloud (if you have it enabled).

Custom Resources

If your particular flavour of hardware does not exist in the list of known resources, you can create your own custom resource.

This is done by clicking the "+" button

at the top of the list of resources. This creates a new custom resource of the appropriate type, and adds it to a "Custom" section at the top of the list.



You can edit the custom resource's attributes by clicking the "i" (information) icon button for that entry.

< Telescopes Edit Telescope

Name

Focal Length (mm)

Aperture (mm)

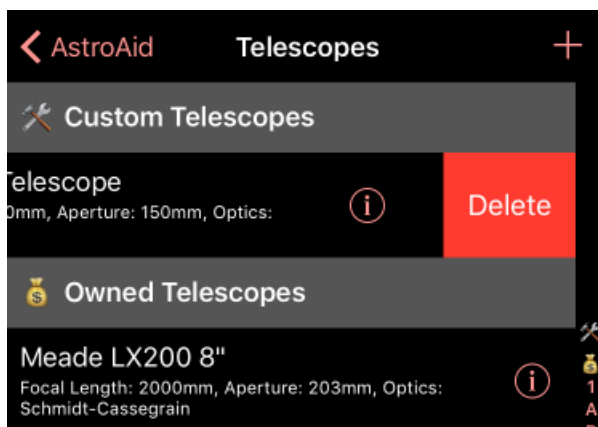
Optics

Unknown
 Refractor
 Newtonian
 Cassegrain
 Schmidt
 Schmidt-Cassegrain

Telescope Data

Focal ratio	f/15
Lower magnification limit	13 ×
Upper magnification limit	159 ×
Prime focus image scale	2.3 ' /mm
Field of acceptable definition	4 °

You can delete a custom resource entry by swiping it left and tapping the red "Delete" button.



You can also create a custom resource from a built-in resource. You do this by swiping left on a built-in entry and selecting the green "Custom" button. This will duplicate the built-in entry's parameter values into a separate custom entry¹.

1. For Imager resources with guider sensors, only the main sensor will be duplicated.

AstroAid

Telescopes

Meade

Meade LX10

Focal Length: 2000mm, Aperture: 203mm, Optics: Schmidt-Cassegrain

Meade LX200 10"

Focal Length: 2500mm, Aperture: 254mm, Optics: Schmidt-Cassegrain

5mm, Optics:

Custom

Owned

Meade LX200 12" Schmidt Camera

Focal Length: 680mm, Aperture: 305mm, Optics: Schmidt

Meade LX200 16"

Focal Length: 4064mm, Aperture: 406mm, Optics: Schmidt-Cassegrain

1

A

B

C

D

E

G

H

I

L

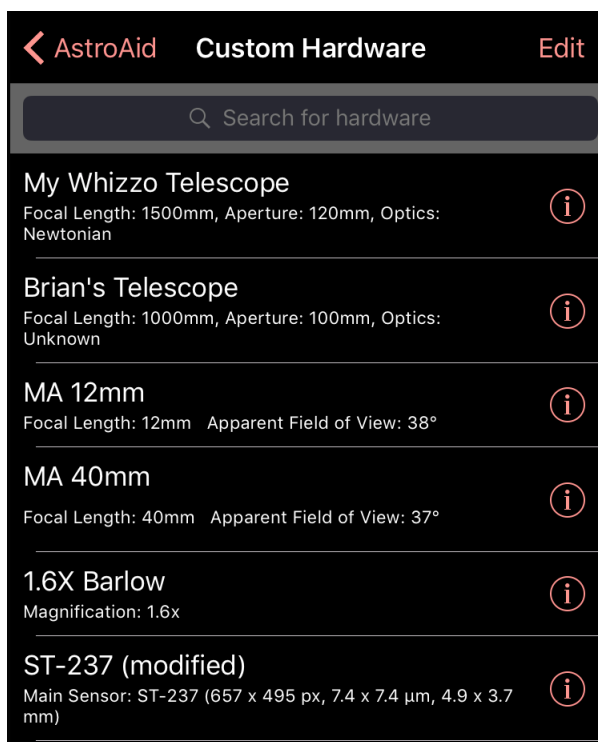
M

O

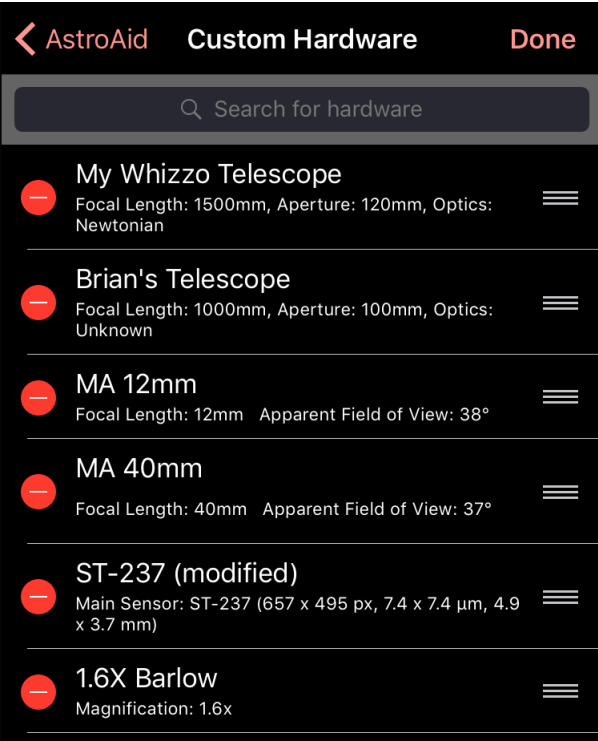
P

Custom Hardware

The Custom Hardware view summarises all of your custom hardware resources in one place. You can click on any of the items to select them.



You can use the Edit button at the top right to delete one or more of the custom resources displayed (by clicking the delete widget on the left of each entry), and to reorder them for your convenience (by dragging on the re-ordering widgets on the right). Click the Done button when you've finished.



System Data

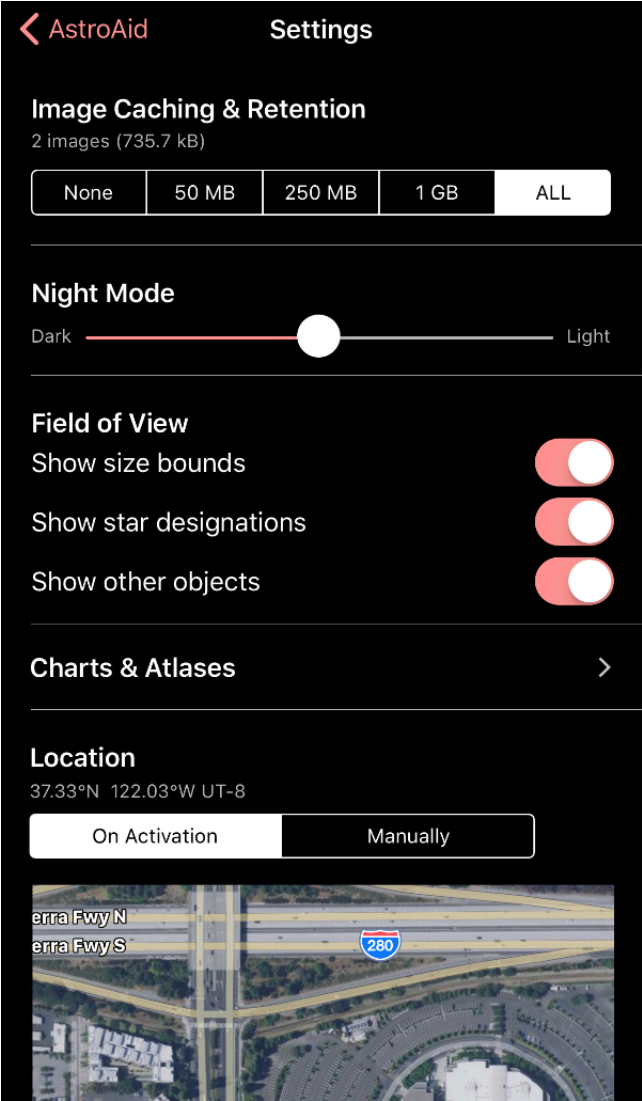
<div><div>< AstroAid</div><div>System Data</div></div>	
Imager Data	
Guide: Pixel size	↔ 7.4 x ↕ 7.4 μm
Guide: Pixels	↔ 657 x ↕ 495
Guide: Sensor size	↔ 4.9 x ↕ 3.7 mm
Object Data	
ID	IC 434
RA/Dec (J2000)	α 05:41.0 δ -02:27
Alt/Az	↑ 4° ↻ 264°
Constellation	Orion
Magnitude	Unknown
Type	Nebula
Size	1°
Name/s	Horsehead Nebula
Description	neb, 60' I, south from zeta Ori
Location & Time	
Site Latitude	37.33°N

The **System Data** entry on the main

screen displays a table of useful information about all the selected hardware resources and the selected object.

Values in red represent values that are outside acceptable limits. Values in blue represent values that change with time (e.g. altitude and azimuth)

Settings



Settings (from the main view) are preference settings that control some aspects of the app's function. They are preserved between runs of the app (but are **not** shared between devices).

Image cache

The **Image Caching and Retention** setting specifies how many images are retained in your image cache (an image is approximately 0.5MB). The values are:

- **None.** Only the currently viewed image is cached. As a new is downloaded, the previous one is deleted.
- **50MB.** All images are cached until the cache reaches 50MB in size (approximately 100 images). After that the oldest downloaded images are dropped and replaced by new ones.
- **250MB.** All images are cached until

the cache reaches 250MB in size (approximately 500 images). After that the oldest downloaded images are dropped and replaced by new ones.

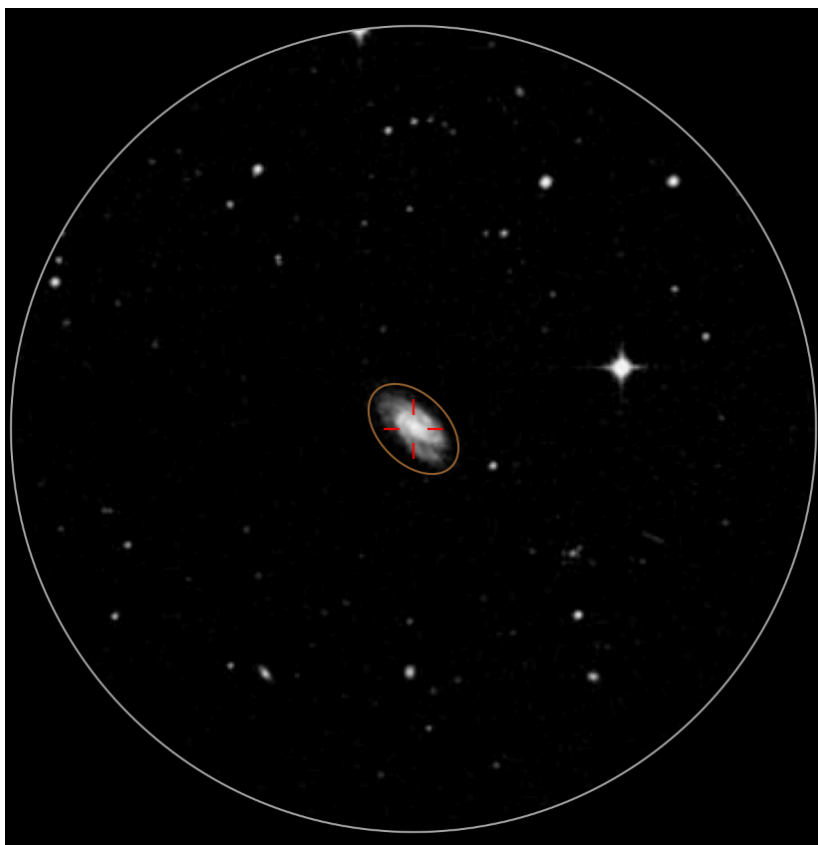
- **1GB.** All images are cached until the cache reaches 1GB in size (approximately 2000 images). After that the oldest downloaded images are dropped and replaced by new ones.
- **ALL.** All images are cached and retained (until the app is deleted, or one of the other values is selected).

Night Mode

When night mode is selected (see below) this setting specifies how dark/dim the screen will be.

Field of View

Switching on **Show size bounds** (default: off) will show the size bounds of the object in the field of view, if that object defines a size (and optionally a position angle). A light brown line is used to show the extent of the size.



Switching on **Show star designations** (default: off) will show the Bayer or Flamsteed designation of brighter background stars in the field of view.

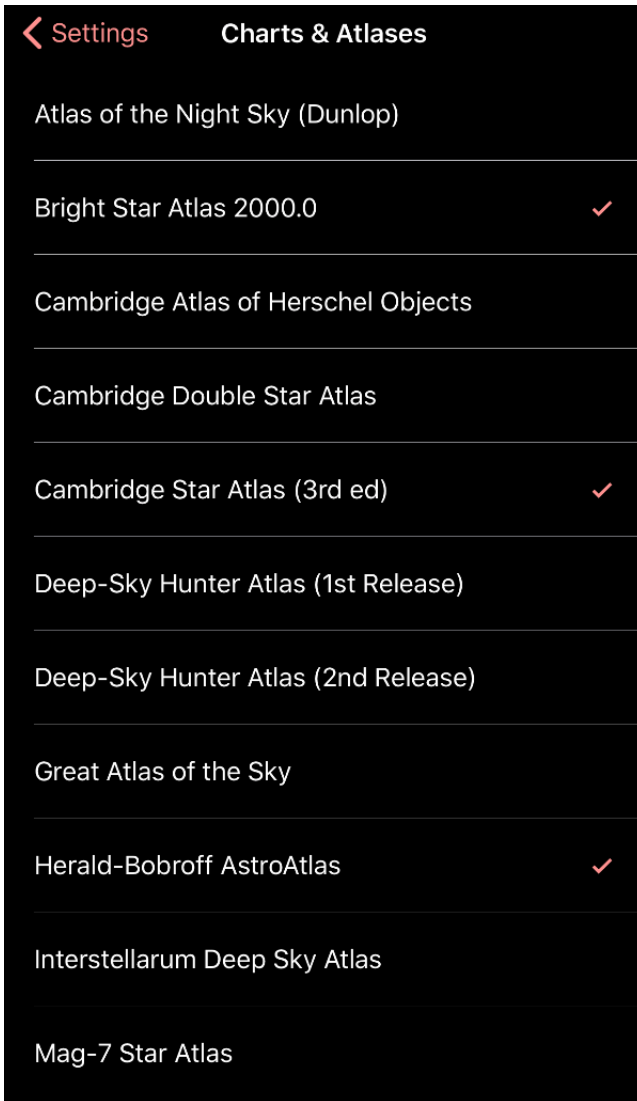
Switching on **Show other objects** will search the installed catalogues and show the position and designations of any other objects in the field of view.

Charts & Atlases

Tapping this will bring up a list of 30+ common charts and atlases that you might own or have access to.

You can select/deselect the entries by tapping on them.

When the information about an object is displayed, the page/chart number for the object's coordinates is shown for all selected charts/atlas.



The chart/atlas settings are shared with all of your devices via iCloud.

Location

The user's location (latitude/longitude) is used to determine the current visibility of objects in the night sky (i.e. altitude and azimuth). You can choose the location via three possible methods:

- **On Activation.** Whenever the app activates, the current location is determined (to an accuracy of 1km or better). This works if you have a device with GPS or connection to a known WiFi base station.
- **Manually.** If this is selected, the location will only get changed if you click the **Get** button.
- **Using the map.** You can scroll around the map and do a long press on a location of your choosing.

Site Information

Information about your observing site
(darkness rating on the Bortle scale).

Site Information

Site Darkness (Bortle Scale):

- 2 - Typical truly dark site
- 3 - Rural sky
- 4 - Rural/suburban transition
- 5 - Suburban sky
- 6 - Bright suburban sky
- 7 - Suburban/urban transition
- 8 - City sky

Sky Brightness: 19.6 mag/arcsec²

Naked-eye Magnitude Limit: +5.1

Night Vision

Enable Night vision mode by tapping the **Night** button at the top of the main view. This colours the entire screen dim and red, and changes the button to **Day**. Tapping this button again cancels night vision mode, as does exiting the app using the Home button.

