

CHCNAV

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CHCNAV APACHE Series

Unmanned Surface Vessel

Product User Manual

Make Your Work More Efficient

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1. Product Overview

1.1 Introduction

The APACHE series USV integrates control system, positioning system, depth measurement system, power system, 360° camera, and millimeter wave obstacle avoidance module. It breaks the traditional underwater depth measurement operation mode and achieves efficient and accurate underwater terrain mapping.

1.2 Product Features

Intelligent, portable, highly integrated

1.3 Usv Assembly Equipment List

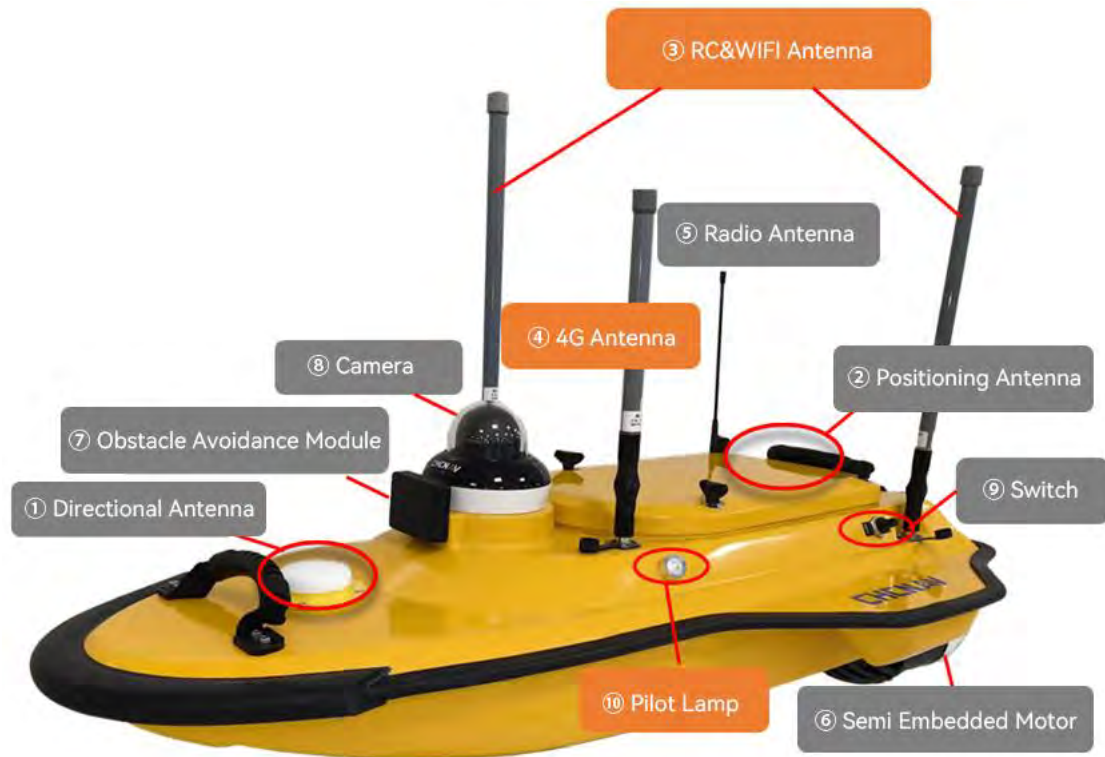
1 USV, 2 9S (red label) batteries, 2 RC&WIFI antennas, 1 4G antenna.

- 1) Open the hatch, install and connect the batteries, secure the batteries, and then close the hatch and tighten the screws.
- 2) Match the antennas with the corresponding base labels, and install the external antennas (4G/RC) clockwise.
- 3) Press and hold the switch at the rear, release the button when the indicator light comes on, and the unmanned boat will start up.
- 4) Press and hold the switch at the lower left corner of the remote control, release it when the screen lights up, and wait for the remote control to start up.
- 5) Before launching, push the remote control joystick to test if the motor direction and power are normal. At the same time, log in to the EasySail software to check the status of the unmanned boat. Once everything is normal, you can proceed with the underwater operation.

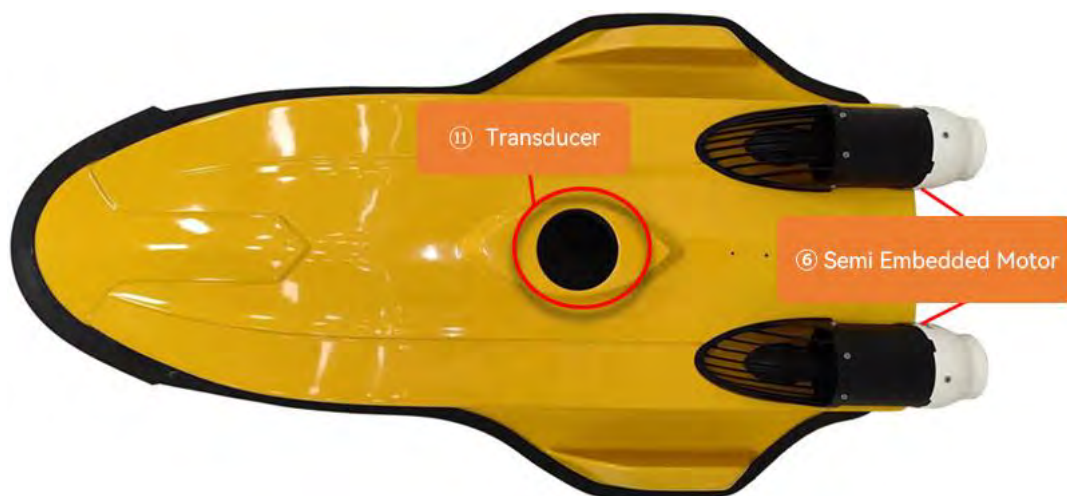
Scan the QR code below, click on [User Guide] - [EasySail Video Tutorial], and view the relevant video tutorials.



1.4 Accessories Of Boat Introduction



APACHE 3 Oblique Drawing



APACHE 3 Bottom View

User Manual for CHCNAV APACHE USV

Navigation antenna: Provides real-time direction for USV.

Positioning antenna: Provides real-time positioning for USV.

Remote control antenna (RC & WIFI): Enhances the remote control signal of USV.

4G antenna: Enhances the 4G signal strength of USV

The 4G mode is the most commonly used mode, which can transmit data and access differential signals through 4G.

Radio antenna: Enhances the radio signal of USV.

Receives differential signals from GNSS reference stations through radio transmission.

Semi-embedded motor: Provides forward and backward power for USV, with shallower draught to reduce scraping.

Obstacle avoidance module: Provides obstacle avoidance function, supporting semi-automatic/fully automatic measurements of USVs.

Camera: Can transmit real-time images from the camera in front of the ship, supporting 360° rotation.

Switch: There is a toggle switch on each side of the ship. Move it to ON to start the USV.

Indicator light: There is an indicator light on each side of the ship. When the red light on the left is constantly on, it indicates initialization completion. The number of flashes of the red light represents the number of tracked satellites. The red light should be constantly on during the survey.

When the green light on the right is constantly on, it indicates a fixed solution. Blinking of the green light indicates a floating solution. If it is not lit, it means that no differential data has been received.

Transducer: The single-beam transducer is integrated on the USV for transmitting and receiving sound signals.

1.5 Introduction To Remote Control Components



1. Power Switch: The button to Power on/off boat, long press to power on/off.
2. Forward/Backward: Control the unmanned boat to move forward and backward. Only valid for the forward and backward direction, invalid for the left and right direction.
3. Left Turn/Right Turn: Control the unmanned boat to turn left or right. Only valid for the left and right direction, invalid for the forward and backward direction.
4. Auto/Manual Switch: Switch the mode of the unmanned boat.
5. Supports manual and automatic mode.
6. Loiter Button: Control loitering.
7. Remote Antenna: Used to control the unmanned boat remotely. Please note that the unmanned boat needs to be equipped with two corresponding RC antennas.

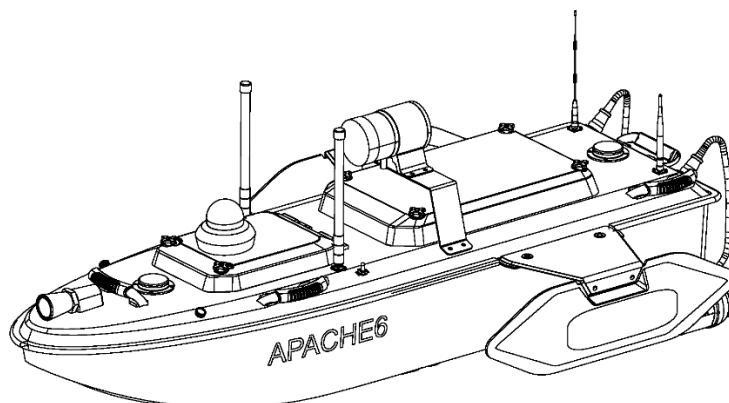
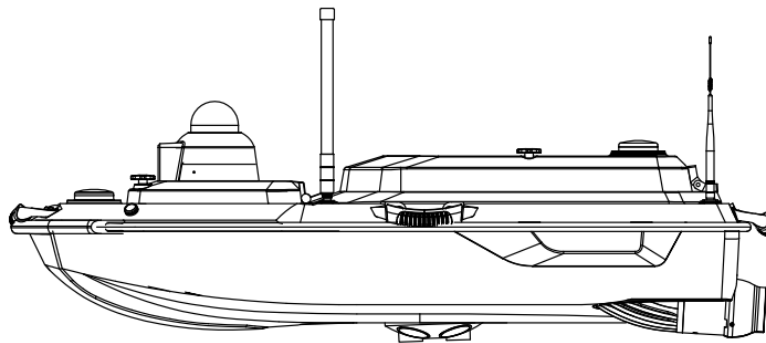
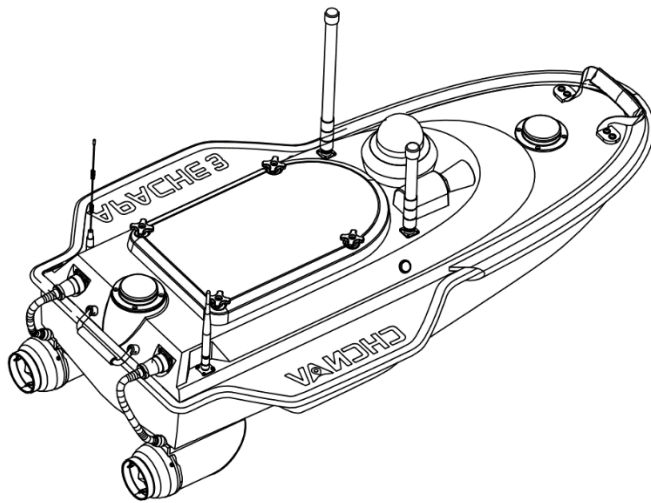


Note:

Physical buttons are subject to actual factory specifications and may not be changed without prior notice.

2. APACHE Series USVs

This section introduces the systems and their functional features in USV.



2.1 GD100 (Main Control System)



Interface Definition:

GNSS1: Connects to the aft antenna of the unmanned boat.

GNSS2: Connects to the front antenna of the unmanned boat.

POWER: Supplies power to GD100.

SIGNAL: Used for data transmission and reception of the unmanned boat.

SIM card slot: Can be used to insert the user's SIM card.

LAN1: Usually connects to the camera of the unmanned boat to provide network connectivity.

RC interface: Connects to the RC antenna connector of the unmanned boat.

User Manual for CHCNAV APACHE USV

4G interface: Connects to the 4G antenna connector.

RADIO interface: Connects to the radio antenna connector.

2.2 Indicators On USV

The Instructions for the indicators on the boat:

Red light solid on: USV initialization completed, switch to automatic mode for measurement.

Red light flashing: USV initialization not completed, the number of flashes indicates the number of tracked satellites. please note that you are not allowed to conduct survey in auto mode at this time.

Red light off: the USV not powered on, check power supply. Refer to GD100 status indicator for actual status.

Green light solid on: USV positioning state - Fixed solution (displayed as fixed on the software with a delay of 5-8s).

Green light flashing: USV positioning state - Floating solution.

Green light off: USV positioning state - Single solution.

Alternating flashing of red and green lights: Firmware upgrade in progress, do not power off. The boat will automatically restart after a successful upgrade.

2.3 Motor



Motor Usage Guide



Using a motor in turbid waters will somewhat reduce the lifespan of the motor and propeller blades.

Please refer to the official configuration and use the corresponding motor for your boat model.

The motor is a consumable item, and after its lifespan expires, please follow the maintenance procedures to purchase a replacement.

Before each voyage, be sure to check if there are any foreign objects entangled in the motor.

Before each voyage, be sure to push the remote control throttle lever to check the status of the motor. If any abnormalities are found, investigate and resolve them before proceeding with the voyage.

When the boat is powered on, do not place your hands near the rotating propeller blades and motor to avoid personal injury.

2.4 Replacing The Motor Or Propeller

User Manual for CHCNAV APACHE USV

Please use the included adjustable wrench from the USV toolkit to remove the nut from the inside of the cabin. Disconnect the three-phase connection between the motor and the BSC, and then remove the motor.

If there are something that entangle the propeller, you can use an Allen wrench to remove the white nozzle at the tail of the motor, and then remove the fixing screws on the propeller to take out the foreign objects.

2.5 Camera

The 360° rotatable camera assists in observing the surrounding environment of the boat.

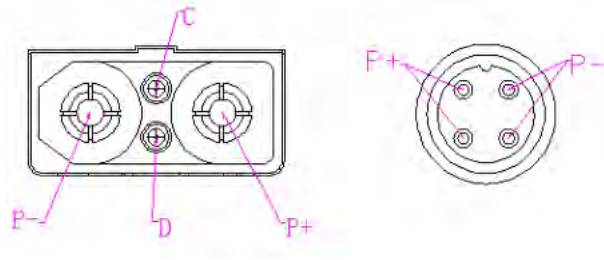
2.6 Millimeter Wave Obstacle Avoidance Module

When this obstacle avoidance function is enabled, you can use the semi/fully automatic measurement mode.

2.7 The Case For Batteries

2.7.1 Battery





2.7.2 Battery Usage Guide

If there is an issue with inaccurate capacity or capacity fluctuations during use, please charge the battery to 100% and wait for two hours before discharging it. Allow the battery to discharge until the system shuts down, then remove the battery and leave it idle for 5 hours. After that, use an external power source to charge the battery. After completing one full cycle, the capacity will be accurately displayed without any fluctuations.



Note:

For safety reasons, do not short-circuit the positive and negative terminals of the battery during use. Do not disassemble the battery or throw it into a fire.

2.7.3 Battery Storage

The product should be stored at room temperature, and the battery should be kept at a semi-charged state of approximately 30% to 50%. To prevent over-discharge, it is recommended to charge the battery once every six months during storage. For long-term storage, customers should charge the battery with a current of 0.5C for about 1 hour to maintain a partial charge.

When the battery is in use, it utilizes energy released from electrochemical reactions to provide power. In essence, it is a chemical product. Due to this nature, if the battery is stored for a long period of time without use, its performance will gradually decline. Therefore, it is important to periodically recharge and discharge the battery after a certain period of storage to activate it and restore its energy.

2.7.4 Battery Charger Usage

User Manual for CHCNAV APACHE USV



1. First, insert the AC plug of the charger into the power socket. The LED indicator of the charger should be green. If the indicator is not lit, or if it flashes red and green, or stays red, stop charging and check for any short circuits in the charger output or loose connection of the input power plug.
2. Once the charger's LED working indicator turns green, plug the output plug of the charger into the socket of the battery device to be charged. At this point, the indicator will turn red, indicating that the charger is charging the battery.
3. When charging is complete (this process may take 1-10 hours depending on the battery capacity and initial charge level), the LED indicator will automatically turn green, indicating that the battery is fully charged and the charger enters the constant voltage charging mode. Long-term constant voltage charging is safe for the battery.
4. After charging is complete, remove the output plug of the charger first, then unplug the AC power plug of the charger, and place the charger in a safe location.

 Note:

1. Before charging, please confirm that the charger and the battery to be charged are compatible (this charger is designed for use with the corresponding device and

User Manual for CHCNAV APACHE USV

battery. It is prohibited to use this product to charge non-matching devices or battery packs).

2. The charger is for indoor use only. It is prohibited to immerse it in water or expose it to rain.
 3. There is high voltage inside, do not open the casing.
 4. The charger should not be charged or used in high temperature, flammable, or explosive environments.
 5. It is prohibited to charge non-rechargeable batteries with the charger.
 6. If there are any quality issues during use, please contact CHCNAV customer service directly. Unauthorized repairs are prohibited.
-

2.7.5 Charger Specification

2.7.5.1 Input Characteristics:

Working voltage range: AC90~260V;

Rated working input voltage: AC100~240V;

Input working frequency: 50 ~ 60HZ;

Charger no-load input power: $\leq 20W$

Rated maximum input power: ≤ 570

2.7.5.2 Output Characteristics:

Charger no-load output voltage: DC37.4V—38.2V

Normal working output voltage: DC27-37.8V;

Rated working output current (constant current): 5.4A-6.6A;

Charger compatible battery pack specifications: 9 cells 8-40H;

Rated output power: $\leq 227W \times 2$ dual groups

Charger efficiency: $\geq 80\%$;

Charging red light indicates that the charger is in charging state;

Charging green light indicates that the charger is in standby or fully charged state;

Conditions for the charging red light to turn into green light: $0.30A < I < 0.90A$ or $V_{out} > 37.8V$;

Conditions for the alternating flashing of the charging red and green lights: charger abnormal protection;

Protection Features:

Overcurrent Protection: When the current of the charger and the connected device exceeds the rated working current, the charger immediately stops working. After the fault is resolved, the charger can resume its operation.

Short Circuit Protection: When there is a short circuit between the positive and negative terminals of the charger, the charger automatically protects itself by disabling the output voltage. After the short circuit is resolved, the charger resumes its operation.

2.7.5.3 Environmental Characteristics:

Normal operating temperature: $0 \sim +40^{\circ}\text{C}$

Storage temperature: $-20 \sim +70^{\circ}\text{C}$

Normal operating humidity: $< +95\% \text{ RH}$

3. Remote control

This section provides a detailed introduction to the remote control performance and its operation.



3.1 HC10 Remote Control



Display: 10.1 Industrial Touch Screen

Resolution: 1920*1200

Memory: 4GB

Storage Capacity: 64GB

Network Interface: RJ45*2

Serial Port Interface: TCP socket*2

Charging Interface: Type-C

Waterproof and Dustproof Rating: IP67

Operating Temperature: -10°C to 55°C

Total Weight: 2kg

Battery Life: 5 hours

Battery Capacity: 20000mAh

Operating Frequency: 1.4GHz, 2.4GHz/800MHz

Channels: 16 channels

Total Dimensions: 361mm (L) * 393.2mm (W) * 102.4mm (H)

3.2 Remote Control Charging

The HC10 remote control has a built-in rechargeable lithium battery and is compatible with the standard TYPE-C interface (such as mobile phones, cameras, and other digital product USB chargers) for charging. When using the official standard Type-C charger, it takes approximately 5 hours and 30 minutes to fully charge the remote control in normal shutdown state.



Note:

Please use the official standard charger to charge the remote control. If the original charger is not available, we recommend using a USB charger that complies with PSE standards and has a specification of 9V/4A.

To maintain the optimal battery condition of the remote control, please ensure to fully charge it once every 3 months.

If there is smoke, an unusual odor, or leakage during charging at the ground terminal, please stop charging and send it to our company for repair.

Do not charge this product in the area accessible to infants to avoid the risk of electric shock. Do not charge this product in an environment exceeding 60°C.

3.3 Operating Environment Conditions

- A) Ambient temperature: -10°C to +45°C.
- B) Storage temperature: -20°C to +50°C.
- C) Relative humidity: Not to exceed 85%.
- D) Atmospheric pressure: 86kPa to 106kPa.

E) The usage location should not have explosive substances, corrosive gases that damage metal and insulation, or conductive media. It should also not be filled with steam or have a severe presence of mold.

F) The usage location should have facilities to defend against rain, snow, wind, sand, and ash.

3.4 Remote Control Maintenance And Repair

Maintenance and Care during Long-term Storage: Put the remote control in a dry and well-ventilated area, away from direct sunlight to prevent battery overheating. If it needs to be stored for more than a month, regularly charge the remote control battery to 70-80% before storage to avoid battery depletion.

Recommended storage temperature range: +22°C to +28°C

Do not store the battery in places with temperatures below -20 degrees Celsius or above 45 degrees Celsius.

3.5 Remote Transportation And Storage



Note:

Do not immerse the remote control in water. If it gets wet, please promptly wipe it dry with a soft cloth and immediately turn off the power. Contact our after-sales service for assistance.

Avoid mechanical impacts, crushing, or piercing of the battery. Do not drop the battery.



Warning:

To avoid potential harm and damage, please follow the following guidelines: As wires and small parts can pose a danger to children, it is important to keep children away from the components of the remote control.。

4. EasySail App

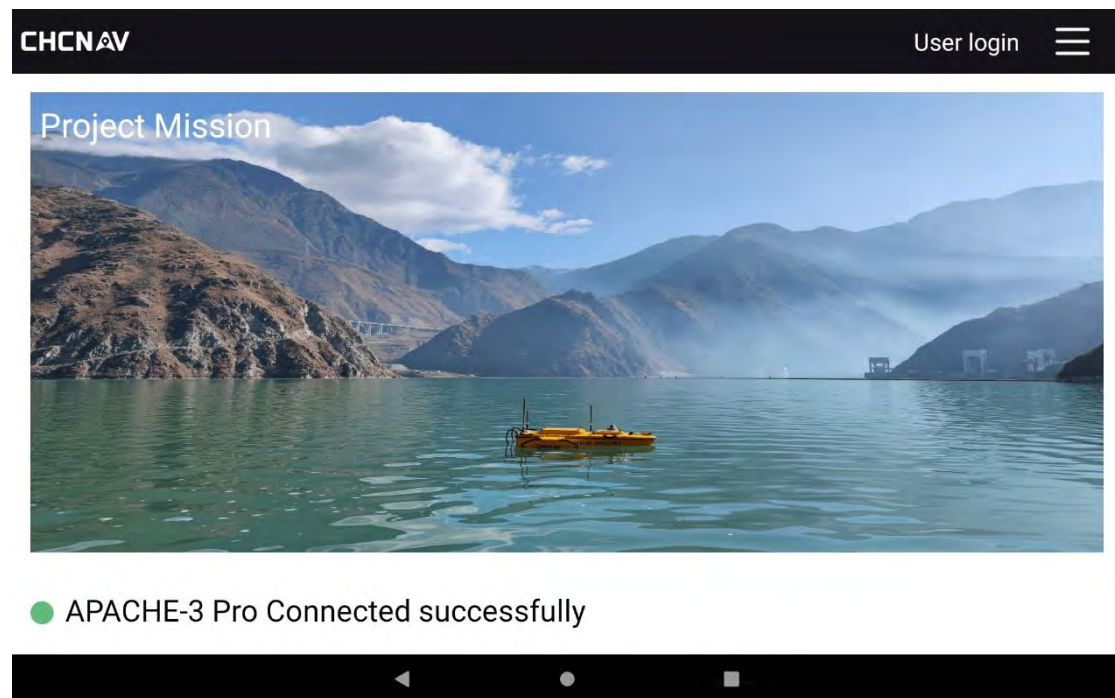


This chapter provides a detailed introduction to the features of EasySail software.

◦

4.1 easysail Overview

EasySail is a measurement and control software for USV industry, developed independently by CHCNAV. It is designed to be used with all APACHE series unmanned boats. The engineering routes include manual drawing routes and importing files. Manual drawing routes mainly involve customers manually drawing route tasks. Importing files mainly involves importing and generating polygons or route tasks with one click. It supports surveying mode, hydrological mode, semi-automatic, and fully automatic measurement modes, allowing unmanned boats to automatically perform measurement tasks to meet the complex requirements of various scenarios. It also supports 4G and data transmission connections, Hikvision video first-person preview, virtual suspended joystick, depth sounder, CORS login, GNSS registration, international unit switching, etc.



4.2 Easysail Software Operating Environment

The software supports Huawei MatePad tablets and HC10 Android remote controllers, with Android 6 and above systems and a resolution of 1920x1080.

Supported products: CHCNAV APACHE series unmanned boats, CHC D270 echo sounder.

Supported language environments: Simplified Chinese, Traditional Chinese, English, Russian. The software will automatically switch languages based on the current system

language environment. If the system language environment is changed during the software operation, the app needs to be restarted.



For safety reasons, do not short-circuit the positive and negative terminals of the battery during use. Do not disassemble the battery or throw it into a fire.

△Note:

Currently, many features of the software require a mobile network. The use of unmanned boats also requires a network to provide Network RTK services. Please ensure that you are in a network available environment when using this product. The software has not been adapted for mobile phones yet, so there may be issues with certain functions such as crashes or location bugs.。

4.3 Easysail Installation/Uninstallation/Data Cleanup

4.3.1 Download and Installation

To download the software installation package, please visit the official website of CHCNAV: [Make your work more efficient | CHCNAV](#), After downloading the APK file, you can directly double-click to install it.

4.3.2 Software Permissions

To ensure the normal use of the software, it requires certain permissions from the user. This includes location and storage permissions. Additionally, the floating window permission is required to open the map interface.



1. To ensure normal access to the remote control position, you must enable location permission and functionality.
 2. To ensure normal recording and storage functionality, storage permission needs to be granted.
 3. Uninstallation Instructions
-

Uninstalling the software will also delete all data, including satellite map tile data, device connection information, custom servers, and route projects (project data, recorded control parameters, sonar parameters, etc.).

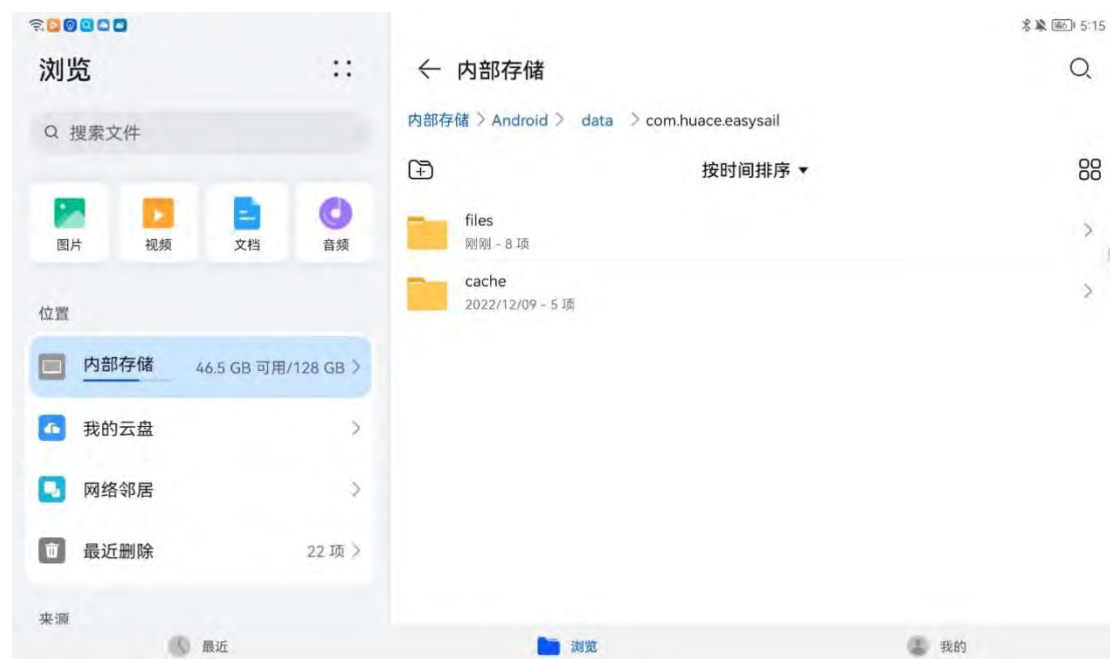
4. Data Clearing Instructions

Using Android to clear historical data will clear all cached application data of the software, including account login information, software engineering, CORS and SWAS information, permission acquisition, logs, etc. The software will return to its initial installation state and require logging in again. SWAS and CORS also need to be actively connected.

4.4 Software Description

The storage locations for the files generated after installing and using the current software are as follows:

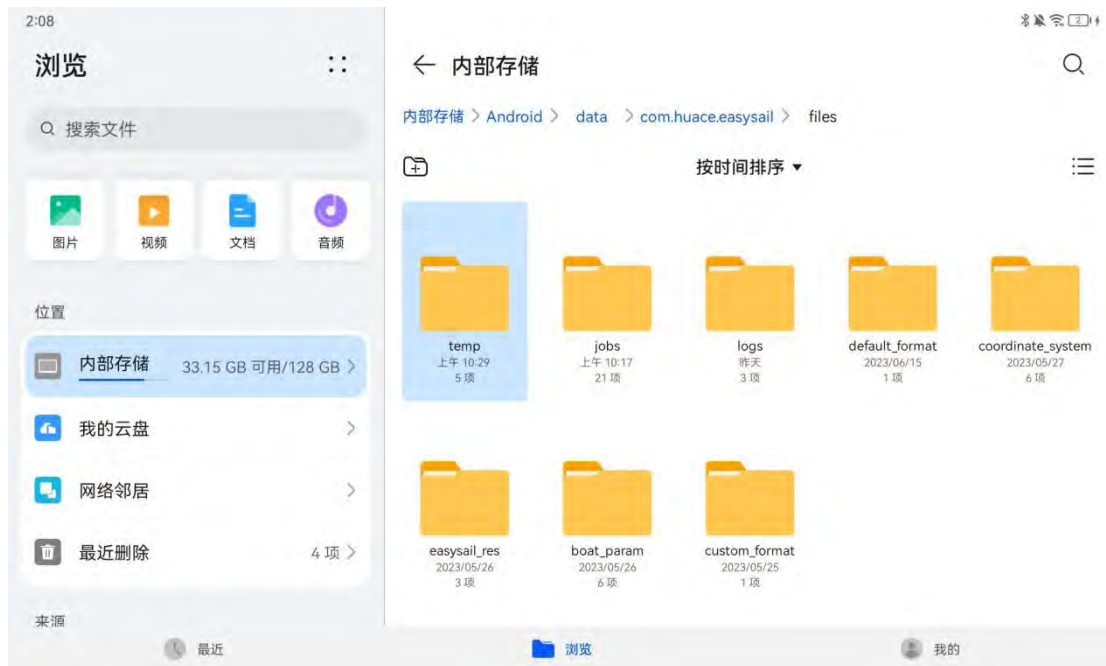
1. EC10 Android Remote Control: EasySail folder in the root directory, including jobs and logs.
2. Other Android devices: Android/data/com.huace.easysail.



“Cache”: Mainly store cached map tile data, including both base map data and map annotation data;

“files”: Other data generated during the software's runtime.

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"easysail_res": Software prototype and map configuration files;

"jobs": Task files, each route project is a folder, the folder name is the route name;

"logs": Software operation logs, recording any exceptions that occur during navigation may require uploading this log;

"boat_param": Stores ship control parameter files (*.param); "coordinate_system": Directory for storing coordinate system-related files;

"temp": Stores files that have been shared;

"fpv": Folder for storing captured photos and recorded videos. Corresponds to the project directory under "jobs".



Note:

The storage path for the result files of shooting and recording after saving the project is as follows: EC10 remote controller: EasySail/jobs/project_filename/fpv Other Android devices: Android/data/com.huace.easysail/jobs/project_filename/fpv.

4.5 Login Account

Currently, the software allows users to register and login to their CHC Cloud accounts. If there is an available network, users can directly register and login using their mobile phone number and verification code.

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Register

MOBILE REGISTRATION

EMAIL REGISTRATION

+86

please input the phone number

Please input the verification code

Send

Please input the password

Confirm the password

REGISTER

[Already have an account?](#)

Click register button means you already agree [User agreement](#) And [Privacy policy](#)

Rigister

Login

PHONE NUMBER

ACCOUNT

+86

please input the phone number

Please input the verification code

Send

LOGIN

[Register account](#)

Click the login button means you already agree [User agreement](#) And [Privacy policy](#)

Login

△Note: Login time exceeds 30 days and requires re-login.

4.6 Quick Start Guide

4.6.1 Connect to boat

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After the boat is powered on, open the EasySail software to connect to the boat. Once connected successfully, the main interface will display the current boat model and connection status.

4.6.2 Plan the route

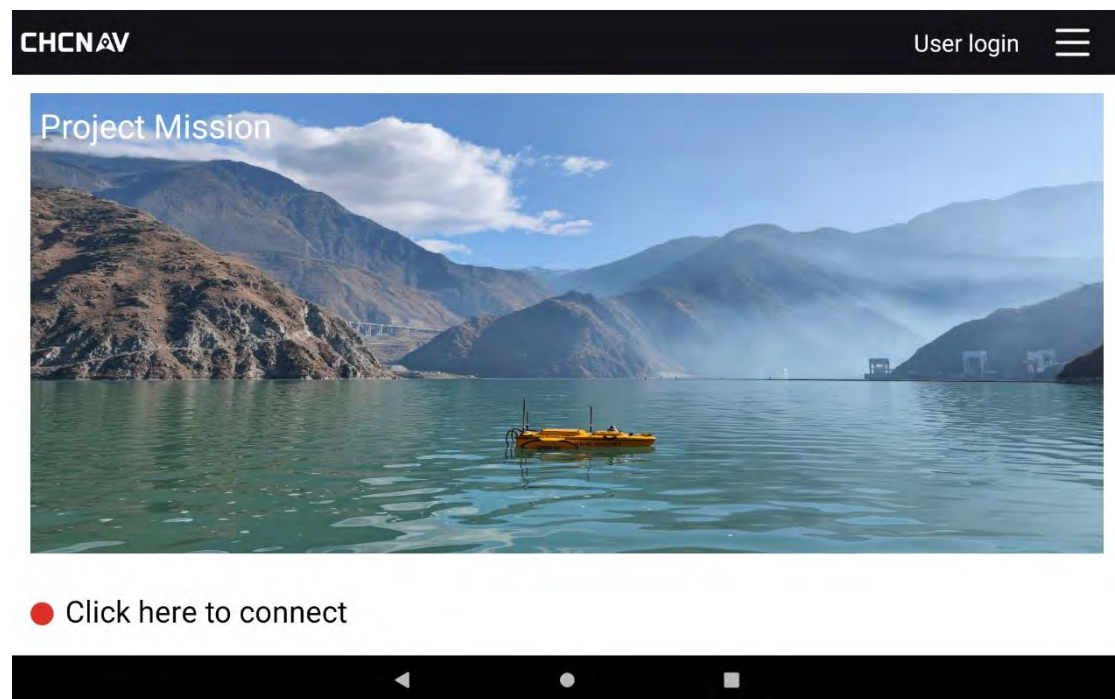
Click on "Project Route" to create a project, hand-draw or import a file, then enter the map interface (edit mode) to check the self-checklist information. Once everything is normal, you can plan the route. After planning the route, click on "Upload" to save the route project automatically.

Start the operation: Automatic cruising, data recording

Switch to automatic navigation mode, click on the "Start Recording" button to officially start the measurement operation.

4.6.3 Device connection

The current software can be connected to unmanned boats in two ways: through 4G connection or data transmission connection. For data transmission connection with unmanned boats, a remote controller is required. For D270 single connection, it needs to be connected to the depth sounder's WiFi.



Device not connected

User Manual for CHCNAV APACHE USV

<

Device Connection

USV Mapping

D270 Echo Sounder

Connect Methods

4G

Lan

Remote Server

International server

Username

3560054

Password

Video Access

☐ CHC Cloud

☒ None

CONNECT

Connection mode -4G network

<

Device Connection

USV Mapping

D270 Echo Sounder

Connect Methods

4G

Lan

Remote Control

☒ EC10

☐ M12

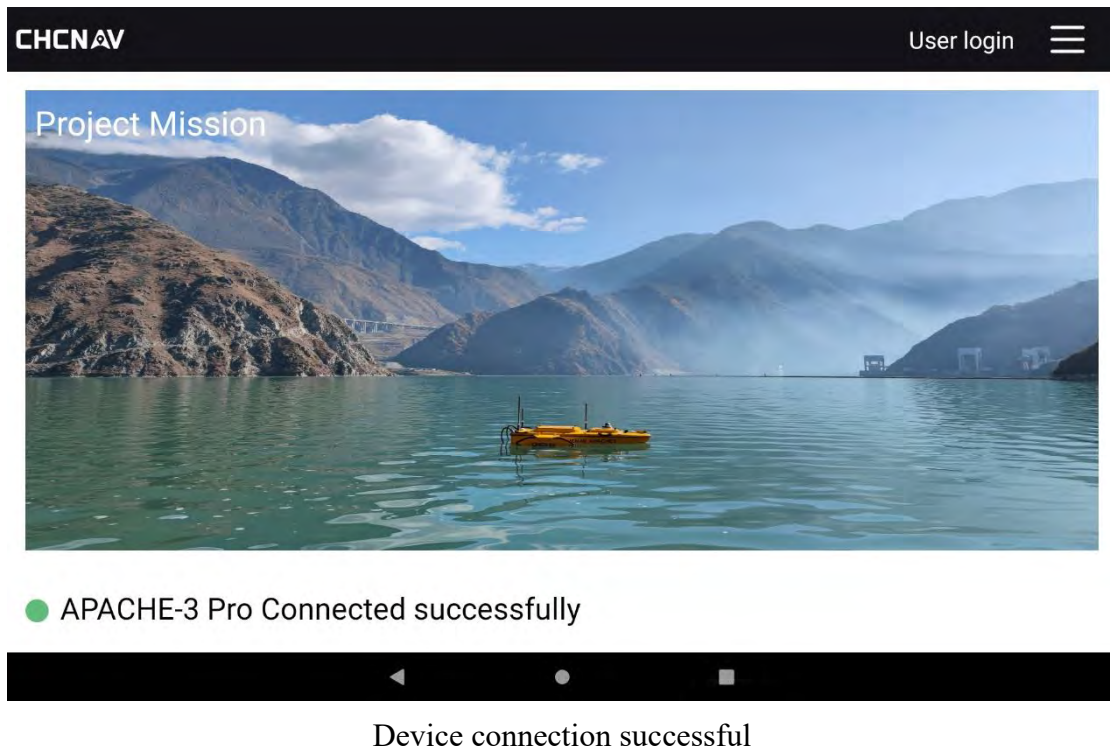
Video Access

☒ Access

☐ None

CONNECT

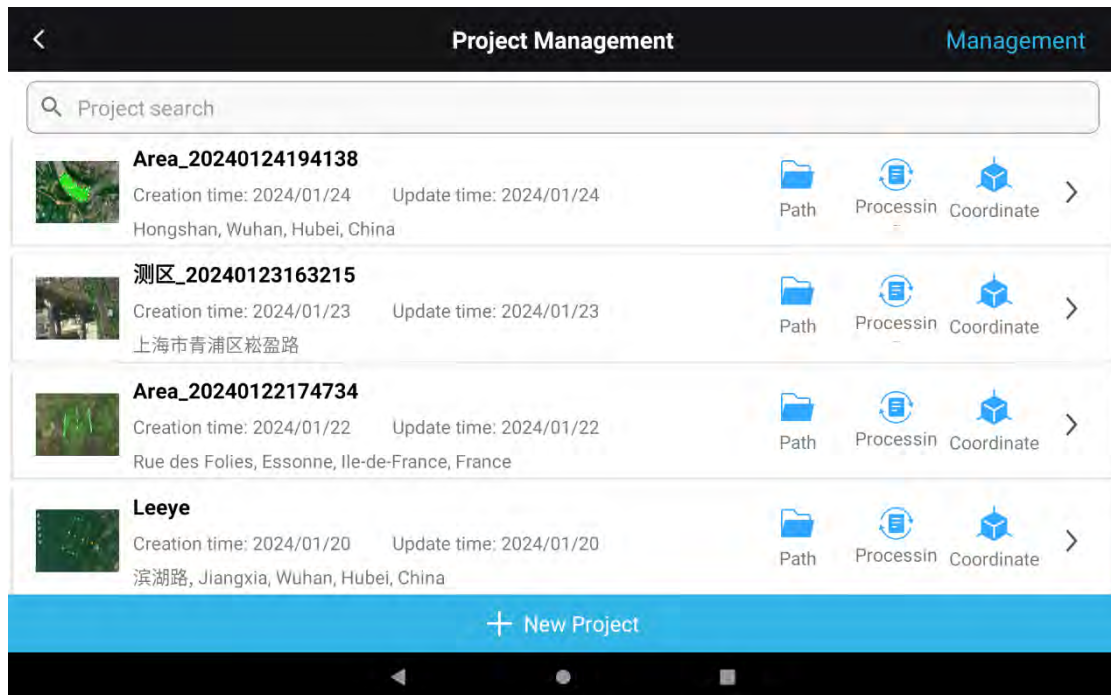
Connection mode - Data transmission



4.7 Project Management

The project management interface can display all the saved projects. Click on "Project Mission" to enter the project management interface. This interface will show a list of all the tasks that have been created. Each task label includes the name, route type, creation time, update time, and job location. Clicking on a label will open the task. After opening the project, you will enter the map interface. You can enter the management mode (Figure 9) by clicking on the "Management" button. In this mode, you can perform multiple selection/deletion/copying/sharing operations on the project files.

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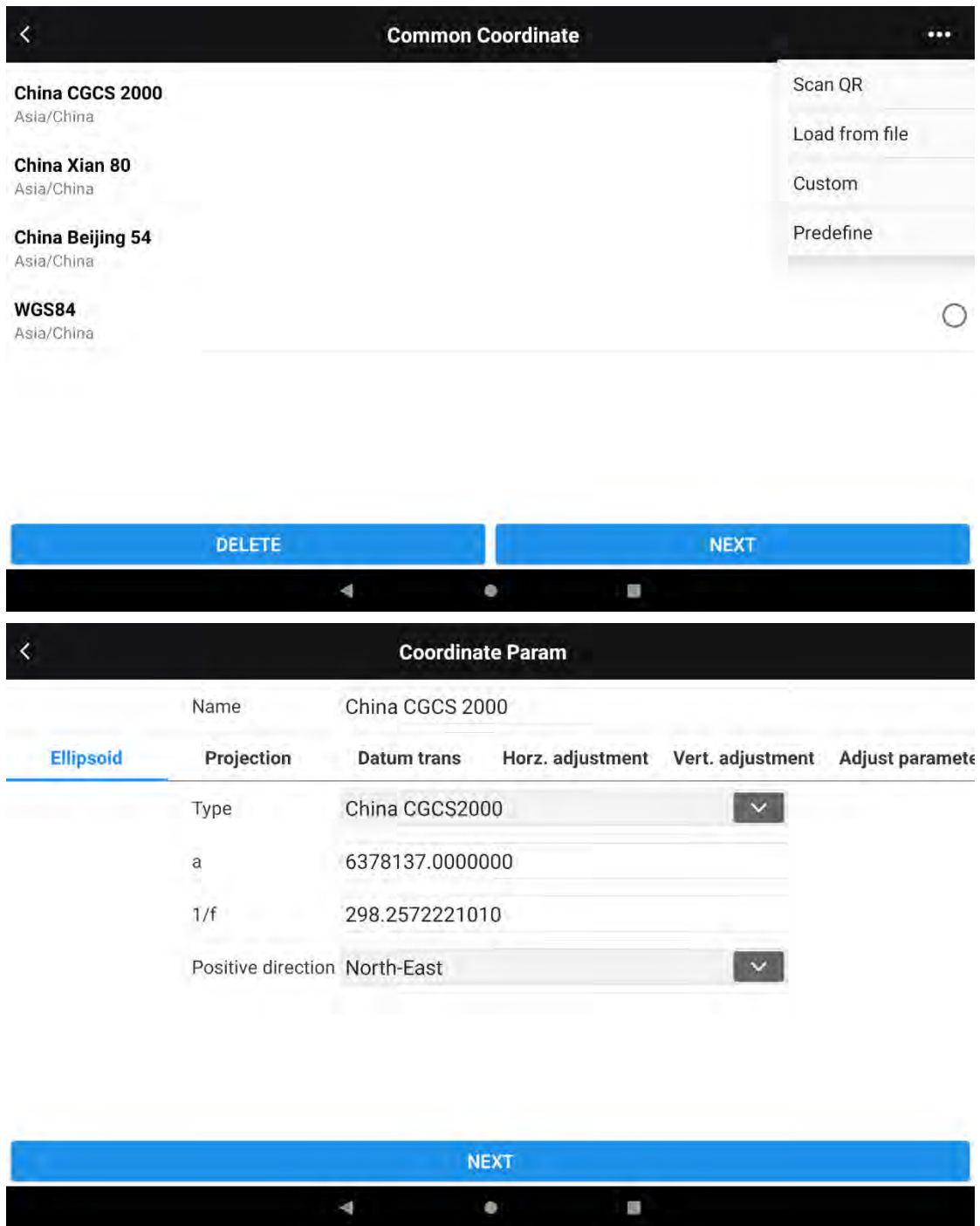
Search: When customers need to search for individual tasks, they can enter the task name in the search box to search for tasks. Fuzzy search is supported.

Copy and Delete: By clicking on "Management," the task management enters the copy and delete mode. The "Create" and "Import" buttons below will be replaced with "Copy" and "Delete." After selecting the tasks, clicking on "Copy" or "Delete" allows for copying or deleting tasks. Multiple selection is supported. After completing the copy or delete operation, click on "Done" to exit the copy and delete mode.

4.8 New Project/Coordinate System

After clicking on "Create New Project", set the coordinate system.

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Coordinate system parameters user-defined Settings

The coordinate system parameter interface allows for custom settings of the coordinate system. The available settings include: ellipsoid, projection, datum transformation, plane correction, elevation fitting, and correction parameter settings. Users can customize the coordinate system according to their needs.

Generate QR code: Generate a QR code for the currently set coordinate system.

Scan QR code: Scan the generated QR code to read the coordinate system parameters.

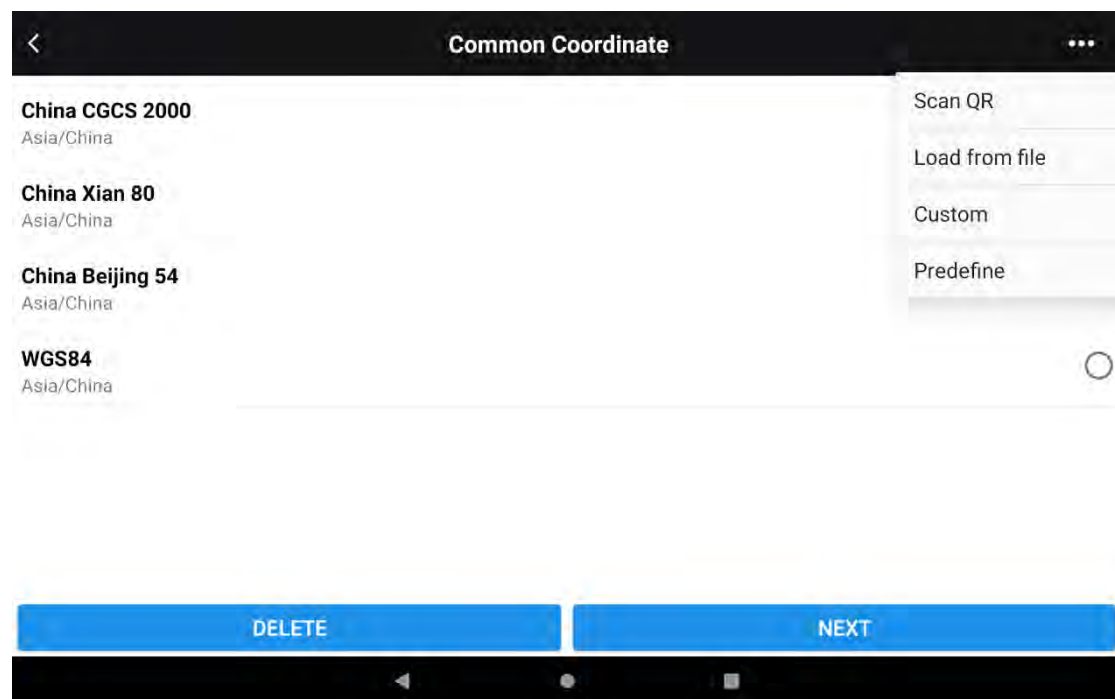
User Manual for CHCNAV APACHE USV

Load from common coordinate systems: Enter the common coordinate system module to directly select commonly used coordinate systems.

Save to common coordinate systems: Save the current coordinate system parameters to the common coordinate systems.

Import from file: Import coordinate files directly from the local directory; supports file search.

Share coordinate system: You need to log in to your Huace Cloud account to share the coordinate system. Generate a 4-digit sharing code that can be read using the Huace sharing code tool on the PC to access the shared coordinate system parameter file. The sharing code is valid for 30 minutes.



Common coordinate system interface

Common Coordinate System Interface: You can select saved common coordinate files and perform delete operations on them.

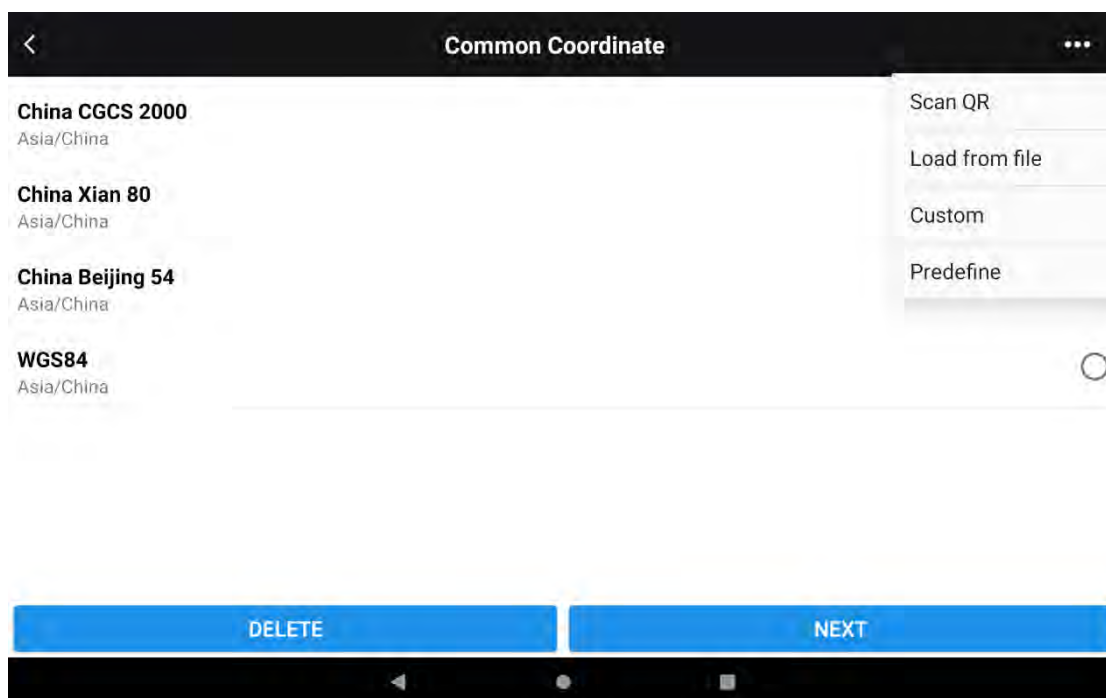
QR Code Scanning: Scanning the generated QR code can read the coordinate system parameters of other devices.

Customization: Enter the coordinate system parameter interface and set the coordinate system parameters according to your requirements.

Predefined: Enter the predefined coordinate system interface, and select the desired coordinate system based on continent and region.

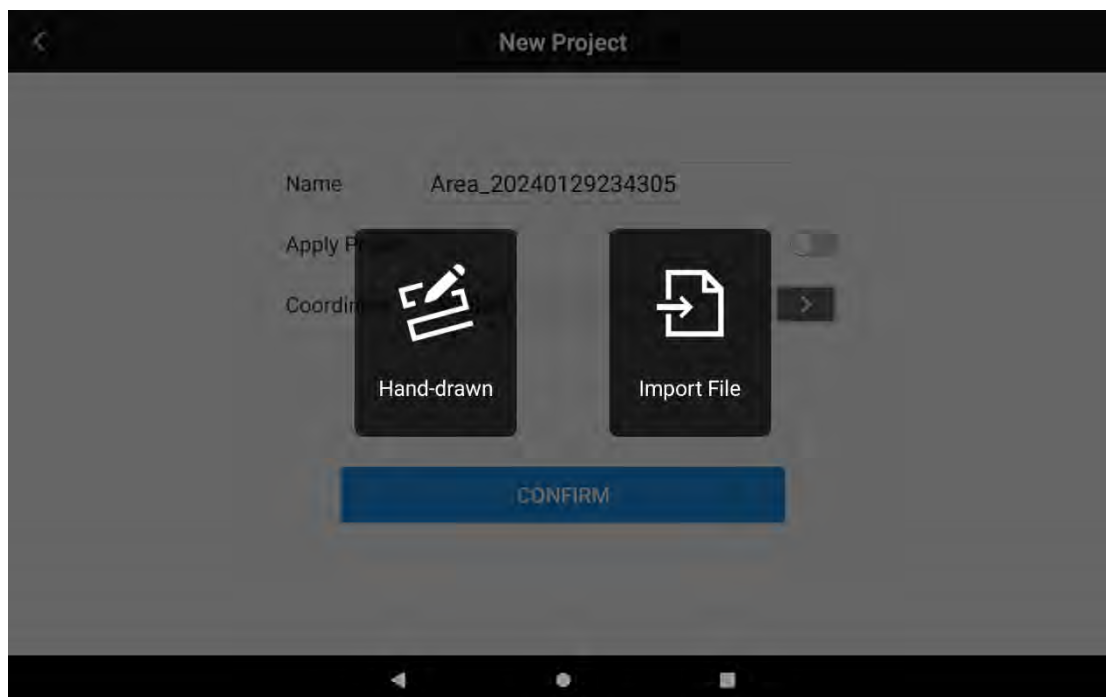
;

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Predefined coordinate system interface

Create Project: The creation of a project supports two methods for route planning, namely hand-drawn routes and importing files.



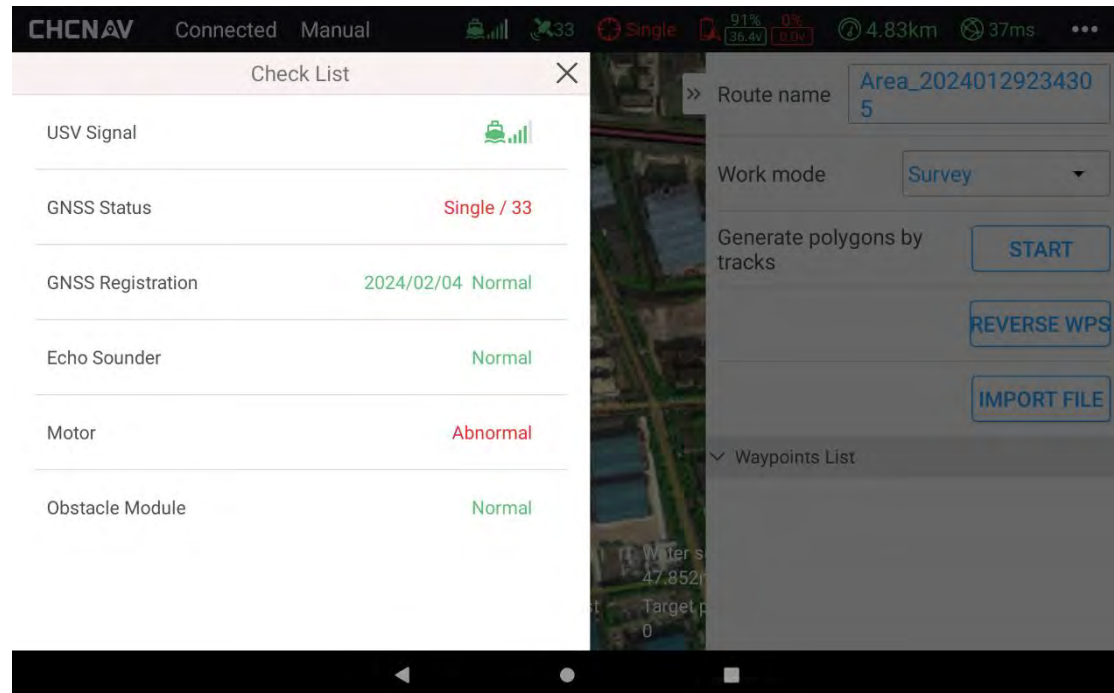
Importing Files: The current software supports importing files such as waypoint files (.waypoints), polygon files (.poly, *.kml, *.kmz, *.dwg, *.dxf) to create route missions or polygon shapes.



Note:

Importing files does not support too many waypoints (limit of 500), large areas, or any 2 points that are more than 10km apart, as it is not possible to generate them;

4.9 Check Itself



1. 4G Network Signal of boat: Real-time display of unmanned ship's network quality. $\geq 95\%$ shows full signal strength (5 bars); $\geq 85\%$ shows 4 bars; $\geq 70\%$ shows 3 bars; $\geq 60\%$ shows 2 bars; $\geq 50\%$ shows 1 bar; otherwise, shows 0 bars.
2. GNSS Positioning Mode: Displays the positioning solution status, including Single (red), Float (flashing), and Fixed (solid green).
3. GNSS Registration: If the expiration time is more than 48 hours, it will display [Expiration Date + Normal] in green. If the expiration time is less than or equal to 48 hours, it will display [2 Days Left + Expiration Date] in yellow. If the expiration time is less than or equal to 24 hours, it will display [1 Day Left + Expiration Date] in yellow. If it has expired, it will display [Expired] in red.
4. Depth Sounder: Shows green when successfully connected.
5. Motor: Shows green when successfully connected. The first connection may display an exception. Check the motor wind direction and power by pushing the remote control to make it turn green.

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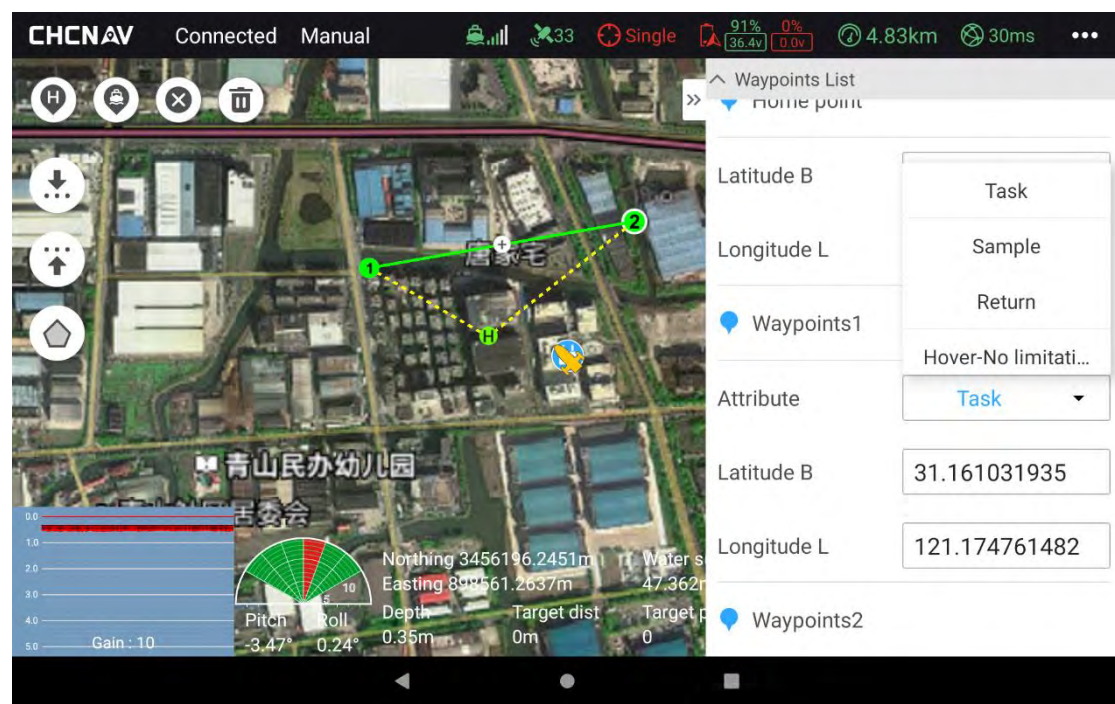
6. Obstacle Avoidance Module: Shows green when successfully connected.

4.10 Mission Plan

4.10.1 Hand-drawn

The current steps for creating a new route are as follows: click on the map once to generate a waypoint, click on the map multiple times to generate waypoints in sequence and confirm the navigation position and direction based on the order of clicks. You can also add waypoints by dragging the "+" points on the route.

Currently, there are two operations available for waypoints: deleting a single point and deleting all points. In addition, you can switch the properties of a waypoint in the dropdown menu under the route list. The options include: Waypoint (green), Sampling Point (purple), Return Point (red), Loiter Point - Unrestricted (yellow), and Loiter Point - Time (yellow). The loiter time can be set according to your needs.



Note:

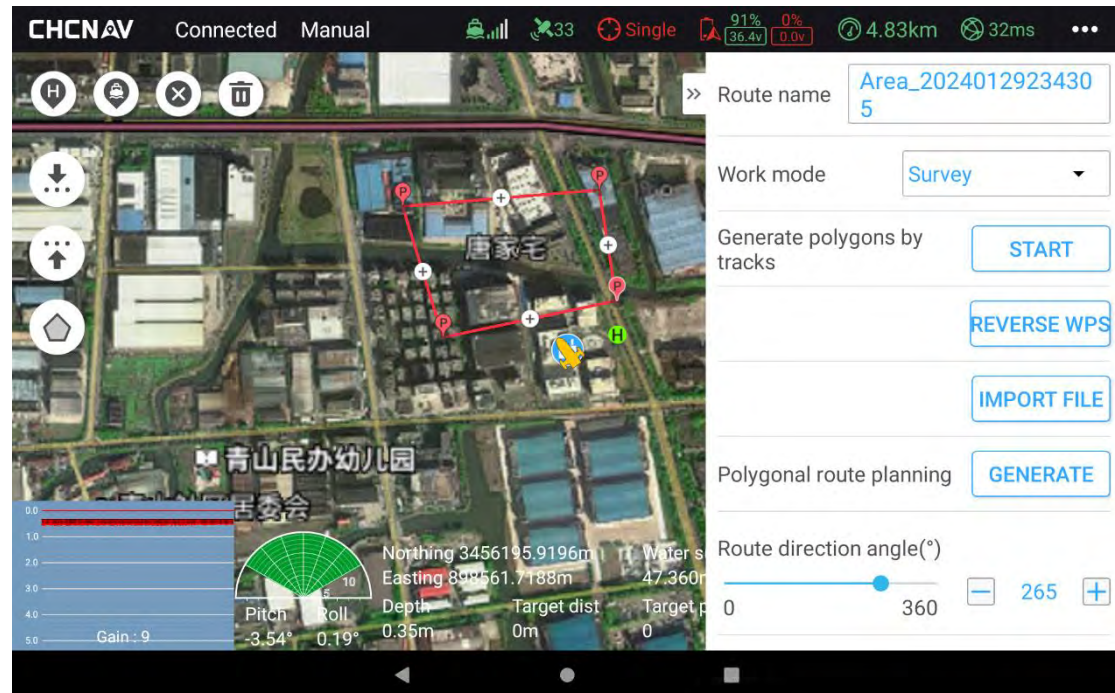
Click the left button of "Waypoint List" to minimize the value interface on the right side. Click the right button of the "Bell" again to open the waypoint list again.

4.10.2 Route planning

User Manual for CHCNAV APACHE USV

The current logic for generating flight routes after creating a polygon is as follows: Clicking once on the map will generate a boundary point for the polygon. Clicking three times consecutively will generate a triangle. Clicking on the map again will continue adding boundary points for the polygon.

When the "Edit Polygon" button on the left is in the selected state, you can move the polygon by dragging it or delete selected points (by clicking on the points to be deleted or using the single-point delete button).



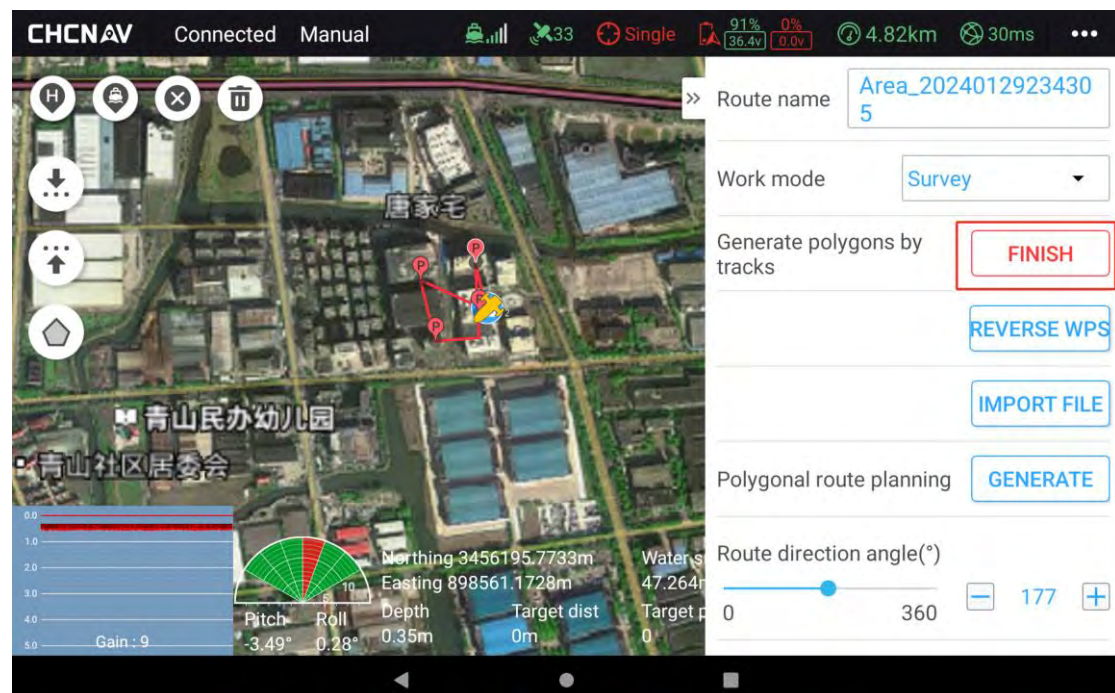
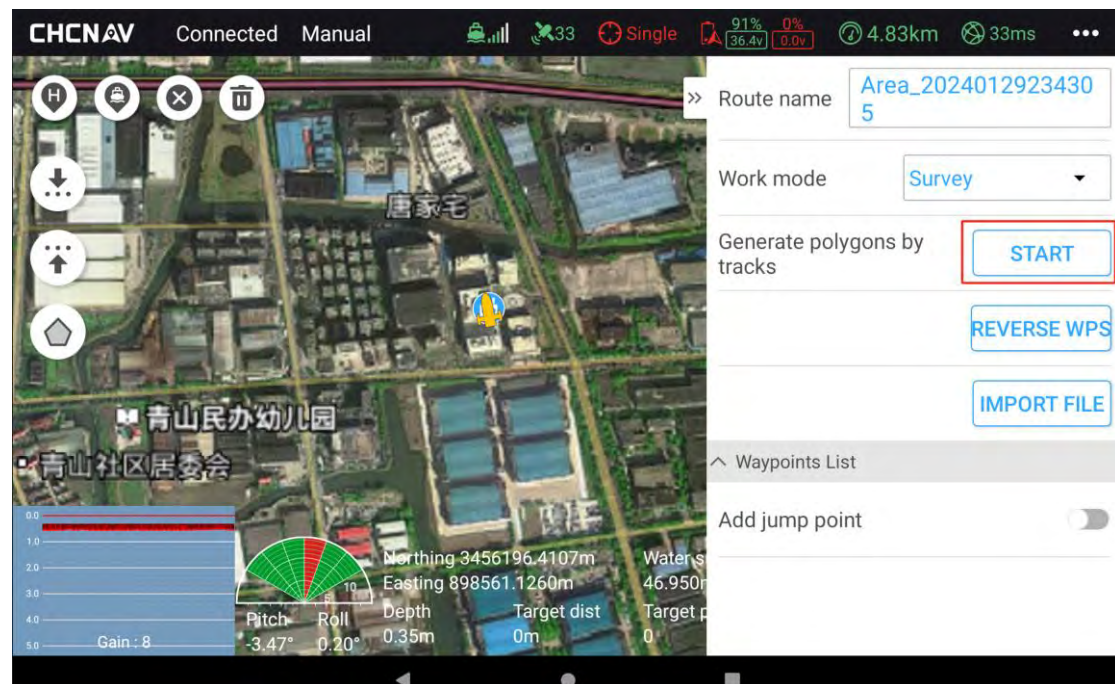
Once the range of the polygon is confirmed, you can generate a default route by clicking the "Generate" button on the right side. You can also modify the route by setting the route azimuth, route spacing, starting point, and polygon expansion.

4.10.3 Generate Polygon from Trajectory

In the route editing mode, click the "Start" button on the right side of the track to generate a polygon. Then, manually control the unmanned boat to run along the boundary of the survey area, and an enclosed polygonal region will be automatically

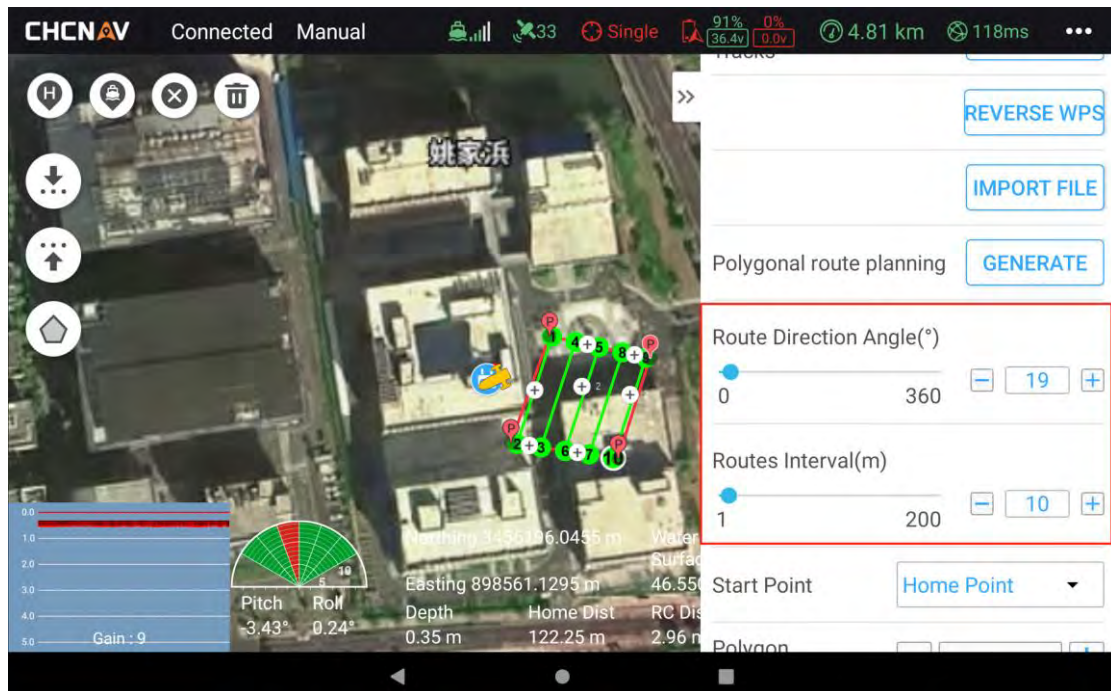
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generated.



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Click the "End" button, then set the direction of routes and spacing of the route. Click the "Generate" button to generate preset flight routes within the polygon area.



4.10.4 Import file

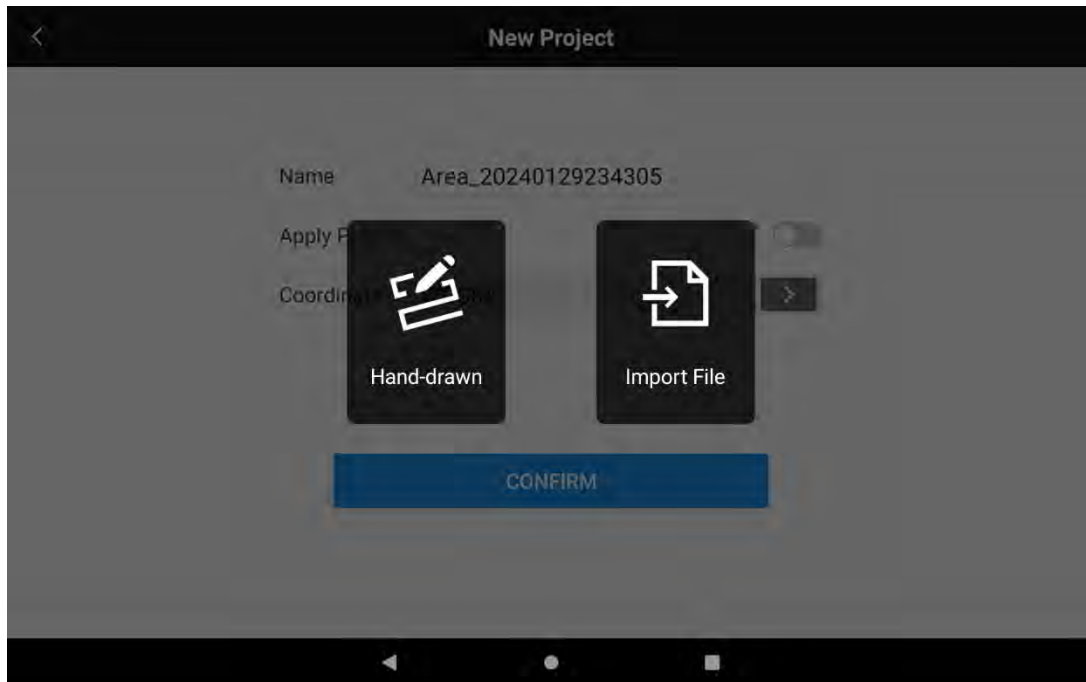
When creating a new project for the first time, choose the "Import File" option. The software currently supports importing waypoint files (.waypoints), polygon files (.poly, *.kml, *.kmz, *.dwg, *.dxf), and other file formats to create missions or polygon.



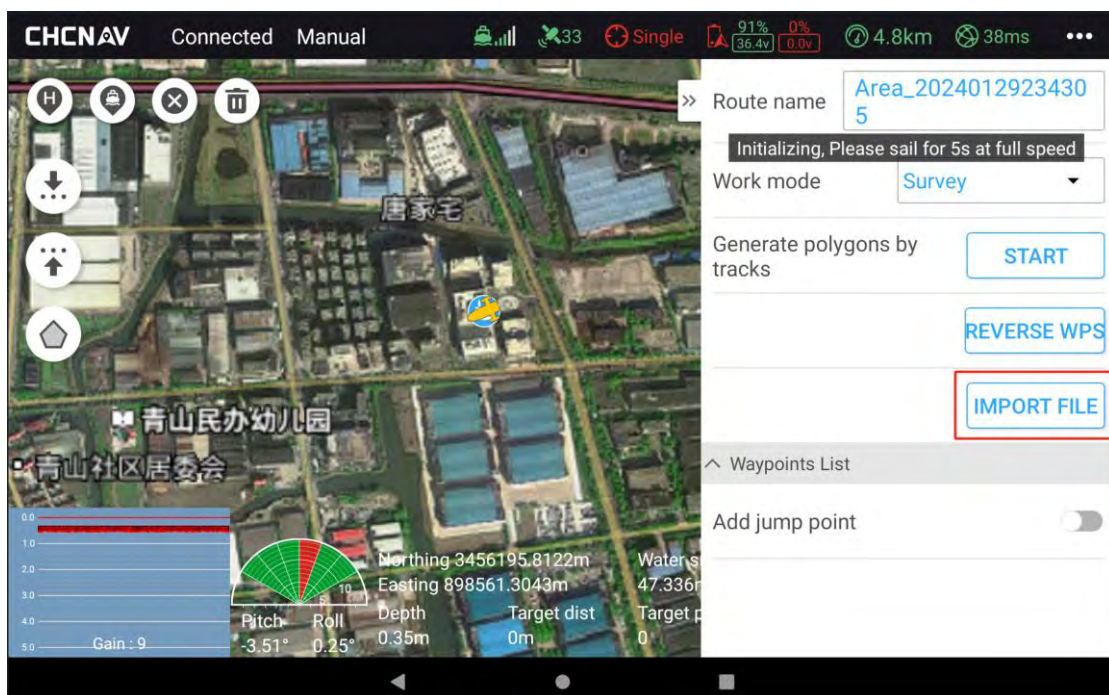
Note:

Importing files does not support too many waypoints, with a maximum limit of 500.

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Additionally, you can also import files by clicking the "Import File" button in the waypoint list on the right side in edit mode.



Import file

4.11 Settings

4.11.1 Record Control

Set up parameters to record data, and the recorded data will be based on the current settings.

For example, if recording is set to every 1 meter, the data recorded in the dep file will be one point every 1 meter.

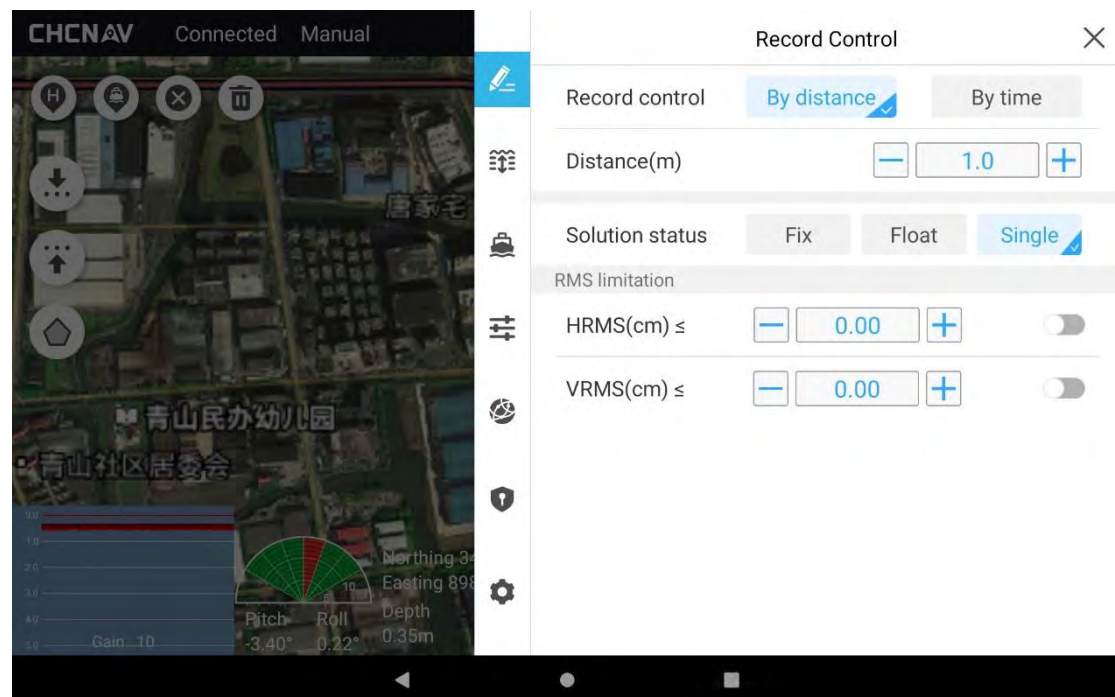
4.11.2 Solution Status:

Select Fixed: Only record fixed solution and inertial navigation solution data.

Select Float: Only record fixed, float solution, and inertial navigation solution data.

Select Single Point: Record all data (fixed, float, differential, inertial, single point).

RMS Limit: Record RMS data that meets the set conditions.



4.11.3 Sounder Settings

Set the parameters of the echo sounder, such as range, gain, sound velocity, and water depth filtering in manually.

The settings take effect in real-time. After setting, you can view the corresponding waveform changes in the lower left corner of the map.

Draft: If connected to boat, the draft is bound to the boat type and cannot be manually modified. If connected to D270, it can be manually modified.

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Sound velocity: Can be manually entered, and also supports calculating the sound velocity value based on temperature and salinity.

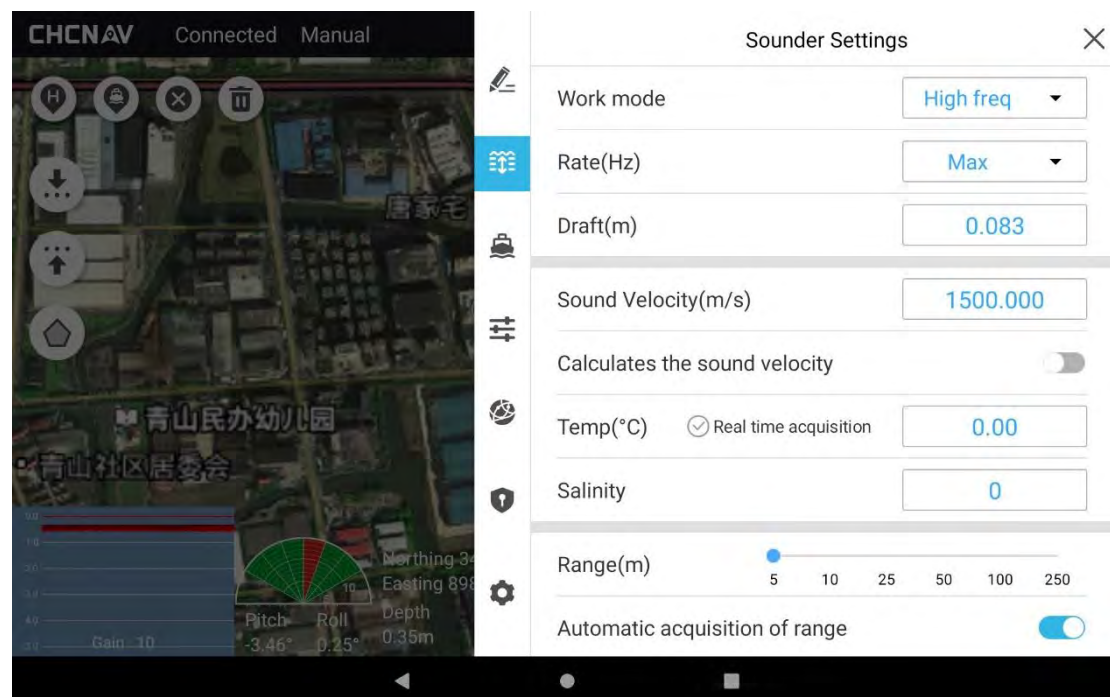
Salinity: Can be manually entered.

Temperature: Can be manually entered, or you can obtain real-time data from the D270 depth sounder temperature sensor.

Range: Supports manual and automatic settings to set the current depth range.

Gain: Supports manual and automatic settings to adjust the sound wave intensity of the depth sounder transducer.

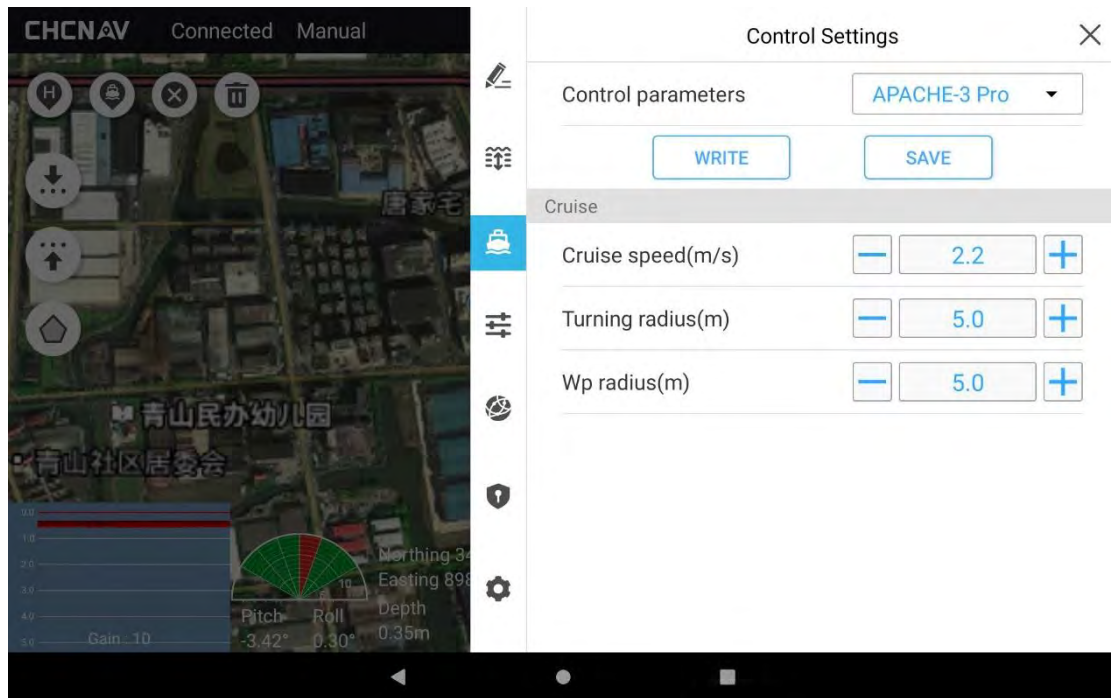
Water depth filtering: Filters out clutter and noise data beyond the filtering range.



4.11.4 Control Settings

a. Write Parameters: The dropdown list displays the names of ship parameter files (.param). Select the corresponding ship name and click [Write] to save. b. Save Parameters: Click the save button to save the current boat's parameters in a custom file (.param). c. Ship Control Parameter Settings: Click + or -, you can dynamically adjust the ship control parameters, and manual input is also supported. The changes take effect in real-time.

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4.11.5 System Settings

Shoal backward: when this function is turned on, the boat will automatically reverse and leave when it enters a shallow beach.

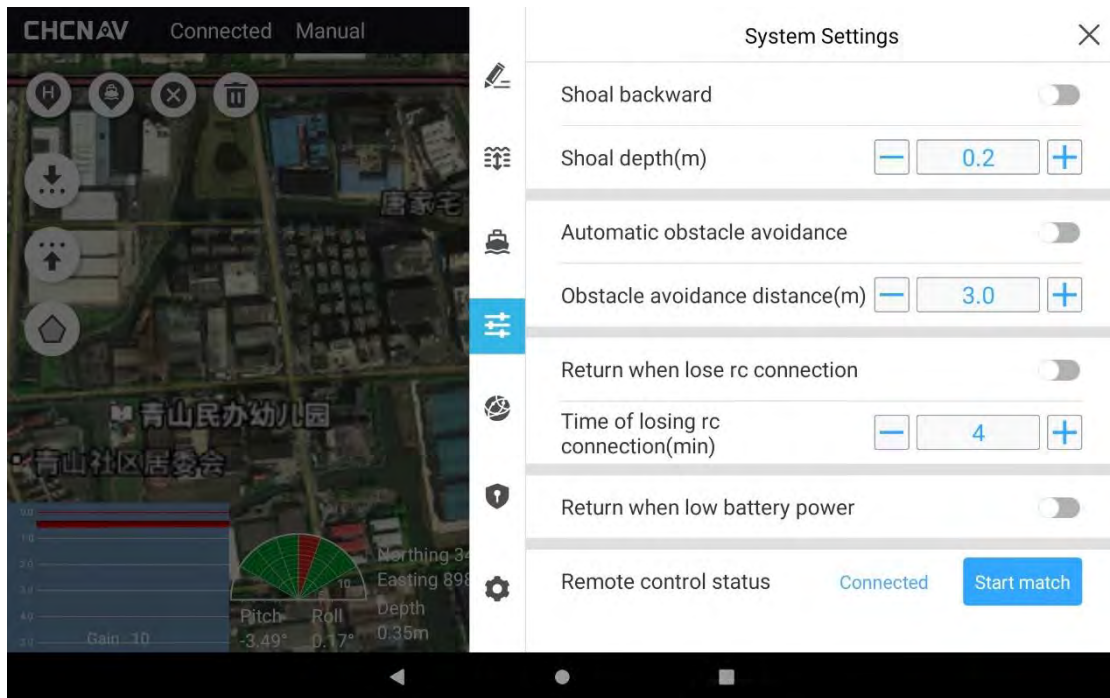
Automatic obstacle avoidance: when this function is turned on, the boat will automatically detour or stop when it detects obstacles ahead.

Return when lose RC connection: when this function is turned on, if the remote controller is disconnected (when the distance between the remote controller and the unmanned boat is far), after a period of time (loss of connection time), it can automatically return.

Return when low battery power: when this function is turned on, the boat will automatically return if the battery power is low.

Remote control status: After turning on the remote controller, if it is not paired with the boat, it can be paired with the remote controller through this button.

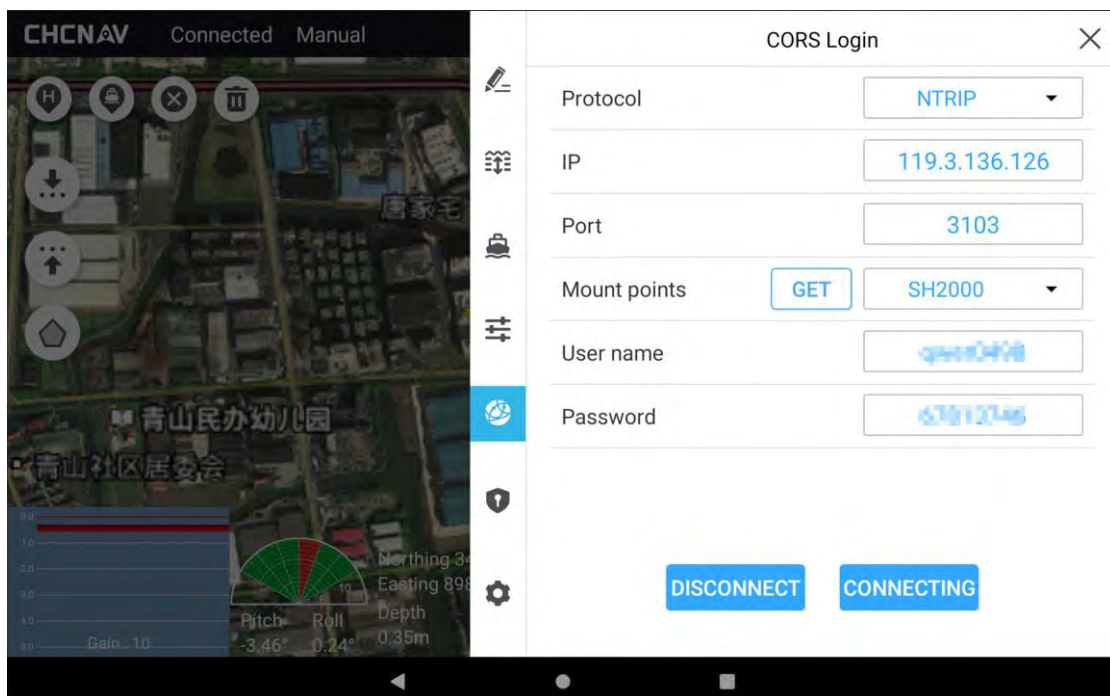
User Manual for CHCNAV APACHE USV



System setting interface

4.11.6 Login CORS

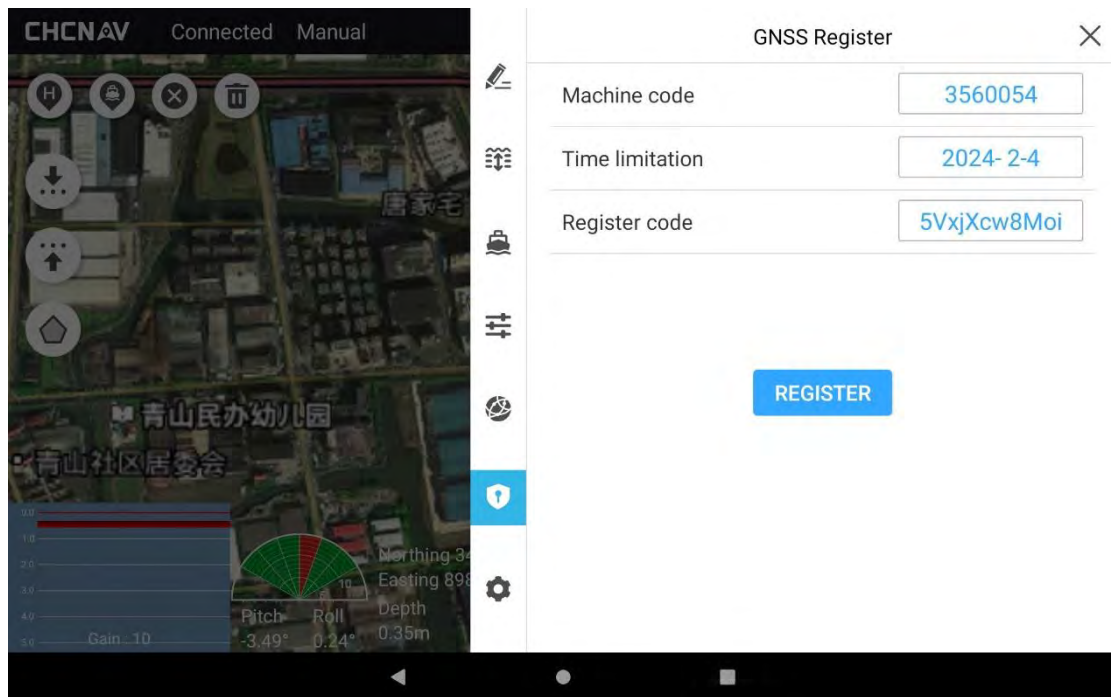
This interface allows you to view the current login status of CORS. You can also manually input parameter information to log in to CORS.



CORS login page

4.11.7 Gnss Registration

it can display the SN number, GNSS registration deadline, and registration code information of the current unmanned vessel. If the GNSS has expired, you can contact technical support from CHCNAV to apply for a new registration code. Then, input the new registration code in the designated field in the following image and click on the registration button to complete the registration.



Registration code interface

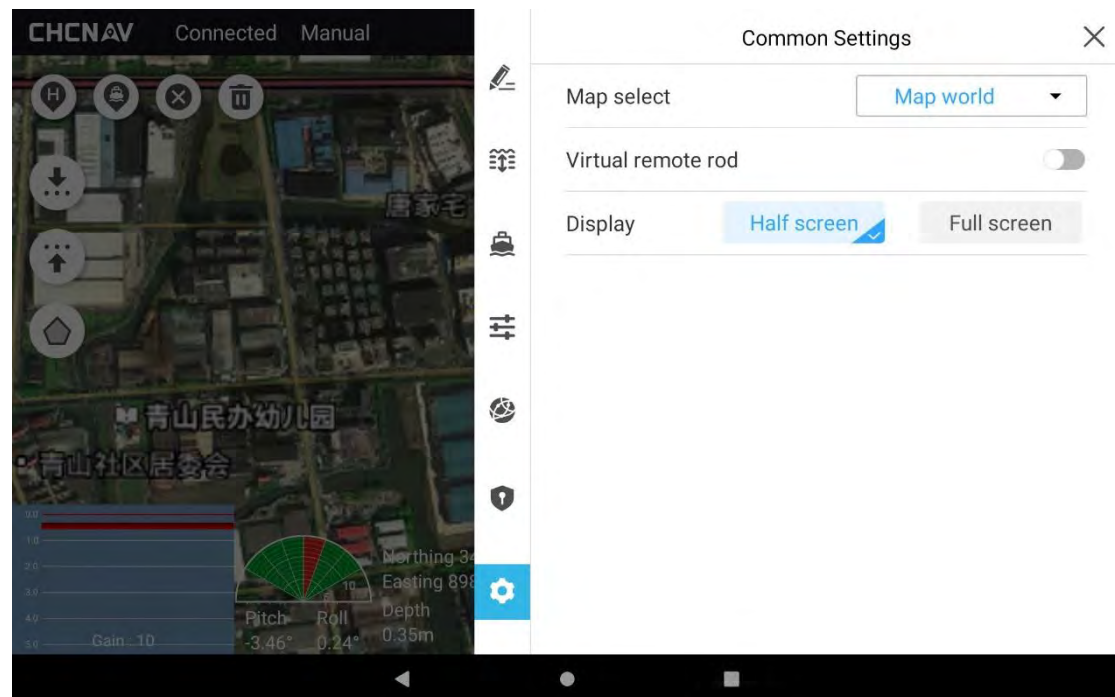
4.11.8 Common Settings

Map select: it support ArcGis, Google, OSM format.

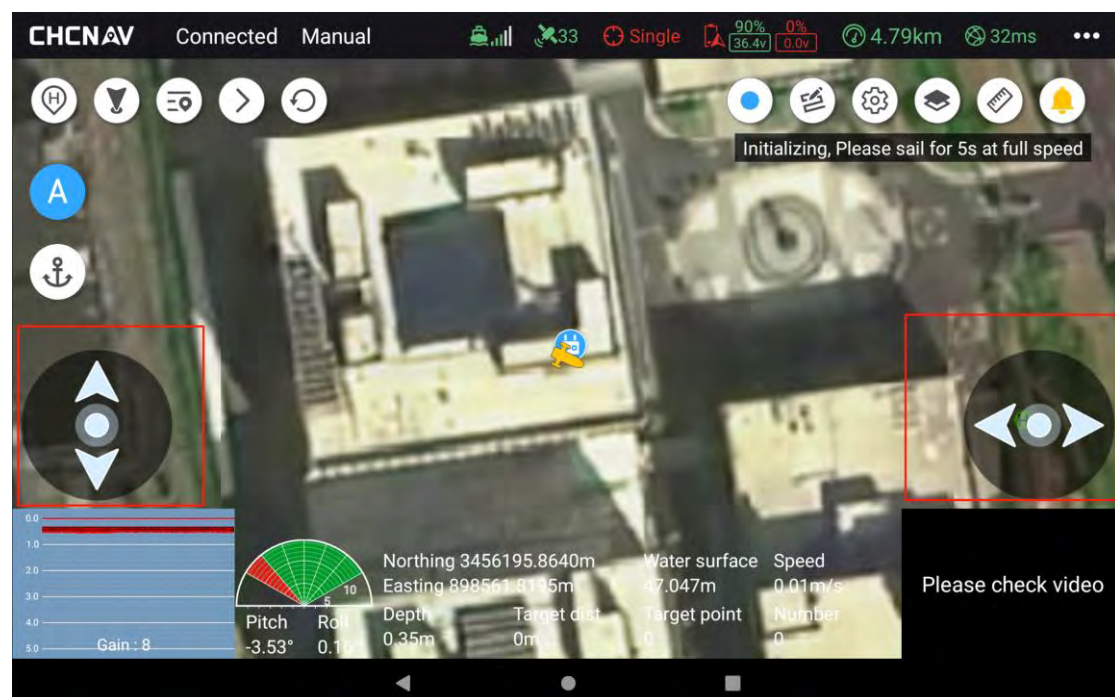
Virtual Remote Rod: Set the display and hide of virtual joystick. It will only be visible after saving the project.

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Set the display and hide of virtual joystick. It will only be visible after saving the project.



Universal setup interface



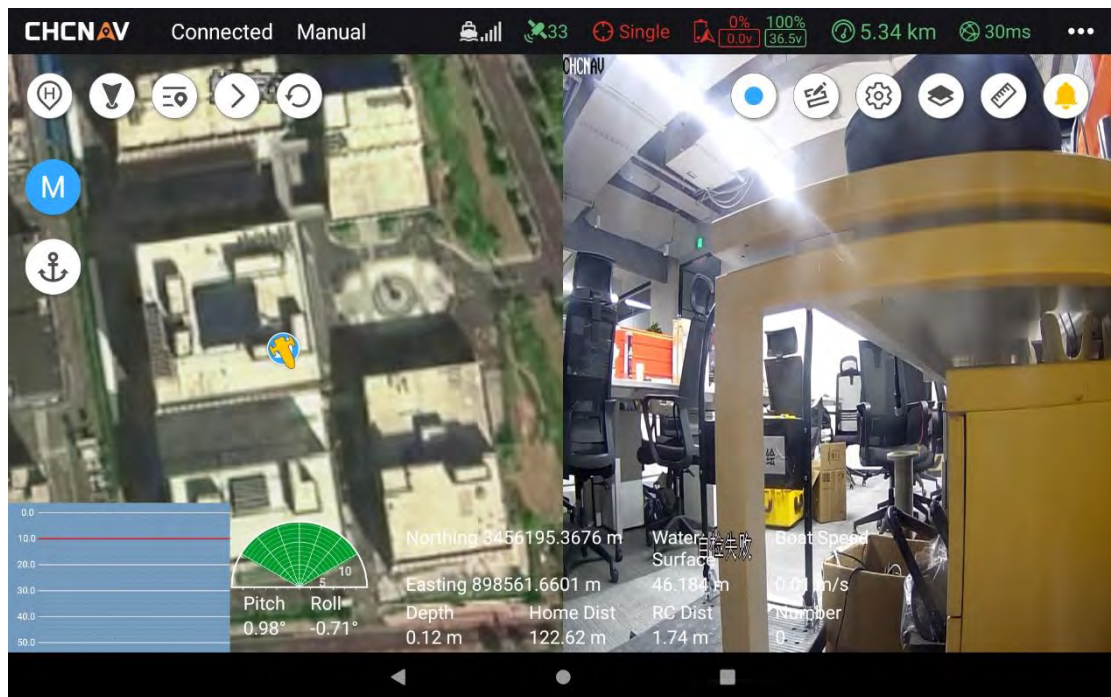
Virtual longitudinal bar

4.12 Map / Video Switching

Click on the bottom right corner of the view window to switch between the map and video interface. It supports switching between half-screen and full-screen. The settings

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for half-screen and full-screen can be configured in the "General Settings" interface. In the full-screen video interface, there are platform rotation, photo capture, and video recording functions on the right side. The captured photos and recorded videos are stored in the "fpv" folder of the current project. In the video view interface, there is a play and close button in the upper right corner of the gimbal center, allowing you to freely open and close the video stream.



Half-screen interface

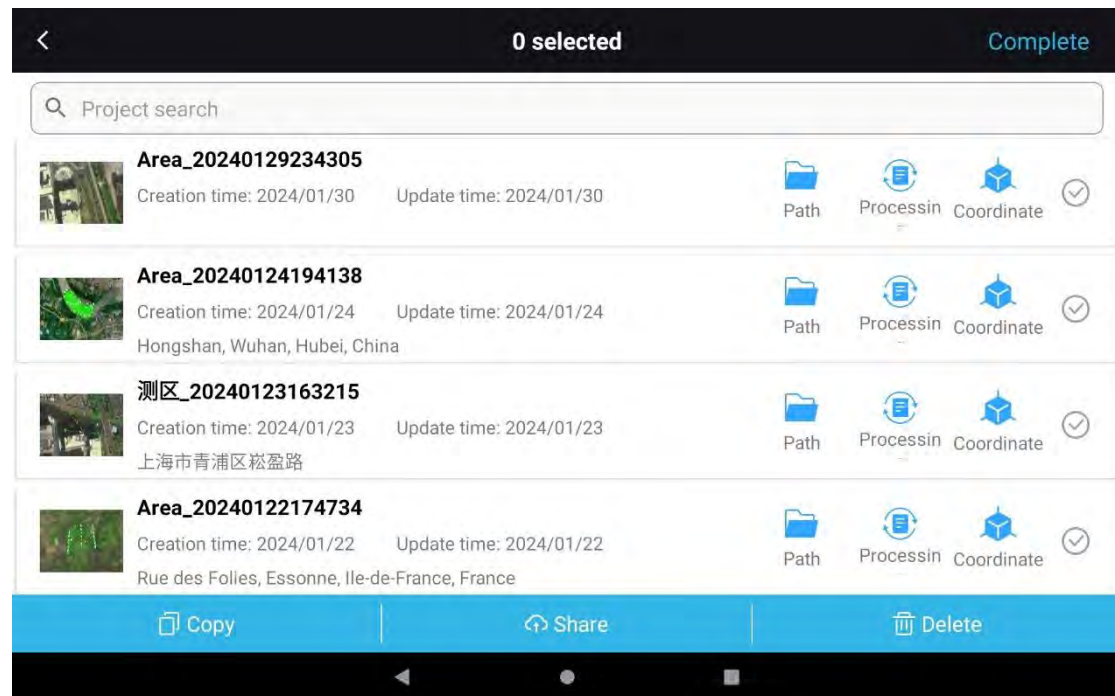


Camera full screen interface

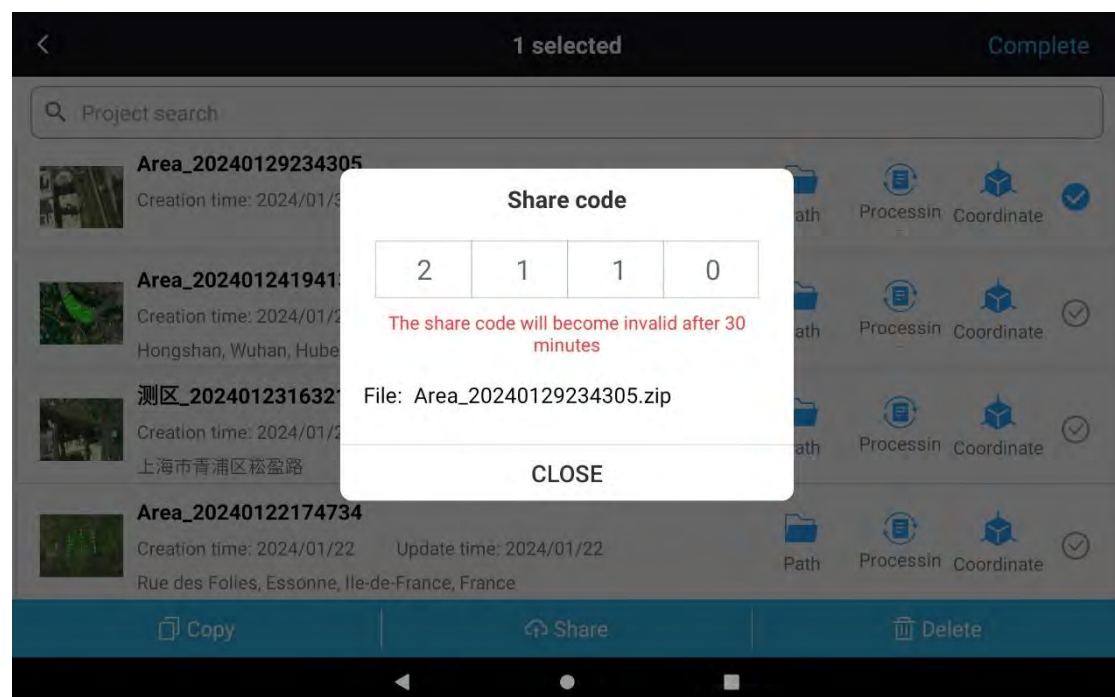
4.13 Other Functions

4.13.1 Share Project/Achievement/Log

In the project management interface, click on the "Manage" option in the top right corner to copy, share, or delete the project.



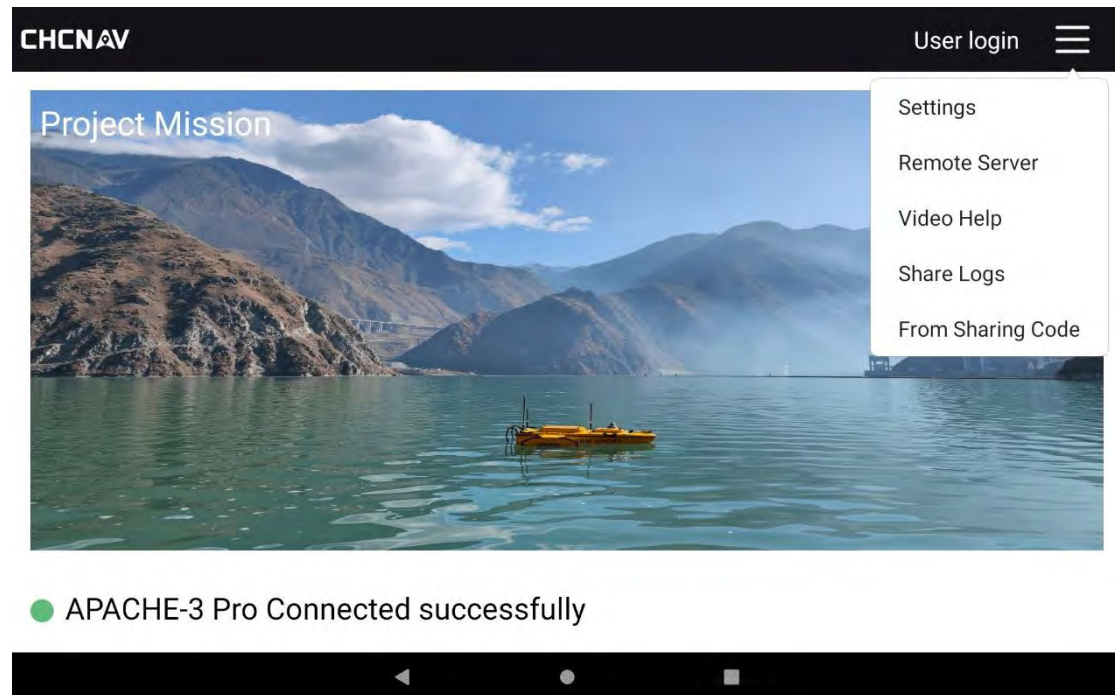
Management



Share code interface

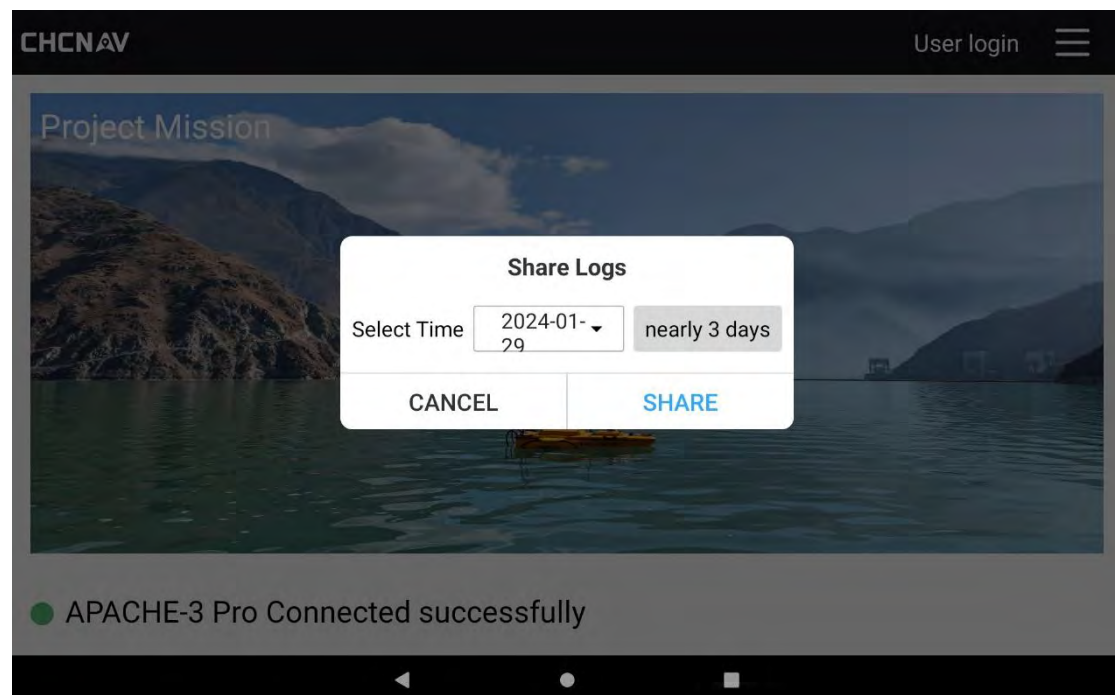
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Click the three dots in the top right corner of the initial interface, then click "Share Log" or "Download Share Code" to obtain the project data

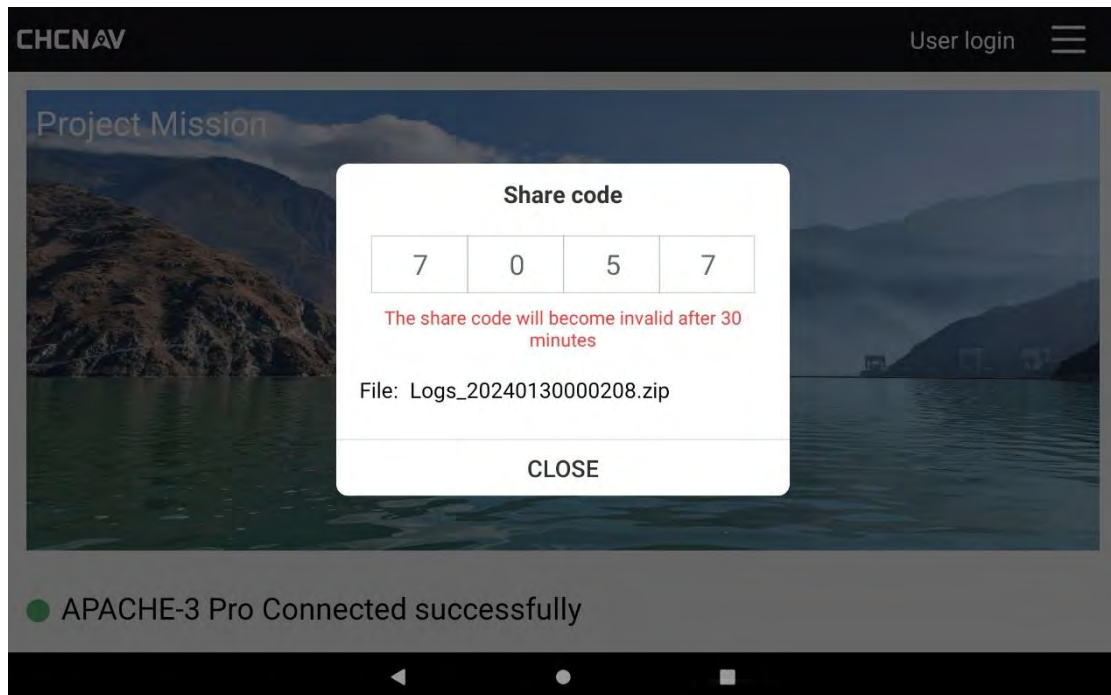


Main interface

Select the software logs corresponding to the date and share them with the technical team for analysis.



Log sharing interface



Share code interface



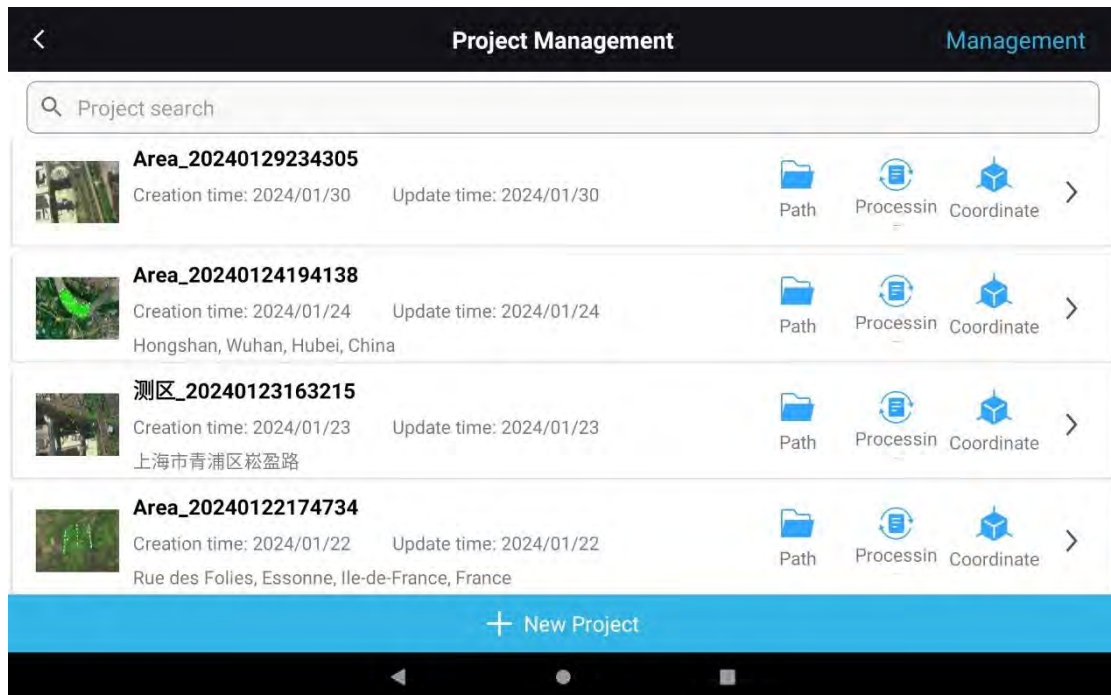
Note:

When using the sharing feature, you must first log in to your CHC account and download the CHC Cloud Sharing Code Tool from the official website to use it together.

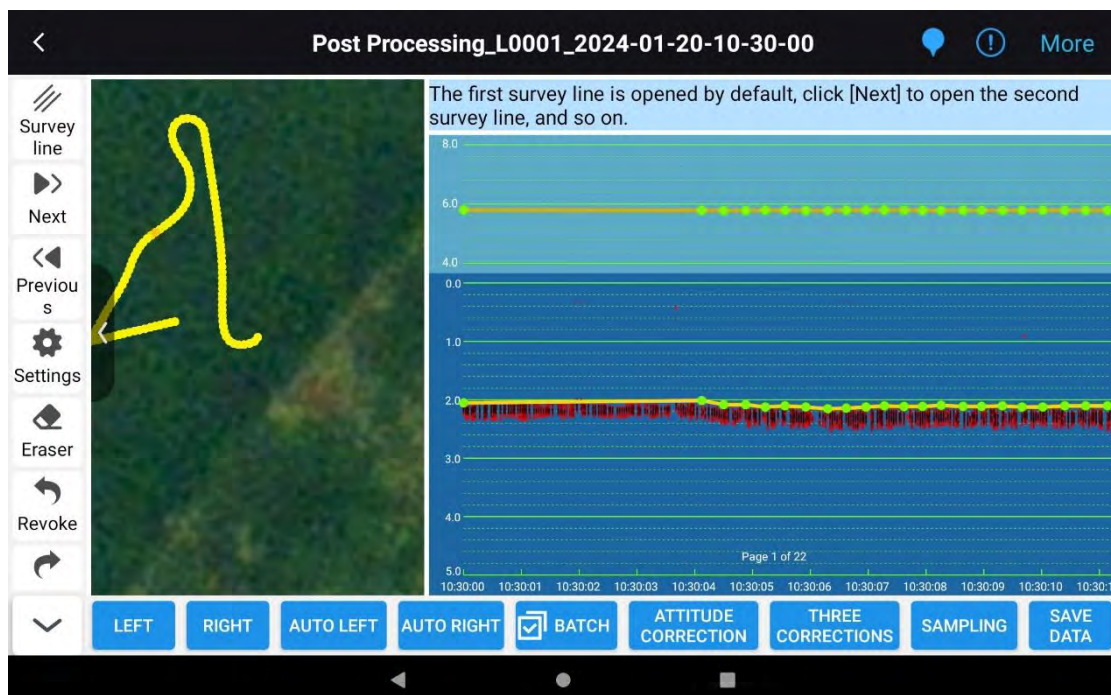
4.14 Post- Processing

Projects management interface, click on the post-processing button for the corresponding project.

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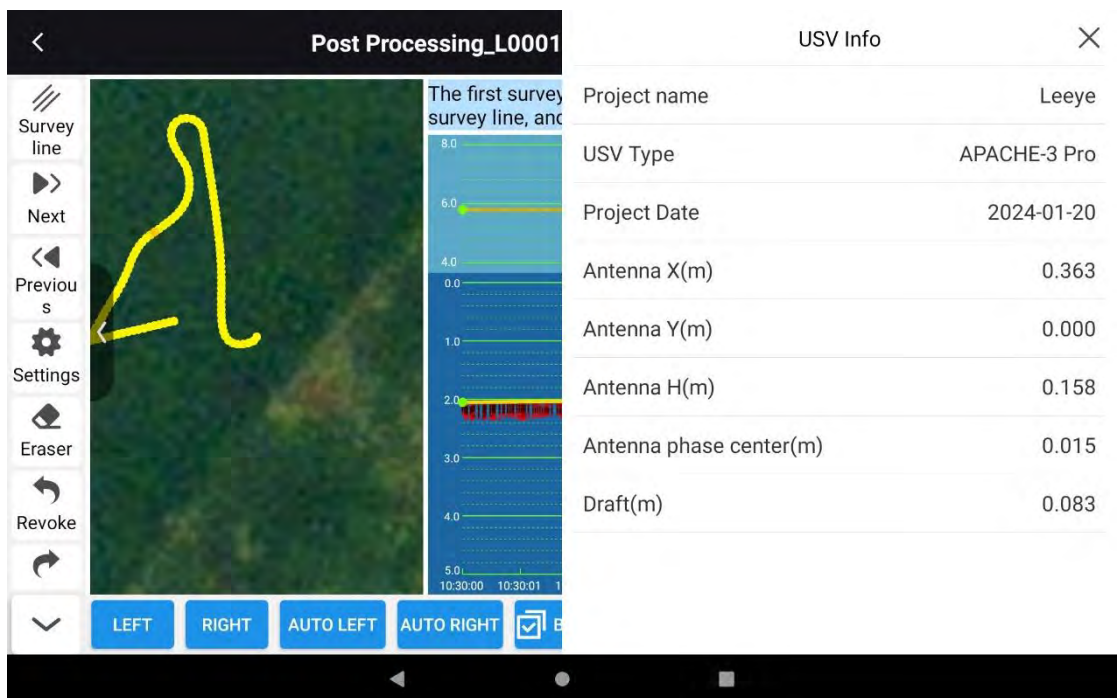
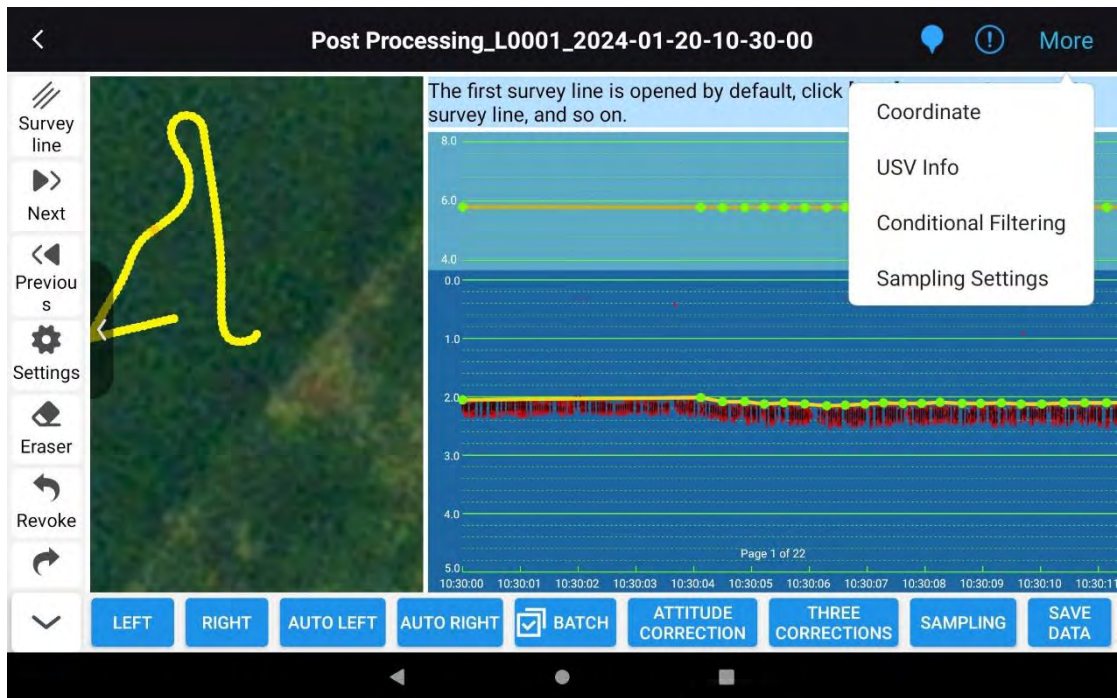


Click on the left sidebar, the "Survey line" button, and select the desired measurement line to process. Click on "Next" or "Previous" to switch between measurement lines for processing.



Click on 'More' button on the top right corner to view "Coordinate System" and "Ship Information" to see if they are normal.

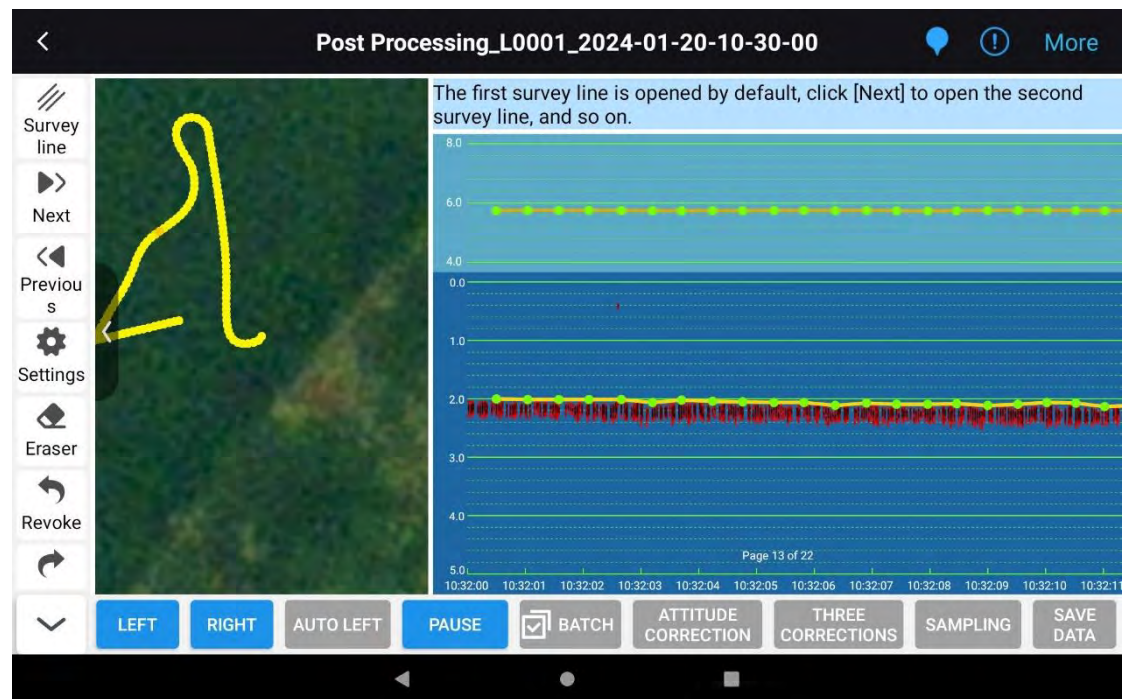
User Manual for CHCNAV APACHE USV



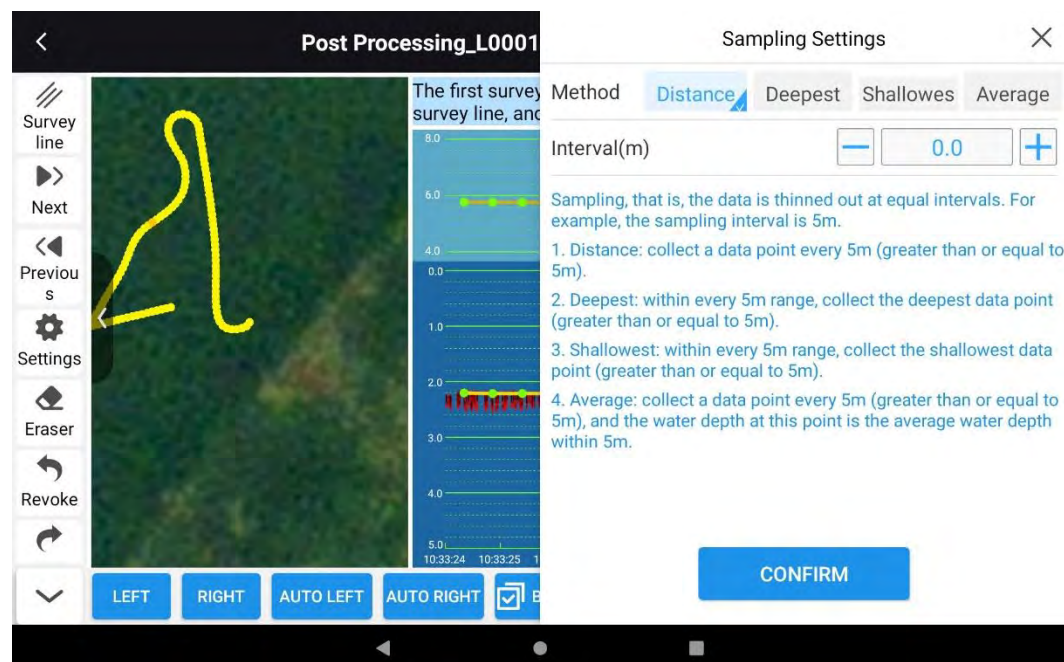
In the water depth interface, you can drag the depth point to the correct position or click "Eraser" to remove noise. Click directly below to move the depth data horizontally,

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such as left, right, auto left, or auto right.

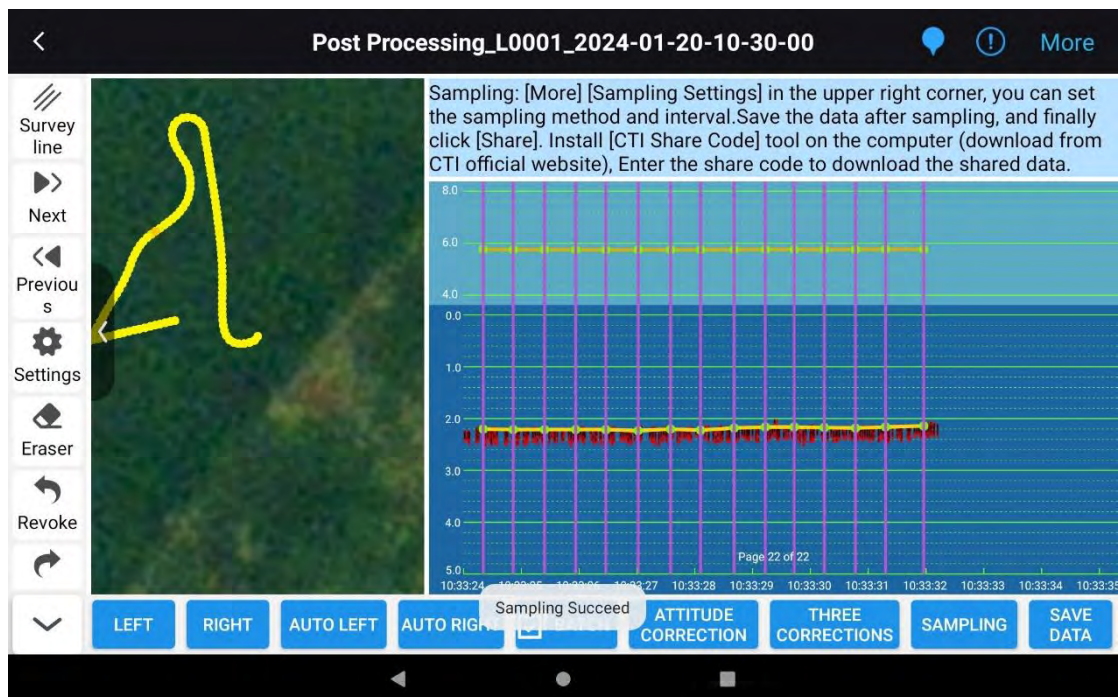


After removing all the line noise one by one, click on "Batch" and select the lines that need to be processed. Then click on "Attitude Correction" or "Three Corrections" (which includes Attitude Correction / Sound Velocity Correction / Delay Correction). Click on "More" in the upper right corner again, select "Sampling Settings", manually set the sampling interval, and click on "Equidistant Sampling" in the lower right corner.

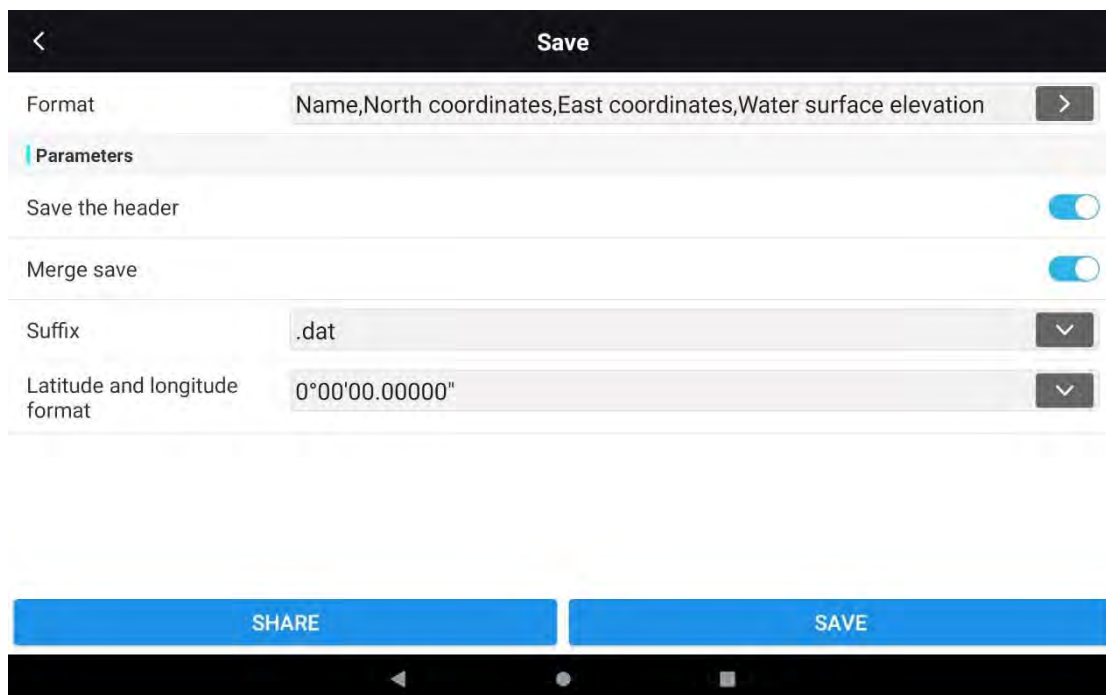


After successful sampling, a purple sampling line is generated on the water depth interface. Click 'Save data' to save the data.

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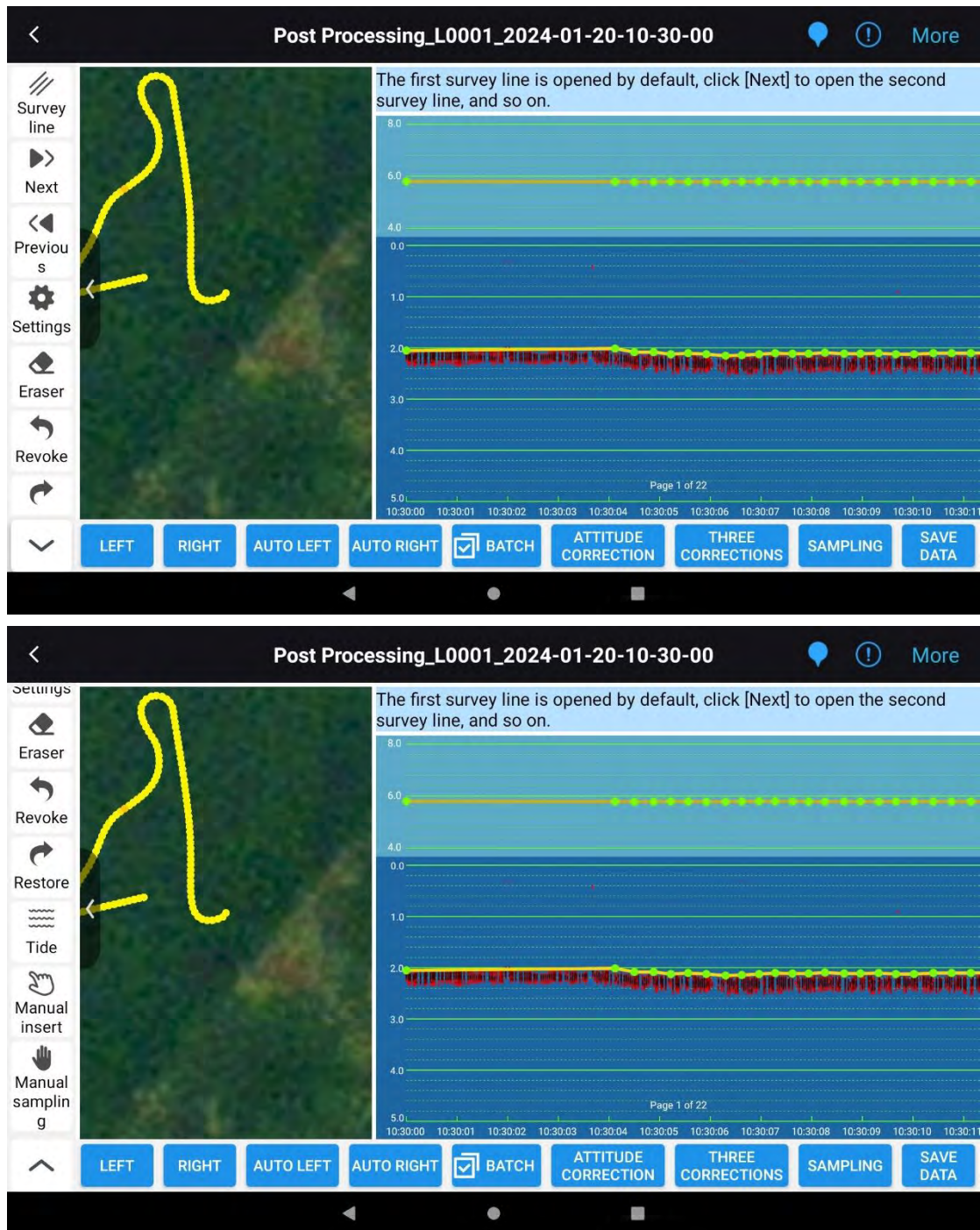
Select the data format and type to be exported, click on Save, and the result file will be saved by default in the current project.



Click to share, you can share data achievements.

Detailed information on Post-processing function in aceterf

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Post-processing operation interface

4.15 View Introduction:

Recorded Point Colors: Fixed solution points are displayed in green, float solution and inertial navigation solution points are displayed in yellow, and other points are displayed in red. The color of the selected point turns orange. At the same time, the

corresponding point on the map trajectory view is also marked (highlighted with a white circle).

Manually inserted points are rendered in purple. Erased points are displayed in gray and cannot be clicked again.

Map Interface: Can be dragged, moved, and zoomed in or out.

Map Recorded Point Display: Colors are rendered based on different water depths, from light to dark: red, orange, yellow, green, cyan, blue, violet.

4.15.1 Introduction of Left-Side Buttons' Function:

Open Tidal Data: Import tidal data files (*.tid). The tid file should contain both the date and time of the tide and the date and time of the depth. After importing, the water surface elevation will be calculated using the elevation data from the tid file.

Fixed Interpolation: Selecting this button will correct the elevation data for non-fixed solutions.

Eraser: Selecting this button and then selecting or drawing a box around multiple depth points will delete those points.

Manual Interpolation: Manually interpolate data - select this button, then click anywhere within the range of the depth view to insert a new data point at the corresponding time and depth position.

Manual Sampling: Manually sample feature point data - sampling is done at regular intervals. This applies only to non-uniform sampling points.

After equidistant sampling, for the unsampled data points, manual sampling can be performed, which is called feature point sampling.

When this button is selected, any non-equidistant sampling point can be selected with the mouse, and a red sampling line will be automatically generated. After multiple operations, click the "Save Data" button to save.

Undo: Go back to the previous operation (dragging points/deleting points/adding or deleting feature point sampling lines).

Redo: Restore the previous operation (dragging points/deleting points/adding or deleting feature point sampling lines).

Map Collapse Button on the left: It can open/close the map interface display.

Profile: Displays all profile files recorded in the current project.

Settings: 1) Can set water depth, time interval, and time width multiplier, and modify the view interface. 2) Can choose the editing method for water depth points: lock/single

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point up and down/multiple points continuously. 3) Fixed interpolation. 4) Show data point information: When enabled, click on selected measurement points/elevation points to display point information.

4.15.2 Introduction To The Function Keys Below:

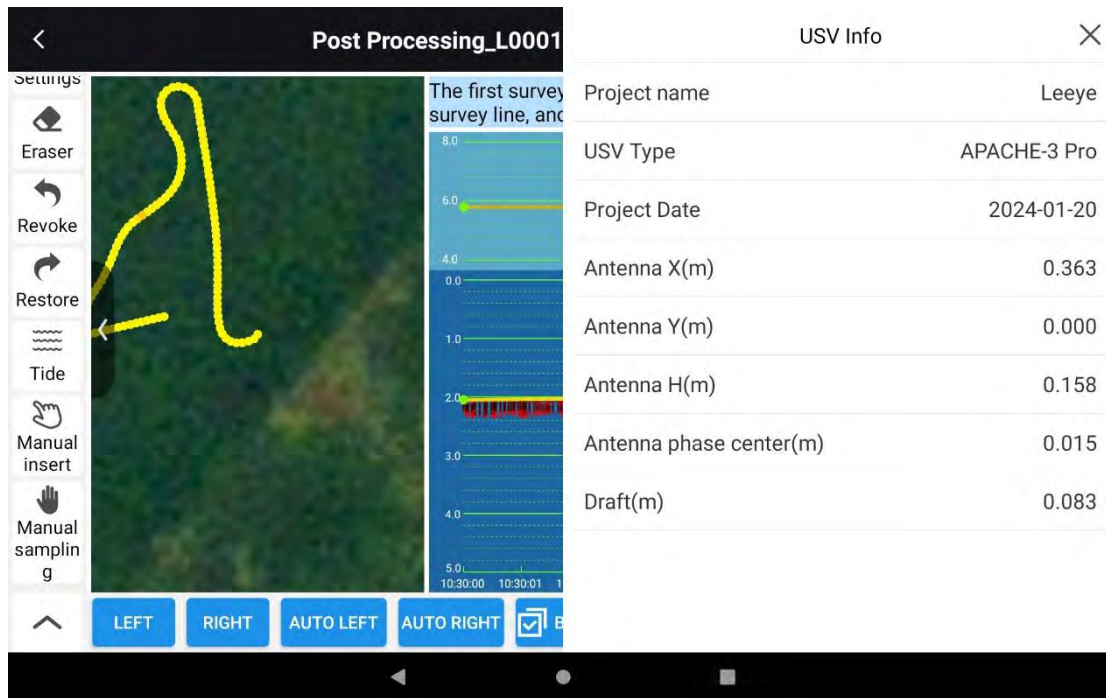
Left/Right Move: Used to flip through the depth interface left or right.

Auto Left/Right Move: One-click to flip left or right, can be manually paused.

Batch: Supports selecting multiple survey lines. Select as many as you want and process them accordingly. Click the Batch button to open the survey line list, where each line has a checkbox on the right side. By default, all survey lines are selected. Click the Confirm button to read the data of the selected survey lines.



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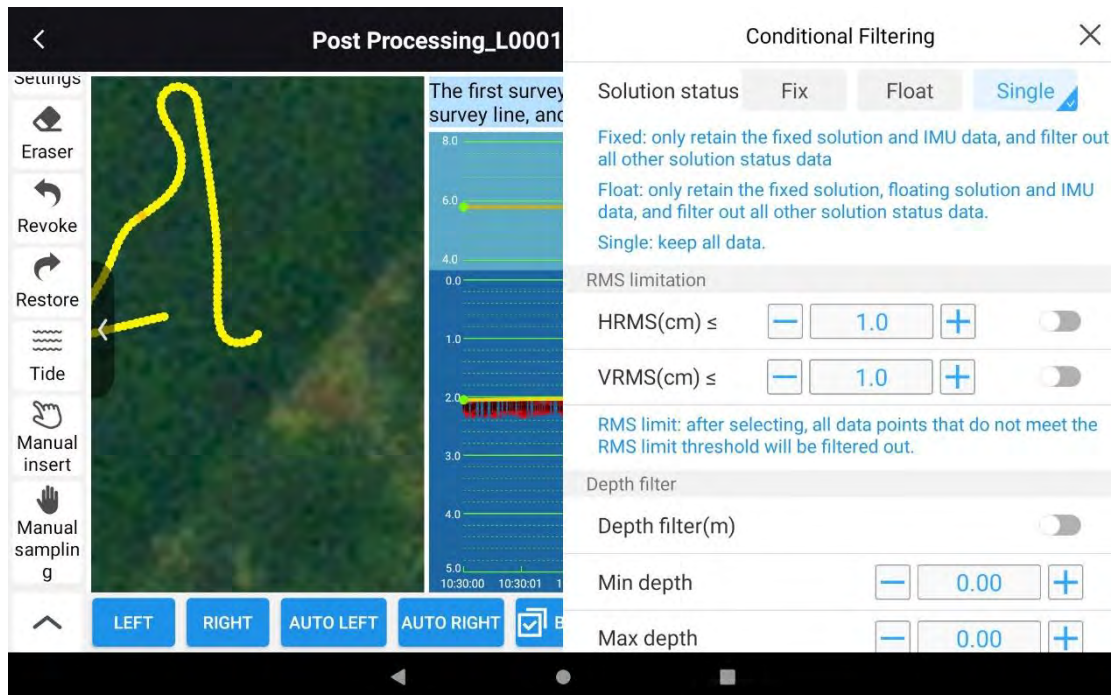


4.15.3 Touchscreen Operation Guide:

Single-point vertical drag: Adjust the water depth.

Points on the water depth view can be edited. For example, if a single point is selected, it can be moved up or down to modify the water depth value. However, the current point cannot be moved left or right. But when a point is selected and moved left or right, it will modify all the points it passes through.

Slide from the upper left to the lower right of a point: Perform multi-selection operation, similar to the PC-side selection action.



The post-processing Settings screen

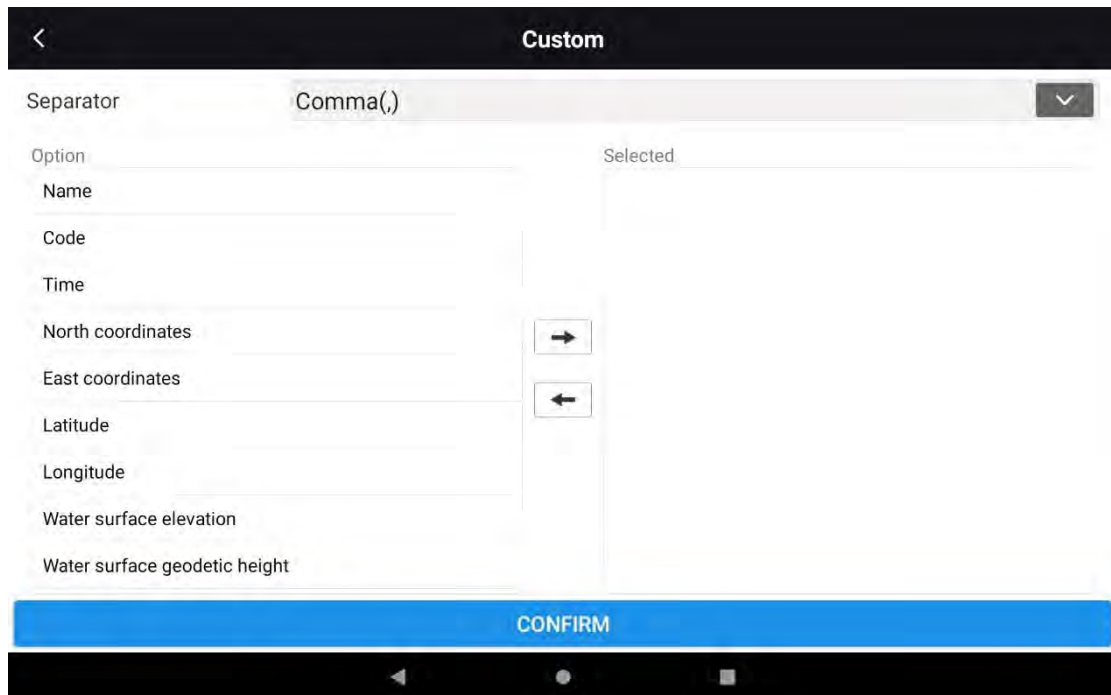
4.15.4 Data Processing Operations:

1. Water Depth Along Vertical Axis: The depth interval along the vertical axis of the water depth view.
2. Time Interval: The time interval along the horizontal axis of the view.
3. Time Width: Expands the time width of the horizontal axis of the view to avoid densely packed points that cannot be selected.
4. Map: Shows the location of the double-clicked dep profile.
5. Conditional Filtering: Select an option from the selection box and then select a dep profile from the profile list to filter and display in the view.
6. Alternatively, you can first select a dep profile, then select the filtering conditions, and click the [OK] button to display them in real-time.
7. Sampling Methods & Sampling Interval X:
 - (1) Distance Sampling: Sample every X distance ($\geq X$);
 - (2) Deepest (within equal intervals): Within an equal interval of X distance, select the deepest point data as the sampling point;
 - (3) Shallowest (within equal intervals): Within an equal interval of X distance, select the shallowest point data as the sampling point;

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8. **(4) Average Value (within equal intervals):** Within an equal interval of **X distance**, calculate the average value of all depth data as the depth point, the sampling point is determined based on distance sampling;
9. Three corrections: Speed of sound correction / Delay correction / Attitude correction;
10. Attitude correction: Only attitude correction;
11. Equidistant sampling: After the data has been corrected and adjusted, it is subsampled based on the sampling interval.
12. Save Data:
13. Choose the save format, which includes saving the header items.
14. Parameter settings:
 - (1) Save header: Display the header information characters.
 - (2) Merge save: Merge and save multiple curves into one summary file.
 - (3) File suffix: Select the file suffix (.txt/.csv/.dat).
 - (4) Latitude and longitude format: Set the display format for latitude and longitude in the saved file.
15. Speed of Sound Correction / Delay Correction / Attitude Correction;
 - (1) "Speed of Sound Correction" can be performed in three correction modes: "single speed", "depth + velocity", and "depth + correction value". After entering the parameters, click "Speed of Sound Correction" to complete the correction, or click "Skip" to proceed to "Delay Correction".
 - (2) In "Delay Correction", enter the delay time for water depth and position. Positive value indicates position lag, while negative value indicates water depth lag. Click "Delay Correction" to complete the correction, or click "Skip" to proceed to "Attitude Correction".
 - (3) In "Attitude Correction", enter the transducer tilt angle, transducer installation error, and select the automatic filtering method (median filtering, weighted filtering, sliding filtering). Click "Delay Correction" to complete the data correction, or click "Skip" to skip the correction.

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Post-processing save format setting screen

4.16 Obtaining/Downloading Data For Sharing Code

Open the official website of CHCNAV, download the "Share Code Tool", and install it on your computer.



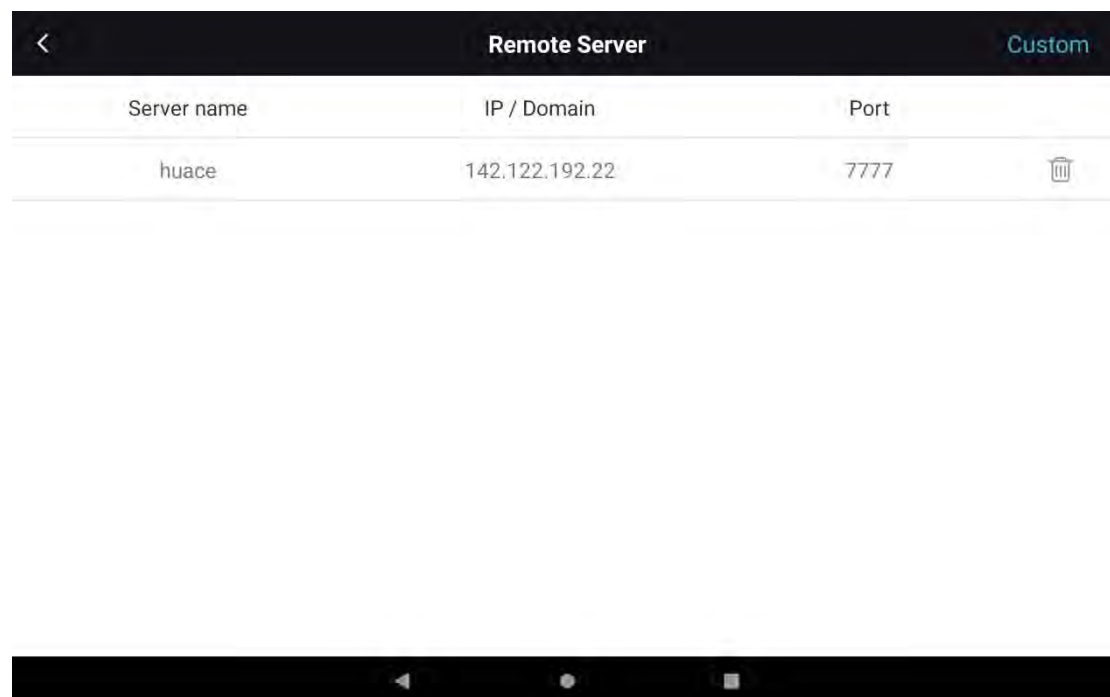
When the corresponding project/achievement/log is shared in the EasySail software, a pop-up window will generate a 4-digit sharing code. Open the computer, right-click on

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the desktop, select "Download files" (CHC Sharing Code-File Download), enter the corresponding sharing code. At this time, the file will be downloaded to the desktop in the form of a compressed package by default.

Custom Server

Click on the upper right corner [Customize], you can add a server, including server name, IP address or domain name, and port number. After adding a new server, it will be displayed in the server options of the [Device Connection] interface. After customizing the server, the unmanned boat webpage also needs to synchronize and add the same server (System Settings-N2N Settings).

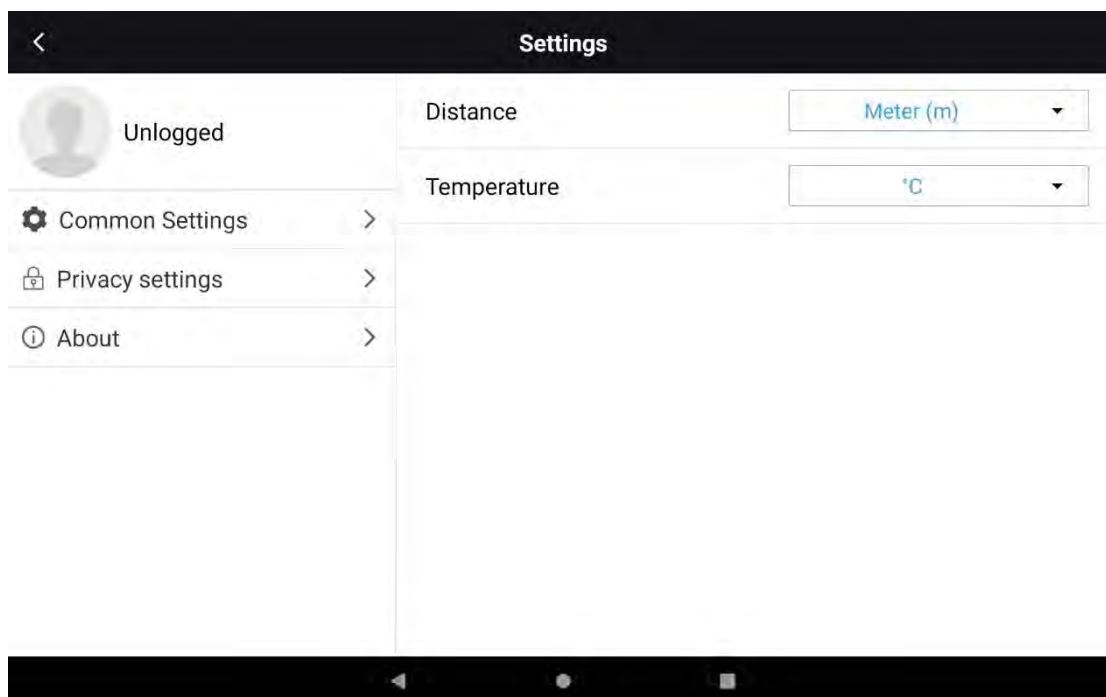


4.17 General Settings - International Unit Settings

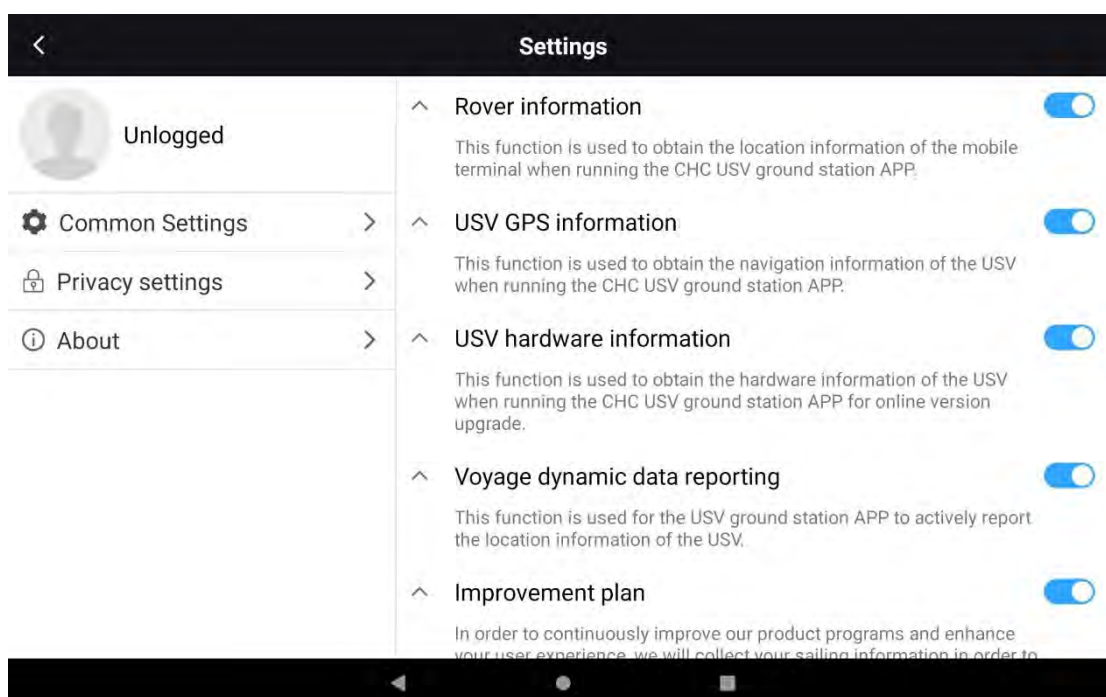
Distance/Elevation Units: Can be set to meters, international feet, or US feet

Temperature Units: Can be set to Celsius °C or Fahrenheit °F

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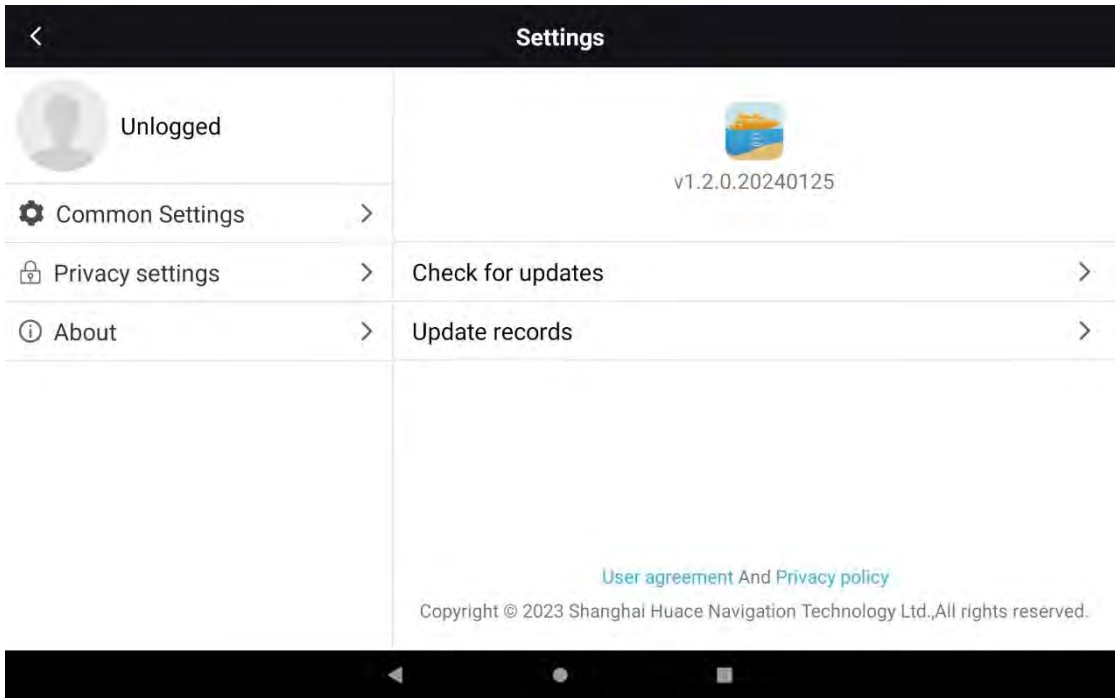
Privacy Settings



About - Check for Updates

Check for app updates, and view the app version. You can also view the firmware version of echo sounder and GD100.

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5. AutoPlanner

This section provides a detailed introduction to the AutoPlanner software functionality. This software is designed for the Huawei series of unmanned ships and is used for ship control. It allows for navigation path planning and modification of basic ship parameters.



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Open the software, the default interface is shown in the figure below. It consists of four sections: Navigation Data, Navigation Plan, Parameters, and Help. Below, we will provide a detailed introduction to each section:



5.1 navigation Data

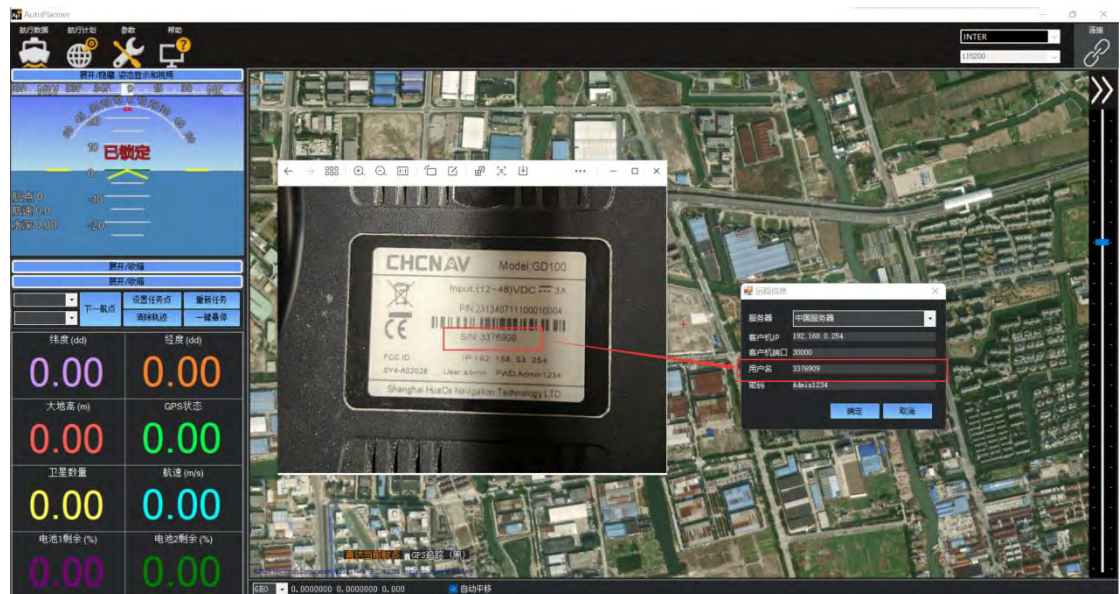
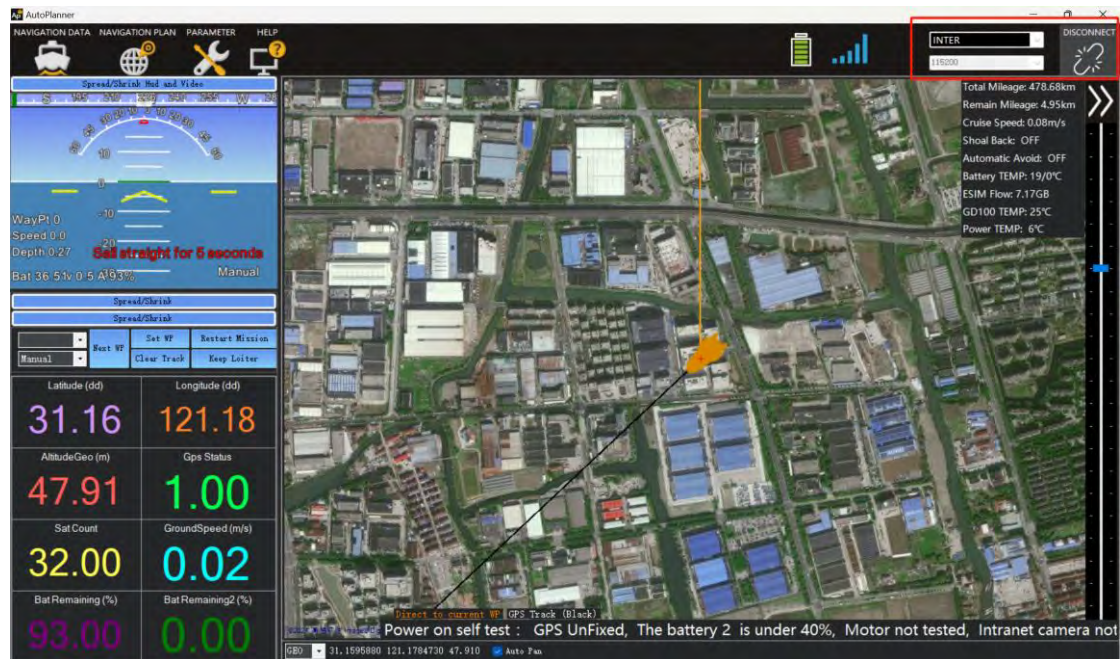
5.1.1 Connect

The connection window offers two connection options: INTER (4G) and TCP (WiFi and network bridge).

When using the 4G connection, the network in the area where the ship is located needs to be in good condition, and there are no restrictions on communication distance.

The TCP connection includes two options. One is to connect to the ship's WiFi, which has a shorter signal distance. This option is mainly used for debugging and is not suitable for operations. The other option is to connect through a bridge, which is suitable for areas with poor network signals. The distance is generally around 300-500 meters. Installing the bridge at a higher position will result in better signal reception.

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Using 4G connection as an example: Choose the INTER connection. The server will select it based on the actual situation. There is no need to change the client port. The username is the SN code on the firmware of the unmanned ship control GD100, and the password is Admin1234 (the client IP under 4G is 192.168.0.254; the IP for WiFi and bridge is 192.168.53.254. You can open the browser to view the current network signal strength, satellite status, etc.)

