

Spyglass and Commander Compass User Guide



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Intro

This guide describes the features of:

- Spyglass 3.7.7
- Commander Compass 3.7.7
- Commander Compass Lite 3.7.7

All the software navigation products above belong to the Spyglass series.

Here is the **comparison table** of the 3 toolkits:

Features	Commander Compass Lite	Commander Compass	Spyglass
Core Features	✓	✓	✓
Color Themes		✓	✓
Camera			✓
Augmented Reality			✓
Rangefinder			✓
Sextant			✓

NB! Within the scope of this guide all the products will be referred to as Spyglass.

What is Spyglass?

Spyglass is a must-have toolkit for every outdoorsman, as it combines all the essential tools in one app – hi-tech viewfinder, milspec compass, [gyrocompass](#), maps, tactical GPS, waypoint tracker, speedometer, altimeter, Sun, Moon and star position finder, [attitude indicator](#), sniper's rangefinder, coordinate converter, [sextant](#), [inclinometer](#), [variometer](#), angular calculator and zoom camera.

Everyday Spyglass is used by lots of people in navigation, traveling, search and rescue, field and military missions, hunting, fishing, boating, sports, hiking, scouting, biking, street gaming, surveys, documenting, and may help with your everyday work – from taking location-aware pictures to aligning Wi-Fi, radio and satellite antennas.

See how else some of Spyglass owners use it:

"I work in film visual effects and lineups between the real world and the visual effects have to be exact. This solves a lot of problems!"

"I am a LE Sniper on a SWAT team. I have used this app several times while navigating on surveillance missions."

"I am on Home Owners Association Board. This app is excellent for documenting problems with violations, dead trees, etc. The images are legal documents."

"I have 16 towers that I have to aim equipment at daily. No guess work. Point and it'll tell me distance and direction. Love it!"

"I got this to help with death certificates. This has helped with 2 cases in just 3 weeks using it. The more I use it the better I like it. I have used it in searches for body recovery twice and I love it."

"I'm in the army and I do land nav all the time. I've this app for all my points in America and it even worked in Afghanistan."

"Works great for Geocaching. Thank you for a great product. So accurate it is amazing."

"I use it to give coordinates to medical helos for emergency landing zones."

As you may see, the range of use can be limited only by your imagination.

Key Settings

Important! Before you start using Spyglass you should properly set up your device in order to get precise readings. Below are some main things that you should keep in mind:

- **Allow Access to Location Services**

In order to access GPS features you should let Spyglass use Location Services. On the first launch Spyglass will ask for permission to use them. If this option is switched off for this app (or switched off in general), Spyglass will notify you about this when you open the app. You can either tap OK or tap the Settings button which will direct you to all privacy settings for Spyglass so you could allow location access while using the app. To make sure that Location Services are turned on in general open the Settings of your device, find Privacy, choose Location Services and enable the option.

- **Allow Access to Camera**

To access augmented reality features you should give permission to use Camera. If camera is switched off for this app, Spyglass will notify you about this when you open the app. You can either tap OK or tap the Settings button which will direct you to all privacy settings for Spyglass so you could allow to access Camera.

- **Allow Access to Photos**

For being able to document locations and save photos via Spyglass, you will need to allow access to your photo library. You can either agree when the system asks for the permission, or turn the option on manually if you open the Settings of your device, find Privacy and choose Photos.

- **Enable Compass Calibration**

In order to get precise sensor readings you will need to turn on the Compass Calibration option in your device. To do that open your device Settings, find Privacy, choose Location Services and then scroll down to find the System Services, tap it and enable the Compass Calibration.

- **Connect to the Internet to use maps to their fullest**

In order to use maps to their fullest you should have Internet connection. The areas of the maps, which you browse when online, will be cached and available later on even when offline. However, in order to open new areas you will need to be connected to the Internet.

- **Offline Usage**

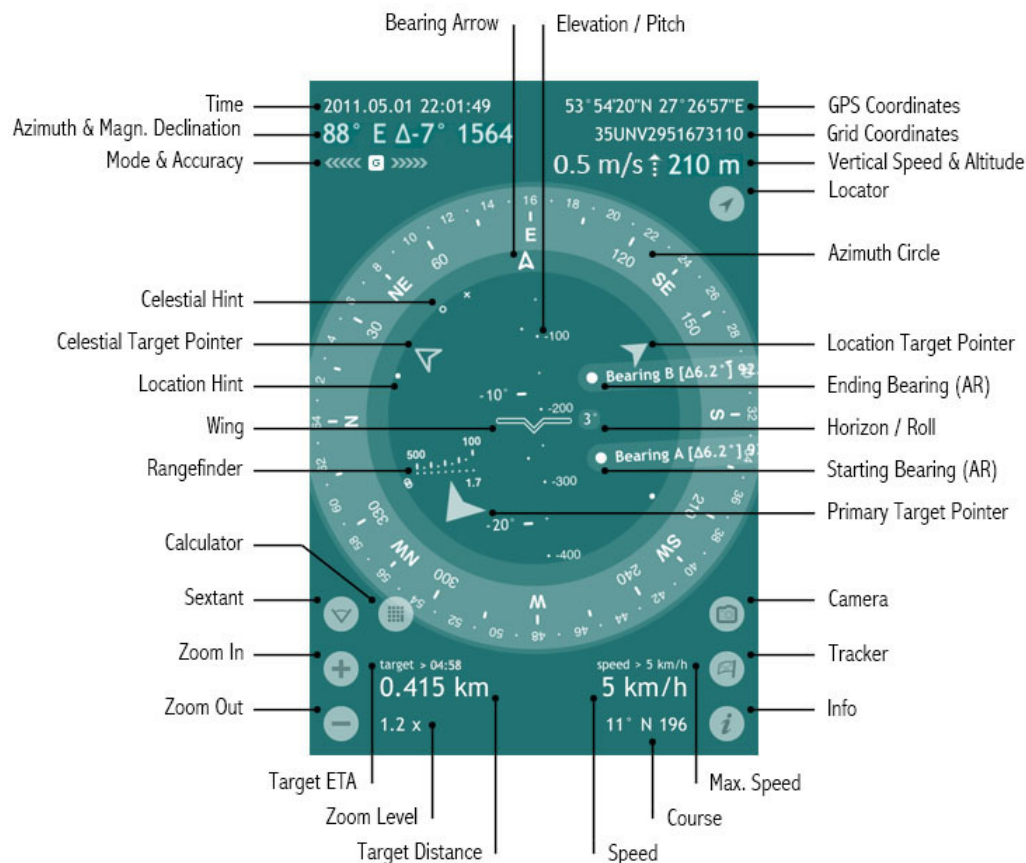
Spyglass also works when offline. To check the Offline mode turn off Wi-Fi and Cellular Data in your device settings. Don't turn the Airplane mode on, as this will switch off Location Services and GPS.

Tip: For better info assimilation read the manual piecemeal and try to practise each particular feature right after reading about it. It has a steep learning curve, but you will see that it's worth it.

What's on Screen (HUD)?

Spyglass reads lots of different data from all the hardware sensors of your device, analyzes and presents it on the main screen in a head-up display (HUD) style.

HUD is any transparent display that presents data without requiring users to look away from their usual viewpoints. The origin of the name stems from a pilot being able to view information with the head positioned "up" and looking forward, instead of angled down looking at lower instruments. In Spyglass HUD may be overlaid over the live image from the camera (thus making the augmented reality features technically possible), maps or over the background color of your choice.



Elevation/Pitch angle is the angle between the horizontal line that your sight forms when you look straight and the line to some particular point above. In Spyglass the elevation angle is marked with Wing or Crosshair and shows how much your device is tilted back or forth. The elevation scale is calibrated with degrees and mils and is


perpendicular to the horizon line.

GPS Coordinates – geodesic latitude and longitude coordinates of your current location, expressed in degrees, minutes and seconds (depending on the chosen coordinate format) along with the corresponding hemispheres.

Grid Coordinates – your current location in the coordinates of the chosen grid coordinate system (MGRS, UTM or OSGB/BNG), to which numbers and letters are assigned for use in designating a point on a gridded map.

Vertical Speed indicator shows your current vertical speed in knots, feet per minute or metres per second, depending on your country and set-up units. The vertical speed data will appear to the left of the altitude readings for vertical speeds higher than 80fpm (0.4m/s).

Altitude – current height above sea level.

Locator  lets you return to the actual GPS readings after manual settings.

Azimuth Circle measures azimuths and bearings. In Spyglass the azimuth circle is graduated with degrees, mils and points of the compass (marking divisions of the four cardinal directions). The current azimuth or bearing is marked with the Bearing Arrow.


Location Target Pointer – points in the direction of an important location or object.


Starting Bearing (AR) and **Ending Bearing (AR)** are the augmented reality (AR) markers, used for the visual angle measurement, performed by the Sextant tool.

Horizon/Roll angle shows how much the device is tilted left or right.

Primary Target Pointer – points in the direction of the target of your primary interest.

Camera  lets you instantly take pictures or screenshots overlaid with all the necessary location data.

Tracker  opens the Destinations menu, via which you can add new destinations (bearings, locations, terrestrial and celestial objects) and manage the saved ones.

Info  opens the Settings & Calibration menu.

Max. Speed – the maximum movement speed within the current session.



Course – your current movement direction.


Speed – your current movement speed (in kilometers, miles or nautical miles – depending on your settings).


Target Distance – the distance to the primary target (if it's a terrestrial object) or the azimuth and elevation of the primary target (if it's a celestial body).

Zoom Level – zoom factor for the live camera picture / scale factor for maps.

Target ETA – estimated time of arrival at your primary target (provided that the distance decreases over time and the current speed is over 1 km/h).

Zoom In  and **Zoom Out**  magnify and minify either the live camera picture or maps – whichever is active. The corresponding zoom level is also applied to the augmented reality object mapping and the measurement scales of the HUD. You can also magnify and minify the picture with zoom and pinch gestures.

Sextant/Inclinometer  is an instrument for measuring angles of slope (or tilt), elevation or depression of an object with respect to gravity. In Spyglass it measures azimuth (yaw), elevation (pitch), horizon (roll) angle deltas and lets you visually measure angles between two bearings, two points on the live camera image or two device attitudes.

Calculator button  appears to the right of the Sextant button after the Starting and Ending Bearings have been set. Angular Calculator allows to calculate distances to objects, angles between objects and sizes of objects.


Rangefinder reticle allows you to quickly measure the distance to objects of a determinate height (1.7m/5.6ft).

Wing reticle represents the actual wings in the attitude indicator (an instrument used in an aircraft to inform the pilot of the orientation of the aircraft relative to Earth's horizon) and is used to align the horizon. It can be turned off or replaced with the Crosshair reticle in the settings. The reticle also marks the current elevation angle on the Elevation scale.

Location Hint – points in the direction of a secondary location or object.

Celestial Target Pointer – points in the direction of an important celestial object.

Celestial Hint – points in the direction of a secondary celestial object.

Mode & Accuracy – the current compass mode and its accuracy along with the current accuracy of GPS. “G” stands for the gyrocompass mode, “M” – for manual orientation, “C” – for the car mode and “” – for the magnetic mode. The arrows

pointing to the left show the accuracy level of magnetic compass, while the arrows pointing to the right show the current GPS accuracy.



Azimuth represents the direction to an object referenced from due north and measured clockwise through a full 360° circle. In Spyglass the current true or magnetic geodesic azimuth is shown in degrees and mils and is complemented by the corresponding intercardinal directions.

Magnetic Declination is the angle between magnetic north and true north.

Time – current date (YYYY.MM.DD) and time (HH:MM:SS).


Bearing Arrow points in the current direction you are facing and marks the correspondent azimuth. The Elevation/Pitch scale serves here as the shaft of the Bearing Arrow.

What You Can Do with Spyglass


Add Destinations for Tracking and Finding

How to Add Your Current Location

Adding your current location for tracking might be useful when you are leaving your car somewhere in the wilds or in a parking lot and will need to get back to it later. To add your current location you need to:


- 1) Tap the Tracker button 
- 2) Choose Add Current Location
- 3) Name the location
- 4) See its pointer (large solid arrow) within the azimuth circle

When you are indoors the GPS readings may be off, so you can add your current location via maps for better precision:

- 1) Tap the Tracker button 
- 2) Choose Add Map Location
- 3) Center the cross on your current location and tap Done
- 4) Name the location
- 5) See its pointer (large solid arrow) within the azimuth circle

How to Add Your Current Bearing


To add your current bearing for tracking:

- 1) Make your device face the necessary direction
- 2) Tap the Tracker button 
- 3) Choose Add Current Bearing
- 4) Name the bearing
- 5) See its augmented reality marker (big solid circle) on the screen

How to Add Map Location

NB! To use maps to their fullest the Internet connection is required!

To add a location via maps:


- 1) Tap the Tracker button 
- 2) Choose Add Map Location
- 3) Pan the map and center the cross on the location or object you'd like to add
- 4) Tap Done and name the location
- 5) See its pointer (large solid arrow) within the azimuth circle

If you know the precise coordinates of some location you can open the map (Tracker button - Add Map Location) and tap the top left area of the screen (the one with coordinates and distance). This will open a small window, where you can manually type the coordinates or paste a link in any supported format. After you do this, the cross on the map will automatically centre on the location. Tap Done and see the location pointer within the azimuth circle.

How to Add Spot at Particular Distance



In some cases you might need to add a spot at some particular distance. E.g. when you are searching for a cache and need to follow the instructions, like “walk West for 100 m”.

To add a location with the distance to it:

- 1) Rotate your device until it faces the desired direction
- 2) Tap the Tracker button 
- 3) Choose Add With Distance
- 4) Enter the distance to the target and tap Done
- 5) Name the location
- 6) See its pointer (large solid arrow) within the azimuth circle



How to Add Location with Known Coordinates

To add a location with known coordinates:

- 1) Tap the Tracker button 
- 2) Choose Manage Destinations
- 3) Tap  or New Destination
- 4) Choose Location
- 5) Give it a name
- 6) Choose the pointer/hint type (read “How Your Added Locations/Objects/ Bearings/Stars Are Displayed On The Screen”)
- 7) Enter the latitude and longitude or grid coordinates in any format
- 8) See its pointer/hint within the azimuth circle

How to Add Bearing with Known Azimuth and Elevation

To add a bearing with known azimuth and elevation:



- 1) Tap the Tracker button 
- 2) Choose Manage Destinations
- 3) Tap  or New Destination
- 4) Choose Bearing
- 5) Give it a name

- 6) Choose the pointer/hint type (read “How Your Added Locations/Objects/ Bearings/Stars Are Displayed On The Screen”)
- 7) Enter the azimuth and elevation data
- 8) See its marker/pointer on the screen




How to Add Star with Known Coordinates


To add a star with known coordinates:

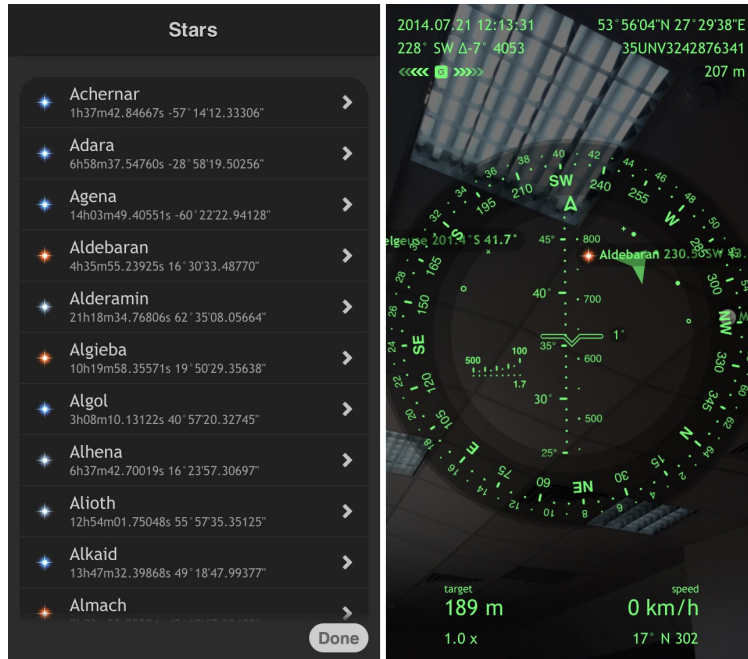
- 1) Tap the Tracker button 
- 2) Choose Manage Destinations
- 3) Tap  or New Destination
- 4) Choose Star
- 5) Give it a name
- 6) Choose the pointer/hint type (read “How Your Added Locations/Objects/ Bearings/Stars Are Displayed On The Screen”)
- 7) Enter the right ascension, declination and proper motion data
- 8) See its marker/pointer on the screen

How to Add Star from the Catalogue

Spyglass has a built-in catalogue of the brightest stars. If you'd like to add one of them in order to find it in the night sky, you should:



- 1) Tap the Tracker button 
- 2) Choose Manage Destinations

- 3) Tap  or New Destination
- 4) Choose Star From Catalogue
- 5) Pick a star
- 6) See its marker/pointer on the screen



How to Paste Location

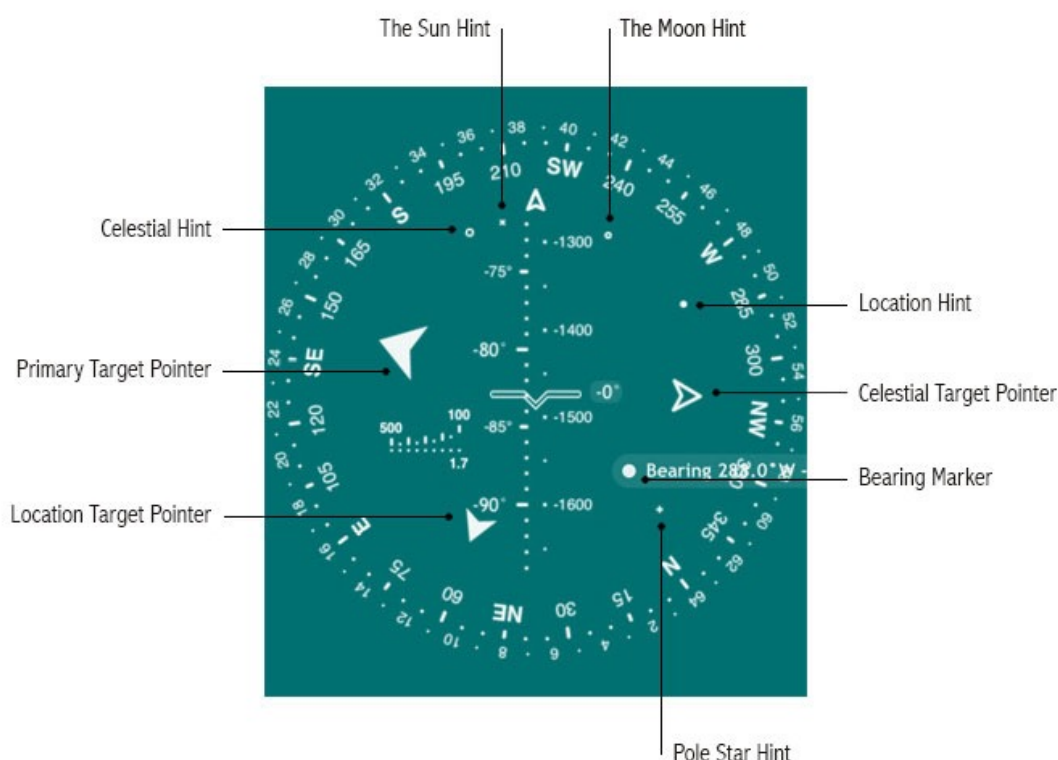
The **Paste** option allows you to paste locations in many different coordinate formats and as map links (Google, Yandex and Bing). As soon as you copy some link or coordinates from mail, web or anywhere else and open Spyglass, it will automatically suggest importing the coordinates. You can however tap cancel and paste them later manually:

- 1) Tap the Tracker button 
- 2) Choose Manage Destinations
- 3) Tap  or New Destination
- 4) Choose Paste
- 5) Name the Location
- 6) Choose the pointer/hint type
- 7) See its pointer/hint within the azimuth circle

Track and Find Your Added Destinations


How Your Added Locations/Objects/Bearings/Stars Are Shown on the Screen

When you add locations and objects for tracking, they instantly appear on the screen. Depending on their importance, the targets will be marked with different symbols:




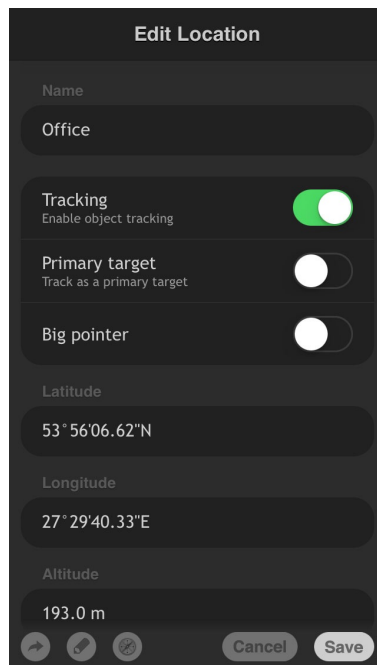
- **Primary Target Pointer** – magnified arrow that points in the direction of your primary target
- **Location Target Pointer** (Big pointer) – solid arrow that points in the direction of an important location or terrestrial object
- **Celestial Target Pointer** (Big pointer) – hollow arrow that points in the direction of an important celestial object
- **Location Hint** – small solid circle that hints the direction to a location or terrestrial object of secondary importance
- **Celestial Hint** – small hollow circle that hints the direction to a celestial object of secondary importance
- **Bearing Marker** – big solid circle that marks a bearing
- **The Sun Hint** - tiny “x” that hints the direction to the Sun
- **The Moon Hint** - tiny “o” that hints the direction to the Moon
- **Pole Star Hint** - tiny “+” that hints the direction to the North Star (Polaris)

Thus, arrows are Big Pointers and show the directions to the locations and objects of primary importance. Circles are small pointers and hint the directions to the locations and objects of secondary importance.

When you add a location or object right after tapping the Tracker button , Spyglass will automatically mark it with the primary target pointer, thus making it a target of primary importance.

But you can always change the pointer manually:

- 1) Tap the Tracker button 
- 2) Choose Manage Destinations
- 3) Pick the destination
- 4) Turn the Big Pointer option on/off



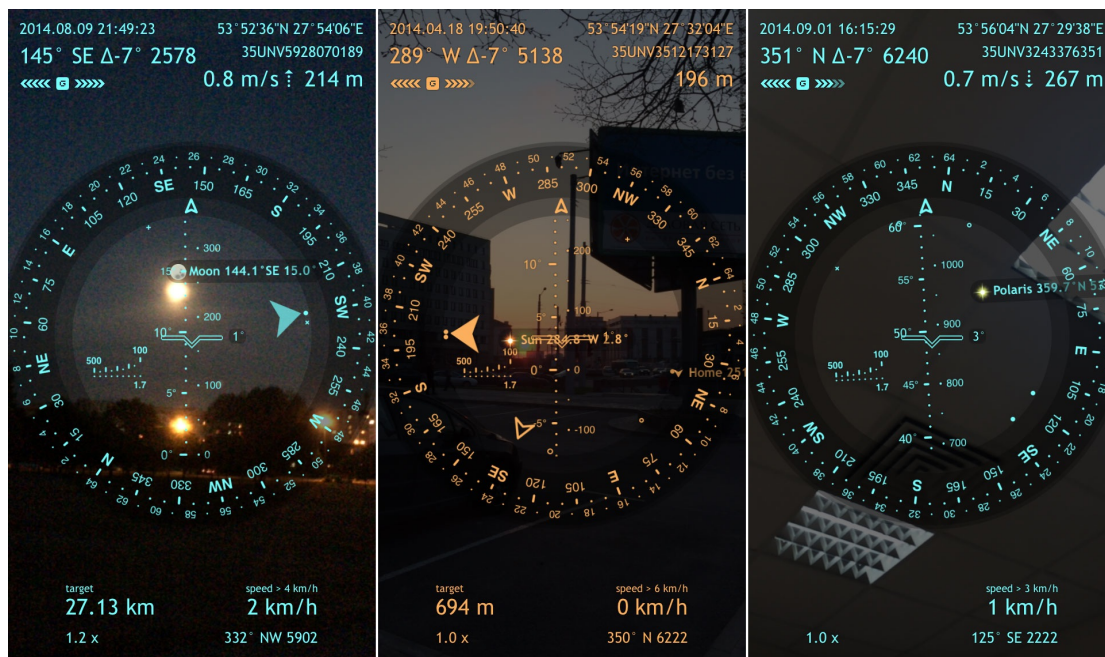
How to Find the Way to Your Added Location/Object/Bearing/Star

After you've added a destination (location, bearing, terrestrial or celestial object), Spyglass will automatically start tracking it, unless you set up otherwise. And you will see its pointer within the azimuth circle. To reach the destination you need to follow the pointer or hint. This can be done in 2 ways:


- 1) When your device is parallel to the ground (i.e. the app works as a common 2D compass), a pointer/hint shows the direction to the object's (location's) azimuth. That is, if you turn your body and your device accordingly so that the bearing arrow would match the pointer/hint and go straight in this direction, you will finally reach the object (location).

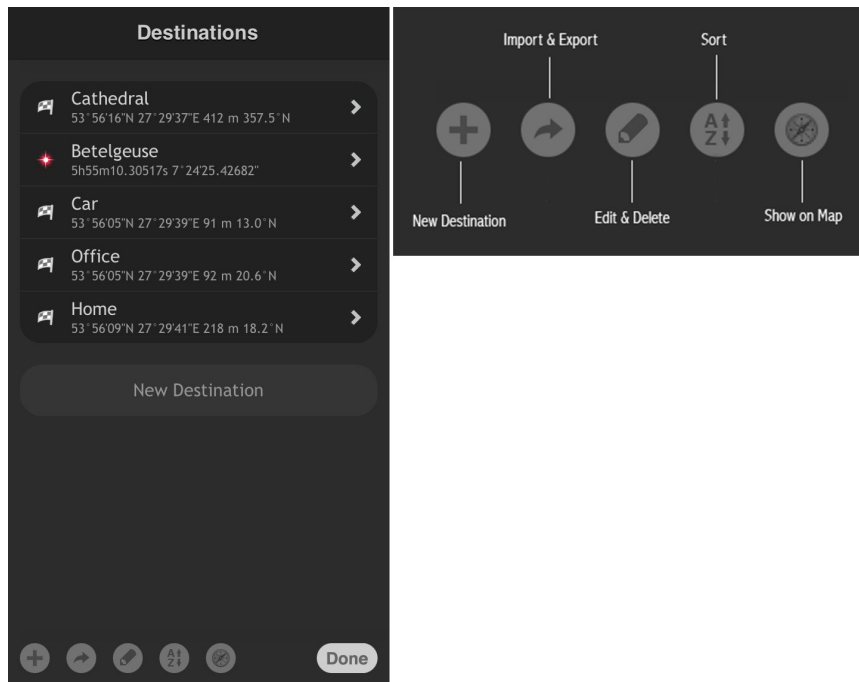
- 2) When your device is in portrait orientation and the camera is on (i.e the app works as a 3D compass), a pointer/hint shows the direction in which you need to rotate the device in order to see the object via camera. When the object comes into view, the information about its name, azimuth, elevation and distance appears next to its marker. Locations on the opposite side of the Earth will appear deep below your feet, while locations like the roofs of the nearby skyscrapers will be high above your head.

By default Spyglass also tracks the Sun, the Moon and the North Star (Polaris). When your device is rotated in their direction, they (and the tracked stars chosen from the catalogue or added manually) are marked with photorealistic **graphic markers**, complemented by name, azimuth and elevation.

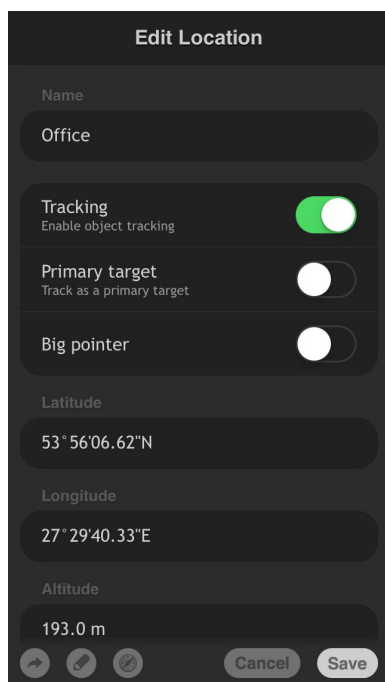


Edit Your Saved Destinations


All your saved destinations (locations, bearings, terrestrial and celestial objects) can be found on the Destinations list – tap the Tracker button  and choose Manage Destinations. This will open the list with your destinations, where you can create new ones and manage the saved ones:




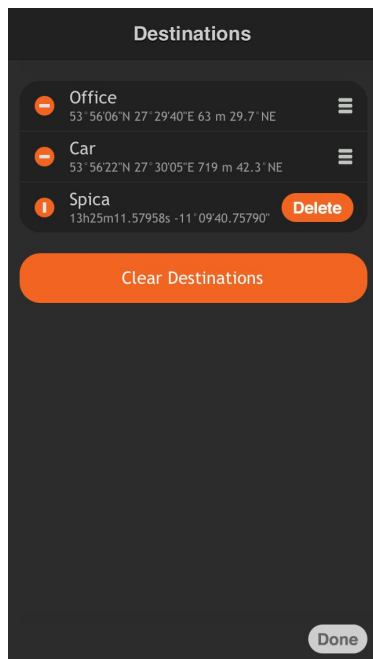
To **edit** a particular destination, find it on the list, tap it and change the necessary parameters.



To **sort** destinations, tap the Sort button  and sort by Name, Type and Name or Range and Visibility.

To **see** your locations **on a map**, tap the Maps button  and choose to show either all or only the tracked locations on a map.


To **delete** a destination swipe right and tap Delete or tap the Edit & Delete button , tap the circle to the left from the destination and press Delete. To delete all your destinations tap Clear Destinations.

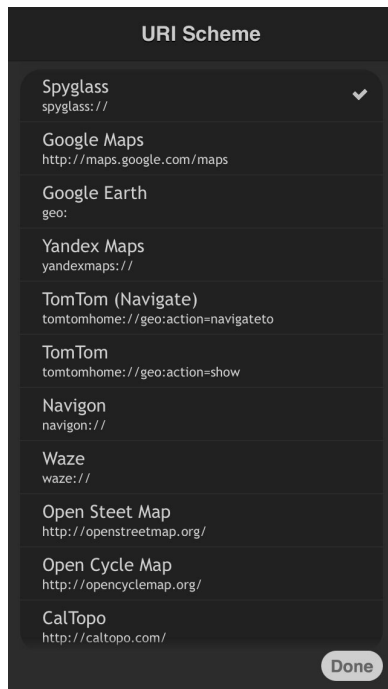


Share Your Destinations with Friends

How to Share Your Current Location

With Spyglass you can share your current location with friends so that they could see where you are and find a way to this location:

- 1) Choose the link scheme depending on the software installed on your recipient's device:
 - tap the Info button 
 - choose Settings
 - scroll down till the Units section
 - find URI sharing scheme
 - choose the scheme (e.g. if Spyglass is installed on your friend's device, choose Spyglass):



- 2) Long tap the screen
- 3) Choose Share via Email or Share via Message


If you choose the **Share via Email** option, the message will contain the coordinates of the location, the link via the scheme which you define in the Settings and the .spyglass, .kml and .gpx files.



If you choose the **Share via Message** option, the message will contain the coordinates of the location and the link via the scheme which you define in the Settings.

When the recipient receives the message, all they need to do is tap the link and the location will open via the app they are using. If there is no navigation app installed on the recipient's device, you can choose the Google Maps link (for example), which can be easily opened on iOS devices as well as on desktops.

How to Share Your Saved Location/Object/Bearing/Star

To share some location or star from your saved list of destinations:



- 1) Choose the link scheme depending on the software installed on your recipient's device:
 - tap the Info button 
 - choose Settings
 - scroll down till the Units section
 - find URI sharing scheme
 - choose the scheme (e.g. if Spyglass is installed on your friend's device, choose Spyglass)

- 2) Tap the Tracker button 
- 3) Choose Manage Destinations
- 4) Pick the destination you'd like to share
- 5) Tap the Export button 
- 6) Choose Share via Email or Share via Message



When the recipient receives the message, all they need to do is tap the link and the location will open via the app they are using. If there is no navigation app installed on the recipient's device, you can send the Google Maps link (for example), which can be easily opened on iOS devices as well as on desktops.

Export/Import Multiple Waypoints

To export your waypoints via iTunes:



- 1) Press the Tracker button 
- 2) Choose Manage Destinations
- 3) Tap the Export button 
- 4) Choose Save to iTunes
- 5) Select file format and tap Done
- 6) Enter file name and tap Done

To import your waypoints via iTunes:

- 1) Press the Tracker button 
- 2) Choose Manage Destinations
- 3) Tap the Export button 
- 4) Choose Load from iTunes
- 5) Select file you'd like to load and tap Done

To learn how iTunes File Sharing works visit the "[iOS: About File Sharing](#)" section in Apple Support.



To export all your waypoints via Email:




- 1) Press the Tracker button 
- 2) Choose Manage Destinations
- 3) Tap the Export button 
- 4) Choose Share via Email

The message will have the .spyglass, .kml and .gpx files attached.

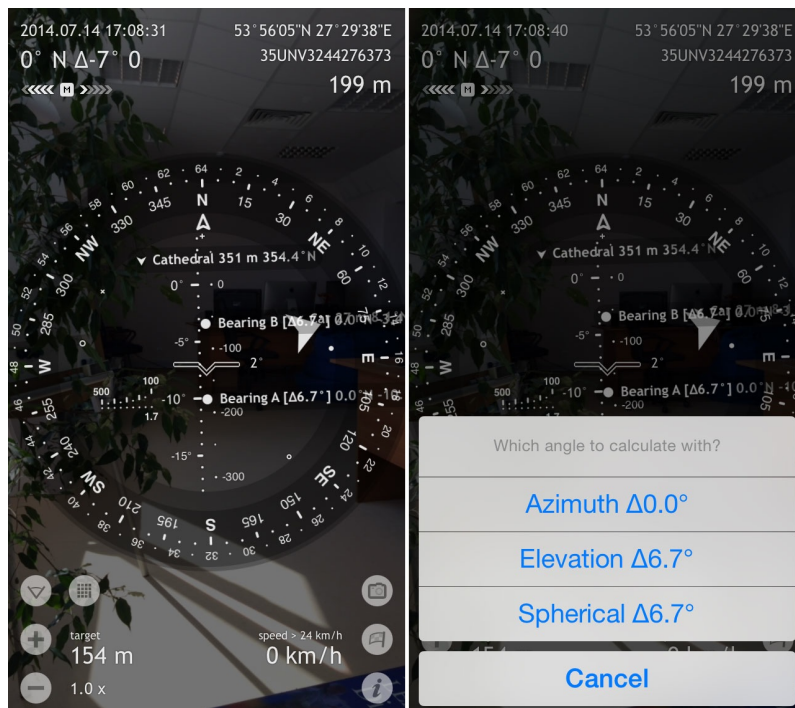
Take Measurements

How to Measure Angle between 2 Points / 2 Device Attitudes

With Spyglass you can measure angles between two bearings, two points on live camera image or two device attitudes. E.g. you can lay your device on a table and tap the Sextant button  once to set the starting bearing (Bearing A). Then you change the attitude of your device and tap the button for the second time to set the ending bearing (Bearing B) and complete the measurement. Tap the Calculator button , that will appear next to the Sextant button, and see the measured angle deltas.

When the camera is on, you can also use the Sextant tool to measure the azimuth and elevation angles. Visually mark the initial point with the help of the Wing and tap the Sextant button  to set the starting bearing A. Then mark the ending point and tap the Sextant button  again to set the ending bearing B. Then tap the Calculator button  to see the measured azimuth, elevation and spherical angles.


The measured angles will help you to calculate size of the objects of your interest or distance to them.

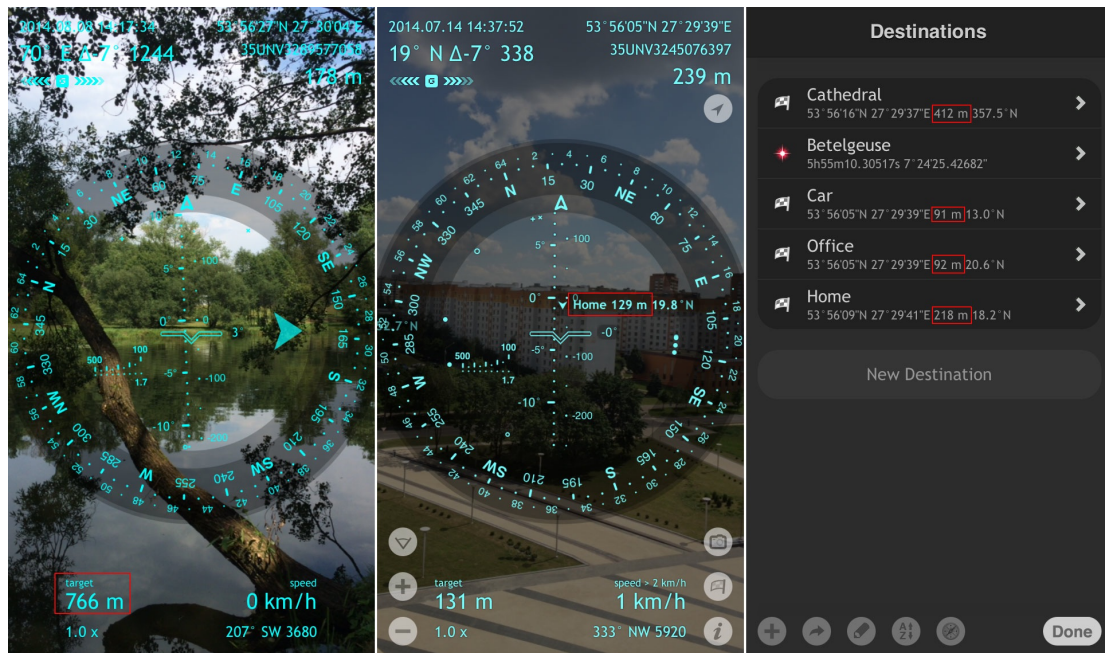


Delta azimuth and delta elevation angles can also be easily calculated in your mind. Memorize the azimuth (at the top left part of the screen)/elevation (on the elevation scale) readings for the initial and final positions and calculate the difference.

How to Find Distance to Added Location/Object

When you add a location for tracking Spyglass always shows the distance to it:

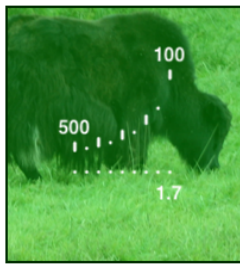
- at the bottom left part of the screen - the distance to your primary target
- next to the augmented reality marker - after you rotate the device in the direction of the location
- on the Destinations list (Tracker button  - Manage Destinations)



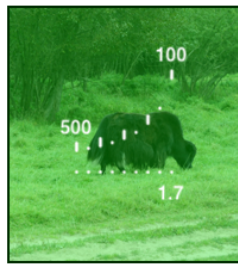
How to Use Rangefinder to Measure Distance

Just like a reticle in a sniper rifle the rangefinder in Spyglass is based on the height of an average human (1.7 meters/5.6 feet) and is used to visually measure the distance to a human, a deer or some object of a similar height. The scale shows the distance from 100 to 500 meters (300 to 1500 feet) with a 50-meter (150-feet) step.

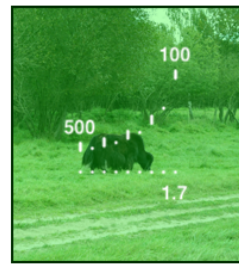
We'll take a bison as an example:



half fits between 100m marks:
distance is 50m
(divided by 2)



fully fits between 150m marks:
distance is 150m







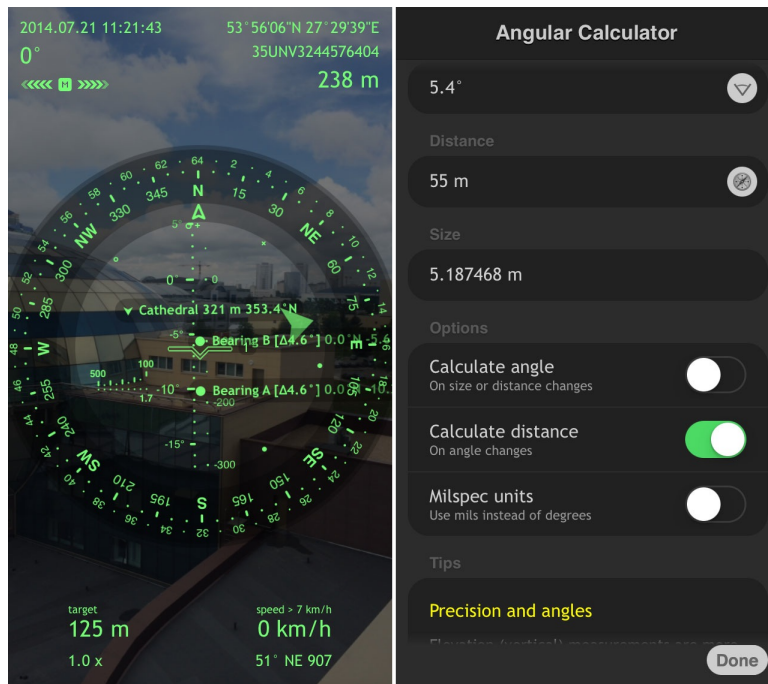
fully fits between 250m marks:
distance is 250m

When a bison fits between the third (from the right) upper and lower marks, then the approximate distance to it is 250 meters. If only half fits between the 100-meter marks, the approximate distance is 50 meters. For a more precise measurement you can use zoom. The reticle will zoom accordingly.

How to Measure Size of Objects

Knowing the distance to an object you can easily measure its size (height, width, diagonal size).

To find out the height of an object centre the Wing on the bottom point of the object and tap  to set the Bearing A. Then center the Wing on the top point of the object and tap  again to set the Bearing B. Tap the Calculator button  and choose the elevation angle. Then manually enter the distance to the object (using any units you like) or measure it on a map (tap the Maps button  on the Distance field) and tap Done. The object height will appear in the corresponding field.



Just as well by marking the leftmost and rightmost points of an object and calculating with the azimuth angle you can find out the width of the object. And by marking the bottom left and top right points and calculating with the spherical angle - the diagonal size of the object.



And vice versa - if you know the height, width or diagonal size of an object, you can calculate the distance to it.

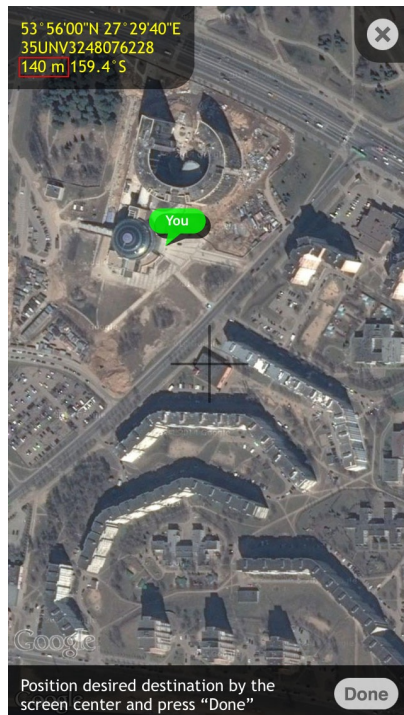


Angle ~ 7.9° (measured with sextant)
 Distance ~ 43.5m (measured with maps)
 Height of two building levels ~ 6m (computed)

How to Find Distance from Your Current Position to Other Location




To find out the distance from your current location to some other one:

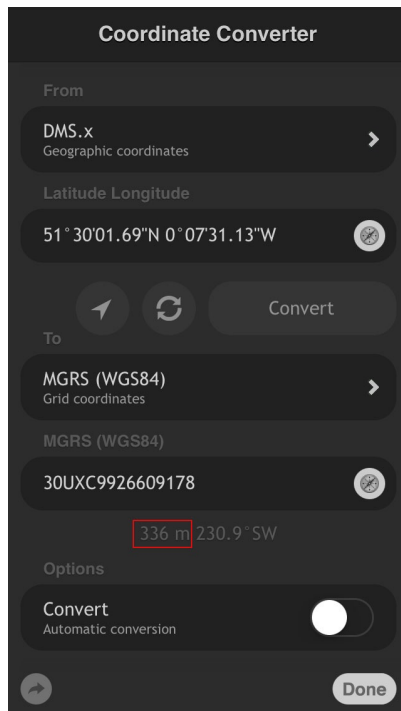
- 1) Tap the Info button  / tap the Tracker button 
- 2) Choose Location / choose Add Map Location
- 3) Center the cross on the ending location
- 4) See the distance to it at the top left part of the screen





How to Find Distance between Two Locations on Maps

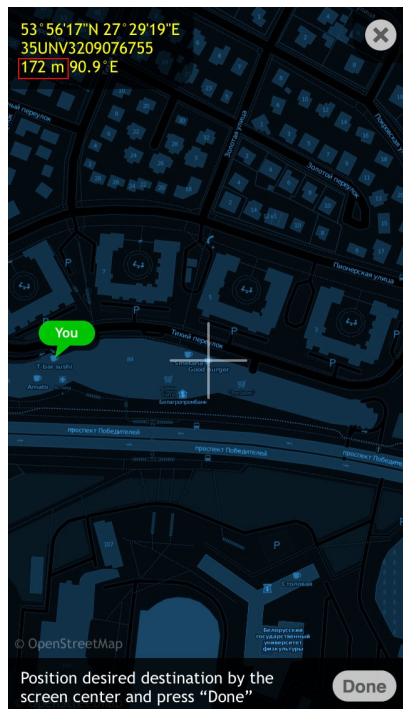
To find out the distance between 2 locations:

- 1) Tap the Info button 
- 2) Choose Converter
- 3) Turn the Automatic conversion off
- 4) Tap the Maps button  in the From section
- 5) Center the cross on the initial location and tap Done
- 6) Tap the Maps button  in the To section
- 7) Center the cross on the ending location and tap Done
- 8) See the distance between the two locations at the bottom of the screen



There's also another way to use maps for finding the distance between 2 locations on maps:

- 1) Tap the Info button 
- 2) Choose Location
- 3) Center the cross on the initial location and tap Done
- 4) Tap the Info button  and choose Location again (the initial location will be pinned as "You")
- 5) Pan the map and center the cross on the ending location
- 6) See the distance between the two locations at the top left part of the screen



How to Use Compass and Measure Azimuth

To measure the **azimuth** of an object you need to place your device in the position of 2D compass (parallel to the floor) and direct the bearing arrow at the object. You will find the current azimuth in degrees and military units at the top left part of the screen.

Note: automatic azimuth determination is only available on the devices with the built-in hardware digital compass sensor. Otherwise (depending on the current compass mode) the current azimuth angle may be set either manually or with the course of movement (read the “Navigate by Stars, Noticeable Objects and Course” section below).

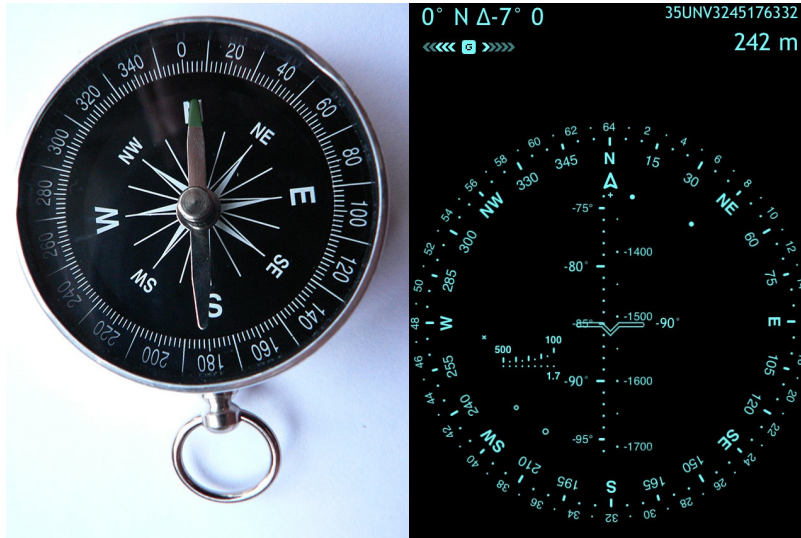
Azimuth angle deltas can also be measured with the help of Inclinator via the Sextant tool.

How to Find North with Spyglass Compass

One of the basic things you need to know about Spyglass before using it is that there is a principal (and for some - confusing) functional difference between a standard compass needle and the Spyglass bearing arrow.

As you might know, the red (green or of other color) part of the needle on standard compasses is always pointing towards the earth’s magnetic north pole no matter where you stand on Earth. However, the bearing arrow in Spyglass is pointing the direction you are now facing (i.e. the azimuth). So in order to find North with Spyglass

compass you simply need to rotate your device until the bearing arrow matches the N mark.



How to Measure Elevation of an Object

To measure the elevation angle, turn your body until the object is straight ahead and tilt the device so that the Wing would mark the object's pitch point (for terrestrial objects) or the object itself (for celestial objects). The number that you'll see on the elevation scale would be the elevation angle of the object.

Elevation angle deltas can also be measured with the help of Inclinometer via the Sextant tool.

How to Measure Horizon Angle


Horizon angle is also marked with the Wing/Crosshair. Place the device vertically in the 0° position and tilt the device left or right in order to see how the horizon angle changes. Spyglass operates in any possible orientation (portrait, portrait upside down, landscape left, landscape right, face up and face down). So the Horizon angle, possible to measure, is limited to 45 degrees in both directions.

If you need to measure bigger Horizon angles, use the device orientation lock feature. In iOS 7 – make sure Control Center is turned on (in device Settings), then swipe up from the bottom of the screen to reveal Control Center and tap the rightmost button with a circle-shaped arrow on it.

Navigate by Stars, Noticeable Objects and Course

How to Navigate by Noticeable Landmarks and Objects

When the magnetic compass accuracy is questionable you can use some noticeable object or landmark to calibrate your compass and set the starting bearing.

Look around and find some object that is also shown on a map, e.g. a building or a road, tap the Tracker button , choose Add Map Location and center the cross on the object. On panning the map you will see how the azimuth changes at the top left part of the screen.

You can memorize the azimuth of the object, cancel its addition and use the azimuth to adjust the gyrocompass starting bearing accordingly:

- 1) Position your device parallel to the ground
- 2) Stand facing the object so that the bearing arrow would point in its direction
- 3) Make sure that the gyrocompass mode is on (double tap - gyrocompass: on)
- 4) Slide horizontally with two fingers until the current compass azimuth (see the readings in the top left part of the screen) matches the memorized one

Or you can add the object for tracking and:

- 1) Position your device into the face up orientation (2D mode), i.e. parallel to the ground
- 2) Stand facing the object so that the bearing arrow would point in its direction
- 3) Slide horizontally with two fingers to move the azimuth circle
- 5) Move it until the pointer for the object matches the bearing arrow

You can also find the object on the map, zoom to see your position in relation to the object more clearly and slide horizontally with two fingers to adjust the gyrocompass bearing.

How to Navigate by Stars

When the magnetic compass accuracy is questionable and there is no noticeable landmark or a reference nearby to determine a starting bearing for the gyrocompass, you can use celestial objects as a reference, e.g. the Sun, the Moon, the North Pole Star (Polaris) and other stars.

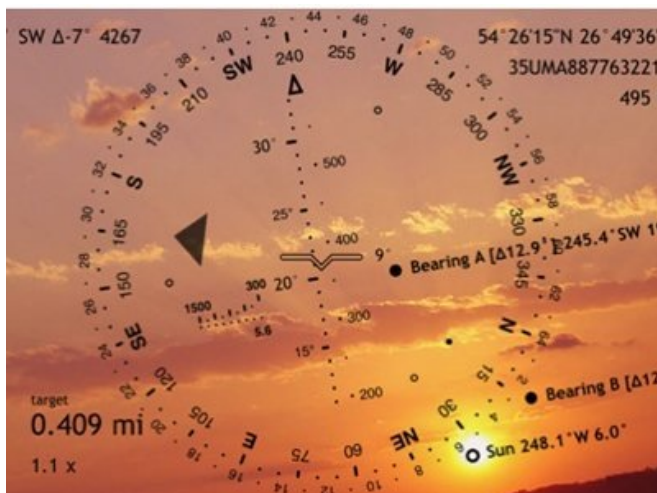
In Spyglass there are some standard AR pointers for the celestial bodies, tracked by default:

- “x” for the Sun
- “+” for the North Pole Star

- “o” for the Moon

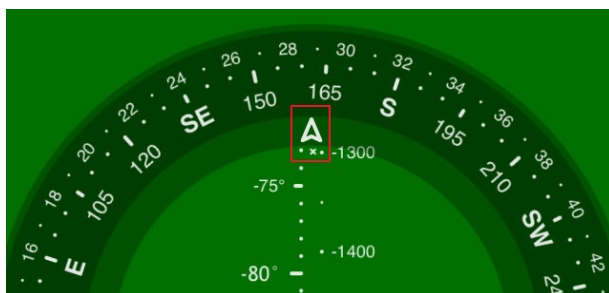
To set the starting bearing in the 3D mode:

- 1) Position your device so that you could see the real celestial object via the camera
- 2) Make sure that the gyrocompass mode is on (double tap - gyrocompass: on)
- 3) Slide horizontally (left-right) with two fingers to move the azimuth circle
- 4) Move it until the marker for the celestial object matches the real object on the live camera image:



To set the starting bearing in the 2D mode:

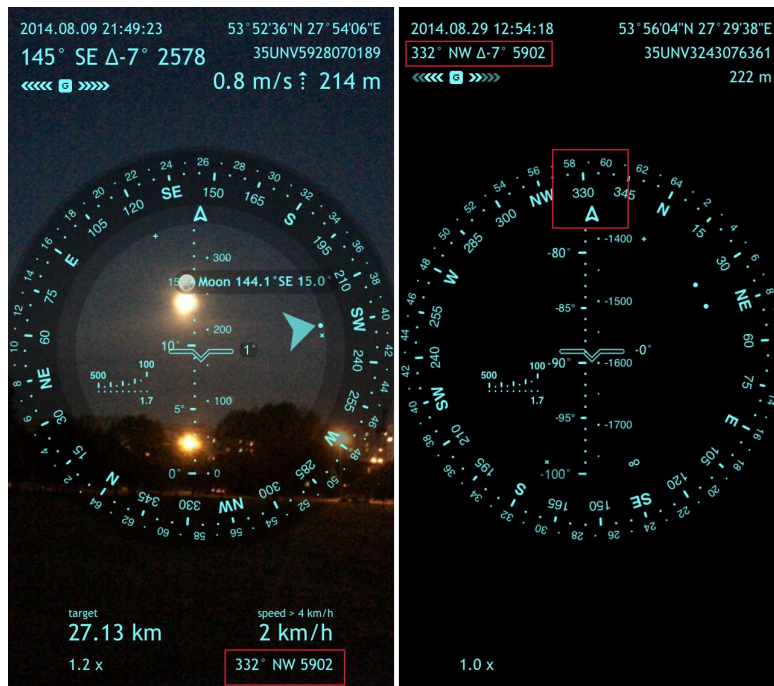
- 1) Stand facing the celestial object, e.g. the Sun
- 2) Position your device into the face up orientation, i.e. parallel to the ground
- 3) Enable the gyrocompass mode (if not active)
- 4) Slide horizontally with two fingers to move the azimuth circle
- 5) Move it until the Sun mark “x” matches the bearing arrow



At night when the Sun is beyond the horizon, you can navigate by the Moon or the stars.

How to Navigate by Your Movement Course

To set the starting bearing of the gyrocompass with the movement course start moving straight in some direction until the course information appears at the lower right corner of the screen. Position the device into the face up orientation (parallel to the ground), point the device top into the direction you moved and slide horizontally with the two fingers until the current azimuth of the compass matches the course, shown at the bottom right part of the screen.




When you are in a car, boat or any other vehicle you can switch to the Car Mode (read the “Compass Modes” section below) to use your movement course as the current azimuth (direction).

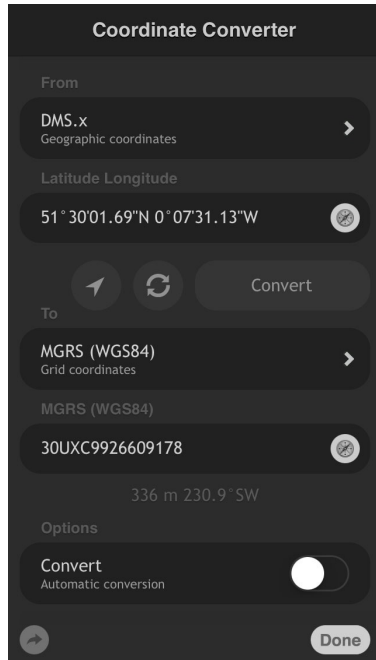
Convert Coordinates


The latest version of Spyglass supports many coordinate formats, including:

- Geographic coordinates:
 - DMS
 - ±DMS
 - DMS.x
 - ±DMS.x
 - DM.x
 - ±DM.x
 - DDDMM.xxx
 - Geocaching
 - ±D.x
- Grid coordinates:
 - MGRS

- UTM
- OSGB/BNG


If you need to convert the coordinates from one format to another, tap the Info button  and choose Converter.



You can type the coordinates manually or tap the Maps button  and choose the location on the map.

With the help of Converter you can also measure the distance between two locations.

Document Locations


With Spyglass you can also take pics with all the onscreen measurements overlaid. When reaching top speeds, climbing hills or mountains, finding a treasure, hunting or just sightseeing – your special moments and places can be impressed with a single tap on the camera button . This option can also help you a lot in your job if you need to document crime scenes, violations, road accidents, trail hazards, etc.

Instead of tapping the camera button you can always make a screenshot by simultaneously pressing the Home and Power buttons of your device.

The pics you've taken are stored on the Camera Roll.

Align Wi-Fi Antennas and Point Satellite Dishes

Augmented reality features such as the ability to see through the Earth, buildings and other objects are of great use when you need to align Wi-Fi and radio antennas, especially in hilly and rocky terrain. For that you'll need to know the altitude of the opposite antenna, which may be measured at its location with the help of Spyglass.

To ensure the accuracy of the aim, check and fine-tune (if necessary) your current location using maps (tap the Info button , choose Location, center the cross on your current location and tap Done).

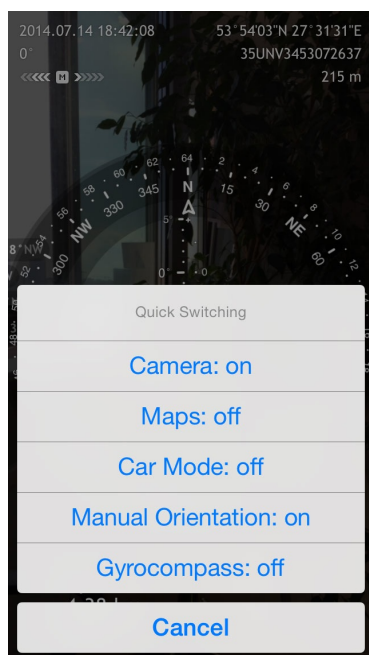
To avoid confusion, caused by the curvature of the Earth, the default augmented reality settings don't take into account location altitudes and elevations. Elevation angles of locations that are far away on the opposite side of the Earth or on roofs of nearby skyscrapers in such cases tend to zero. So if you need to take into account the elevation of both objects, set the corresponding options in the Augmented Reality section in the Settings.

Spyglass is also of great use for pointing satellite dishes. As you might know, to receive satellite broadcast signals, your dish needs to be positioned correctly. For this you will need to check the level, find the elevation and azimuth for your satellite dish. All this can be easily done with the help of Spyglass (read the "How to Use Compass and Measure Azimuth", "How to Measure Elevation of an Object" and "How to Measure Horizon Angle" sections above).

How to Customize Spyglass

Quick Switching Menu

The Quick Switching menu was created to let you quickly and easily toggle the compass and operation modes. A double tap on the screen will open the menu and you'll be able to turn on/off the necessary parameters:



Compass Modes


Spyglass compass can operate in **5 different modes**:

- 1) Magnetic (Default) Mode (M)
- 2) Gyrocompass Mode (G)
- 3) Gyroscope-assisted Magnetic Mode
- 4) Car Mode (C)
- 5) Manual orientation Mode(M)



You can **set the necessary mode** via:

- Quick Switching menu

- Settings (tap the Info button  , choose Settings and scroll to the Compass mode section)

Magnetic Mode

Magnetic Mode is the default mode on the devices with the built-in digital compass sensor but with no gyroscope (or with the turned off Gyroscope option in the app Settings). As any magnetic compass, the digital compass sensor is very sensitive to the surrounding magnetic fields, which may influence the readings. In order to improve the accuracy, recalibrate the compass (read the “Calibration and Accuracy” section).

Gyrocompass Mode

Gyrocompass mode is preferable if you’d like to avoid magnetic interference. That is, when close to metallic objects, live lines or strong magnetic fields, this mode would show the most precise readings.


In this mode the compass relies primarily on gyroscope (the rotation sensor). However, since the app version 3.7.5 the gyrocompass mode also uses the digital compass readings (if available) not only to set the initial azimuth (like it did before) but also to continually adjust it. Thus, until you adjust the azimuth manually with a two-finger sliding gesture (read the “Navigate by Stars, Noticeable Objects and Course” section) the app works as a gyro-assisted magnetic compass. But after you set the azimuth by hand the app operates in pure gyrocompass mode and relies entirely on the gyroscope readings.

On devices with no digital compass the initial azimuth should be set by hand. E.g. you can navigate by the Sun, if you see it (read the “Navigate by Stars, Noticeable Objects and Course” section).

Even though the accuracy of the readings in the gyrocompass mode is not affected by magnetic interference, slight drifts may occur due to its sensitivity to vibrations (e.g. your heartbeat). So it’s recommended to occasionally recalibrate the sensor (read the “Calibration and Accuracy” section below).

Gyroscope-assisted Magnetic Mode

In case the gyroscope (the rotation sensor) is available in your device and the Gyroscope option in the app Settings is on, it will be automatically used to assist the digital compass sensor in order to reach higher precision and reduce the influence of magnetic field disturbances. This option enables a fusion of data from gyroscope and other sensors to increase the accuracy of the digital compass and GPS readings. To provide this accuracy, however, more computations are needed. So if you’d like to

save the battery power, you can turn off this option in the app Settings (Info button  - Settings - Compass section - Gyroscope).

Car Mode

Car Mode is preferable when you are in a car, boat or any other vehicle. The movement course is read from the GPS receiver and is used as the current azimuth. This mode requires no calibration, though you may need to move quite fast to stay accurate.

Manual Orientation Mode

Manual orientation is good for taking precise measurements (like distance to and size of objects). With this mode on, the digital compass sensor is not in use, so there is no interference and nothing hinders your measurements. Even though this mode does not provide live real-time azimuth updates, you can still determine directions by matching the celestial hints on the azimuth circle with the real objects.

2D compass vs. 3D compass

Depending on your needs, the compass in Spyglass can operate in 2 or 3 dimensions. When your device is in the face up orientation, i.e. parallel to the ground – the compass operates in the 2D or the common compass mode. And the bearing arrow shows the direction the device top (in portrait orientation), bottom (in upside down orientation) or right/left side (in landscape orientations) is facing.

When the inclination of the device screen plane to the horizon plane is over eleven degrees, the bearing arrow of the compass shows the direction the device camera is facing – the compass operates in the 3D or the viewfinder mode, also referred to as the augmented reality mode.

The transition between the 2D and 3D modes is seamless. When you switch from 3D to 2D the app keeps interface orientation. Thus if you used the app in, say, landscape right when in 3D, it will be kept landscape right in face up.

The bearing arrow of the compass always shows the correct current azimuth regardless the device orientation. However, that is different when it comes to augmented reality markers.

When the compass is used in the 2D or the compass mode, a pointer for an object being tracked shows the direction to the object and marks its azimuth.


When the compass is used in the 3D or the viewfinder mode, a pointer for an object being tracked shows where you need to rotate your device to get the object in sight.

Operation Modes

The data you see on the screen can be overlaid over the live picture from the camera, the color filter (read the “Colors and Filters” section below) or maps. Thus, there are 3 Spyglass operation modes:

- Viewfinder mode
- Compass mode
- Maps mode

You can **set the necessary mode** via:

- Quick Switching menu (double tap on the main screen)
- Settings (tap the Info button , choose Settings and scroll to the Display and Maps sections)

Viewfinder

The viewfinder or the camera mode is the default Spyglass mode – HUD is overlaid over the live picture from the camera and you may fully use the augmented reality features. **Augmented reality** is a live, copy, view of a physical, real-world environment, the elements of which are augmented (or supplemented) by computer-generated sensory input such as sound, video, graphics or GPS data.

Compass

If there is no need in augmented reality or if you’d like to save the battery power, you can turn the camera off, thus switching to the Compass mode. The HUD is overlaid over the color background of your choice (read the “Colors and Filters” section below) and the camera is turned off to reduce the hardware processing power usage. The augmented reality features aren’t turned off along with the camera in the compass mode, however it won’t be possible to perform such tasks as visual measurements effectively.


Maps and Offline Usage Mode

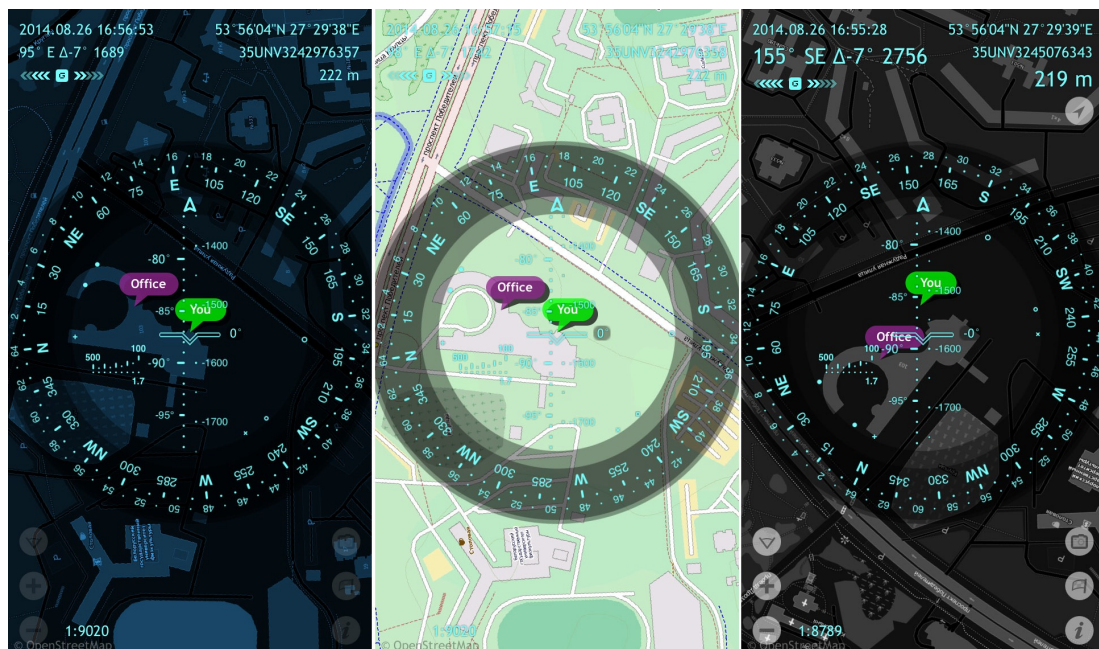
Important! Internet connection is required to view the maps. However, the parts of maps, that were browsed by you when online, would be saved and visible in the offline mode as well. When offline, the GPS startup can take some time (up to several minutes) and will depend on atmospheric and satellite visibility.

In the maps mode all the onscreen measurements are overlaid over maps.

Spyglass offers **different map providers**, including:

- Google Maps
- Apple Maps
- Open Street Map
- Open Cycle Map
- USGS @ CalTopo

You can choose the one you like by tapping the Info button , choosing Settings and scrolling to the Maps section. Besides choosing a provider you can also pick the map type, mode and change filters with simple swiping gestures (read the “Colors and Filters” section below).



The maps can also be used with the camera on. In such case, however, you will only see them when your device is parallel to the ground.

To pan the map slide 3 fingers in any direction.

Calibration and Accuracy

NB! Make sure that compass calibration is enabled on your device! To check that open your device Settings, find Privacy, choose Location Services and then scroll down to find the System Services, tap it and see whether the Compass Calibration is on.


To feel the motion of your device, Spyglass uses both the **accelerometer** (gravity sensor that identifies where in 3 dimensions your device is at the moment) and, if present, the **gyroscope** (the rotation sensor that identifies how your device is rotating).

The readings of the sensors differ slightly on each device and depend on many factors, even such as the temperature or your heartbeat. Thus, it is recommended to perform calibration before taking measurements.

Digital Compass Sensor Calibration

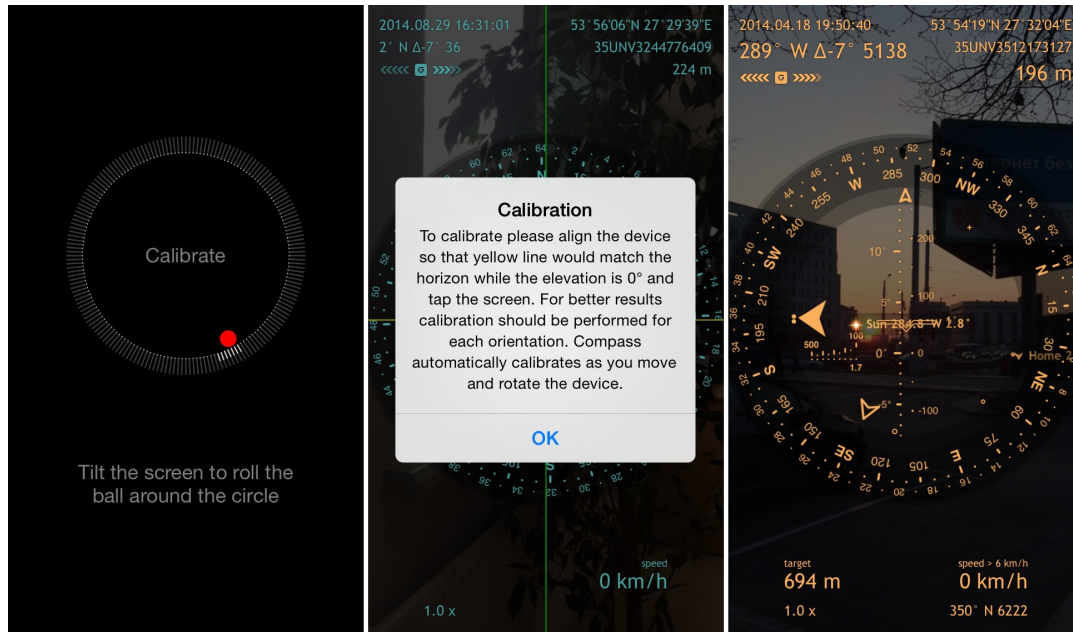
The digital compass sensor calibrates automatically whenever you move or rotate your device. In cases of significant disturbances, the system asks you to calibrate the sensor manually by tilting the screen to roll the ball around the circle.


Accelerometer Calibration

If you notice inaccurate accelerometer readings (i.e. imprecise horizon or/and elevation angles), you should calibrate the sensor by positioning the device properly in accordance with the chosen orientation, tapping the Info button , picking Calibration and following the instructions.


Gyroscope Calibration

While using the gyrocompass mode, some drifts may occur due to the gyroscope's sensitivity to vibration. In this case you should calibrate the sensor by manually adjusting the azimuth using celestial objects or noticeable landmarks (read the "Navigate by Stars, Noticeable Objects and Course" section above).



In cases when your current location accuracy is crucial (e.g. when aligning wi-fi antennas or measuring distance), make sure to check and fine-tune it via maps (tap the Info button , choose Location and center the cross precisely on your current location – you can zoom and rotate the map for higher precision).

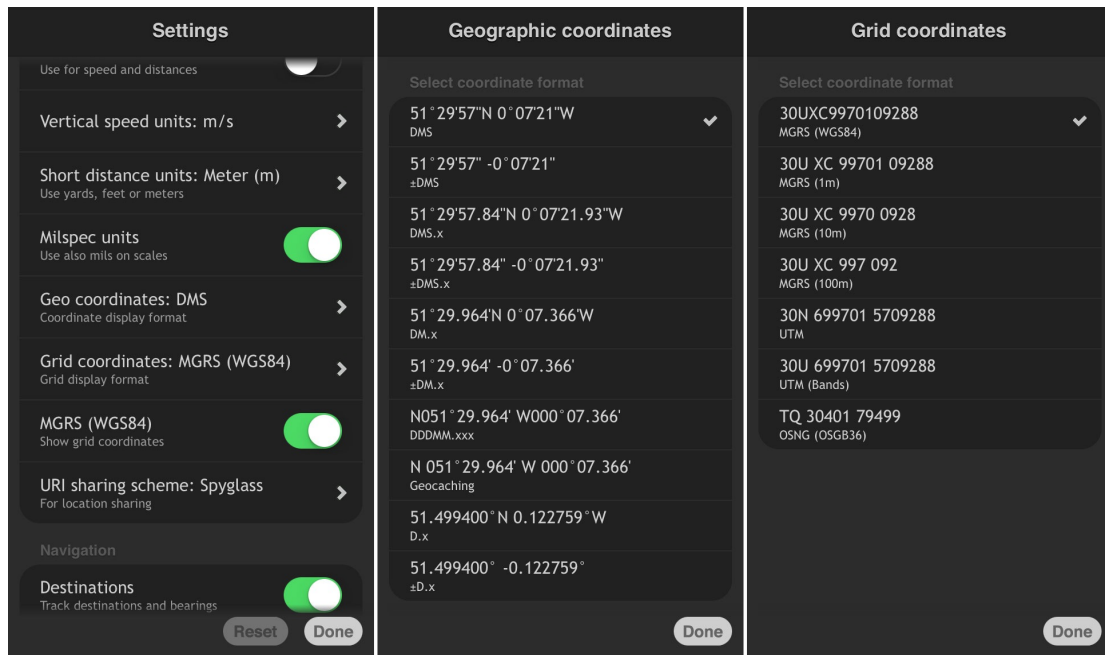
Units and Coordinates

Spyglass supports metric, imperial, nautical and military units. In accordance with the regional settings on your device, the app will choose the units automatically. However you can also set units and coordinates manually via Settings (tap the Info button , choose Settings and scroll to the Units section).

When turned on, the nautical units override the metric or imperial units for distances and speeds.

Spyglass supports different coordinate systems, including:

- Geographic coordinates (in different latitude and longitude formats)
- Grid coordinates:
 - MGRS
 - UTM
 - OSGB/BNG




NB! Spyglass automatically converts the coordinates and units according to your settings. That is, wherever you may need to insert some data, you may do it using any supported format without reconfiguring the app. E.g. for distances and sizes you can just type the number and the unit abbreviation – “10 yd 1 ft” – and it will be automatically converted into your current units.

Coordinates can also be converted via the Coordinate Converter tool (read the “Convert Coordinates” section above).

Display


The amount of data you see on the screen is not constant. Depending on your actions, the data may appear and disappear from the screen. E.g. when you take some measurements, your device is in a relatively static position and the bottom space of the screen is almost empty. However, when you start moving, the information about your speed and ETA will appear.

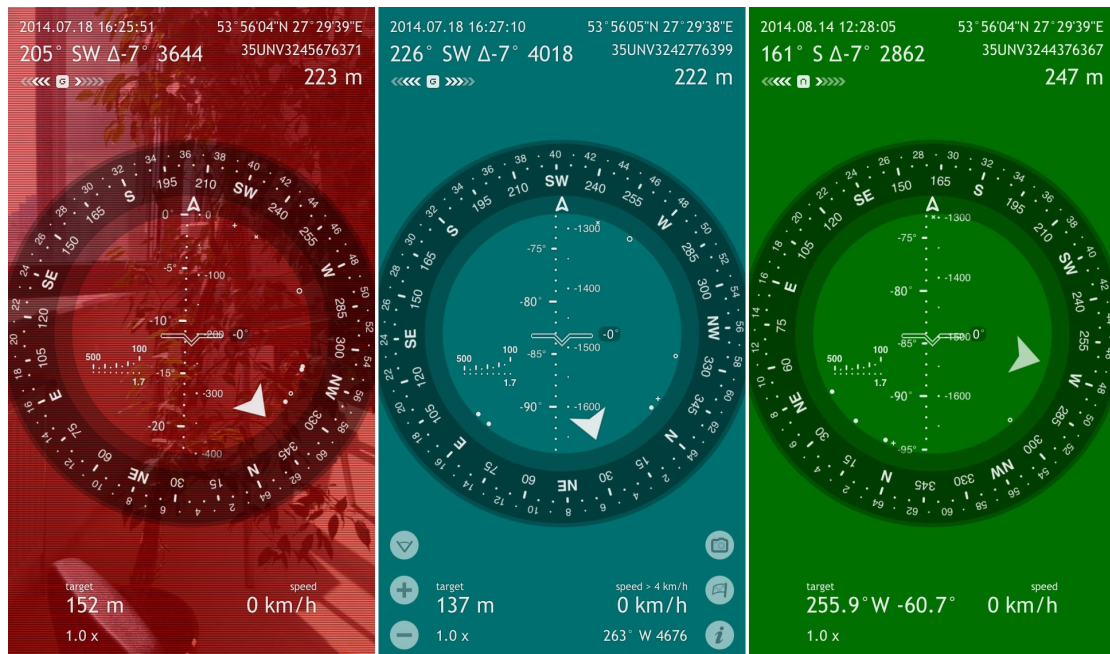
Moreover, via Settings (Info button  – Settings) you can change the amount of data shown, the precision and the amount of marks on the measurement scales along with the measurement units. You can also limit the tracking range for your destinations, set up the compass interface (classic or backwards), switch between magnetic and true North, choose the necessary compass orientation mode, operation mode and much more.

Colors and Filters

In order to create a better contrast between the on-screen data and the live picture from the camera, you can change the colors of the HUD elements, filter and background of the azimuth circle. Use these simple gestures to customize the device to your needs and liking.

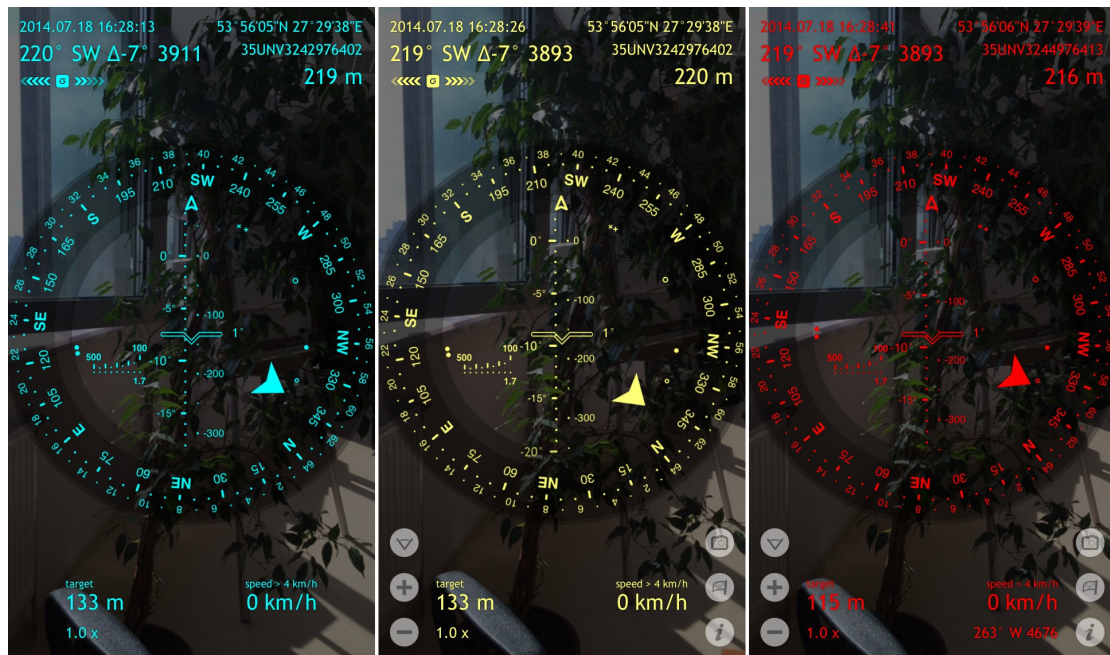
Vertical Swipe

The Vertical Swipe switches the **color filters** or lens that overlay the live picture from the camera, the maps or the default screen background. You can also change the filter opacity if you tap the Info button , choose Settings and scroll to the Display section.



Horizontal Swipe

The Horizontal Swipe switches the available **colors of the** HUD elements.



Diagonal Swipe

The Diagonal Swipe switches the possible azimuth circle background types. The background is transparent and is drawn right under the azimuth circle elements over the color filter.

