

AA6D Survey System User Manual



Shanghai Huace Navigation Technology Ltd.

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Preface

This manual is designed to help users better utilize the AA6D survey system from Shanghai Huace Navigation Technology Co., Ltd. (hereinafter referred to as "CHCNAV").

If you have any questions about this manual, please contact us at 021-51508100 for professional consultation and assistance.

CHCNAV reserves the right to modify product status and user manuals without prior notice.

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1 Reading Tips

1.1 Symbol description



Prohibit



Warning



Important Notes



Operation and Usage Tips

1.2 Disclaimer

Customers must use and maintain the equipment in accordance with the user manual. We shall not be liable for any equipment lifespan reduction or malfunction caused by improper use or maintenance. All related repair and maintenance services will be charged at standard rates.

We shall not be liable for any instrument damage caused by improper logistics handling during transportation.

If the customer disassembles or reassembles the equipment without following the manufacturer's instructions during its use, resulting in damage, we shall not be held liable.

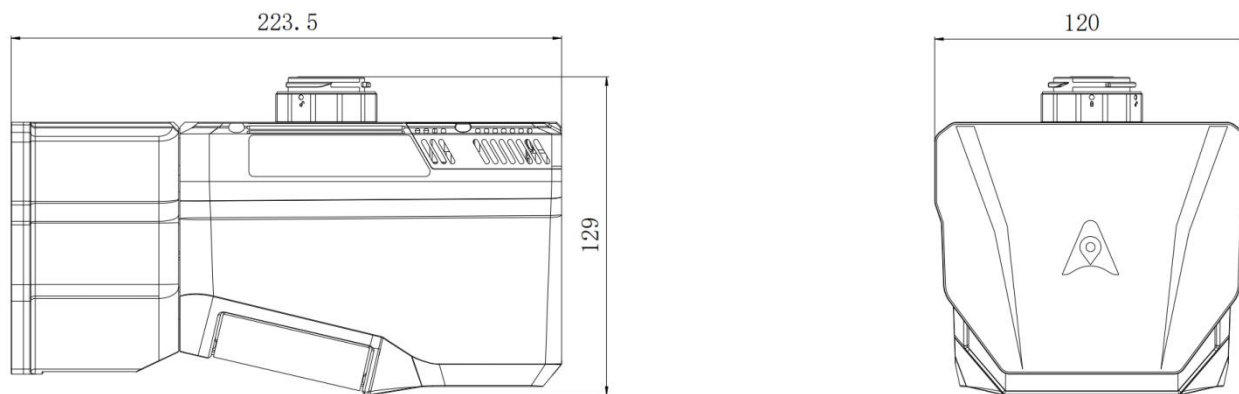
2 Product Introduction

The AA6D surveying system is specifically designed for vehicle-mounted mode and is widely used in vehicle-based operations such as urban surveying.

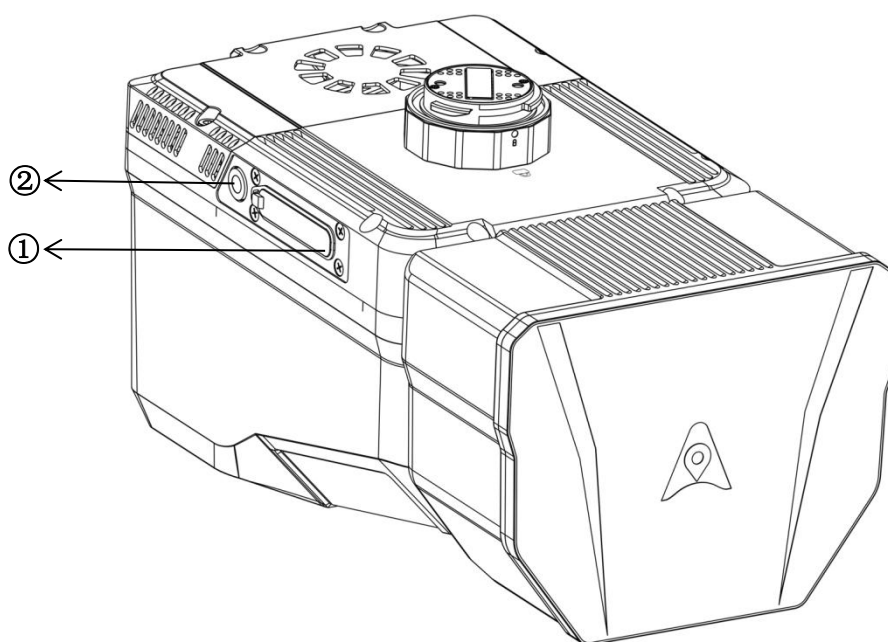
2.1 Device Specifications, Dimensions, and Interface Definitions

The weight of the host is 1.85 kg.

The dimensions (223.5×120×129mm) are shown in the figure below:



Device interface and indicator light description:



1. Card slot for storage 2. Indicator light

2.2 Product Parameter

2.2.1 System Parameter

System parameter	System accuracy	5 cm H, 5 cm Z
	Weight	1.85kg
	Size	223.5×120×129mm
	Service voltage	24V (wide voltage range: 17-30V)
	Data storage	512GB
	Transmit speed	200MB/s
	Work temperature	-20°C~+50°C
	Typical power	50W@300KHz,200I/s
	Max.power	60W
	IP level	IP64
Laser measurement system	range	10~2100m
	Maximum point frequency	2 million points per second
	Line speed	Up to 400 lines per second
	FOV	90°
	Maximum returns	16
	MTA	7
	range accuracy/repeatability	15mm/5mm@150m
Position and orientation system	GNSS	GPS:L1,L2,L5 GLONASS:L1,L2 BEIDOU:B1,B2,B3 GALILEO:E1 E5a E5b
	Position accuracy after post-processing	Pitch/roll angle: 0.006° (post-processing, 1σ); yaw angle: 0.015° (post-processing, 1σ);

	Post-processing accuracy	Horizontal: 1 cm + 1 ppm; Vertical: 1.5 cm + 1 ppm;
	IMU update rate	500Hz
Camera parameters	Resolution	26MP * 2 (6252 * 4168)
	Focal length	16mm
	Sensor size	Semi-frame
	Field of view	110°
	Minimum photo interval	1s

2.2.2 Range Capability

The ranging capability of different frequency points is shown in the table below:

Point frequency Reflectivity	100k	200k	300k	500k	1000k	2000k	1000k low power
Reflectivity $\rho \geq 10\%$	960m	870m	750m	640m	460m	320m	250m
Reflectivity $\rho \geq 80\%$	2100m	1800m	1700m	1450m	1000m	525m	500m

 Note:

- The point frequency is rounded to the nearest integer, with the actual point frequency slightly exceeding this value.

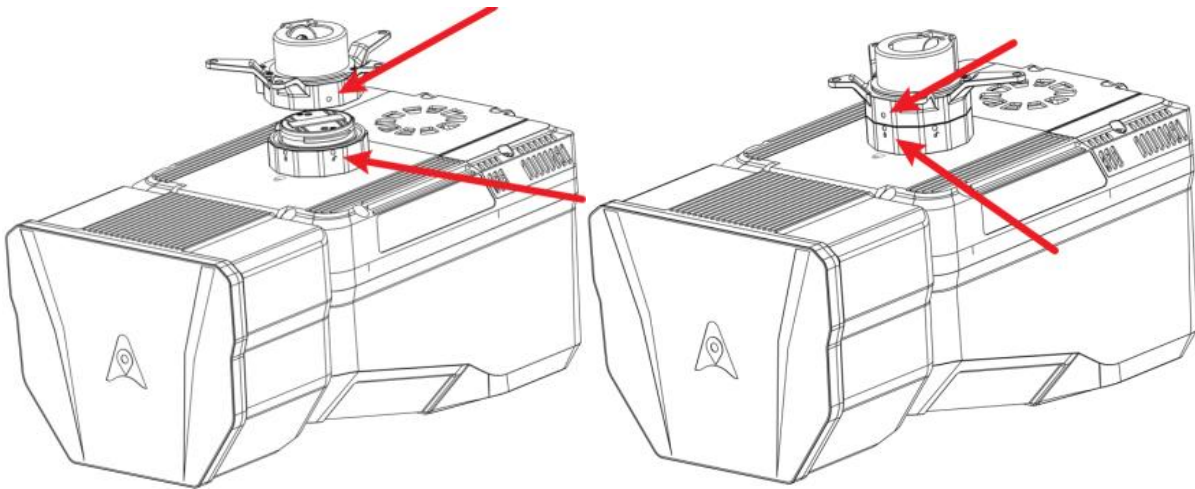
3 Product Usage

3.1 Previous Preparation

1. The base station must be pre-installed, with its coordinates measured and instrument height recorded. The base station should then be powered on and static data logged.

3.2 Device Attachment

- (1) Align the white dot on the device's interface with the red dot on the mounting board, then connect the device.
- (2) Rotate the device clockwise with the right hand to align its red dot with the mounting board's red dot, completing the installation.



2. After the device is installed, The AA6D will automatically power on. Wait about ten seconds, and the device's indicator light will start blinking, indicating successful power-up.

Power on and wait 60-70 seconds until the device indicator light stays on, indicating initialization completion. At this point, you can start data collection.

Different states of AA6D indicator light

Indicator & Buzzer Status	Device status	Device Operating State
Steady off	Power off	No power
Flashing at 5Hz	Power on, not ready	Satellite not locked, INS not synchronized
Steady on	Initialization complete	Satellite locked, INS synchronized
Two flashes, one off	Project started	INS/GNSS data collection
Green light slow flash (2 seconds)	Data collection	Point cloud/image data collection
Steady red	Abnormal	Device operating abnormally
Red and green alternating flash	Firmware update	Updating firmware
Buzzer sounds once for 1 second	Device startup	Device just powered on
Buzzer sounds for 1 second at 1-second intervals	Abnormal	Device faulty, unable to operate
Buzzer sounds for 2.5 seconds at 2.5-second intervals	License expired	Device unlicensed or license expired

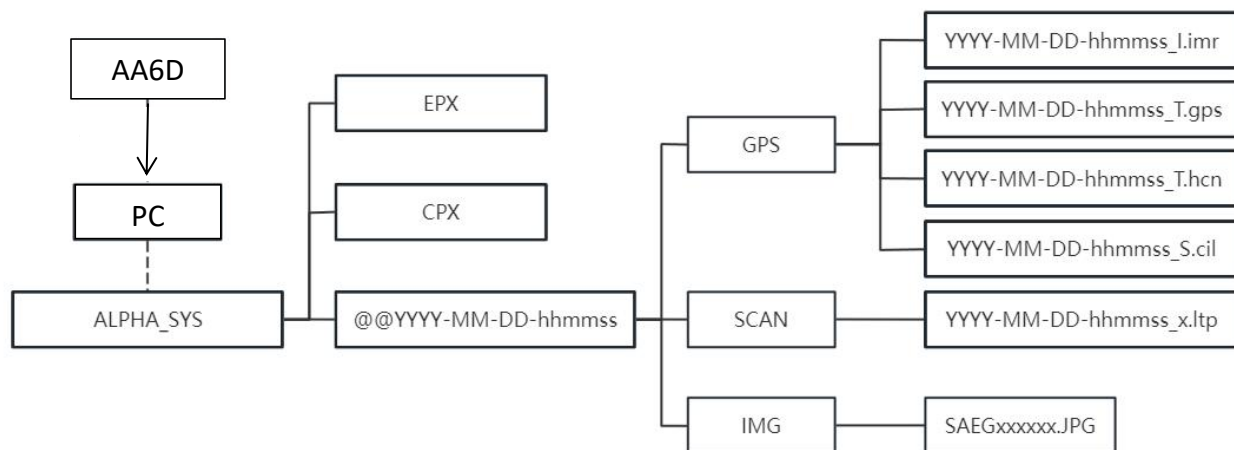
4 Data Copy

4.1 Introduction to Hard Disk Data

To access the storage card in the device, connect it to the computer using the included card reader. The computer will then display the ALPHA_SYS drive letter. The AA6D device has 512GB of memory, as shown in the figure below.



Data organization diagram



File Specification :

- (1) The ALPHA_SYS contains three folders: EPX, CPX, and the project folder starting with @@.
- (2) A folder named after the collection time, storing all collection project information, including:
 - ① GNSS observation data (xxxxxx_T.gps and xxxxxx_T.hcn)
 - ② Inertial navigation data (xxxxxx_l.imr)
 - ③ Lidar and camera control commands and interaction data (xxxxxx_S. cil)
 - ④ Laser data (xxxxxx.ltp) file
 - ⑤ Calibration parameter files (CPX for camera calibration, EPX for laser calibration).

Note:

- After the data copy is complete, eject the data card from the computer and unplug the data copy cable. If the data card is not ejected, it may be damaged.

- The EPX and CPX folders are parameter files provided by the manufacturer. You cannot delete this file, as it is required for data copying.

4.2 Data Copy

1. Confirm that the ALPHA_SYS drive letter appears on the computer.
2. Simply copy the project you need to transfer to your local computer.

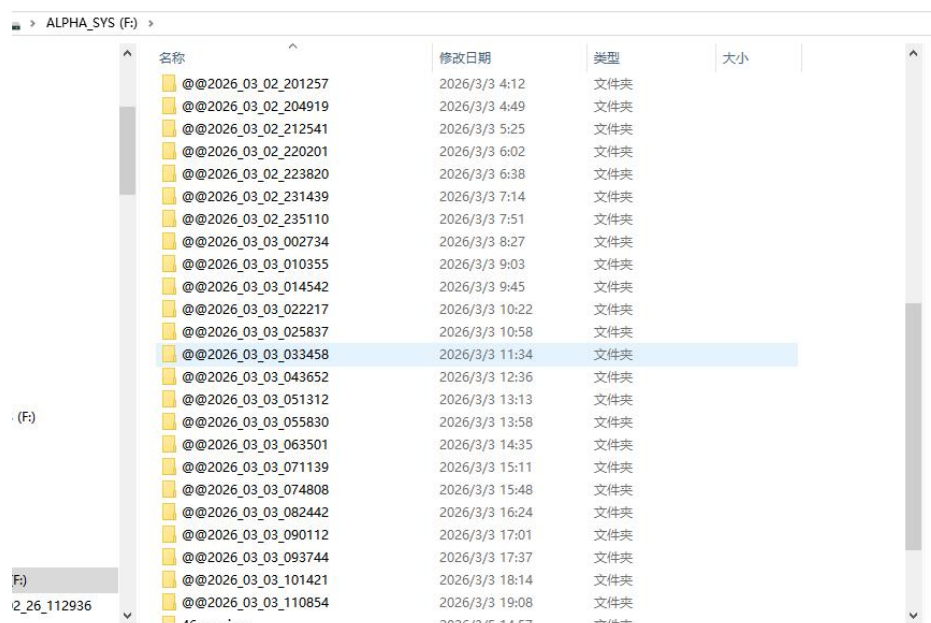
 Note:

- Keep your computer and card reader stable during data copying to prevent interruptions.
- Do not use the cut function to copy data to avoid losing your backup.
- Copy the project file to an English path and do not contain the space.

4.3 Data Clear

When the ALPHA_SYS hard drive has less than 10% remaining capacity or the capacity cannot meet the current project requirements, data cleanup is required.

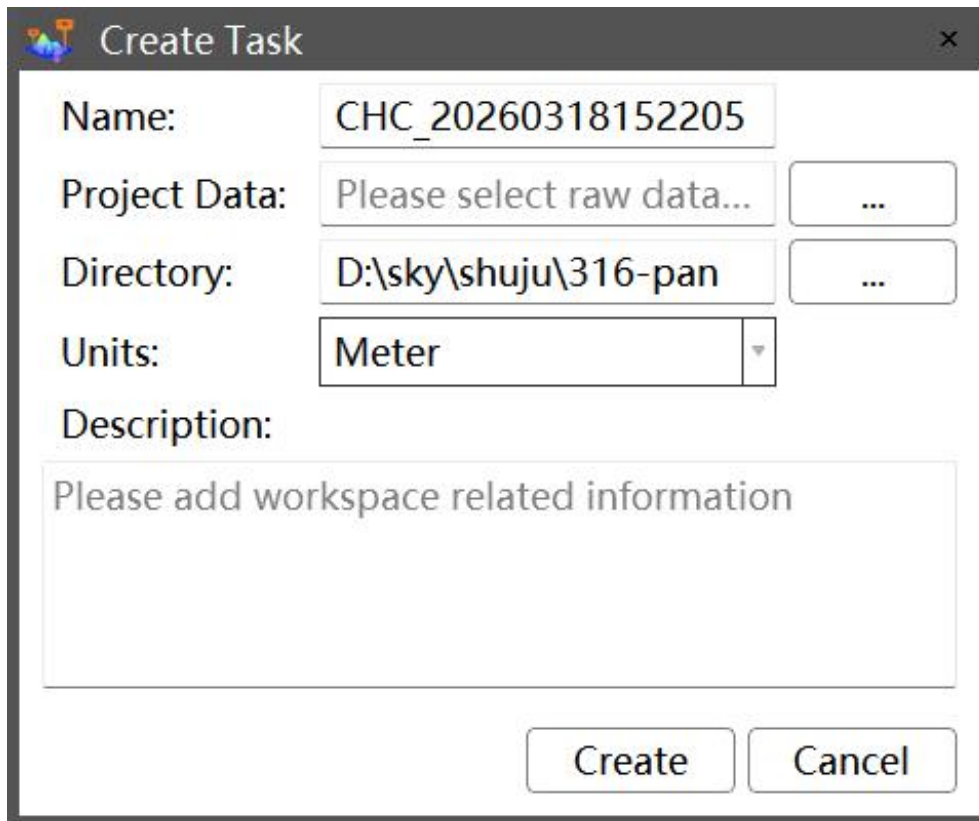
Open the ALPHA_SYS drive, select the project folder starting with @@ to delete, and right-click to remove. Do not delete other system configuration folders.



5 Workflow of Data Processing

5.1 Create a New Project

1. Open CoPre software, click "Engineering Management-> New", and the task creation dialog box will appear.



The screenshot shows the 'Create Task' dialog box. The 'Name' field is filled with 'CHC_20260318152205'. The 'Project Data' field shows 'Please select raw data...' with a browse button '...'. The 'Directory' field shows 'D:\sky\shuju\316-pan' with a browse button '...'. The 'Units' dropdown is set to 'Meter'. The 'Description' text area contains the placeholder 'Please add workspace related information'. The 'Create' and 'Cancel' buttons are at the bottom right.

Task name: Name of the new workspace;

Engineering data: Copy the original engineering data (from the @@+ collection time folder) using the copy tool.

Task path: the location for intermediate and final data.

Unit: Default is meters.

Note: The original project and CoPre task do not support non-English paths or spaces. The original data should be stored in an English path. When creating a new CoPre task, use an English name and storage path.

2. After clicking "Create", the coordinate system setup window will appear. Click the "..." button on the right side of the coordinate system to open the setup window. Set the corresponding coordinate system as needed, then click "OK" to complete the new project.

Coordinate Settings

Please set the target coordinate system of the task.

Coordinate System:
China CGCS2000 / Gaussian Projection / 117E

Method:
Gaussian Projection

Projection settings	Parameter value	
Central Meridian	117:00:00.000000	E
Origin Latitude	00:00:00.000000	N
Scale Factor	1	
False Easting(m)	500000	
False Northing(m)	0	
Average Latitude	00:00:00.000000	N
Projection Height(m)	0	

5.2 POS Resolving

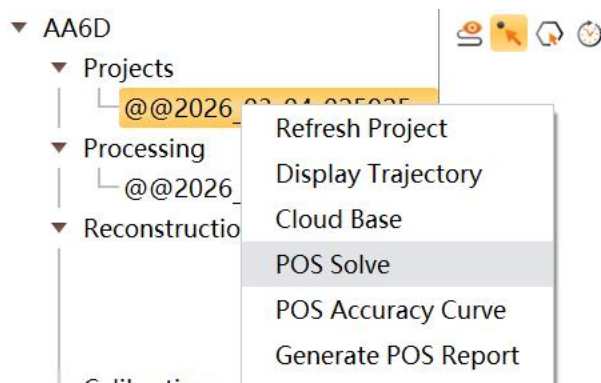
5.2.1 Base Station Data Preparation

Place the base station observation file (either *.HCN format or a standard Rinex 3.02 observation file) into the @@YY-MM-DD-hhmmss/GPS/Base folder.

@@2021-08-11-083024 > GPS > Base

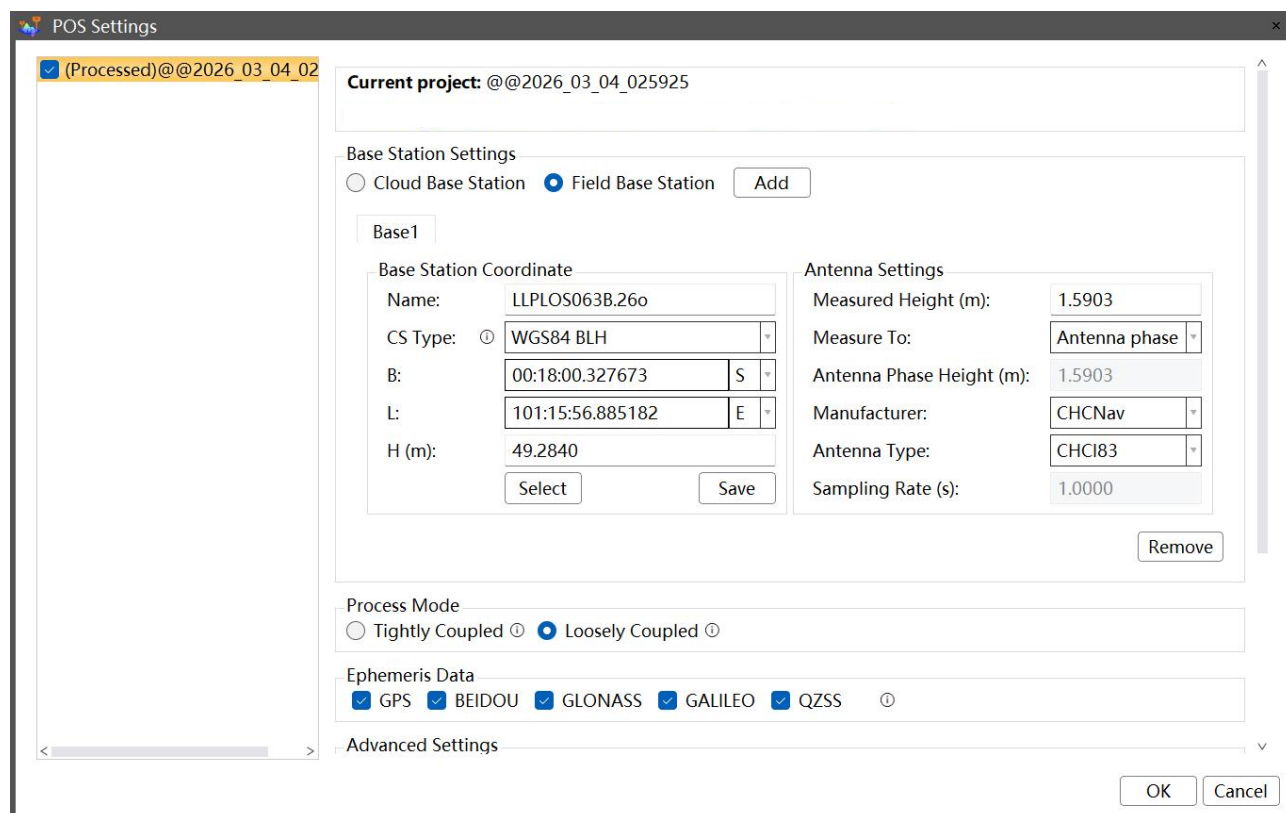
5.2.2 POS Resolving

Select the engineering file for POS calculation. Right-click to open the options. Choose 'POS Calculation' to open the POS calculation window, as shown below:



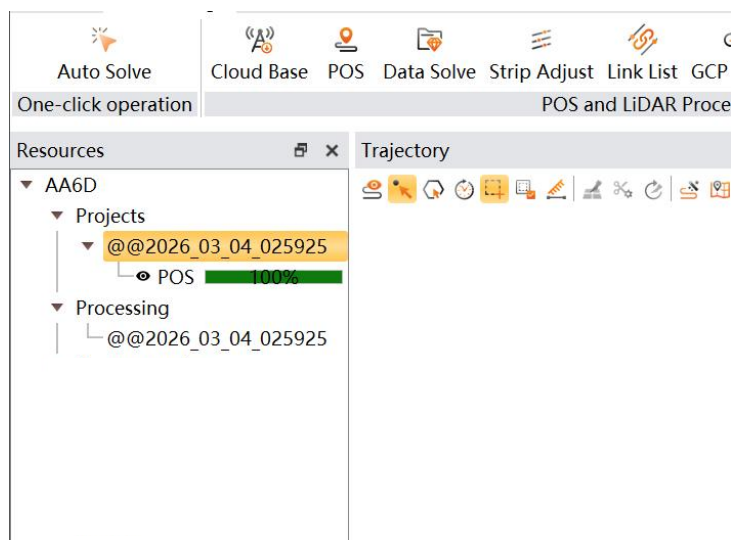
If the static base station file (HCN) is placed in the Base folder under the GPS folder, the system will automatically detect the base station file and read the corresponding antenna elevation. You need to manually enter the measured coordinates into the base station coordinates (geodetic coordinates in degree, minute, and second format).

In the 'More' option at the bottom right, you can configure the Ephemeris Data for calculation. As shown in the figure below.



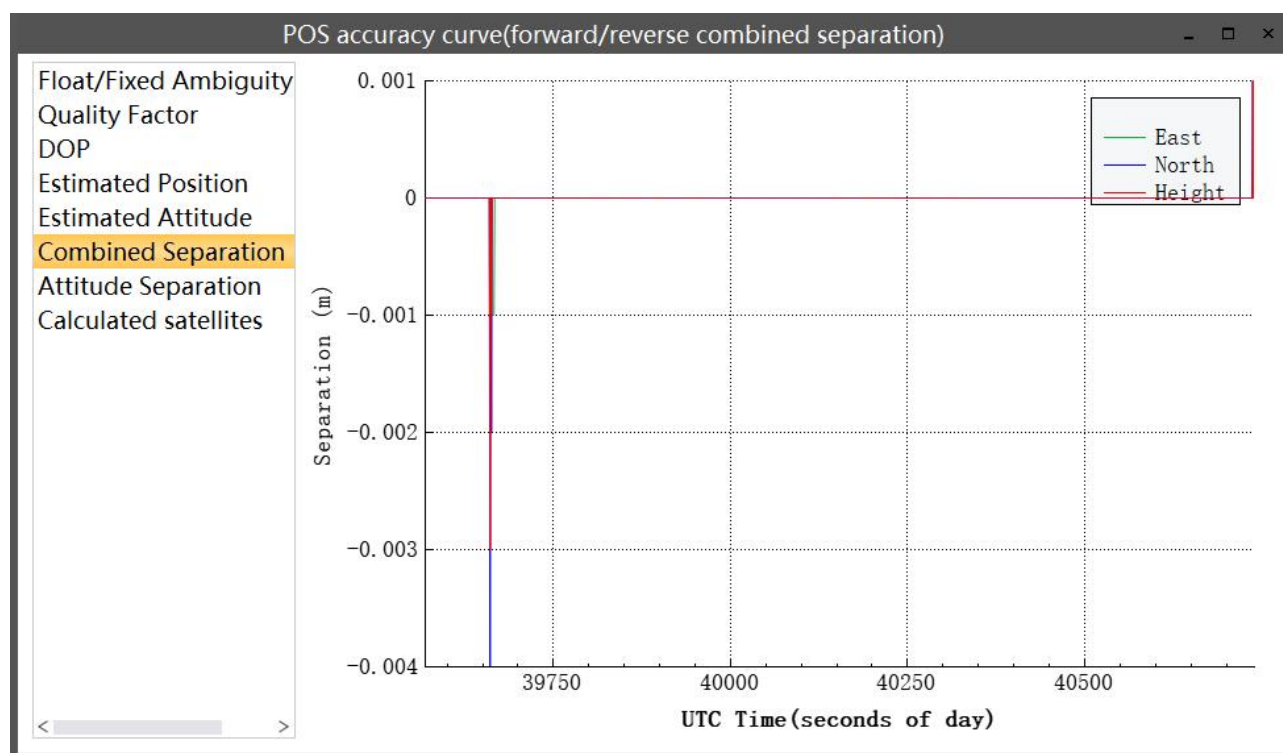
After setting the base station coordinates and antenna type, click 'Confirm' to start POS calculation.

After POS calculation, the task management interface displays a progress bar showing the calculation percentage, while the software's output panel shows relevant POS calculation details, as shown in the figure below.



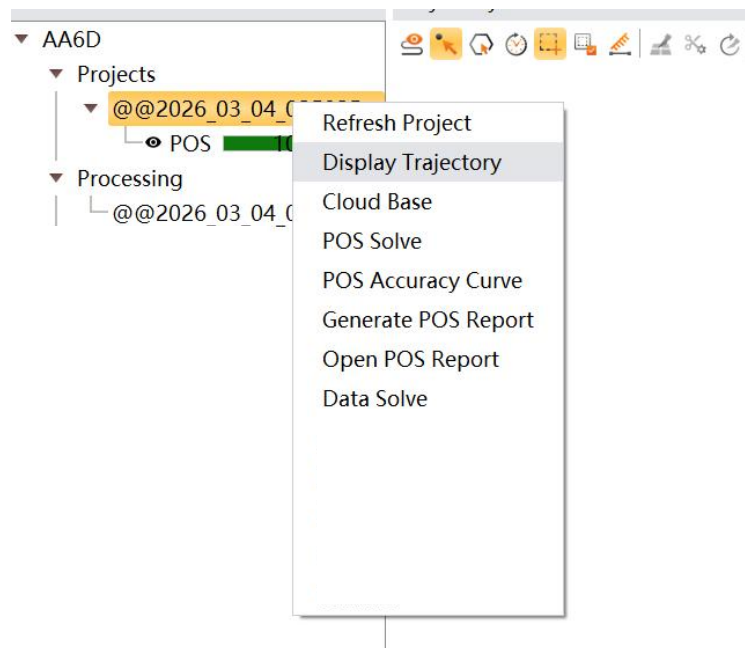
5.2.3 POS Quality Control

After POS calculation, right-click the engineering node and select 'POS Accuracy Curve' to evaluate data quality through multiple metrics. Key reference parameters include forward/reverse positions and the number of satellites involved in calculations. The 'Combined Separation should not exceed 1cm, as shown in the figure below.



5.2.4 Solution Region Selection

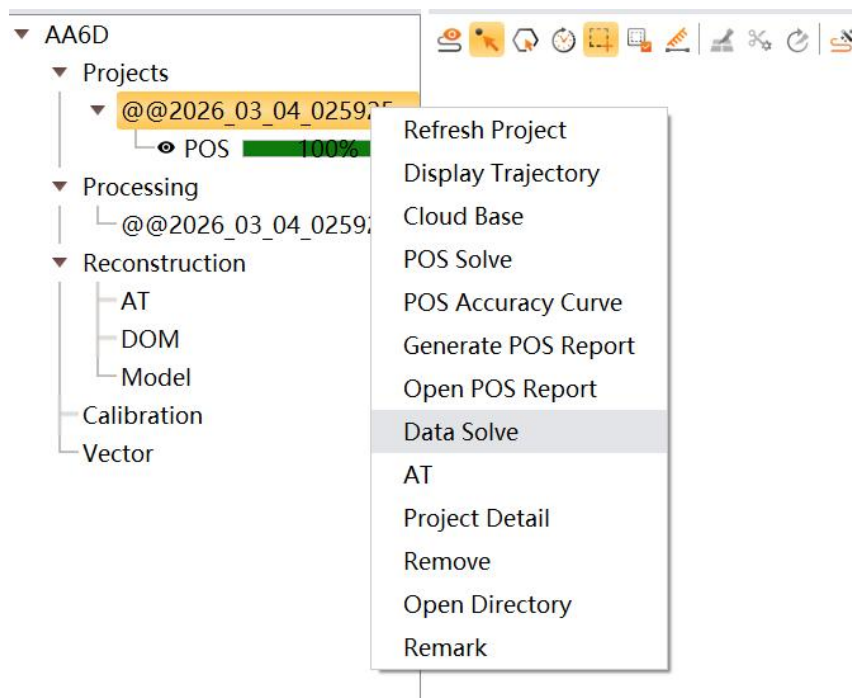
After POS calculation, right-click the engineering file and select 'Display Trajectory' with the left click to view the POS trajectory.



CoPre automatically selects trajectory data from long straight lines. If there are calculation areas with recognition errors, hover over the corresponding trajectory to right-click and cancel the selected POS segment. Alternatively, right-click to cancel all POS segments and manually select the trajectory points.

5.3 Data solve

After selecting the path, click 'Data solve' in the 'Processing' window, or right-click the project and select 'Data Solve' as shown below.

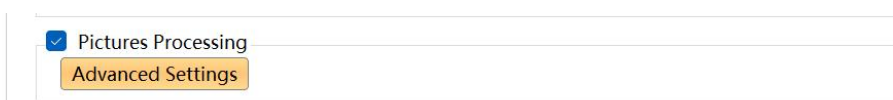


5.3.1 Pictures processing

Pictures processing: If the project contains image data, select 'Pictures processing' to enable CoPre to automatically match and generate corresponding photo POS files.

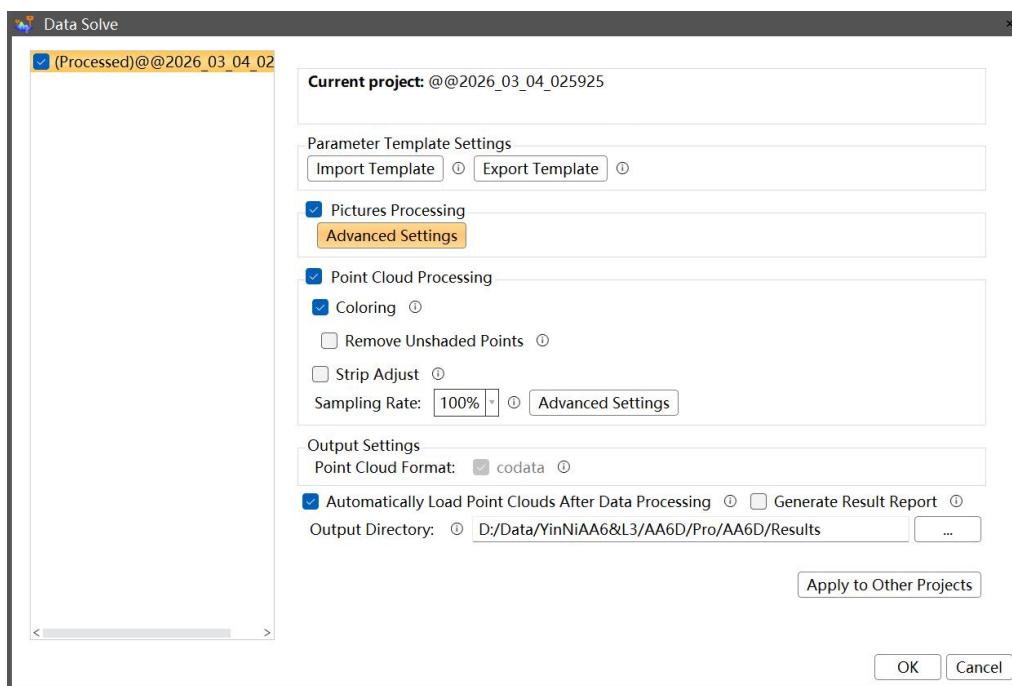
Time delay: Default is 0 seconds. You can set this if the photo has a time delay.

Write EXIF information: Not selected by default. When selected, it writes location, POS, and other information to the organized photo file, as shown below:



5.3.2 Point Cloud Processing

This part primarily generates point cloud data, including filter settings, sampling rate, and coloring settings, as shown in the figure below.



Click the 'Advanced Settings' button to access the filter setting interface. The settings primarily include MTA filter, Circle Noise Filter, FOV Filter, 3D Distance Filtering, Intensity Filtering, Noise Filtering and 2D Distance filtering.

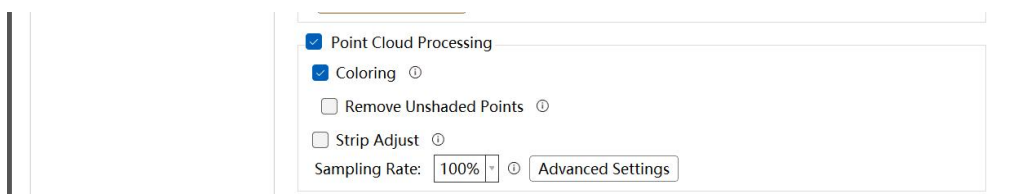
The filtering options are usually selected as Intensity filtering, Noise filtering and 2D Distance filtering.

Intensity filtering: Filters out points outside the range based on grayscale values. The default range is 800-65535.

Noise filtering: Set the distance threshold parameter to filter out noise points.

5.3.3 Point Cloud Coloring Settings

Point cloud coloring generates a colored point cloud with RGB information based on the point cloud and photo. This option is enabled by default. When selected, the point cloud will be rendered as a colored point cloud. As shown in the figure below:



Point cloud coloring parameters: default range 0-65535;

Filter Tower Shadow: This option resolves the issue of tower colors being assigned to the ground during power line data coloring.

5.3.4 Generate Results

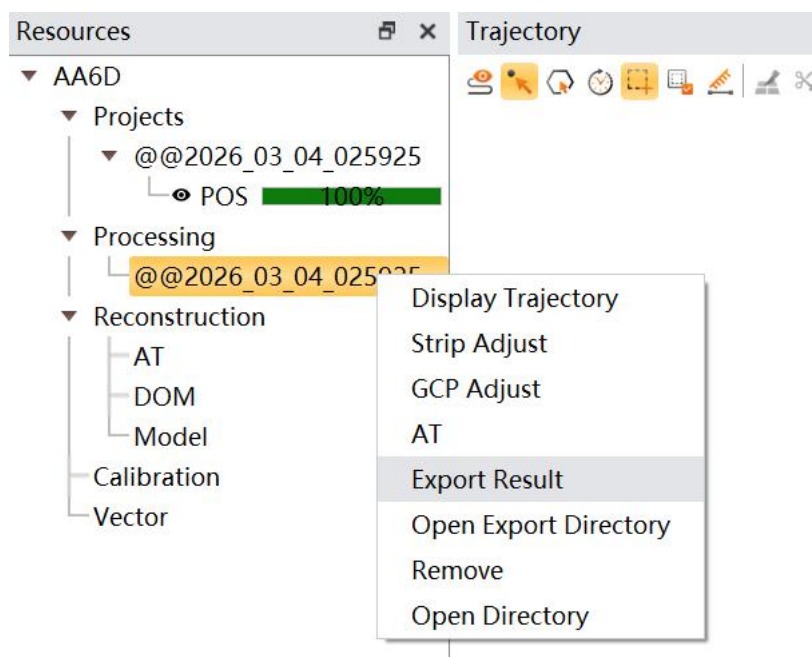
After completing the parameter settings, click OK to generate the result. Once the processing is successful, the software dialog will indicate that all data processing is complete, and the 3D View will display the result project.

5.3.5 Achievements

Select a project under the 'Processing' node, right-click to display the trajectory, and the result trajectory will load into the trajectory view. Click two points on the result trajectory or hold the left mouse button to select a box, and the point cloud corresponding to the selected trajectory will load into the point cloud view. You can choose the rendering mode in 3D view to browse the point cloud.

5.3.6 Export Results

After verifying the point cloud's data quality, export the results if meet the requirements. In the 'Processing' node, select the project and right-click to export the results. Coordinate types include ENH/BLH/ENU/XYZ, and supported export formats are (.las/.laz/e57/pts), as shown in the figure below.



6 Precautions for Daily Use

6.1 Service Environment

- ⊘ For equipment safety and to avoid excessive noise in point clouds, the device is prohibited from use during rain, snow, or heavy fog, and must not be operated in windy or dusty conditions.
- ⊘ Do not expose the device and its accessories to extreme temperatures. The operating and storage temperatures must not be lower than or higher than the specified temperatures in the specifications.
- ⊘ When transferring products from a cold environment to a warm one, condensation may occur on certain components inside the scanner due to moisture. To prevent this, it is recommended to place the scanner in a sealed plastic bag before transfer. The device should only be opened after its temperature has substantially equalized with the external environment and the condensation has evaporated.

6.2 Daily Usage Guidelines

The AA6D survey system is a sophisticated precision instrument. Proper operation and maintenance during daily handling, transportation, and storage are essential to ensure optimal accuracy and prolong its service life.

Key usage considerations include:

- Do not disassemble the instrument. If a malfunction occurs, please contact the supplier.
 - This document serves as a comprehensive guide for the AA6D. Select the appropriate operation method based on your specific workflow. For any questions, please contact the supplier's technical support team.
 - Strictly follow the wiring instructions in the installation manual to connect the equipment. Regularly inspect structural components for loose screws and connectors, and check for cable damage. Clean the equipment surface, laser window, and camera lens every 7–10 days using a cleaning kit, following the steps below:
 - (1) In a dust-free area, use a mini air blower to remove dust from the laser head, camera lens, and device body.
 - (2) Gently wipe the laser window, camera lens, and any gaps with a wet wipe to remove residual dust, fingerprints, and other contaminants.
 - (3) Wipe the device body and camera with a damp cloth. A soft towel may be used if necessary.
- Note: Do not use corrosive liquids such as alcohol to clean the device body or non-metallic camera parts.
- Always disconnect power before plugging or unplugging the device.
 - Protect the instrument from strong impact or vibration.

- After use, pack the instrument promptly. Ensure both the instrument and its case are dry before packing.
- For continuous extended operation or use in high-humidity environments, consult the Huace Technology Center for specific precautions. Malfunctions under such special conditions are not covered by the warranty.
- Handle the equipment with care to avoid surface contamination or scratches. Do not sit on the equipment or its packaging box.

6.3 Equipment Transportation

1. The device is equipped with a dedicated carrying case. During transport or transit, place the device inside the case and use seat belts or other securing methods to keep the case in a fixed position. This prevents the case from colliding with the vehicle body and experiencing strong shocks or vibrations during transit.
2. When transporting the device with other means of conveyance, avoid improper handling by shipping personnel. Inform the handlers that the device is a precision instrument requiring careful handling. Affix fragile labels to the case.
3. When shipping the device by courier, use an outer box in addition to the original carrying case. Fill the gap between the two with shock-absorbing materials such as foam padding.

6.4 Device Storage

1. When not in use, place the device neatly in its carrying case. Store the cases on a workbench or shelf without stacking them.
2. The storage room should be clean, dry, and well-ventilated. Replace the desiccant inside the case regularly.

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