

GUIDE

# Polar Mount Align Guide

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# What the app does

Polar Mount Align helps you manually polar-align the base of an equatorial mount. The phone takes the place of the telescope in the saddle: the app reads its tilt and direction using the sensors and tells you how far to turn the two screws on the base, altitude and azimuth, until the polar axis points to the celestial pole.

It also works during the day and when the pole is hidden from view, as it does not require visible stars. It does not use the camera, requires no account, and works offline, in six languages.

What it does not do:

- It does not control the mount or move any motors: you turn the screws yourself.
- It does not replace fine alignment. The app performs the initial alignment, with a realistic target of around ±0.5°. You then refine the alignment using a star-based method, such as two-star or multi-star alignment, plate solving, or a polar scope.
- It does not guarantee absolute accuracy. The result depends on your phone, how it is mounted, and the north reference you use. Iron and motors in the mount can disturb the compass, which is why the app also offers north references that do not use the compass at all.

Alignment, level, north reference, compass correction, sky, and polar scope are free and will remain free. Certain additional features, such as multiple mount profiles, multiple saved observing sites, and session history, will move to a one-off purchase: the app indicates this on the relevant pages.

# What you need

- An equatorial mount with altitude and azimuth adjustment screws and a dovetail saddle (such as Vixen).
- An Android phone or an iPhone with an accelerometer and a magnetometer. A gyroscope is needed for north references that are independent of the compass.
- A holder that keeps the phone flat in the saddle, held firmly and parallel to the polar axis, with the top edge towards the pole. The printable arm described below works well.
- Your location: from the phone's GPS or entered manually.
- For calibration: a spirit level or another tool to level the base.

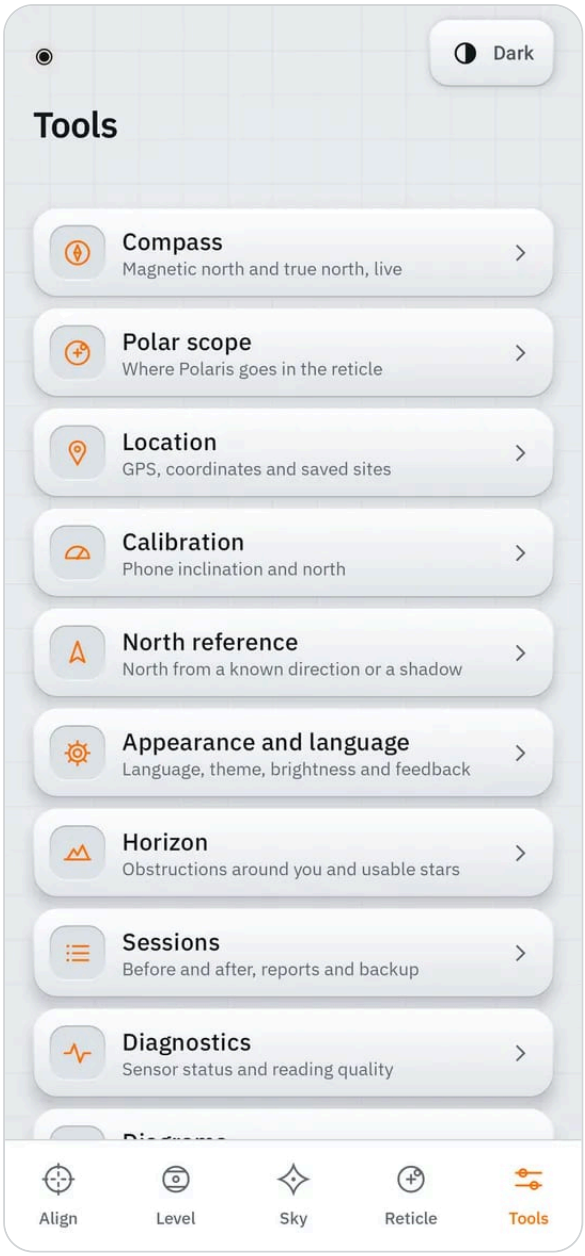
# How the app is laid out

At the bottom there are five tabs:

- Align: the working screen, with everything you need to adjust the base.
- Level: holder and phone calibration.
- Sky: pointing at a star or planet using the sensors.
- Reticle: the polar scope, showing the position of Polaris on the reticle.
- Tools: location, calibration, north reference, appearance, sessions, and the other pages.

At the top right is the theme button, which cycles through the Day, Dark, and Red themes in turn. The label on the button indicates the theme that will be activated when you tap it.

On first launch, the app displays “How it works”, an illustrated introduction summarising the procedure. You can step through it with “Next” or close it with “Skip”. In Tools → Guide you will find the full illustrated guide, which can also be read offline.




*The Tools page: each entry has a line explaining what it is for.*

# The phone on the mount

The phone takes the place of the telescope. For an accurate measurement:

1. Fit the holder in the saddle in place of the telescope.
2. Lay the phone flat on it, screen up, parallel to the polar axis, with the top edge towards the pole.
3. Move the mount to its home position: counterweight bar down and saddle parallel to the polar axis. Lock the RA and DEC axes.
4. From this point on, do not touch the phone or the axes again: only adjust the base screws.

If the app reports a non-zero “Sideways tilt”, either the phone is twisted in the saddle or the base is not level.

## The printable arm

A phone clamped inside a steel saddle sits within the mount’s magnetic field, and the compass can be out by several degrees. For this reason, there is a parametric arm for a Vixen dovetail, made for this app, free to download and print: it carries the phone away from the saddle and can be adapted to other phone sizes. You can find it in Tools → Guide (“3D model of the arm”) and on the model page on Printables.

## The holder rod

On the same Printables page are the two printable parts of the holder rod: a base that slides onto the holder’s bottom short side and a rod that slides into it. Once fitted, the rod is tilted at 40° towards the phone’s top edge, rising away from the glass, and casts its shadow onto the screen. It is used to obtain true north from the Sun without removing the phone from the saddle (see The north reference).

1. Place the phone in the holder.
2. Slide the base onto the holder’s bottom short side from behind. It clips onto the shell of the holder without screws and without touching the screen.
3. Slide the foot of the rod all the way into the angled slot in the base.

If you prefer to make one yourself, use a straight, rigid rod about 3 mm thick, protruding by roughly 190 mm, fixed to the holder (never to the phone) at the middle of the bottom short side, just clear of the screen. It must be tilted at 40° from the perpendicular to the screen, towards the top edge, with no sideways tilt: even half a degree of sideways tilt can cause an azimuth error of half a degree or more. Its position along that edge does not affect the calculation, whereas the angle does.

Dimensions, assembly, and use of the holder rod are also covered in the holder rod PDF guide, in English.

# Initial setup

These steps are performed once per holder. The calibrations remain saved.

## 1. Location

In Tools → Location (or using “Get GPS” in Align), the app searches for your GPS position. Below the button you can see the search status: visible and used satellites, elapsed time, and estimated accuracy. If no position is detected after thirty seconds, move somewhere with a clear view of the sky: the search continues.

Alternatively, enter your latitude (north positive), longitude (east positive), and elevation, then tap “Save and use these coordinates”. The location becomes a saved observing site, which you will find under “Saved observing sites” and under “Site” in Align.

On Android, precise location is required: if the phone only grants approximate location, the app opens Settings so you can enable it.

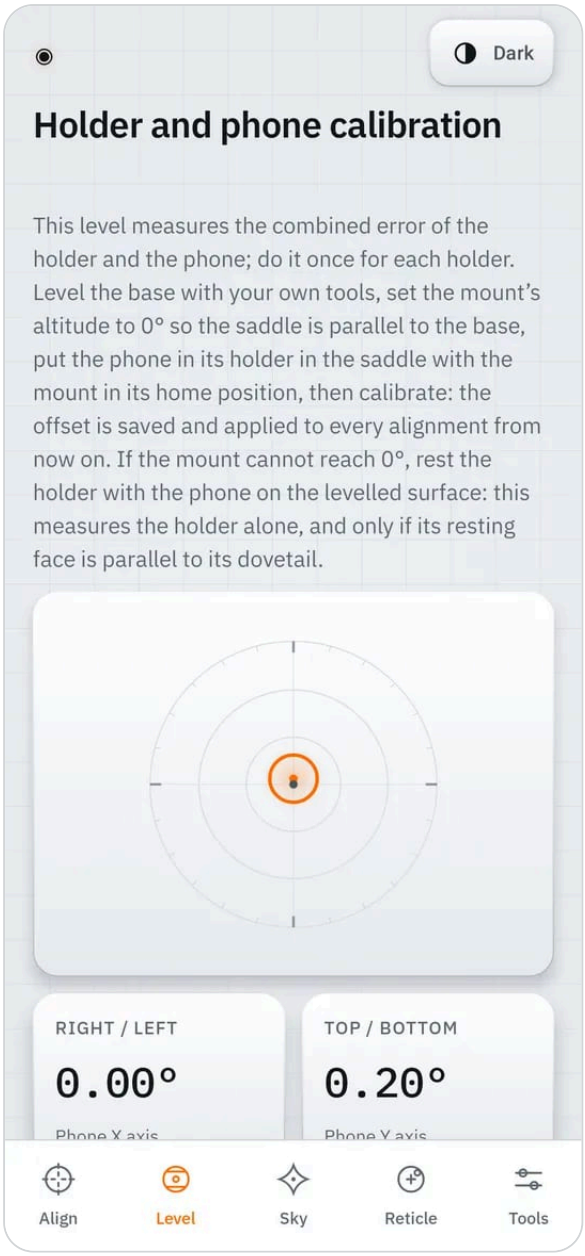
## 2. Holder and phone calibration

Calibration in the Level tab measures the combined error of the holder and phone. This offset is saved and applied to every subsequent alignment.

1. Level the base with your own tools.
2. Set the mount’s altitude to 0° so the saddle is parallel to the base, with the mount in its home position.
3. Fit the phone into its holder, mounted in the saddle.
4. Wait until the reading is steady, then tap “Calibrate holder and phone” and confirm.

If the mount cannot reach 0°, place the holder with the phone on a level surface. This measures only the holder, and the measurement is valid only if its resting face is parallel to the dovetail.

Use a surface checked with an independent tool: zeroing on a surface that is not level would hide the error rather than correct it. To start again, use “Reset holder calibration”.




*The Level tab: calibration is carried out once for each holder.*

## 3. Mounting and profile

In Tools → Calibration, under "1. Inclination and mounting", enable "Mounting and home position checked" once the phone is mounted as described above. Until you do so, Align will remind you.

If you use more than one mount or holder, save a profile for each: in "Advanced", give the profile a name and tap "Save mount profile". The profile stores the active calibrations: tilt, level zero, and compass correction. When you switch mounts, select the profile under "Mount" in Align and its calibrations are restored.

# The north reference

To calculate azimuth, the app needs to know the direction of true north. The reference currently in use is always displayed. The options are in Tools → North reference or in Calibration, under “2. North and compass correction”.

- “Compass · WMM2025”: the phone’s compass, corrected using the WMM2025 magnetic model, valid from 2025 to 2029. This is the standard method and is sufficient when the phone is kept away from the iron in the mount.
- “Sun’s shadow”: true north from the shadow of a vertical object, with the phone out of its holder.
- “Holder rod”: true north from the shadow of the printed rod, with the phone already in the saddle.
- “Known direction”: north from a line whose true azimuth you know from an independent measurement.

When an alternative north reference is active, azimuth comes from the gyroscope and the compass is not used. However, the gyroscope accumulates a small error over time and the reference is lost if the app goes into the background or if you switch profiles: in that case, it must be acquired again. To switch back to the compass, tap “Return to compass”.

## North from the Sun’s shadow

Used during the day, with the Sun between 10° and 75° altitude. You only need to do this once for that phone on that mount.

1. Take the phone out of the holder. Place a vertical object on a level surface: a rod, or a tripod leg.
2. Choose “Sun’s shadow”. Lay the phone flat, screen up, so that the shadow falls across it.
3. Rotate the phone until the shadow covers the black line, with the tip of the shadow pointing towards the top edge of the screen, away from the Sun. “Phone level” must show “Yes”.
4. Enable the confirmation switch and tap “Calibrate north reference”, without moving the phone.
5. Put the phone back into the holder without leaving the app: the gyroscope tracks the movement.

If “Phone the wrong way round” appears, the shadow was pointing the wrong way: rotate the phone and acquire the reference again.

## North from the holder rod

Used during the day, with the Sun above 10° and facing the screen.

1. Place the phone in the saddle, with the rod fitted and the mount in its home position.
2. Tap “Calibrate north reference” and choose “Holder rod”.
3. Tap “Show the lines”. If prompted by the app, lower the polar axis to the angle shown.
4. Turn the tripod for coarse adjustment, then use the azimuth screw until the rod’s shadow is parallel to the lines.
5. Tap “The shadow is on the lines” without touching the phone or the mount. If you lowered the polar axis, raise it again.

When the rod cannot be used, the app explains why: Sun below 10° or behind the screen, polar axis tilted more than 80°, shadow too short or off the phone, shadow rotating too little, or the Sun so high that the shadow stays parallel to the lines even when the azimuth is wrong. In these cases, use the Sun's shadow method or wait. Accuracy depends on how straight the rod is: working close to solar noon reduces the effect of any error in its tilt.

## Saving the compass correction

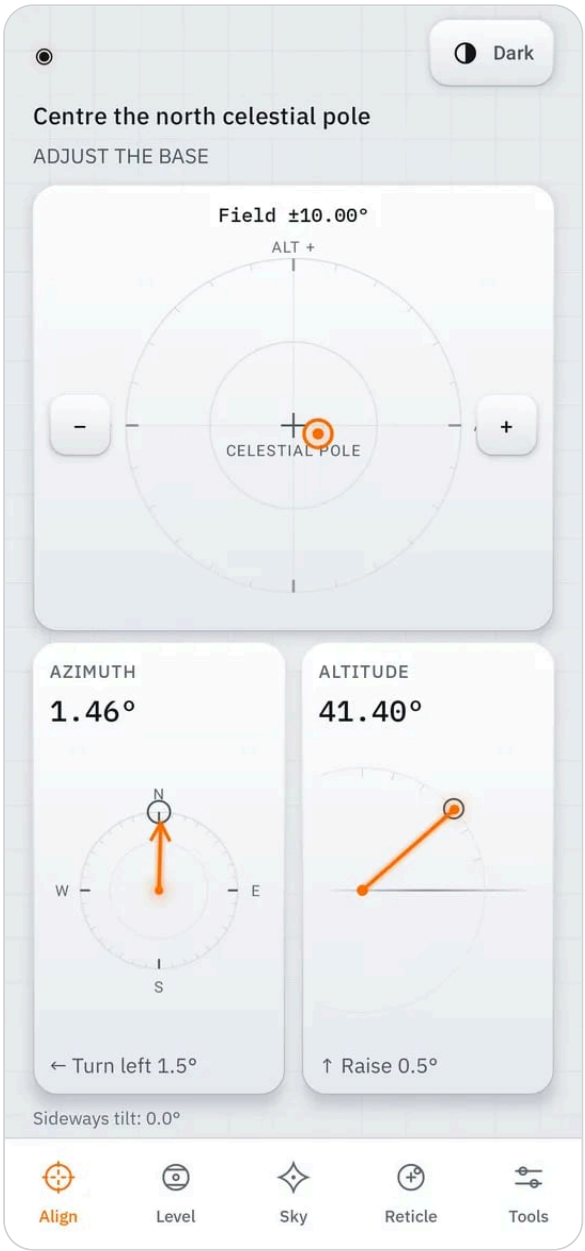
A reference acquired from a shadow, from the rod, or from a known direction can also be used to correct the compass once and for all. With the phone in the saddle, the base already close to the pole, and the reference still active, tap "Save the compass correction for this mount" (in Align under "Details", or in Calibration). The correction remains saved even after closing the app and becomes part of the mount profile: on subsequent nights the compass is corrected automatically and you no longer need the shadow.

The correction applies to that mount and that holder, with the phone in the same position. If the measured magnetic field changes significantly compared with the calibration, the app warns that the correction may no longer be valid.

# Aligning the base step by step

1. Mount the phone and move the mount to its home position, with the axes locked.
2. Open Align and check the active mount and observing site at the top.
3. If needed, update your location using “Get GPS”.
4. Read the three views and turn the base screws (see below).
5. When the orange dot sits on the cross, tighten the screws while watching the dot to make sure it does not move.
6. Take your hands off the mount. If the dot stays on the cross, the base is aligned.

Once the base stays centred for a few seconds, the title changes to “CENTRED ACCORDING TO THE SENSORS”. If you have enabled the alerts in Appearance and language, the phone vibrates or announces it aloud.




*The Align screen: the pole target at the top, azimuth and altitude below.*

## Reading the screen

- The title tells you which pole to centre (“Centre the north celestial pole”, or the south celestial pole in the southern hemisphere) and the status: “ADJUST THE BASE” while you are working, “CENTRED ACCORDING TO THE SENSORS” when done.
- The target view at the top shows the fixed cross of the celestial pole and the orange dot, which represents the phone’s measured axis. “Field” shows the width of the view: it starts at ±10° and changes with – and +. If the dot moves outside the field, an arrow on the edge shows the direction: press – to widen the view.
- The Azimuth panel is a top-down compass view: the ring marks the direction of the pole and the arrow marks that of the phone. Below it is the instruction for the azimuth screw, for example ”← Turn left 1.5°”.
- The Altitude panel gives a side view of the phone’s tilt (solid line) and the target altitude (ring). Below it is the instruction for the altitude screw, for example ”↑ Raise 0.5°”.

All three views remain visible, even far from the target. For large errors, point the whole tripod towards the pole first: the fine adjustment screws have limited travel. Never rotate RA or DEC.

Below the views, “Details” shows the active reference, the compass reading, the measured and expected magnetic field, the compass correction, and the distance from the pole. Any warnings appear underneath: read them before trusting the result.

While turning the screws, you can tap “Lock controls during adjustment” so an accidental tap cannot change anything. “Unlock controls” re-enables them.

## Recording the session

If you want to keep a record of the result:

1. Before adjusting, tap “Record before adjustment”: the app stores the initial reading.
2. Adjust the base and tighten the screws, then tap “Save after tightening”. You can add “Session notes”.

The session records the date, observing site, coordinates, measurements before and after adjustment, and the north reference used. You can find it in Tools → Sessions. “Cancel recording” discards the initial reading.

# Level

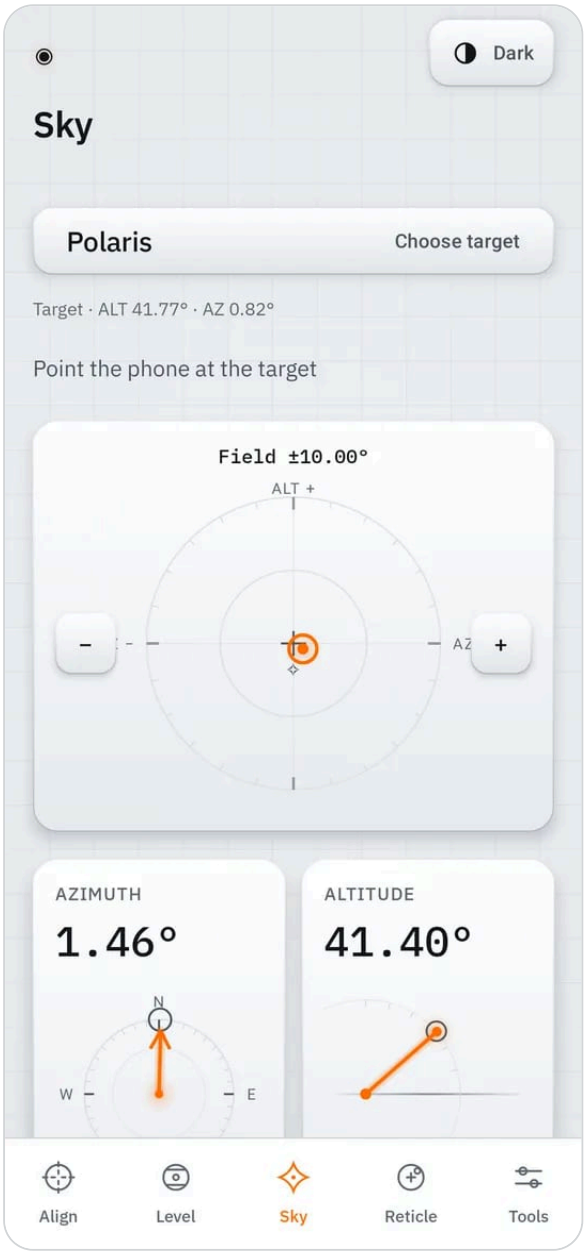
The Level tab also displays a two-axis bubble level, left-right and up-down, which is useful for checking the holder. The bubble only becomes reliable after calibration: until you run it, the app warns you.

# Sky

The Sky tab lets you point the phone at a star or planet. Tap “Choose target” and search by name, HIP or HYG number, or constellation among the 119,625 stars in the built-in catalogue. You can filter with “Only targets above the horizon”, “Favourites only”, and “Magnitude limit”, and add a star to your favourites.

The fixed cross is the object, and the moving dot is the top edge of the phone. Coordinates are calculated from your location and the phone’s clock. Altitudes are geometric, without atmospheric refraction, and pointing relies solely on the sensors rather than optical confirmation. The object card also shows sunrise, sunset, twilight times, and Moon transits over the next 24 hours.

Sky is a separate mode: moving the base to point at a star alters your polar alignment. For polar alignment, return to the Align tab. Never look at the Sun through optics without an adequate solar filter.



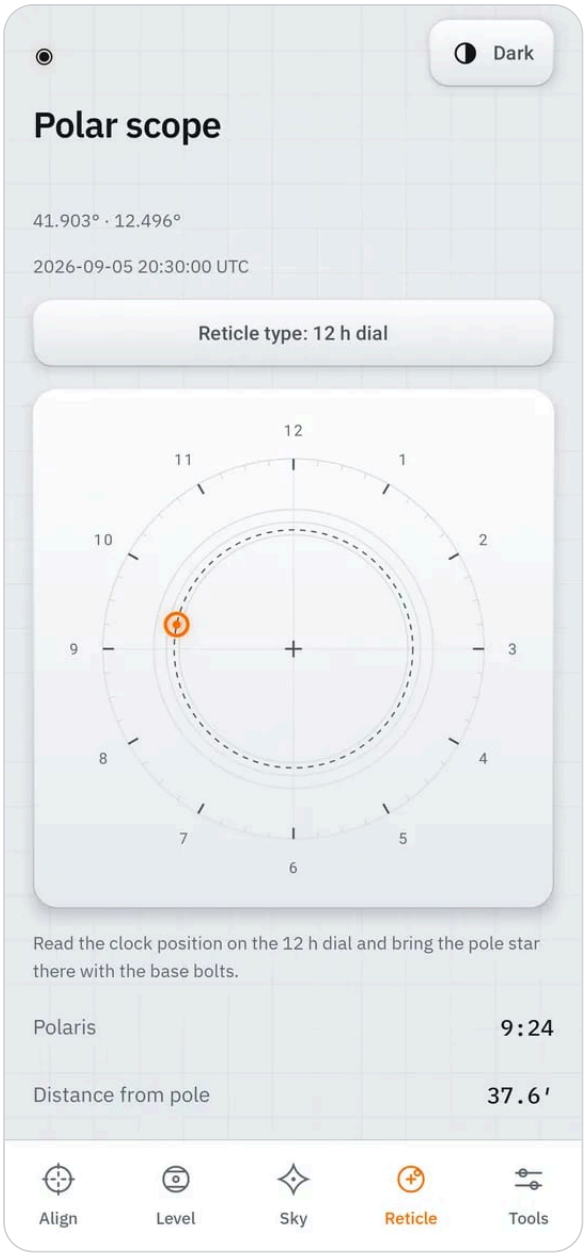

*The Sky tab, with Polaris as the target.*

# Polar scope

The Reticle tab (also available in Tools → Polar scope) shows where Polaris should sit in the reticle of your polar scope, based on your location and the phone's clock. In the southern hemisphere, the reference is Sigma Octantis.

1. Check that the phone's date and time are correct: the reticle updates with the device's clock.
2. Under "Reticle type", choose the pattern closest to yours: 12 h dial, 24 h dial, Star field, Rings and clock, Constellation guide, Three stars, Linear scale. For some families, the list names the mounts that use them.
3. Choose the image orientation: "Inverted (180°)" for a typical straight-through polar scope, or "Upright image" or "Mirrored (left/right)" only if they match your optics.
4. Using the base's altitude and azimuth screws, bring Polaris to the indicated position.

These are generic diagrams, not exact copies of manufacturers' markings: to rotate the reticle and use the year graduations, follow your polar scope's manual. Optical polar alignment requires visible stars and a polar scope that is collimated with the RA axis.




*The polar scope with the 12 h dial.*

# Themes: Day, Dark and Red

The app has three themes:

- “Day”: light, for working in sunlight.
- “Dark”: dark background, for twilight.
- “Red”: red on black, to preserve your dark adaptation. In Appearance and language you can adjust the screen brightness and the red intensity.

With “Auto”, selected in Appearance and language, the app uses the Red theme when the Sun is more than 6° below the horizon at your location and the Day theme at all other times. The button at the top right switches themes at any time.




*Align with the Dark theme.*

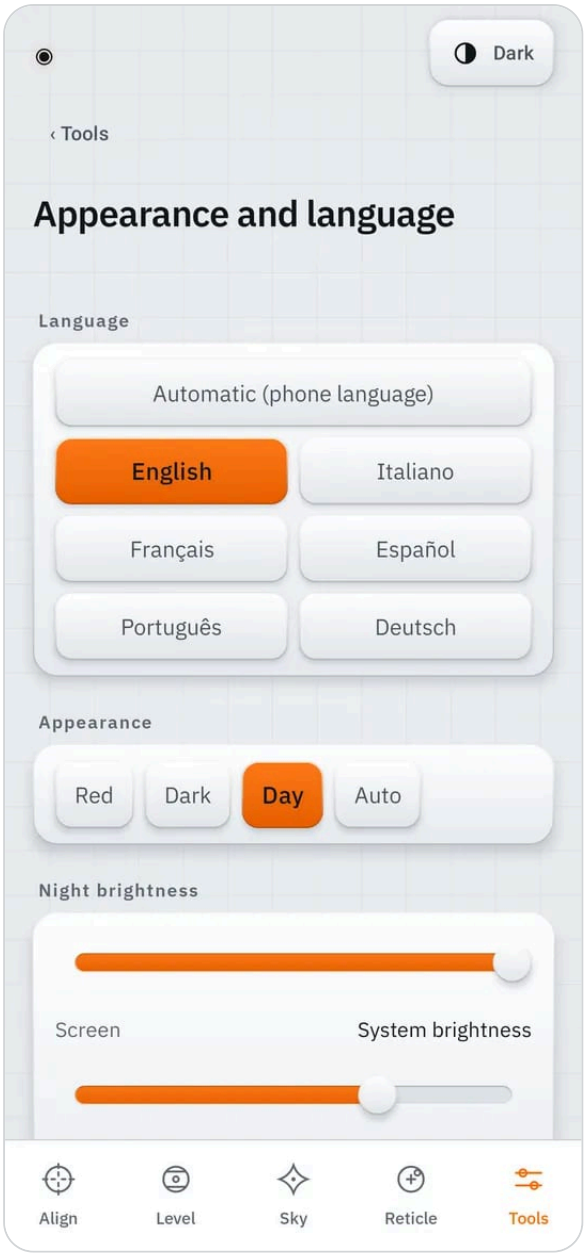



*Align with the Red theme, for night use.*

# Settings

## Appearance and language

- “Language”: “Automatic (phone language)” or one of the app’s six languages.
- “Appearance”: Red, Dark, Day, or Auto.
- “Night brightness”: screen brightness and “Red intensity”. “Restore readable brightness” restores safe values if the screen becomes too dim.
- “Keep screen on”: enabled by default.
- “Vibrate when centred” and “Voice confirmation when centred”: disabled by default. “Test feedback” lets you try them out. Voice confirmation works only if an offline voice for the chosen language is installed on the phone.
- “Long averaging near the target”: averages readings over a longer window when you are close to the pole, giving a steadier value.
- “Animations”: enables or disables animations.
- “Centring tolerance”: sets how close to the pole the axis must be to count as centred. Default: 0.5°.
- “Red screen light”: “Turn on the red panel” turns part of the screen into a small red light.




*Appearance and language: language, theme and brightness.*

## The other Tools pages

- “Compass”: magnetic north and true north in real time, with magnetic declination and measured and expected magnetic inclination.
- “Horizon”: obstacle altitude across 12 directions and “Minimum target altitude” (default: 15°), used to filter observable stars. “Restore clear horizon” resets the profile.
- “Diagnostics”: sensor status, direction source, magnetic field, satellites, and reading quality.
- “Diagrams”: live views of the base, from the side (altitude) and from above (azimuth).
- “Simulator”: with “Enable simulation” you can practise centring the target using simulated readings. The SIMULATION label remains visible at all times and recording is disabled.
- “Privacy and licences”: the privacy notice, data licences, and deletion of local data.
- “What’s new”: the window showing what is new in this version. It opens once after each update, and you can reopen it from here whenever you like.

# Export and backup

In Tools → Sessions:

- “Export full backup”: a JSON file containing settings, calibrations, profiles, observing sites, and sessions.
- “Export all sessions as CSV”: a table with one row per session.
- “Import backup”: lets you select a backup file and, with “Import and replace”, replaces settings, profiles, and sessions. Export your current data first if you want to keep it.

When you open a session, you can use “Export JSON report”, “Export readable report”, or “Delete session”. In Diagnostics, “Export diagnostics without coordinates” prepares a file to attach when asking for support.

Files are saved through your phone’s file picker wherever you choose. Backups, reports, and CSV files contain your coordinates, whereas diagnostics do not. After importing a backup created on another phone or with another holder, repeat calibration in the Level tab.

# Troubleshooting and FAQ

## Align asks you to set the location

Without your latitude, the app does not know where the pole sits above your horizon. Tap “Get GPS” or enter your coordinates in Tools → Location.

## GPS cannot find a position

Move outdoors with a clear view of the sky: the search continues automatically. You can always enter your coordinates manually. If the phone is using a system mock location, the app asks you to choose a manual observing site.

## ”Possible magnetic interference” or “Compass needs calibration or has low reliability” appears

Iron in the mount or a motor is interfering with the compass. Move the phone away from the saddle using the printable arm, or obtain north from a shadow or the rod and save the compass correction for this mount.

## The phone points almost opposite to the pole (“Opposite azimuth”)

First point the base towards the ring indicating the pole. If the top edge of the phone is already facing that way, check the compass away from metal.

## The dot is not visible in the target view

It is outside the field: press – to widen the view and follow the arrow on the edge.

## ”Auxiliary reference expired” appears

The gyroscope has accumulated too much error, or the app went into the background. Acquire the reference again or return to the compass.

## Align asks you to confirm the mounting in Calibration

Enable “Mounting and home position checked” in Tools → Calibration, after checking that the phone is mounted as described in The phone on the mount.

## ”Wait until the phone is steady” appears

Take your hands off the mount and wait a few seconds: measurements and confirmations require a steady reading.

## Voice confirmation does not work

The phone does not have an offline voice installed for the chosen language. Install one in your phone's text-to-speech settings, or use vibration instead.

## I changed phone or holder

Repeat calibration in the Level tab and, if you use compass correction, acquire it again: the calibrations apply to that specific phone in that specific holder.

## How accurate is the result?

The decimal places show numerical resolution, not guaranteed accuracy. Treat ±0.5° as a good target and finish your alignment using a star-based method.