Software User Manual

KlauPPK UAV

Software Version 2.1

User Manual Version 2.1.0.251125

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

Contents

Installation 3
Software Activation 6
Trial Mode 6
Obtaining a Licence 6
Online Activation (Recommended) 6
Offline Activation 7
Software Deactivation 8
Accessing the Deactivation Screen 8
Online Deactivation (Recommended) 9
Offline Deactivation 10
Processing Workflow 11
Step 1: Import Drone Log File 11
Step 2: Import Timestamp File 12
Step 3: Import Base RINEX File 12
Step 4: Process GPS Data 17
Step 5: Open Image Folder 19
PPK Preferences 22
Best Practices for Reliable Positioning 24
Coordinate Systems and Geoid Support 26

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

Installation

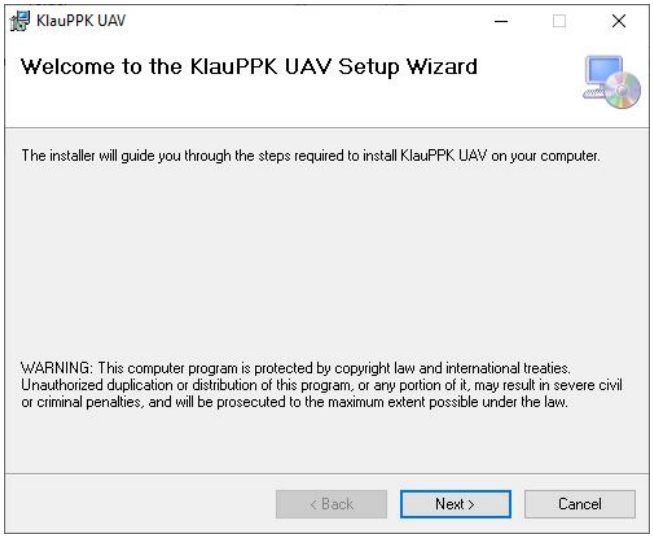
1. Launch the Installer

Locate the downloaded .msi installer file.

Double-click the file to begin the installation.

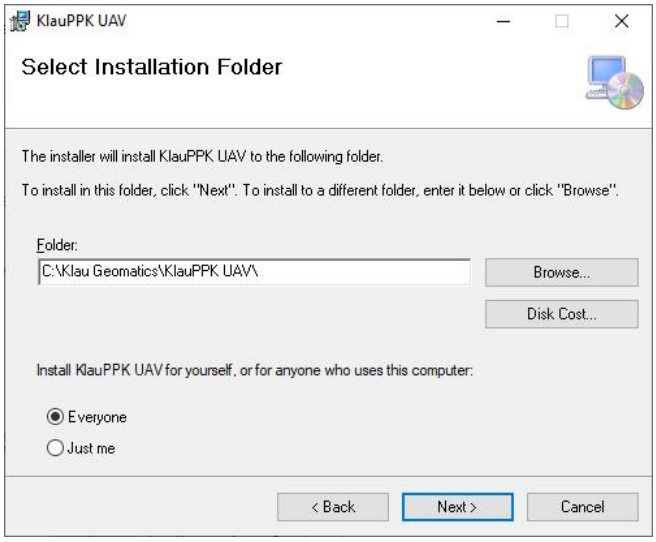
2. Welcome Screen

On the Welcome screen, click Next to proceed.



3. Installation Options

Choose the destination folder where the software should be installed.
Select whether to install the software for Everyone or Just Me.

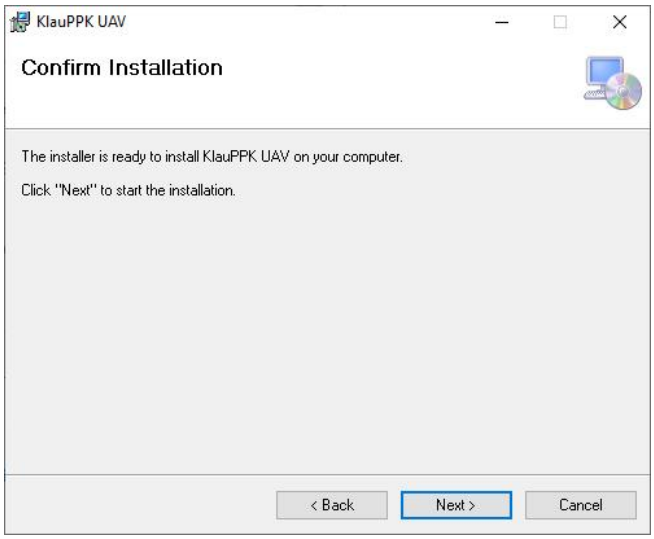


Click Next to continue.

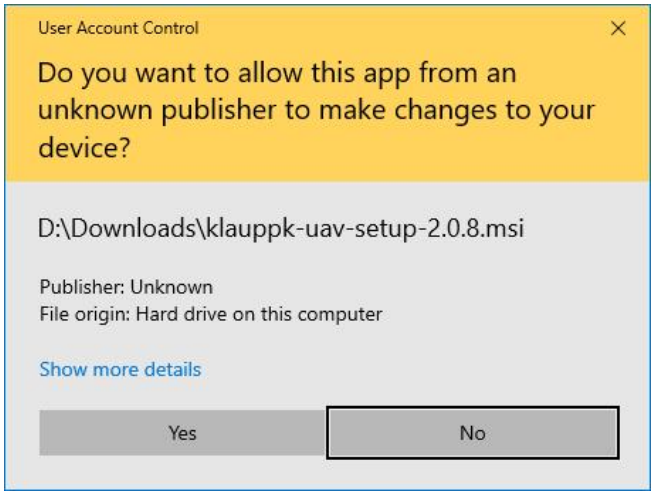
4. Confirm Installation

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

On the Confirm Installation screen, click Next.



Note: A system prompt may appear stating: *"Do you want to allow this app from an unknown publisher to make changes to your device?"* If prompted, click Yes to continue.



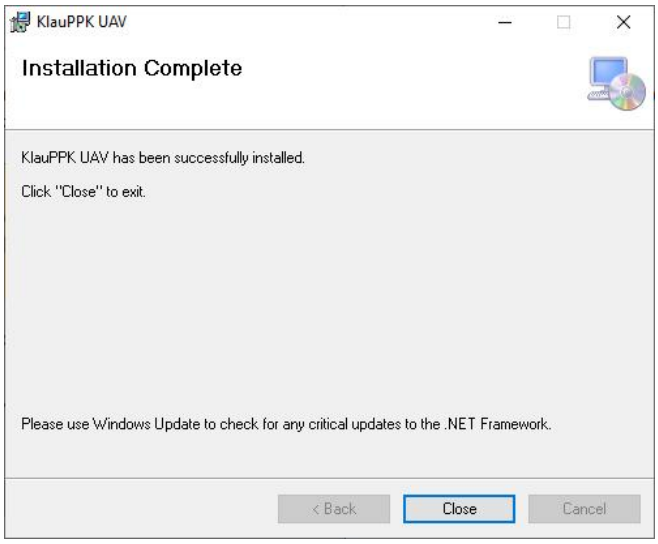
5. Installation Progress

The software will now install. This may take a few moments.

6. Complete Installation

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

Once the installation is complete, click Close to exit the installer.



7. First Launch

Navigate to the installed application (via Start Menu or install location) and launch the software.

Software Activation

Trial Mode

Upon installation, the software will operate in full-featured trial mode for a period of 7 days. No activation is required during this period.

After 7 days, you'll be prompted to activate the software to continue using it.

> **Need More Time?** Users may request a one-time 7-day trial extension. Please contact us https://geomatics.com.au/contact/ and our team will assist you.

> **Ready to Activate?** You don't need to wait for the trial period to end. You can activate the software at any time by clicking the Activate Software link in the bottom-left corner of the screen.

Obtaining a Licence

If you haven't yet purchased a licence, visit https://geomatics.com.au/contact/ for contact details to organise payment. Once you've received a serial number, you can choose to activate the software online or offline.

> **Important!** If you plan to decommission your computer or transfer the software to another machine, you must first deactivate the licence on the current system.
>
> Failing to do so may prevent reactivation on a new device and could result in delays.
>
> Please refer to the section Software Deactivation within this user manual for deactivation instructions.

Online Activation (Recommended)

Online activation is the fastest and most convenient method.

1. Launch the software.
2. Enter your **serial number** into the activation field.
3. Click **Activate**.
4. The software will validate the serial number and bind the licence to your system.
5. If successful, you'll receive a confirmation message and the software will unlock automatically.

> **Note:** Each serial number can only be activated at any one time on one machine.

Offline Activation

If your computer is not connected to the internet:

1. Click on the Offline Activation tab if you have not already.
2. Enter your **serial number** and click **Apply**.
3. This will generate a **Licence Request Code**.
4. Copy the code and email it to us (contact details available at the bottom of the activation screen).
5. Our team will process your request and return a **Licence Key File** or activation code.

> **Turnaround Time:** We aim to respond within 24 hours, though requests submitted over weekends or public holidays may take longer.

6. Once you receive your key:
   - Paste the licence key into the provided field or
   - Drag and drop the .lic file into the activation window.
7. Click **Activate** to complete the process.

Activation Success

If activation is successful, a confirmation message will appear and the full version of the software will be unlocked for use.

> **Tip:** After activation, your serial number (and software version) will appear in the window title bar.

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

Software Deactivation

Deactivating the software frees up your licence so it can be used on another computer. Once deactivated, you will no longer be able to run the software on the current machine unless it is reactivated.

> **Important!** Please note that there are limits to how many times a licence can be transferred to another computer within a set time period.
>
> If this limit is exceeded, the licensing server will temporarily prevent further transfers until the next available transfer window.

Accessing the Deactivation Screen

1. Launch the software.

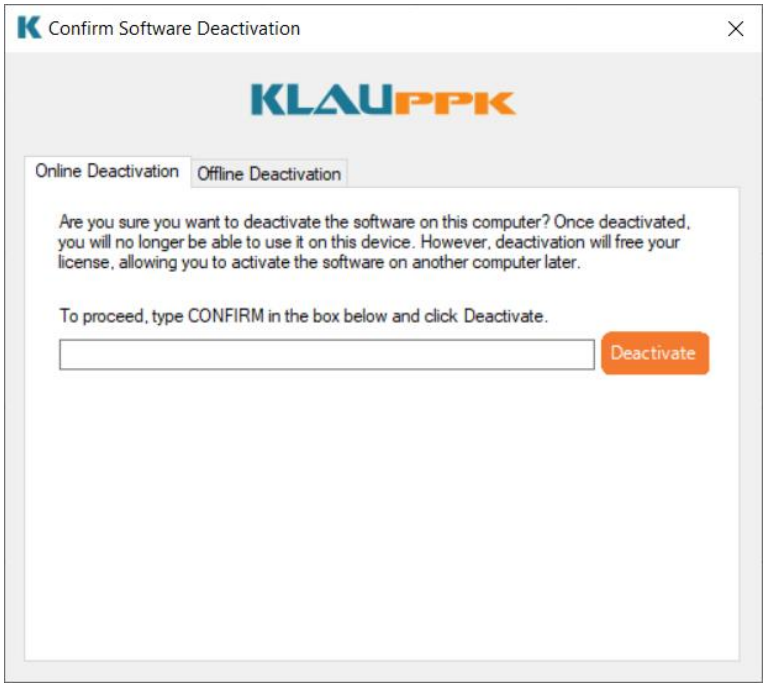
2. In the bottom-left corner, click the **Transfer Licence** link.

3. The Confirm Deactivation form will appear.

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

Online Deactivation (Recommended)

Online deactivation is the fastest and most convenient method.



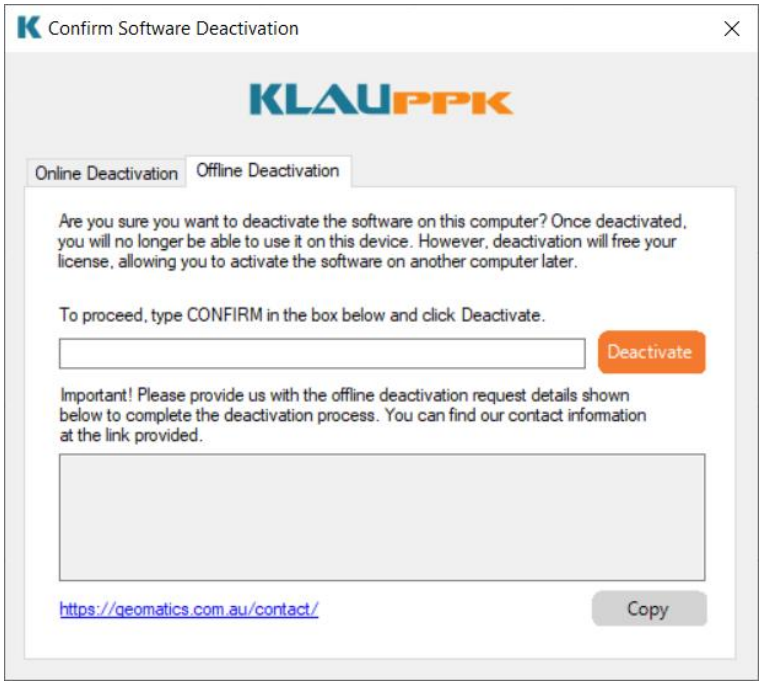
1. In the deactivation form, enter the word CONFIRM into the text box.

2. Click **Deactivate**.

3. If successful, a confirmation message will appear and the software will be deactivated immediately.

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

Offline Deactivation



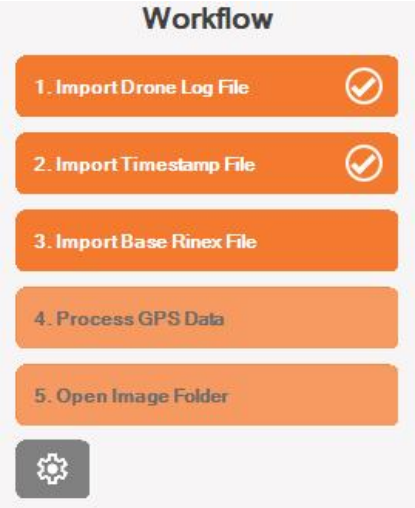
If your computer is not connected to the internet:

1. Navigate to the **Offline Deactivation** tab (if not already selected).
2. Type **CONFIRM** into the text box and click **Deactivate**.
3. A unique **Offline Deactivation Request** code will be generated.
4. Copy and email this code to our team (contact details are listed at the bottom of the activation screen).
5. We will process your request and confirm deactivation from our end.

> **Turnaround Time:** We aim to respond within 24 hours, though requests submitted over weekends or public holidays may take longer.

Processing Workflow

Follow the workflow steps located on the left-hand panel to process your drone's mission data.



Each step in the workflow is marked by a progress indicator. When a step is successfully completed, a tick appears beside it to confirm completion. Steps that are greyed out are disabled until one or more prerequisite actions are satisfied.

The button located beneath the workflow steps allows you to define PPK processing preferences.

Step 1: Import Drone Log File

Use this step to load your drone's mission log.

1. Click **Import Drone Log File**.

2. Browse to your mission folder and locate the log file.

3. Supported file formats include:

- .bin (preferred)
- .rtk (preferred)
- .obs
- .dat

4. Once loaded, the software will parse the file and display on the right panel the file path and local start and end time of the mission. For longer file paths, simply hover your mouse over the truncated path to reveal the full location.

> **Note:** The software will alert you if the mission duration is too short. See Best Practices for Reliable Positioning for more info.

Step 2: Import Timestamp File

This file contains precise timestamps for camera events. In most cases, the software will automatically locate the timestamp file. If not, you can:

1. Click the **Import Timestamp File** button to select it manually.
2. Supported formats:

    - .MRK (common for most drones)
    - imagelog.json (used by Freefly drones)

3. Once imported the software will display the number of recorded **camera events**.

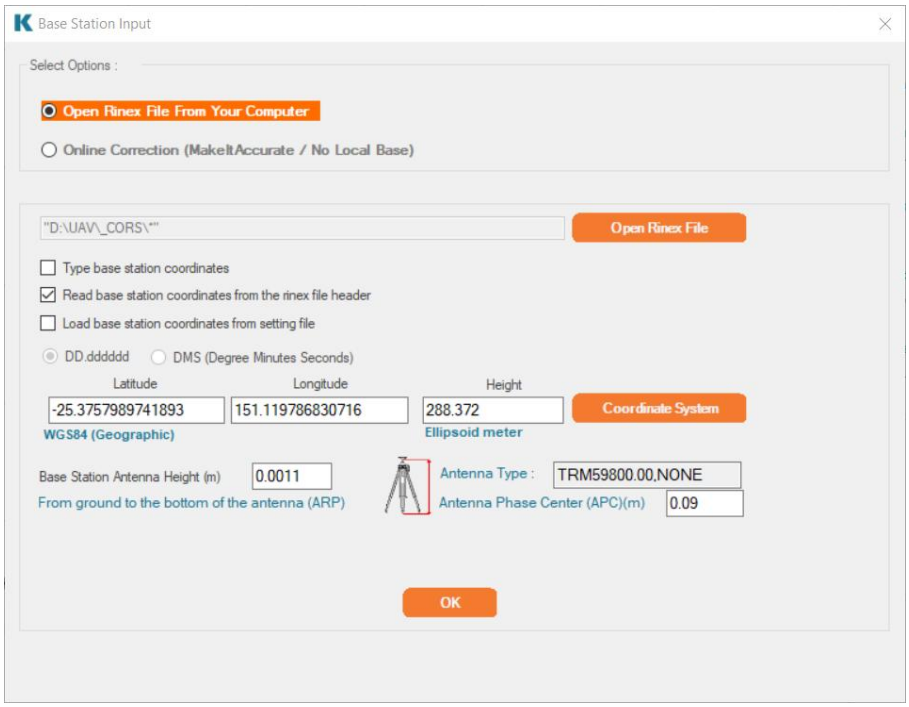
Step 3: Import Base RINEX File

This step is essential for Post-Processed Kinematic (PPK) corrections.

Click **Import Base RINEX File**

Choose a data source:

Open Rinex File From Your Computer
Use this option to manually load RINEX files from a local directory.



Click **Open Rinex File** to browse to your base station data folder and select the desired file. Supported formats include:

- Standard RINEX files (*.o, *.obs)
- KlauPPK base station logs (*.ppk)

- UBX logs (*.UBX), and
- DJI BaseStation RTCM logs (*.DAT).

To select multiple files such as when your base station data spans several files, hold down the Ctrl or Shift key while selecting. Once your selection is complete, click **Open** to proceed.

> **Important:** Ensure the folder also contains the **navigation files**, typically named:
> *.n (NAV message file)
> *.g (GLONASS navigation file, if applicable)

After selecting the file:

Enter your **base station coordinates** and any other required fields. The software will automatically extract from the RINEX header the:

- **Antenna height**
- **Antenna Phase Center (APC)** position

You may manually edit these values if adjustments are needed.

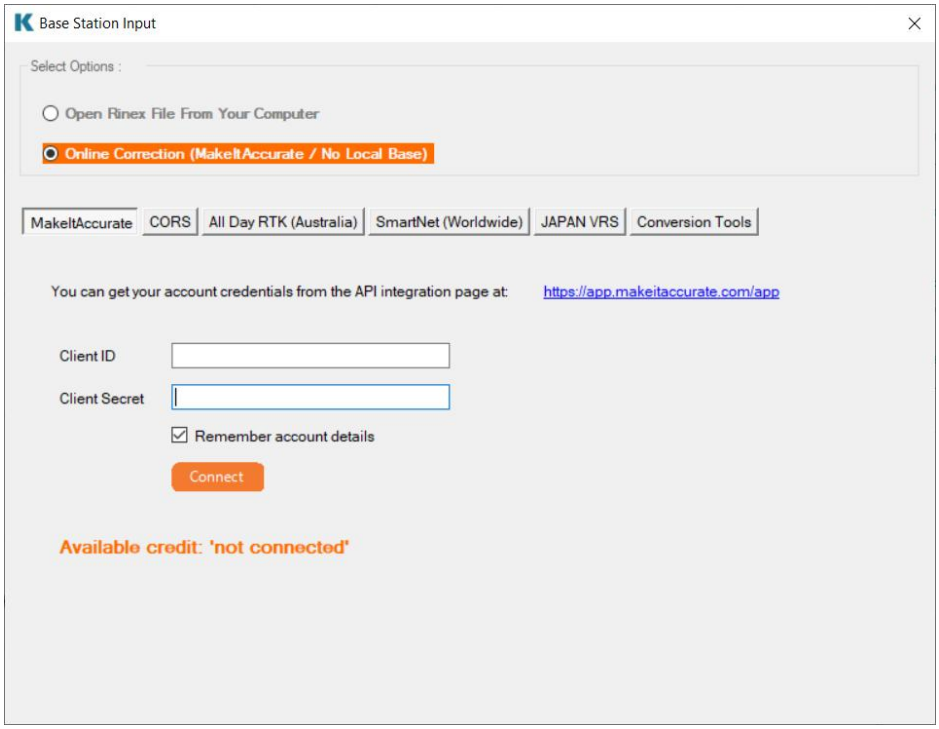
Online Corrections (Make It Accurate / No Local Base)
If you're unable to obtain "fixed" results in your processing or don't have access to a local base station, there are several integrated online correction options available to enhance your solution.

MakeItAccurate (Pay-Per-Use)
This is an excellent choice when:

- You don't have base station data
- You don't have a Premium CORS Services account
- PPK is failing to resolve "fixed" solutions

MakeItAccurate provides high-precision GNSS corrections using precise satellite clock, orbit data and Ionospheric corrections This system is less dependent on nearby ground stations and can be accessed by creating an account at https://app.makeitaccurate.com

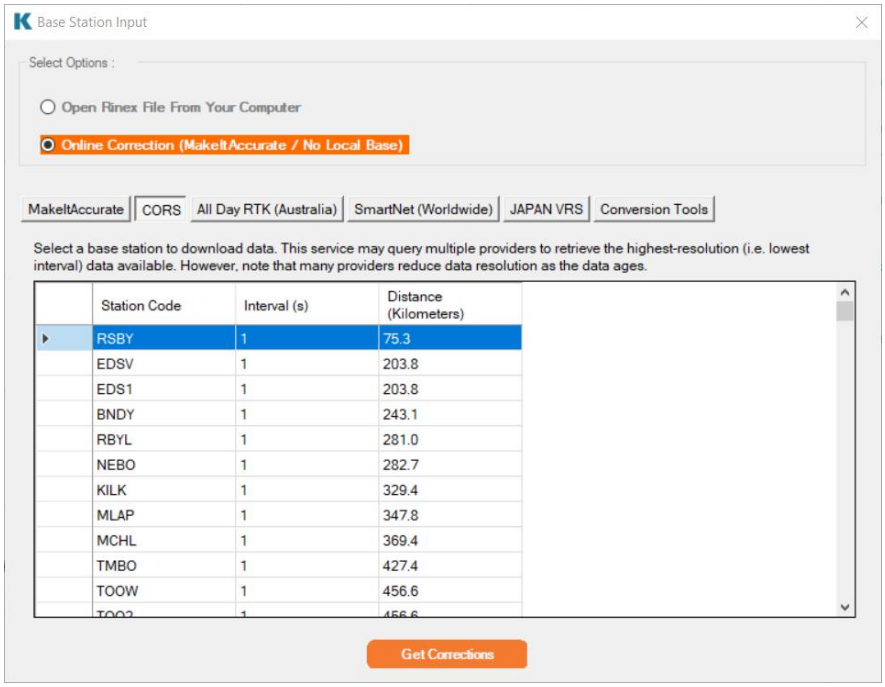
ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541



CORS Corrections (No Account Needed)
This tool simplifies the retrieval of public CORS data by:

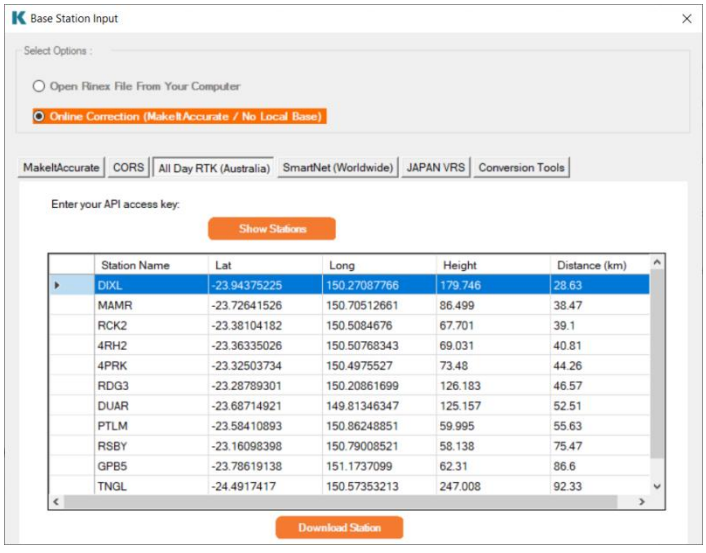
- Automatically locating nearby CORS stations
- Retrieving data that covers the entire observation period
- Selecting optimal data (based on sample interval)
- Falling back to alternate sources when needed and available

No login is required - ideal for quick access to widely available public stations.
Continually Expanding Coverage - We are actively extending support for new regions and CORS stations to improve data availability and accuracy worldwide.

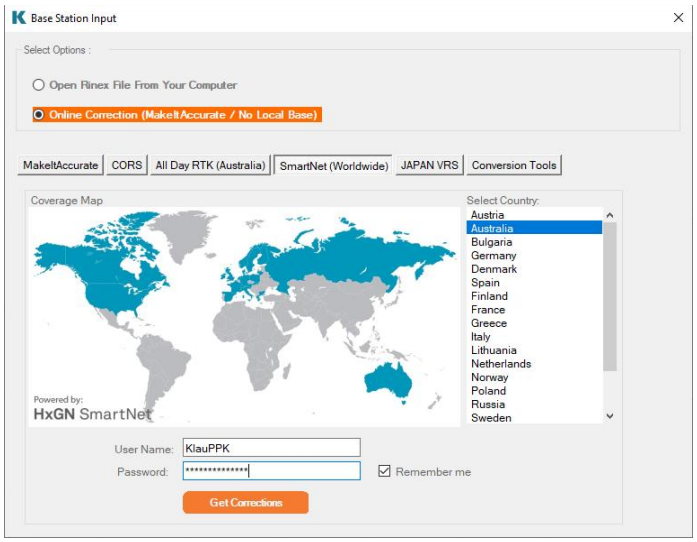


Premium CORS Services (Account Required)
These platforms offer more consistent access to high-quality correction data:

AllDayRTK: High-density CORS network supporting Australia and New Zealand



SmartNet Worldwide: Global coverage across many regions with premium-grade GNSS positioning



Access to these services requires an active account with the respective providers.

Conversion Tools
Additional utilities are included to support file compatibility:

- Compressed RINEX → Standard RINEX
- UBX → RINEX

These tools help ensure your files meet format requirements for post-processing or correction services in KlauPPK UAV.

Once the base station data is selected/downloaded the right-hand side panel will show the local start and end time of the base data and the time overlap graph with your base station and drone data.

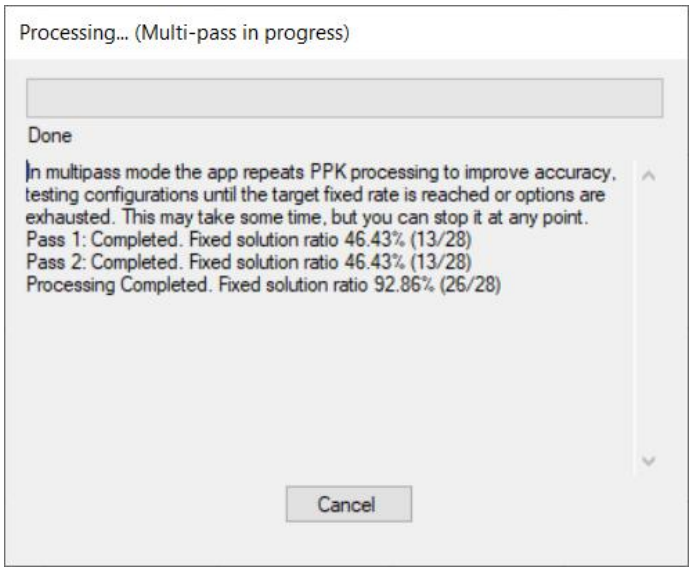
You will now be able to proceed with processing the GPS data.

> **Note:** The software will alert you if the observation internal of your base station data is > 1 sec. See Best Practices for Reliable Positioning for more info.

Step 4: Process GPS Data

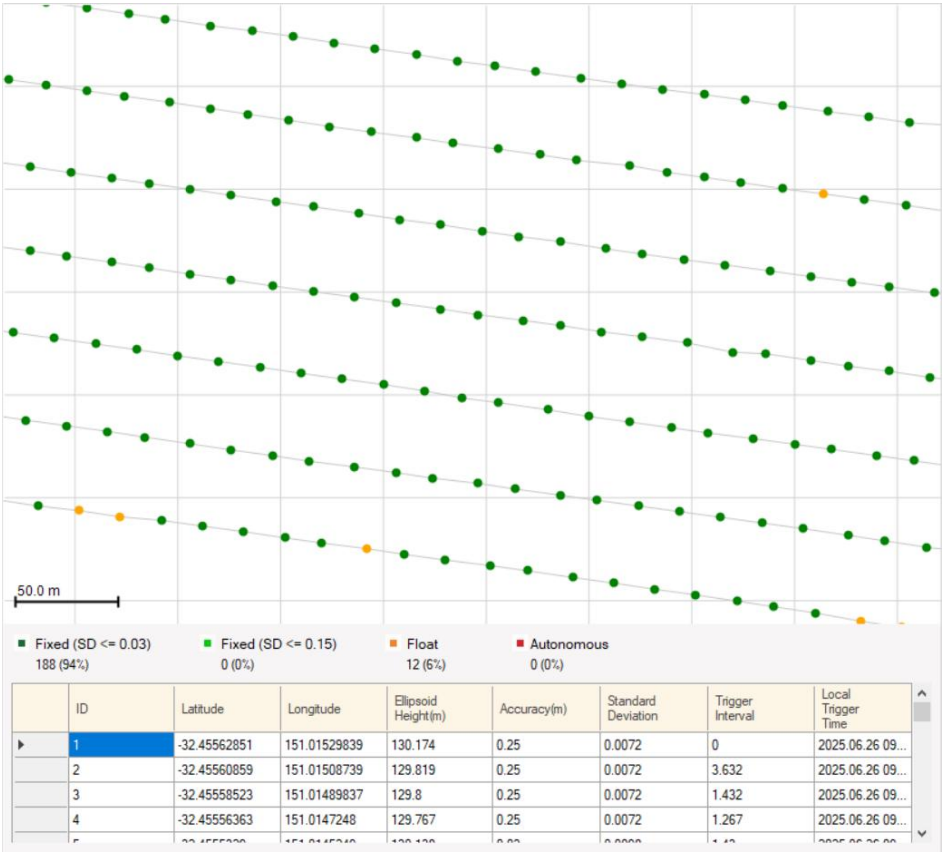
This step performs Post-Processed Kinematic (PPK) analysis on the GNSS data. Once initiated, the system will compute high-accuracy positions using reference base station corrections.

During processing, a dialog window displays the current progress percentage. If multi-pass processing is enabled and the fixed results ratio is below your configured setting, the app will continue running additional PPK passes with different configurations until the target fixed rate is reached or all options are exhausted. You can cancel processing at any time by clicking the Cancel button.



Once processing is complete, the dialog window closes and the list of processed coordinates is displayed, confirming successful completion. Processing time depends on mission duration, baseline distance, data density (for example, 1- second intervals may take longer), and the number of PPK passes required (if enabled) to reach the fixed result target.

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541



	ID	Latitude	Longitude	Ellipsoid Height(m)	Accuracy(m)	Standard Deviation	Trigger Interval	Local Trigger Time
▶	1	-32.45562851	151.01529839	130.174	0.25	0.0072	0	2025.06.26 09...
	2	-32.45560859	151.01508739	129.819	0.25	0.0072	3.632	2025.06.26 09...
	3	-32.45558523	151.01489837	129.8	0.25	0.0072	1.432	2025.06.26 09...
	4	-32.45556363	151.0147248	129.767	0.25	0.0072	1.267	2025.06.26 09...

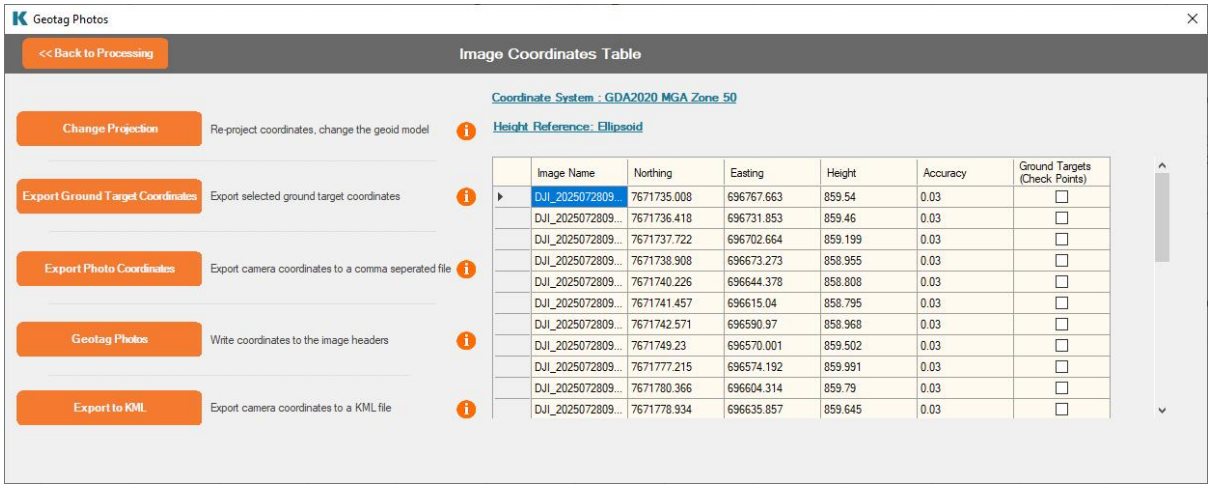
Each camera capture event is plotted on the grid and color-coded by its computed precision: dark green for centimeter-level (≈3 cm), bright green for sub-decimeter (≈15 cm), orange for float fixes, and red for

autonomous solutions. The legend beneath the grid shows each color, along with the count and percentage of events in each category. You can pan, zoom in, and zoom out with your mouse to explore the data.

Clicking a marker opens its location details, where you'll find coordinates and other metadata, plus a link to view the point directly in Google Maps. The same events are listed in the table below the grid. Clicking any row highlights and briefly pulses its corresponding point on the map for quick cross-reference.

Step 5: Open Image Folder

Select the image folder to import. A progress indicator will appear in the bottom-right corner, displaying the percentage of photos that have been read. This allows the system to assign post-processed GPS coordinates to each photo and link orientation data where available. Together, this ensures each image is accurately positioned and aligned in space.

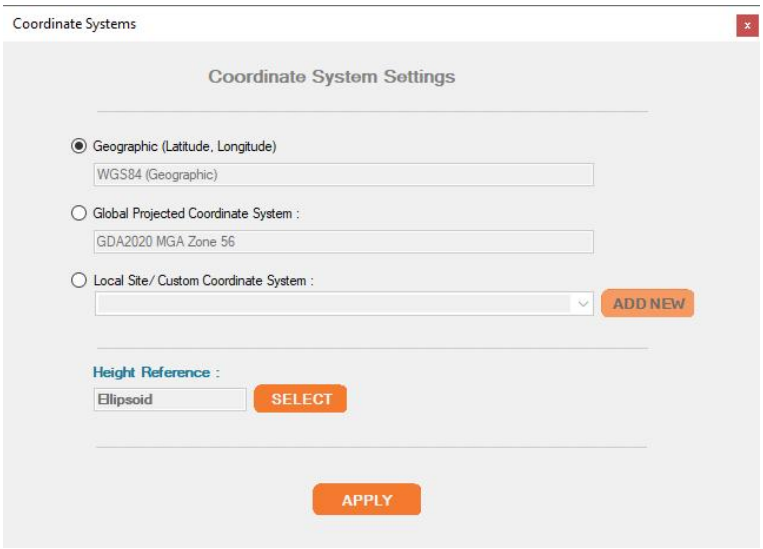


From this window, you can update the coordinate system of your camera positions, define a local site coordinate system, set the height reference, and export the processed positions or geotag them directly into the image metadata.

Changing the Coordinate System

Click **Change Projection** to select your preferred coordinate system and height reference. This defines how photo positions will be represented during export or geotagging.

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541



Defining a Site Localisation (Custom Coordinate System)

Commonly used in mining and construction environments, custom local coordinate systems can be defined by clicking Local Site/Custom Coordinate System, then selecting Add New.

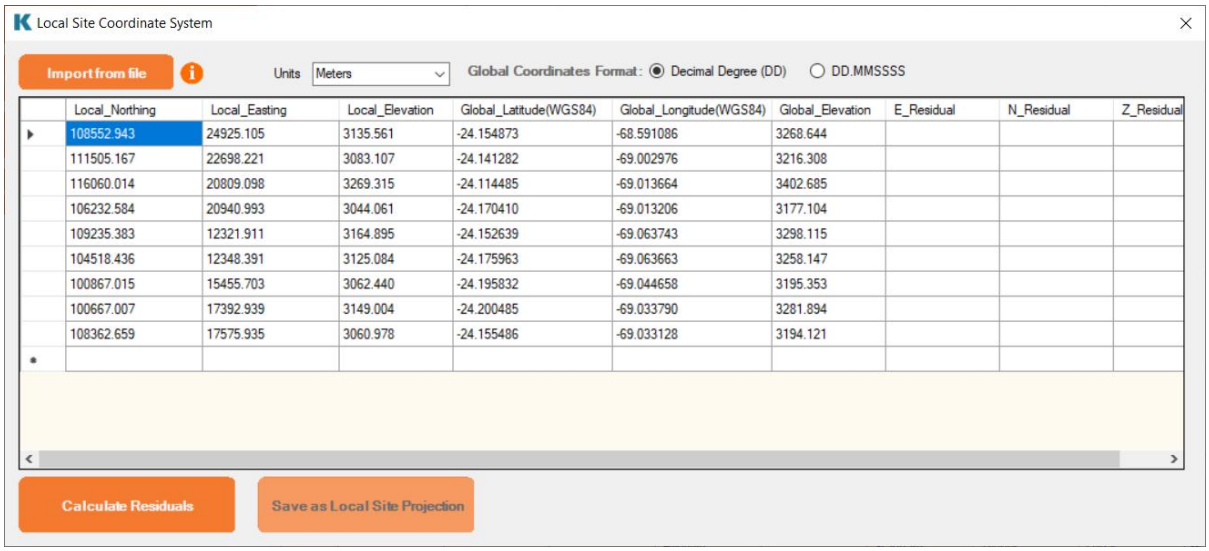
To create a custom site localisation:

- Prepare a plain text file with at least five pairs of coordinates.
- Each row must include 6 space-separated columns:
- 3 columns for your local site coordinates
- 3 columns for geographic WGS84 coordinates
- The column order must match the format shown in the reference image above.

Once imported:

- Click **Calculate Residuals** to view transformation errors.
- If acceptable, click **Save as Local Site Projection** and assign a name.
- You can later select this saved system from the Local Site/Custom Coordinate System dropdown to apply it to all photo positions.

ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541



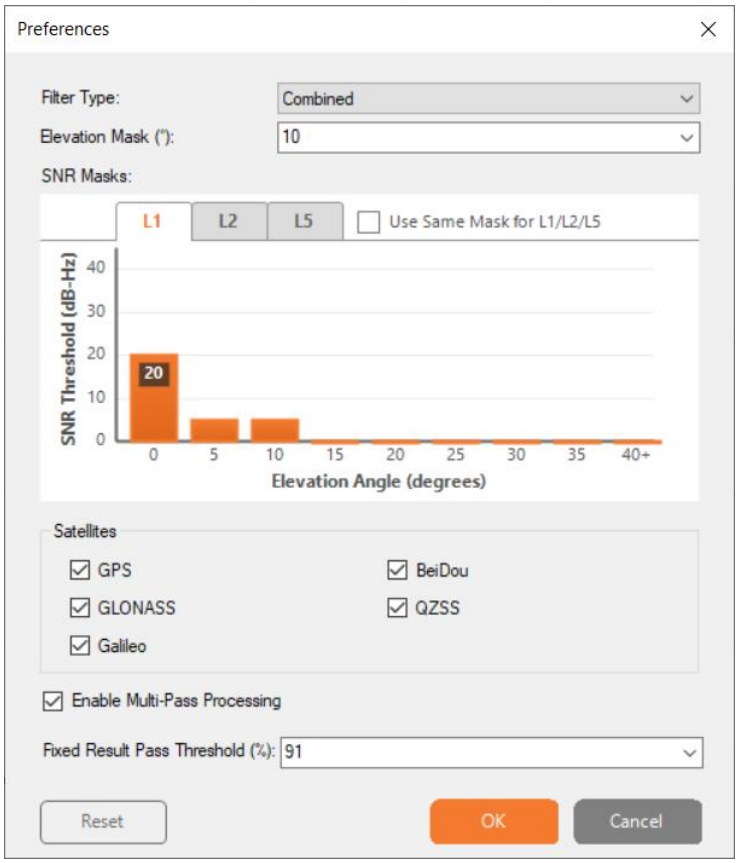
Exporting or Geotagging

Once the coordinate system has been applied (if applicable) you can choose one of the following options for use in photogrammetry software:

- Geotag photos by embedding coordinates directly into the EXIF metadata.
  Note: EXIF format only supports WGS84 latitude and longitude.
- Export a CSV or tab-delimited file containing photo filenames and accurate coordinates in your preferred coordinate system.
- Export the camera coordinates to a KML file
  Note: KML format only supports WGS84 latitude and longitude.

Make sure to match the reported accuracy field from your output to the camera accuracy settings in your photogrammetry workflow.

PPK Preferences



The Preferences window allows you to:

- Set signal filtering parameters
- Define elevation and SNR masks
- Select satellite constellations
- Enable multi-pass processing
- Adjust fixed result pass thresholds

Filter Type

Combined:
Description: Runs both forward and backward passes through the GNSS data, then merges the results.
Benefits: Offers the most robust solution, especially in areas with signal loss or multipath interference.
Use Case: Ideal for high-precision applications like surveying, mapping, or photogrammetry where consistency and reliability are critical

Forward Only
Description: Processes data chronologically from start to finish.
Benefits: Faster and simpler, but may struggle with signal dropouts or poor satellite geometry.
Use Case: Suitable for real time emulation or when backward data isn't available.

Backward Only
Description: Processes data in reverse; from end to start.

Benefits: Can improve results in scenarios where the end of the dataset has better satellite visibility.
Use Case: Useful for post-processing when the forward pass yields poor results due to early signal issues.

Elevation Mask (°)

Description: Sets the minimum elevation angle for satellite inclusion.
Benefits: Exclude low elevation satellites, reducing multipath errors.
Use Case: Helpful when you are getting float solutions from low angle satellites that degrade fix quality. Raising the mask forces the processor to rely on higher elevation satellites, which typically provide stronger, cleaner signals and improve the chance of achieving a stable fixed solution.

SNR Mask Configuration

Description: Defines the minimum signal-to-noise ratio (SNR, measured in dBHz) required for satellites to be included in processing. Thresholds can be set by elevation angle, and optionally applied equally across L1, L2 and L5 bands.
Benefits: Filters out weak or noisy signals that can cause cycle slips, float solutions, or degraded accuracy. Ensures only satellites with sufficient signal strength contribute to the solution.
Use Case: Helpful when you are getting unstable fixes due to low quality signals, especially in environments with interference, multipath, or partial obstructions. Raising the SNR mask excludes marginal satellites, improving reliability of fixed solutions.
Tip: Use Same Mask for L1/L2/L5 applies the same SNR mask to the L1, L2 and L5 bands.You can adjust the values by dragging the bars up and down.

Satellite System Selection

Choose which GNSS constellations to include in processing:

- GPS
- GLONASS
- Galileo
- BeiDou
- QZSS

All systems are enabled by default for maximum coverage.

Multi-Pass Processing

Description: Runs multiple passes of the GNSS data through the processing engine, comparing results across iterations to refine accuracy.
Benefits: Helps automate the detection and rejection of false fixes caused by noise, multipath, or poor satellite geometry.
Use Case: Helpful when you are getting inconsistent fixes or frequent float solutions.

Fixed Result Pass Threshold (%)

Description: Sets the minimum fixed result ratio that a single processing pass must achieve for its results to be accepted. Once a pass meets or exceeds this threshold, multi-pass processing stops and the solution is finalised.
Benefits: Prevents unnecessary additional passes once a sufficiently strong fixed solution is found, saving time while ensuring reliability.
Use Case: Helpful when you want to enforce a minimum quality requirement for accepting a pass as the final result. For example, setting the threshold to 95% ensures that only passes with at least 95% fixed epochs are accepted, and once such a pass is found, its results are used.

To revert the preferences back to the the default settings, click the reset button on the bottom left of the preferences window.

Best Practices for Reliable Positioning

Baseline Distance
Positioning accuracy depends heavily on the distance between the **rover** (drone receiver) and the **base station**. Shorter baselines typically result in higher precision due to reduced atmospheric and orbital error impact. The table below illustrates how varying baseline lengths can affect post-processing outcomes:

Distance	Impact on Accuracy
0 - 10 km (Short Baseline)	Highest accuracy and reliability Minimal atmospheric error Integer ambiguity resolution is fast and effective
10 - 30 km (Medium Baseline)	Accuracy is still good but may slightly degrade Atmospheric and ionospheric delays begin to affect phase measurements
30+ km (Long Baseline)	Fix quality can degrade significantly Integer ambiguity resolution becomes more difficult More float solutions and fewer fast fixes Errors from satellite orbit and clock biases become more significant

Mission Duration

The total time span of your GNSS data collection determines the robustness of your solution.

Recommended: Minimum of 15 minutes where practical. A 10-minute duration is considered the minimum viable threshold and may suffice if all other conditions such as baseline distance, satellite geometry, and signal quality are strong.

Why it matters: Longer durations provide more data for convergence and error mitigation, especially useful in marginal satellite visibility or challenging environments.

Risks of short durations: Missions shorter than the recommended duration minutes may lead to unstable fixes or incomplete ambiguity resolution.

Observation Interval
The interval between GNSS observations directly affects the quality and granularity of post-processing. Most providers offer data at intervals such as 1, 5, 15, or 30 seconds.

Recommended: 1-second intervals

Why it matters: Shorter intervals capture more detailed phase and signal information, which improves solution quality, especially for high-dynamics platforms like drones.

Trade-offs: Longer intervals (e.g. 5–30 seconds) may miss critical transitions, reduce redundancy, and increase the chance of cycle slips.

Some providers decimate their high-resolution data after a set retention period, typically 30 to 45 days by downsampling to lower intervals. To ensure optimal results, it's recommended to process or retrieve the relevant GNSS data soon after the flight mission, before any data decimation occurs.

Satellite Geometry (DOP Values)
The quality of GNSS positioning is directly influenced by satellite geometry, which is measured using Dilution of Precision (DOP) values.

Target low DOP values: Ideal positioning occurs when PDOP is below 2.0, indicating strong satellite geometry and minimal distortion.

Check forecasted DOP windows: Some GNSS planning tools offer satellite visibility charts—schedule missions during periods of favorable geometry.

Avoid obstructed environments: Tree cover, buildings, and terrain can reduce satellite visibility, increasing DOP and lowering accuracy.

Use multi-constellation receivers: Access to GPS, Galileo, GLONASS, and BeiDou improves satellite distribution and reduces DOP.

Antenna Setup & Mounting Guidelines
Proper antenna installation is critical to achieving high-precision GNSS results. Even with quality receivers and correction data, poor mounting can introduce multipath errors, signal loss, and degraded accuracy.

Placement Location

- Clear sky view is essential. install antennas in open areas with minimal obstructions (trees, buildings, etc.).
- Avoid reflective surfaces nearby (metal, glass, water) to reduce multipath interference.
- For mobile platforms (e.g. drones or vehicles), ensure the antenna is centered and isolated from vibration and movement.

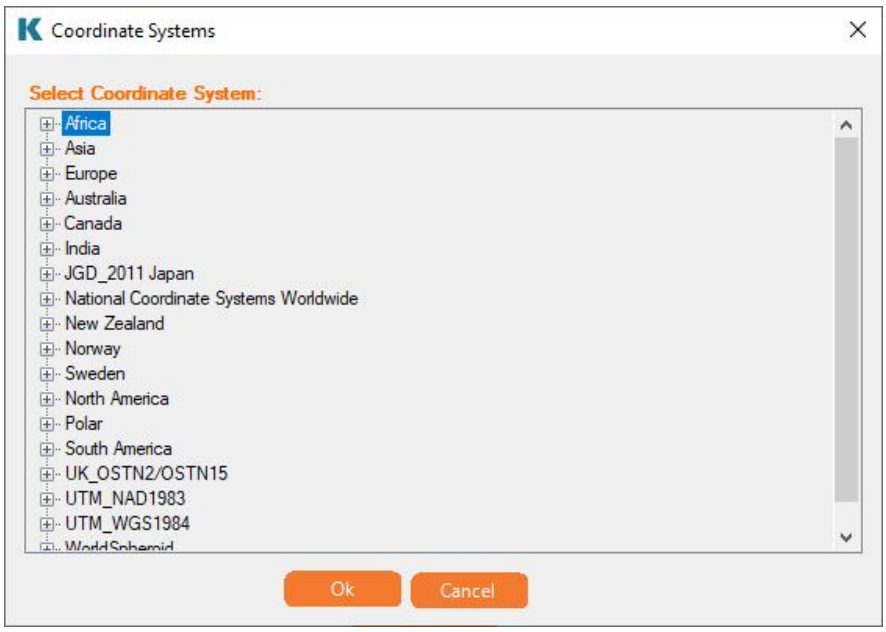
Avoiding Interference

- Keep antennas away from RF sources like radios, cellular transmitters, or satellite uplinks.
- Maintain at least a 3 meter separation from other antennas or electronics to prevent cross-talk and jamming.

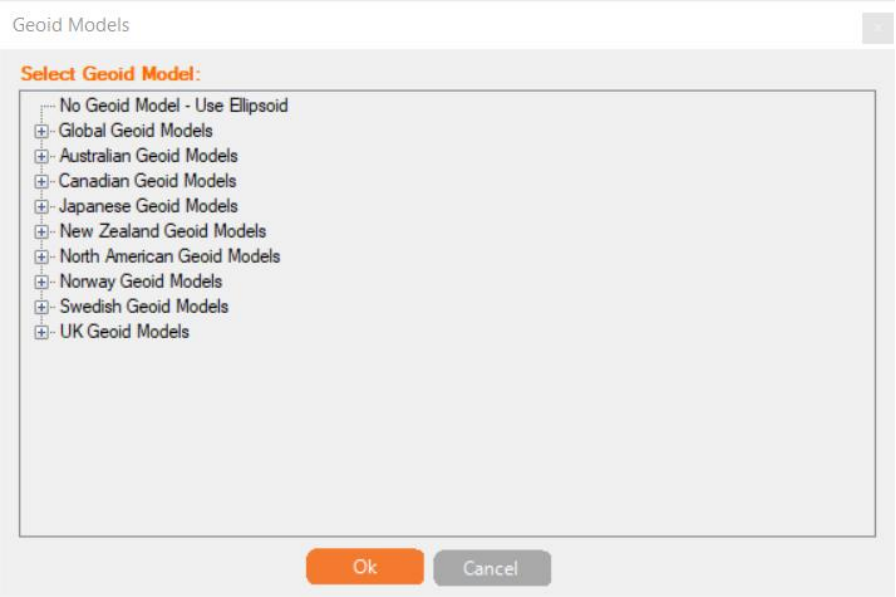
ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541

Coordinate Systems and Geoid Support

Coordinate systems define how geographic data is represented on a flat surface, making sure location data remains meaningful and accurate. KlauPPK UAV supports over 1,400 coordinate systems, including global, national, and state/regional options along with more than 20 geoids for vertical reference. Users can select one that meets their mapping standards or project requirements. To simplify navigation, supported systems are grouped by region, as shown in the screenshot below.



ABN 53 132 851 775
Unit 10/164C Princes Hwy
South Nowra NSW 2541



For a list of supported coordinate systems and geoids, please visit:
https://cdn.geomatics.com.au/klauppk-uav/KlauPPK_UAV_CoordinateSystems.pdf