

ComNav Technology

User Guide

SV600 Unmanned Surface Vessel



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CAUTION- A Caution alerts you to a possible risk of damage to the equipment and/or data loss.

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Technical Assistance

If you have any question and can't find the answer in this manual, please contact your local dealer from which you purchased the SV600. Alternatively, request technical support from ComNav Technology Website: www.comnavtech.com or technical support email: support@comnavtech.com. Your feedback about this Guide will help us to improve it with future revisions. Please email your comments to: support@comnavtech.com.

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1 SinoGNSS SV600 Overview

1.1 SinoGNSS SV600 Profile

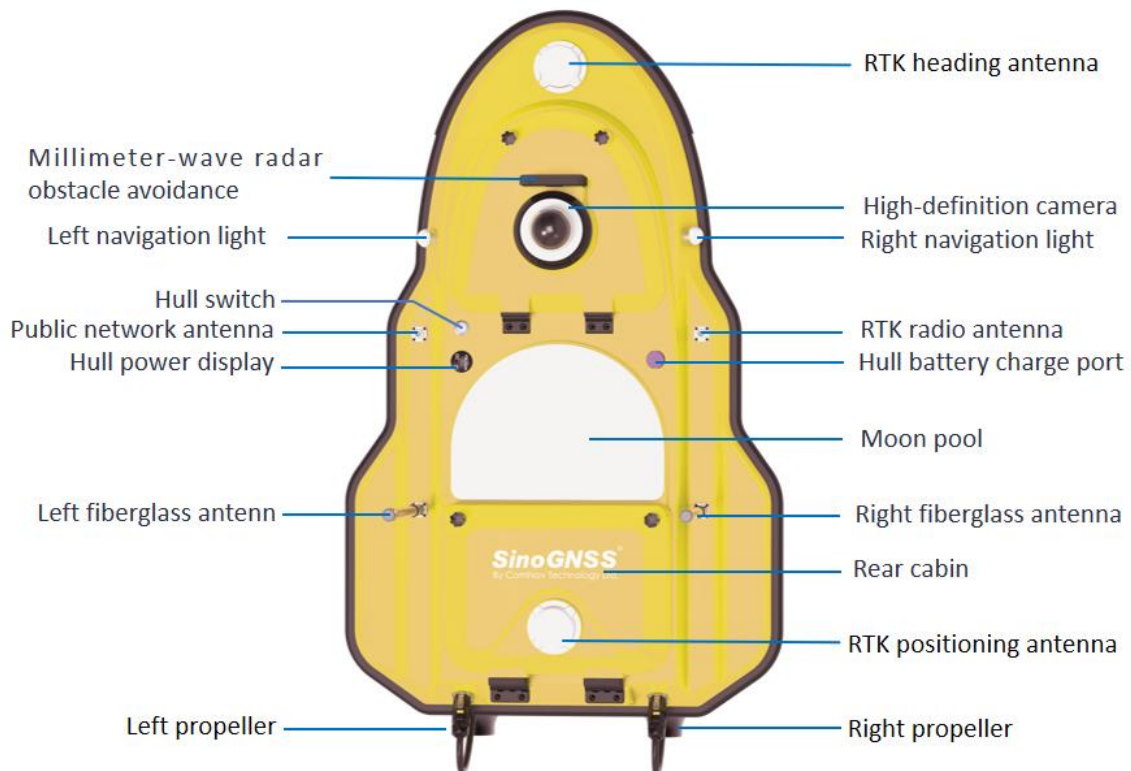


Figure 1-1 Frontal Configuration of the SinoGNSS SV600

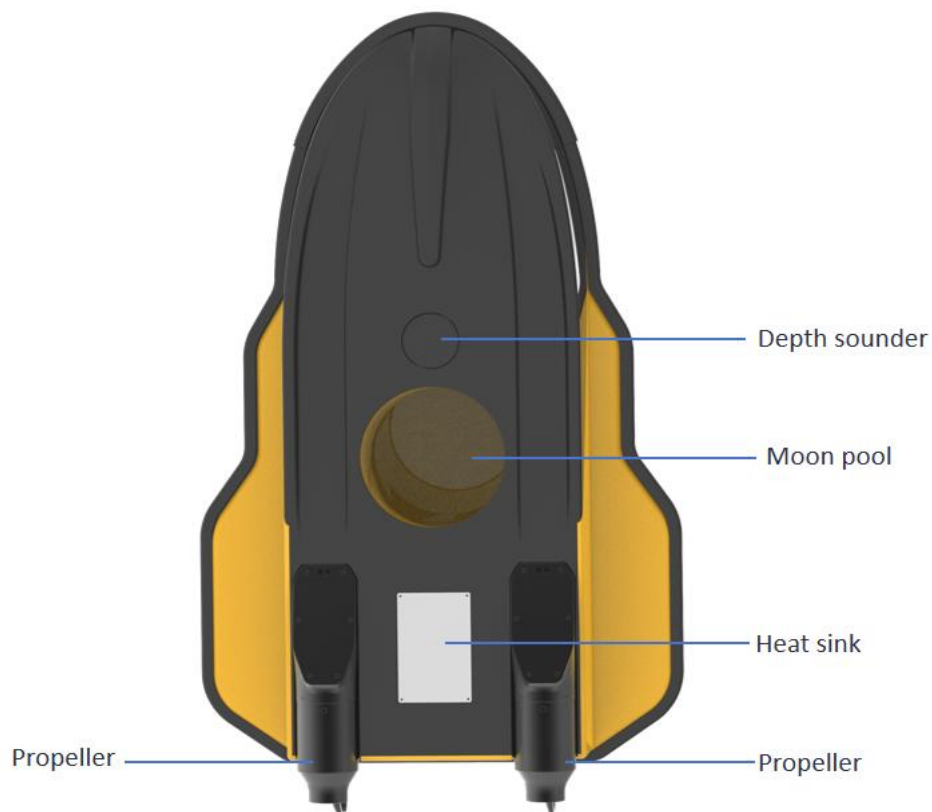


Figure 1-2 Bottom Configuration of the SinoGNSS SV600

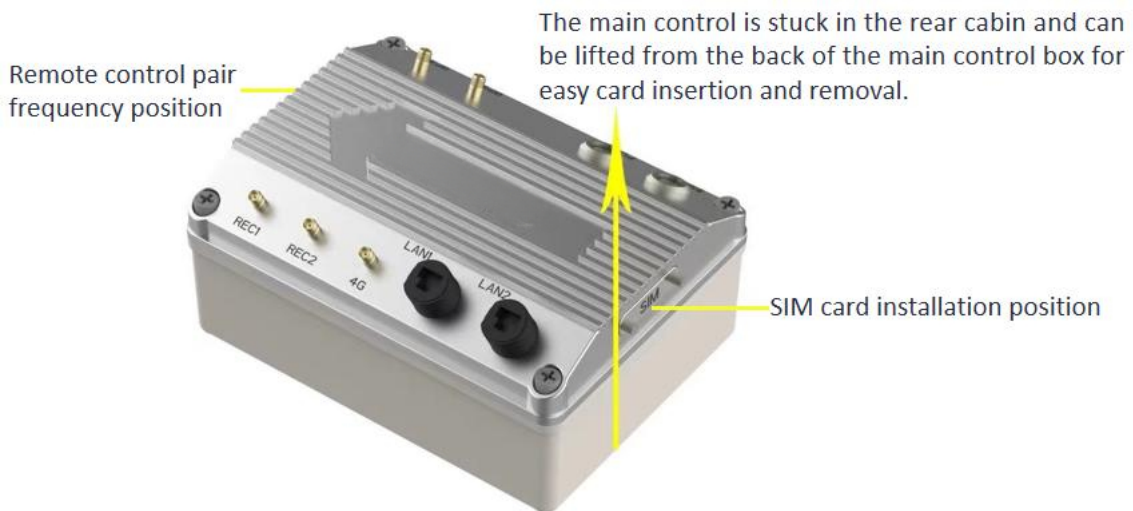


Figure 1-3 SinoGNSS SV600 Main Control Box

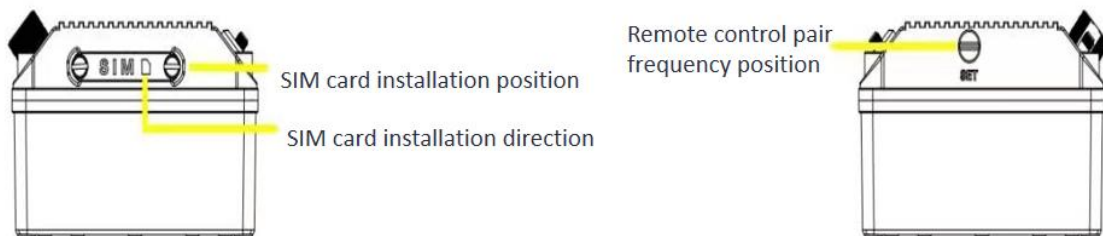


Figure 1-4 Front and Rear Views of the SinoGNSS SV600 Main Control Box

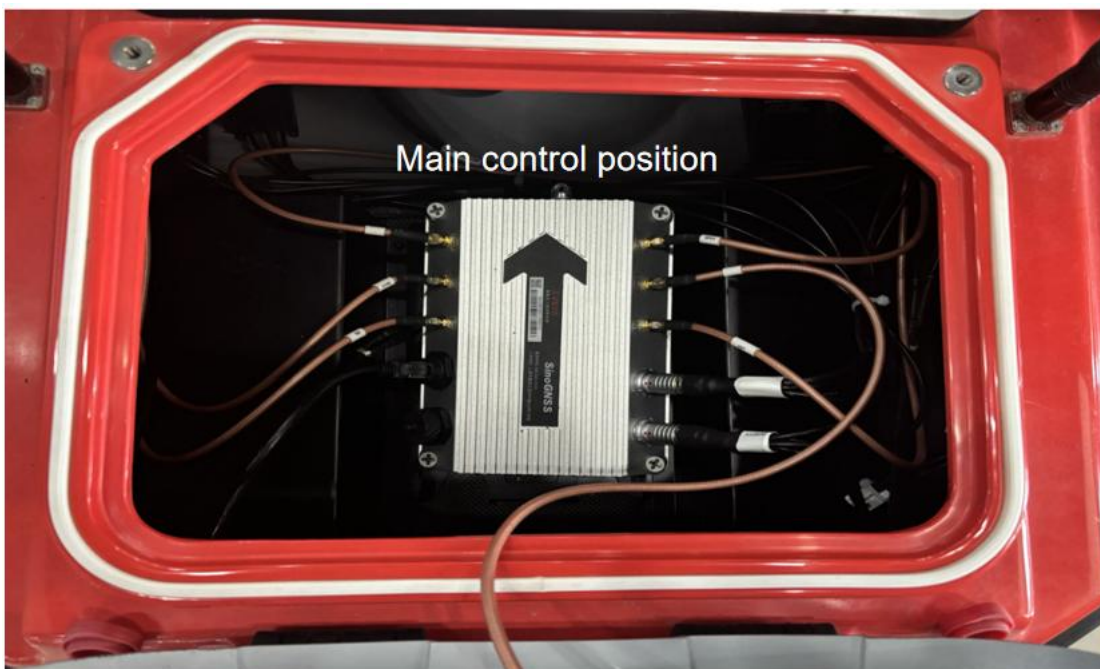


Figure 1-5 Actual Photo of the Main Control Box of the SinoGNSS SV600

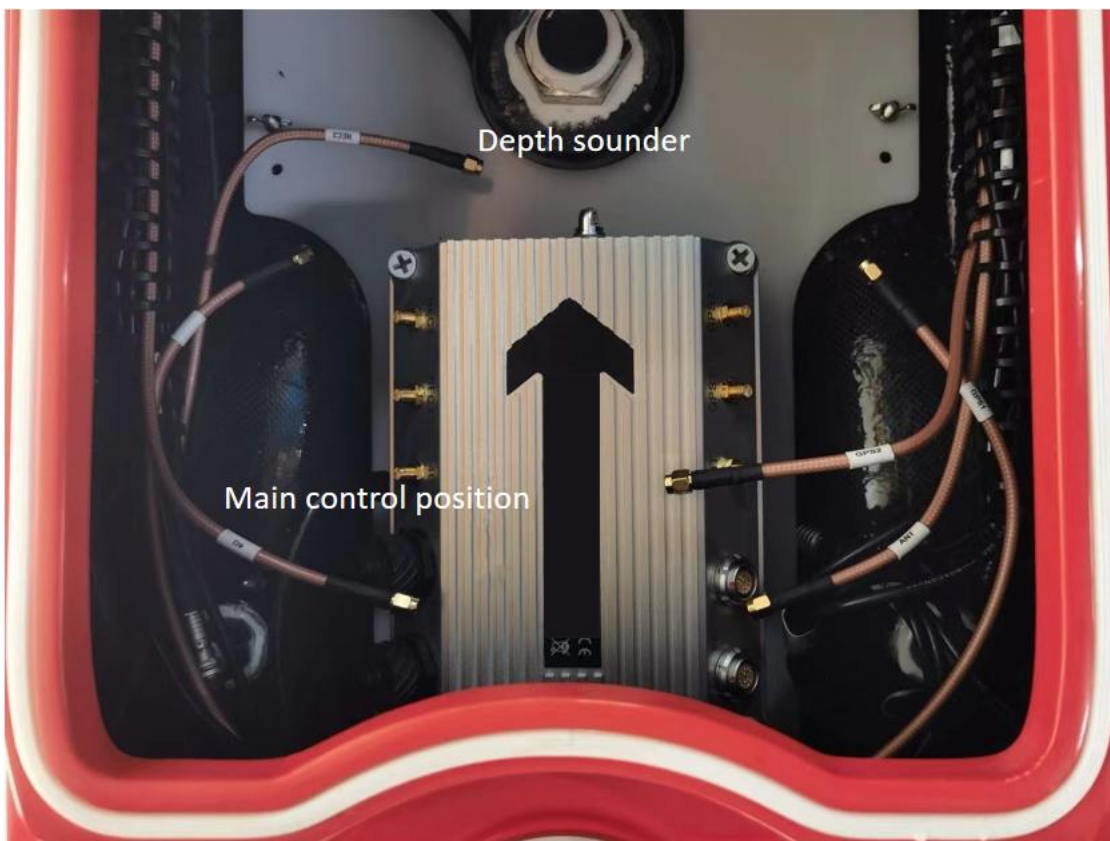


Figure 1-6 Actual Photo of the Main Control Box of the SinoGNSS SV600

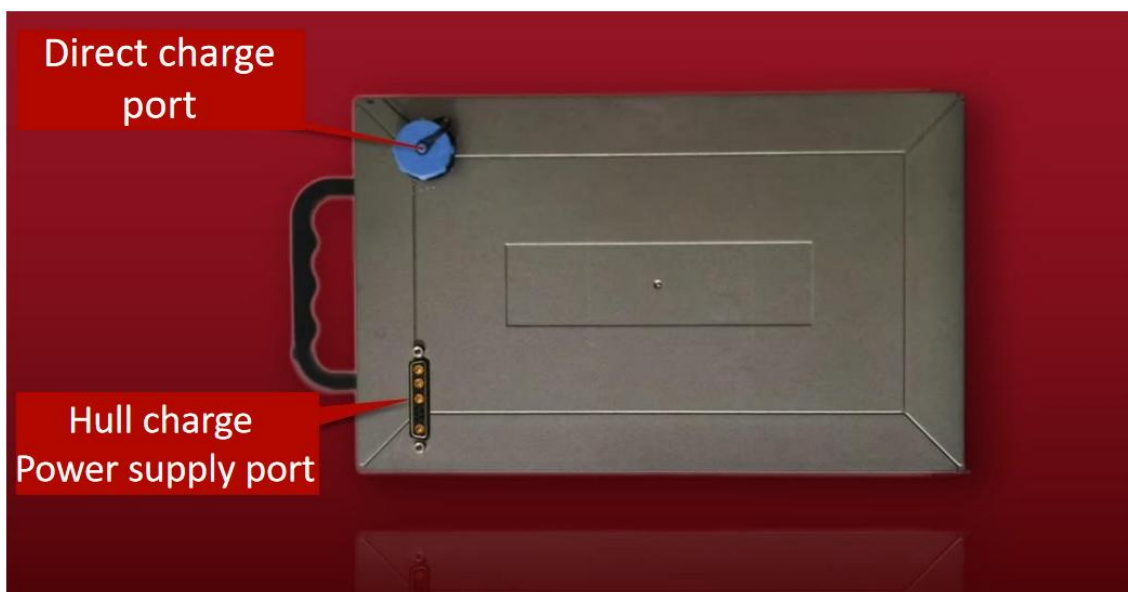


Figure 1-7 SinoGNSS SV600 Hull Battery

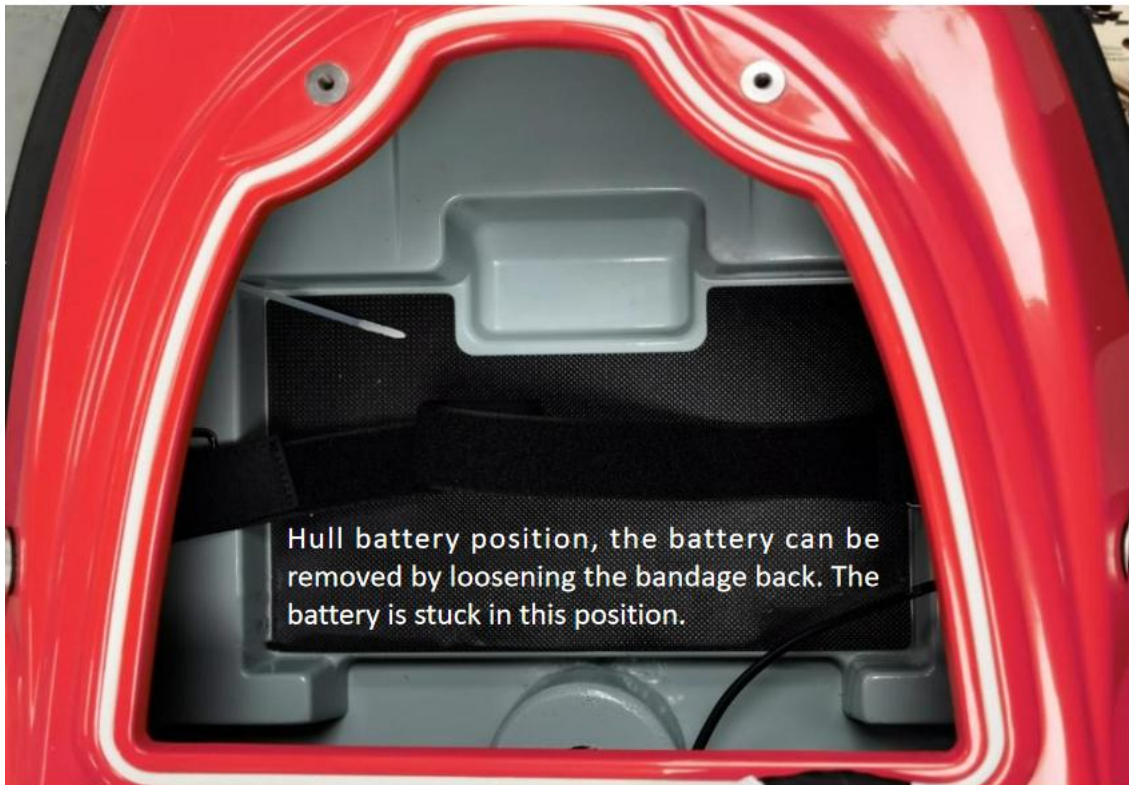


Figure 1-8 SinoGNSS SV600 Hull Battery Installation



Figure 1-9 SinoGNSS SV600 Hull Battery Installation

Note: When charging, it is better to connect the output terminal of the charger first, and then connect the input terminal of the charger. During the charging process, the charger's fan will rotate and the red light will blink. Once the battery is fully charged, the fan will stop and the green light will remain on. If these indicators do not appear after connecting the power source and battery, please repeat the steps as described to check again.

1.2 Remote Control Introduction



Figure 1-10 SinoGNSS SV600 Remote Control

1. The SW1 switch has three positions: up, middle, and down. These correspond to high speed, medium speed, and low speed for manual navigation of the USV.
2. The SW3 switch has three positions: up, middle, and down. These represent the unlock, unlock, and lock. In the lock state, the remote control's joystick cannot operate the USV.
3. The SW4 switch has three positions: up, middle, and down. These correspond to the USV's automatic, manual, and hover. Switching between automatic and manual allows the USV to pause and resume surveying during automatic navigation.
4. The left joystick controls the USV's forward and backward movement, as well as the speed of movement by adjusting the forward and backward tilt. The right joystick controls the USV's left and right direction and adjusts the speed of turning by varying the left and right tilt.
5. The power button in the lower-left corner of the remote control turns the remote on and off. Press and hold the button to power the remote control on or off. Press the button once to put the remote control screen to sleep or wake it up.
6. The USB port of the remote control can be used to transfer data. The type-c port can be used to transfer data or charge the remote control. It is recommended to use a USB flash disk to copy data.



Figure 1-11 SinoGNSS SV600 Remote Control Interface

Note:

1. When the remote control is connected to hotspot, select 5G for the AP band of the Android, and do not select "Maximum Compatibility" for the hotspot of the Apple.



Figure 1-12 Android and Apple Hotspot Setting Interface

2. If the hull's wiring and power are functioning normally, but the remote control cannot connect to the hull and the joystick cannot control it, check if the remote control's flight mode is turned on.

2 SNPilot Software Introduction

2.1 Software Introduction

The SNPilot software is used for underwater topography surveying. The functional modules of the software mainly include: Project, Survey, Setting, Layer, Route, Connection, Image, GNSS, Data Import, and Data Export. These functionalities are tailored to meet the diverse survey needs of customers.

2.1.1 Software Parameter

Running environment: remote control H16, android 7.1.2, language: English.

2.1.2 Install and Uninstall

Install: Copy the SNPilot software (*.apk) to the remote control. Locate the software in the file manager, then click to install it. Follow the prompts to grant the necessary permissions. After a brief moment, the installation will be complete. You will find the USV icon on the remote control.



Figure 2-1 SinoGNSS SV600 Icon

Uninstall: Long press the SNPilot and drag it to the uninstall location at the top of the screen (trash bin). When the pop-up message appears asking "Do you want to uninstall this app?", click "Confirm" to uninstall the software.

2.1.3 About

In the "About" interface, there are instructions about the SNPilot software version and update. On the main software interface, click the "More" in the top right corner, then select "About". Here, you can view the software version. Click "Check Update" to see if a newer version is available.

2.2 Software Operation Introduction

2.2.1 Main Software Interface

Run the software and enter the main interface. The main interface includes modules such as Project management, Base map, Center, Route plan, Route edit, Toolbox, Route List, Image, More, and Start Connection. Users can operate according to their needs.



Figure 2-2 Main Interface after Connecting the Hull and the Remote Control

2.2.2 Operation Process

1. Create New Project

Click the “folder” icon in the upper left corner and a list of projects will pop up on the left. Click the "New project" button at the bottom (If the USVI is connected to the remote control, you have to disconnect the USV from the remote control to create a new project) to enter the new project interface. Input the project name (required), operator, notice and other information (optional). After verifying the information, click "Confirm" to complete the project creation. There will be a default project when you enter the software, you should check the parameters of the default project file to see if it meets your requirements before deciding whether to use it or not.

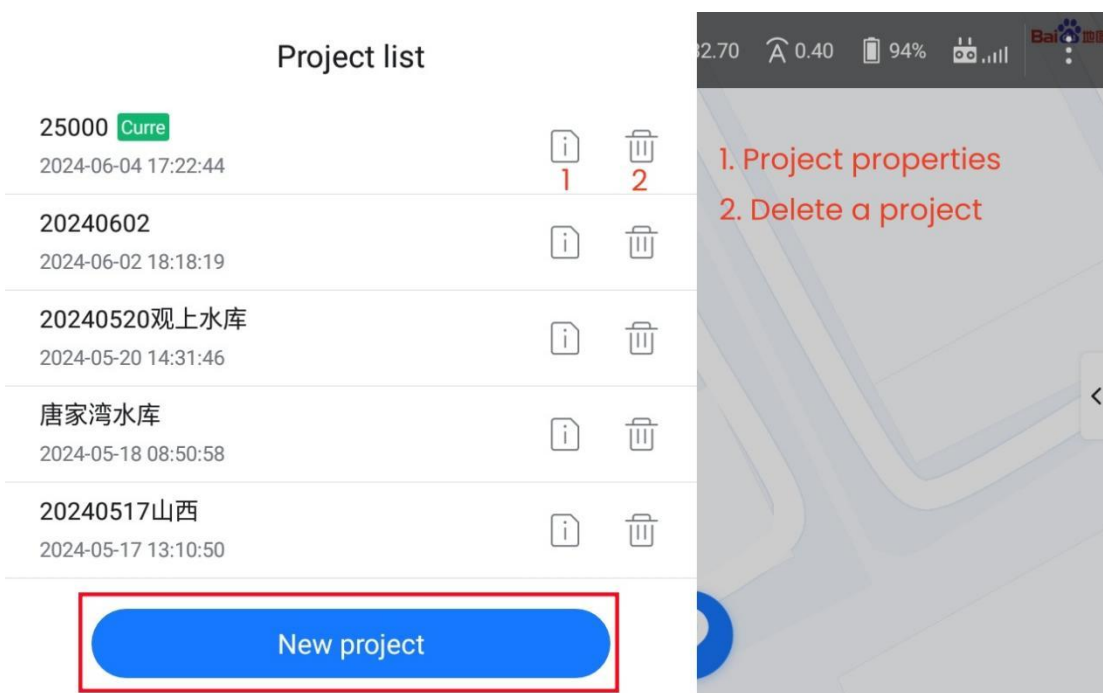


Figure 2-3 Create New Project

The screenshot shows a 'New project' screen with a title bar containing a back arrow and the text 'New project'. Below the title bar is a section titled 'Project information' in red. This section contains five input fields: 'Project name' with the value '20240821', 'Operator' with the placeholder 'Input operator name', 'Notice' with the placeholder 'Pls enter the notice', 'Create time' with the value '2024-08-21 14:01:53', and '套用工程参数' (Apply project parameters) with the placeholder '选择工程' (Select project). At the bottom of the form is a large blue button labeled 'Confirm'.

Figure 2-4 Create New Project

2. Connect USV

After clicking the "Connect" or the "Hull Status" at the bottom of the main interface, a popup window for connecting to the device will appear on the right side of the software interface. You can select either "direct connection" or "4G mode". After inputting the corresponding "IP" and "Port" (usually the default settings), click "Confirm" to complete the USV connection.

The screenshot shows the main interface of the software. At the top, there is a status bar with a folder icon, the number '25000', and a red box saying 'Not connected'. Below this is a toolbar with icons for camera, layers, measurement, drawing, and location. The main area has a grid background with red text instructions: 'The connection mode is usually selected as direct connection.' and 'The remote control needs to be connected to a hotspot when using the 4G mode.' On the right side, a dark-themed popup window titled 'Connect to the device' is open. It has two radio buttons: 'Direct connection' (selected with a blue checkmark) and '4G mode'. Below these are input fields for 'IP' (192.168.144.30) and 'Port' (8080). At the bottom of the popup are two blue buttons: 'CONNECT' and 'CONFIRM'.

Figure 2-5 Connect USV

3. Coordinate System Settings

After creating the new project, click the "More" button in the top right corner of the main interface. In the drop-down menu, select "Coordinate system" to access the coordinate system settings. Here, you can configure parameters such as the coordinate system name, ellipsoid, projection, central meridian, 7 parameters, 4 parameters,

height fitting, vertical adjustment, geoid file, and local offset.

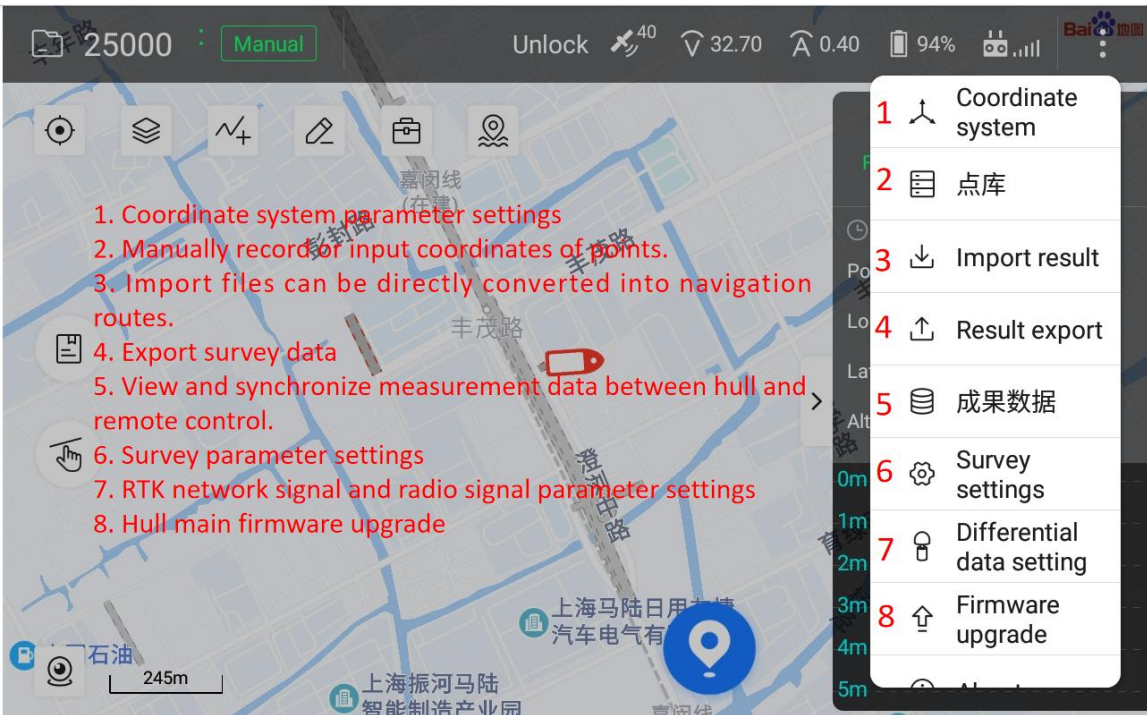


Figure 2-6 Coordinate System

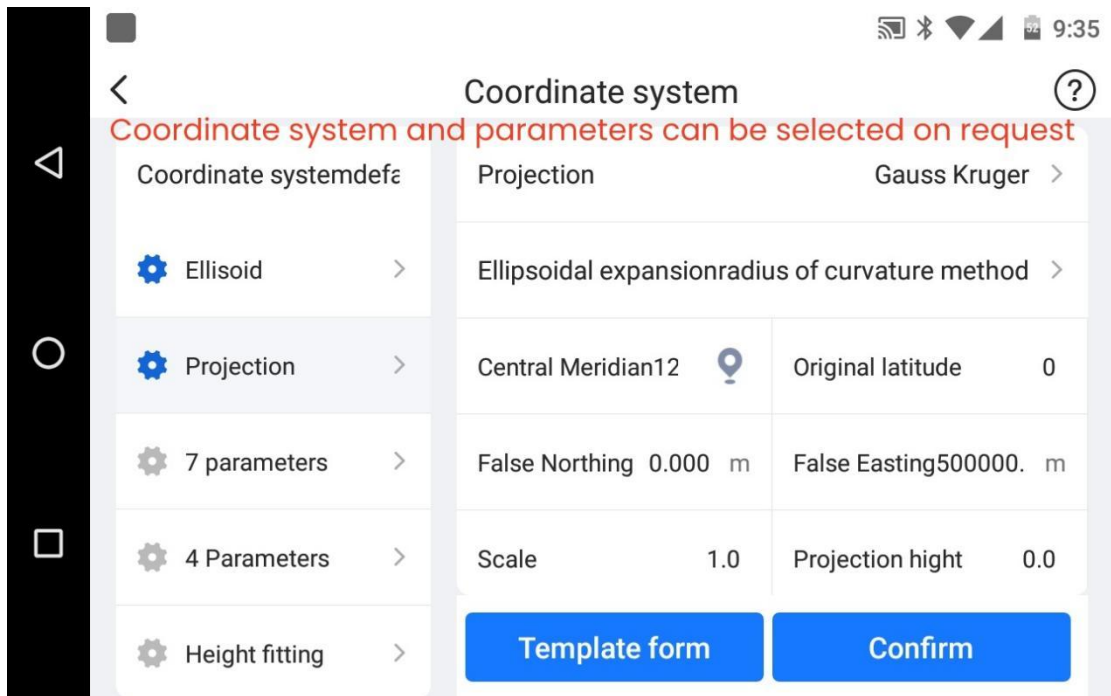


Figure 2-7 Coordinate System Parameter Settings

4. Survey Settings

Click the "More" button in the top right corner of the main interface. In the drop-down menu, select "Survey Settings" to access the configuration options. You can adjust settings for the data collection process, including collection conditions, antenna height, mark mode, GPS output source, and point name display mode. Additionally, you can configure settings for the echo sounder, boat, units, and more.

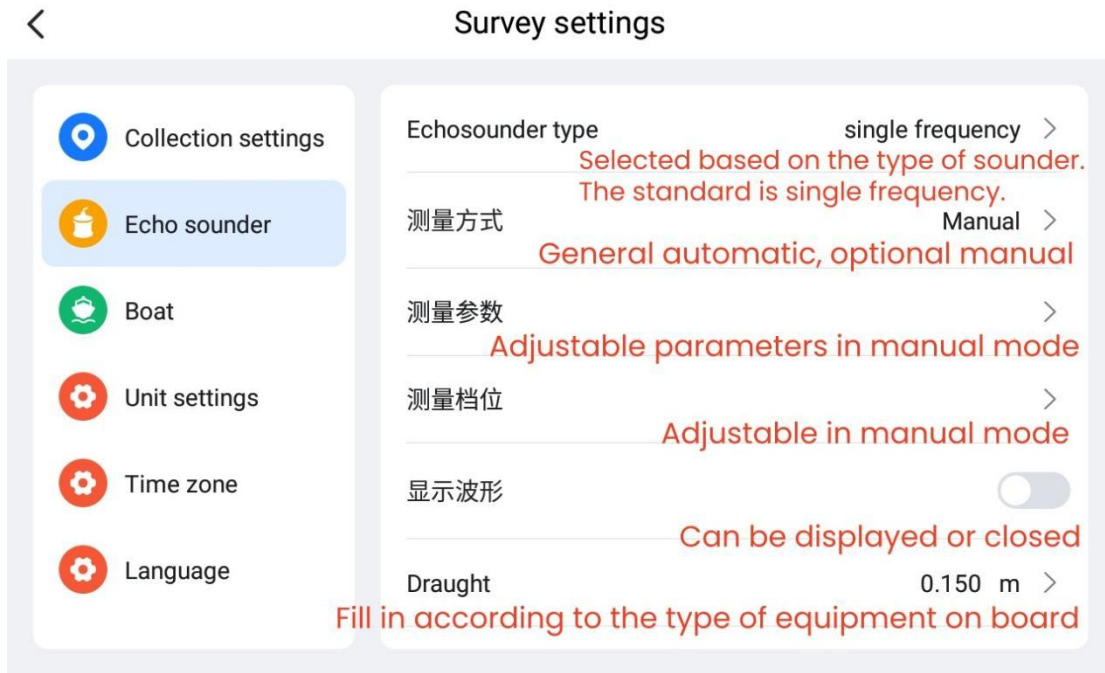


Figure 2-8 Survey Settings

5. Route Plan

Route plan offers options for regional routes, channel routes plan, parallel routes, free routes planning, and routes import. After selecting the route method, input the corresponding parameter and select points on the screen. Click "Confirm" to complete the route plan for survey.

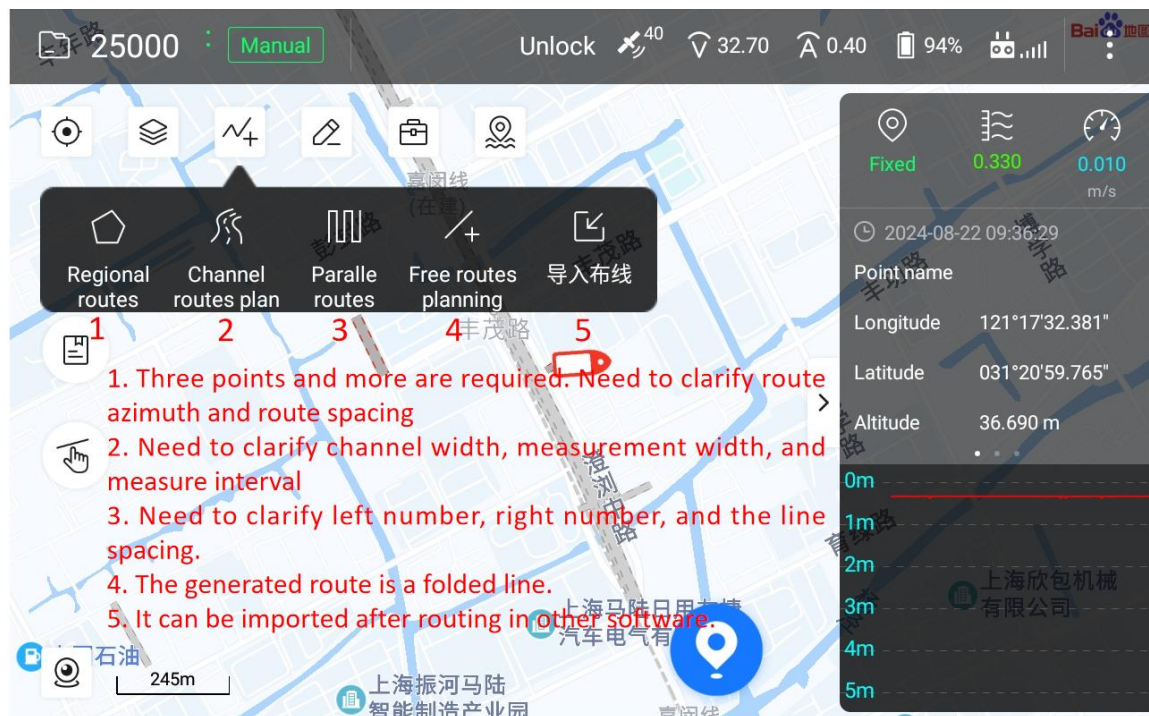


Figure 2-9 Route Plan

6. Start Surveying

After planning the route, select the survey route using the survey line list or by selecting lines on the screen (selected routes will appear in purple, while unselected routes will be in yellow). Click the "Upload plan line" button at the bottom of the main interface, then click the "Start" buttons. The USV will then automatically navigate according to

the uploaded route and record data, drawing the corresponding track lines and marking points. You can also manually control the USV to record data. Whether the USV is navigating automatically or manually, ensure the "Record" button is turned on to capture data.

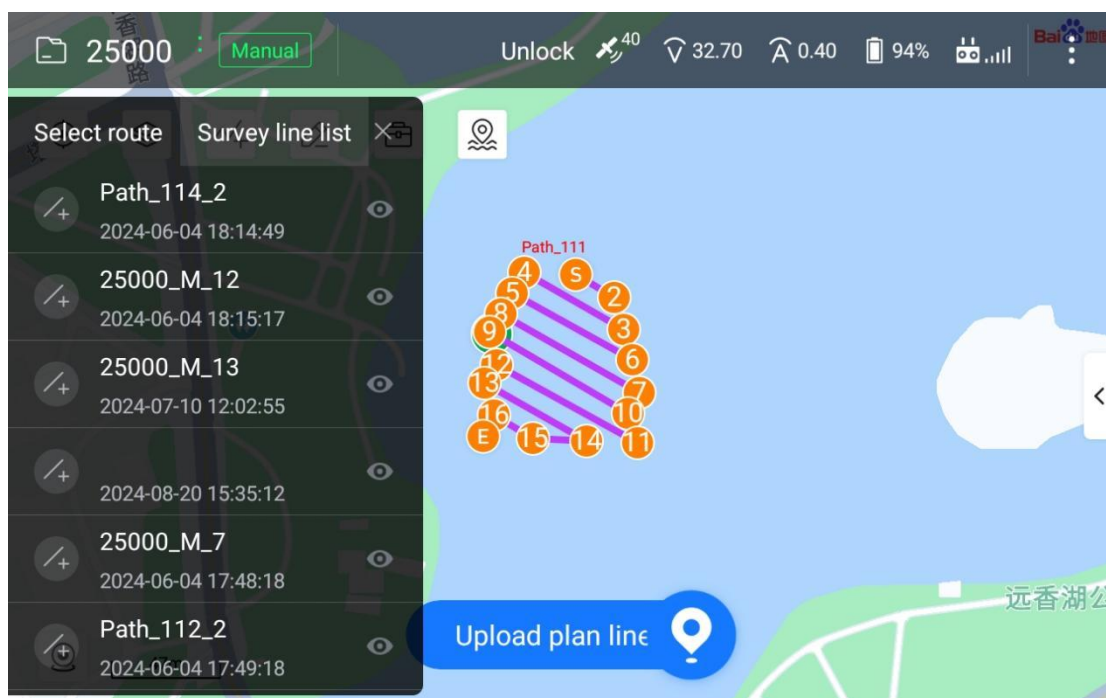


Figure 2-10 Survey Process

7. Result Data

After completing the survey, click the "More" button in the top right corner of the main interface. In the drop-down menu, select "Result Data". Here, you can view and synchronize the survey data. Be sure to synchronize the data before exporting it!

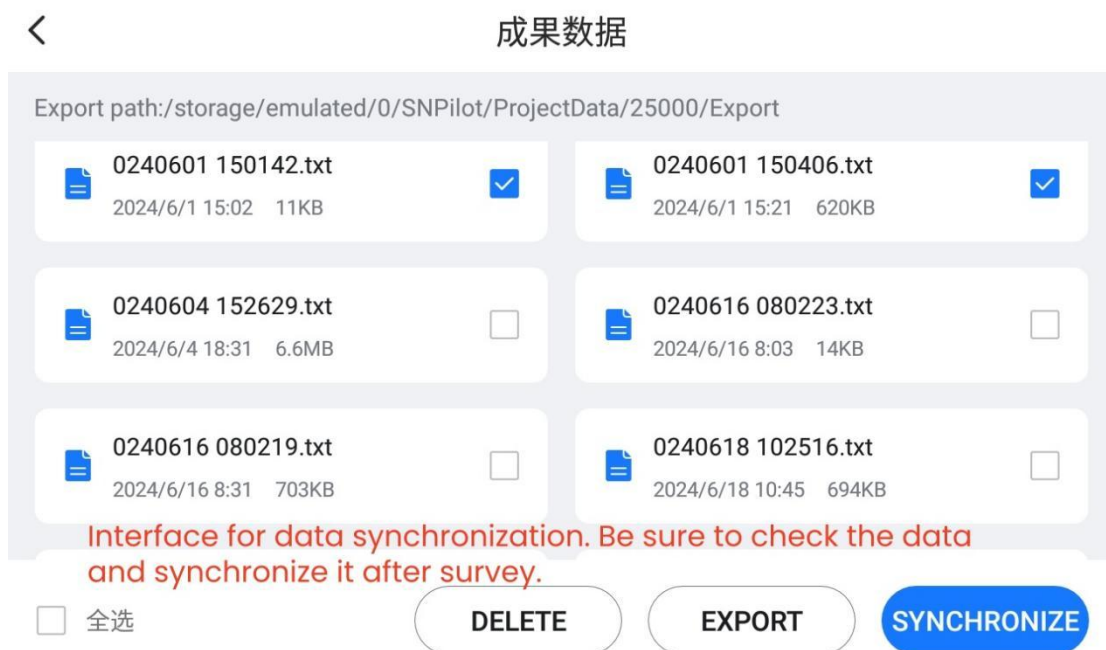


Figure 2-11 Result Data Synchronize

8. Result Export

After synchronizing the result data, click the "More" button in the top right corner of the main interface. In the drop-down menu, select "Result export". Here, you can

export the survey data. The exported data can then be processed using post-processing software.

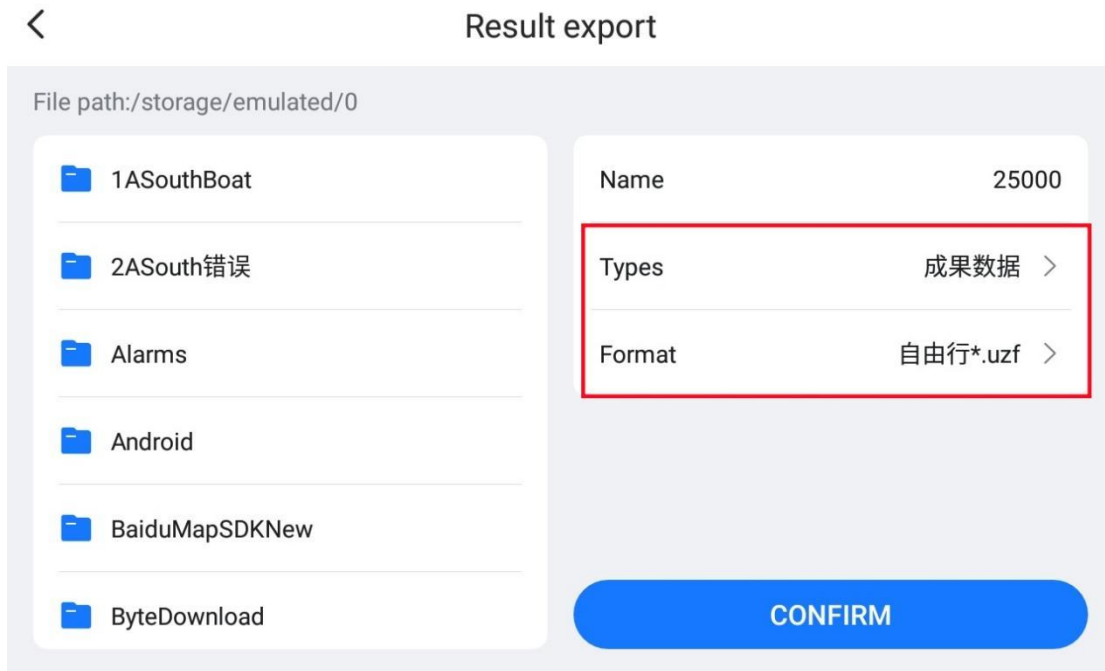


Figure 2-12 Result Export

2.3 Software Function Introduction

2.3.1 Information Column

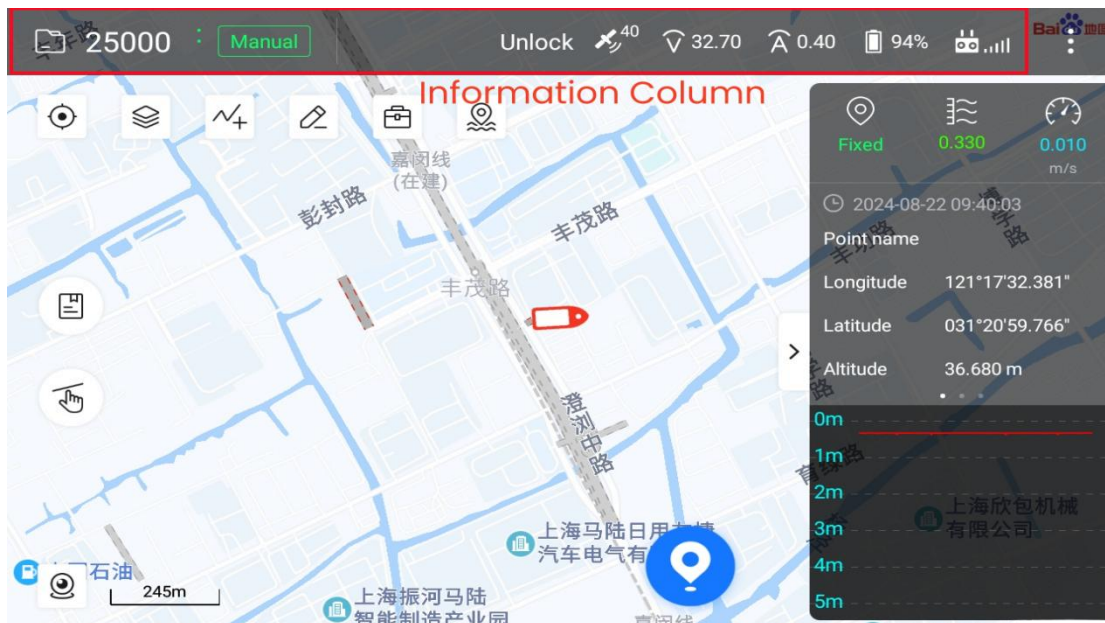


Figure 2-13 Information Column

2.3.1.1 Project File

Click the "folder" icon in the top left corner of the main interface to access the project list. Here, you can manage the current project list, view the selected project, and access historical projects. You can create new projects, view project info, and delete projects. Click on the corresponding project to switch between projects.

Click the "New Project" button in the project list interface. Input the project name (required; can include Chinese characters, letters, numbers, etc.), the operator and notice. After confirming the information is correct, click "Confirm" to complete the

project creation. The newly created project will be automatically selected, allowing you to configure the project's coordinate system, vessel parameters, echo sounder settings, and more. If a project with the same name already exists in the historical projects, a message will prompt "Project already exists," and you will need to rename the project.

To delete a project, click the "trash can" icon next to the project (Note: you cannot delete the currently selected project). A confirmation window will appear. Click "Confirm" to delete the project's associated system files. Deleted projects cannot be recovered, so proceed with caution to avoid unnecessary loss.

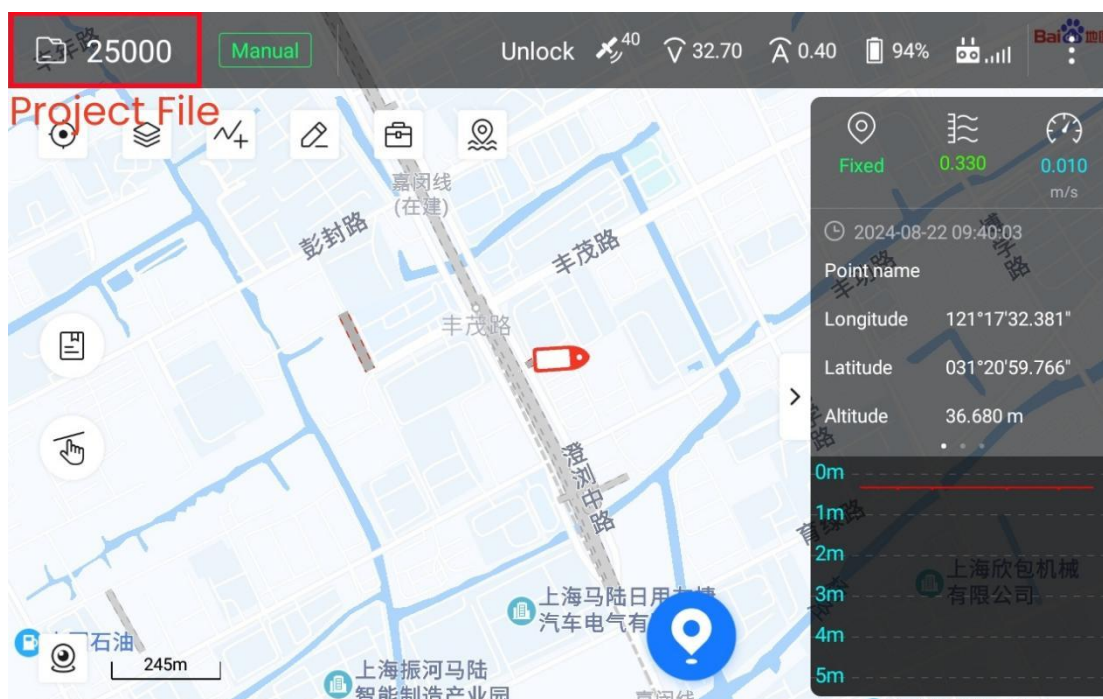


Figure 2-14 Project File

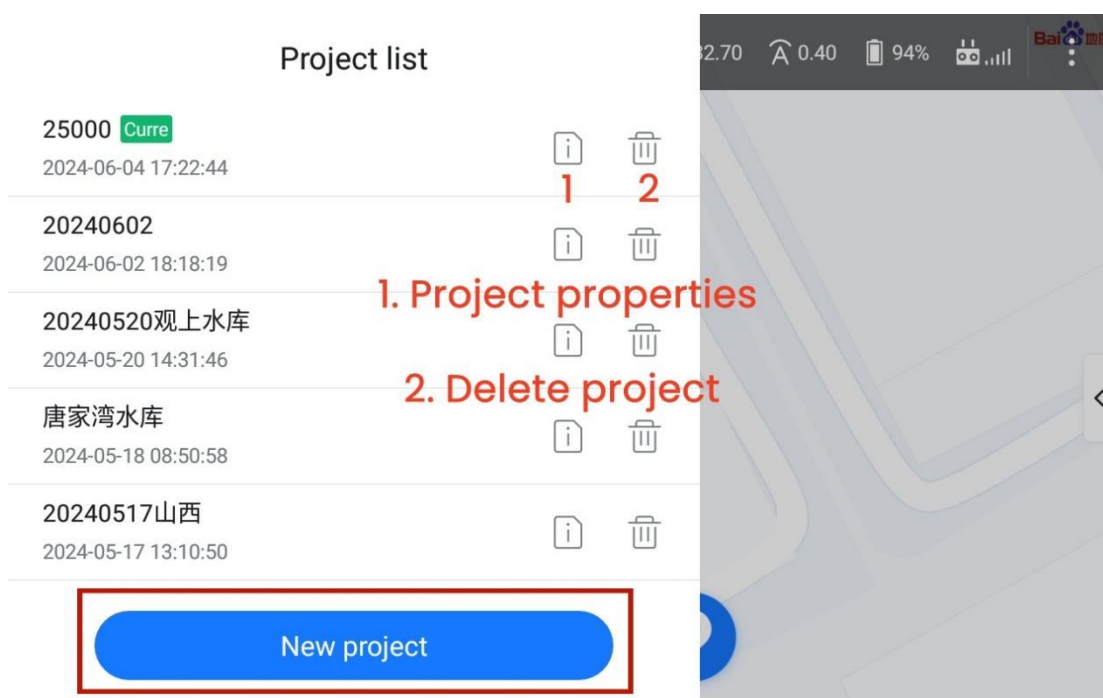


Figure 2-15 Project List

< New project

Project information

Project name	20240821
Operator	Input operator name
Notice	Pls enter the notice
Create time	2024-08-21 14:01:53
套用工程参数	选择工程

Confirm

Figure 2-16 New Project

2.3.1.2 Data Link

If the data link indicator shows green, the data link is operating normally. If it shows red, there is a problem with the data link. Please contact technical support for resolution.

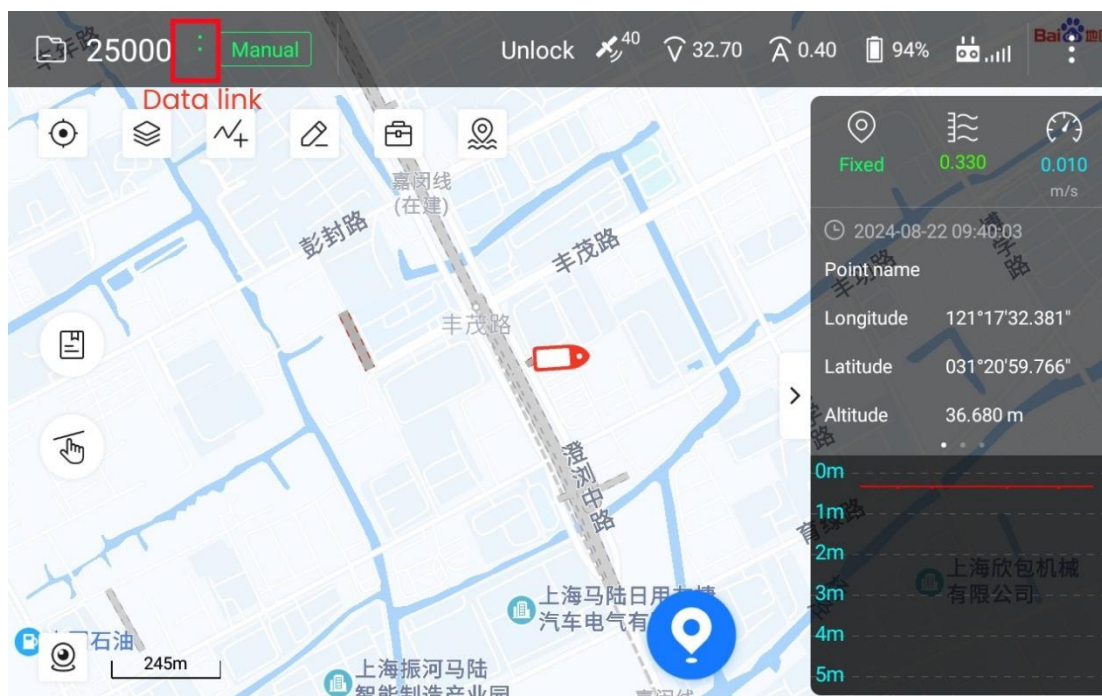


Figure 2-17 Data Link

2.3.1.3 Hull Status

In the upper left corner of the main interface, the hull status is displayed within a red box. During surveys, you can monitor this status to assist with the operation. The statuses displayed include: Not Connected, Connected, Reconnecting, Heading to Work Point, In Operation, Auto, Returning, Hovering, Manual, Holding, and Unknown. You can use this section to disconnect or reconnect the USV and the remote control.

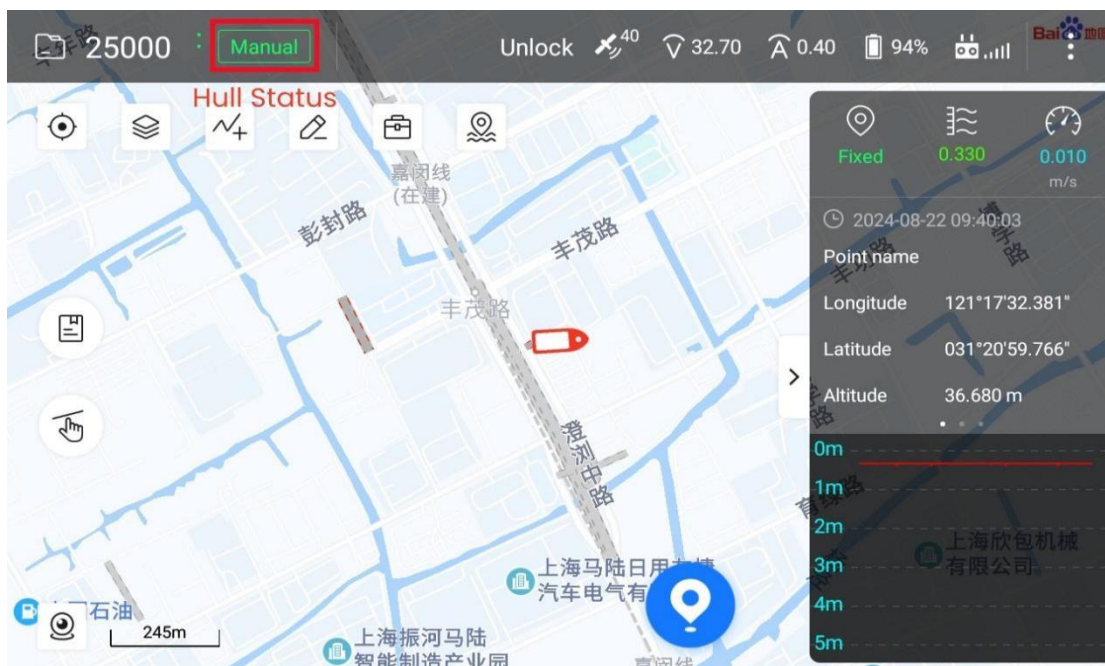


Figure 2-18 Hull Status

2.3.1.4 Remote Control Status

By using the SW3 joysticks on the remote control, you can set the other joysticks to either locked or unlocked status. In the locked state, the other joysticks will not control the USV.

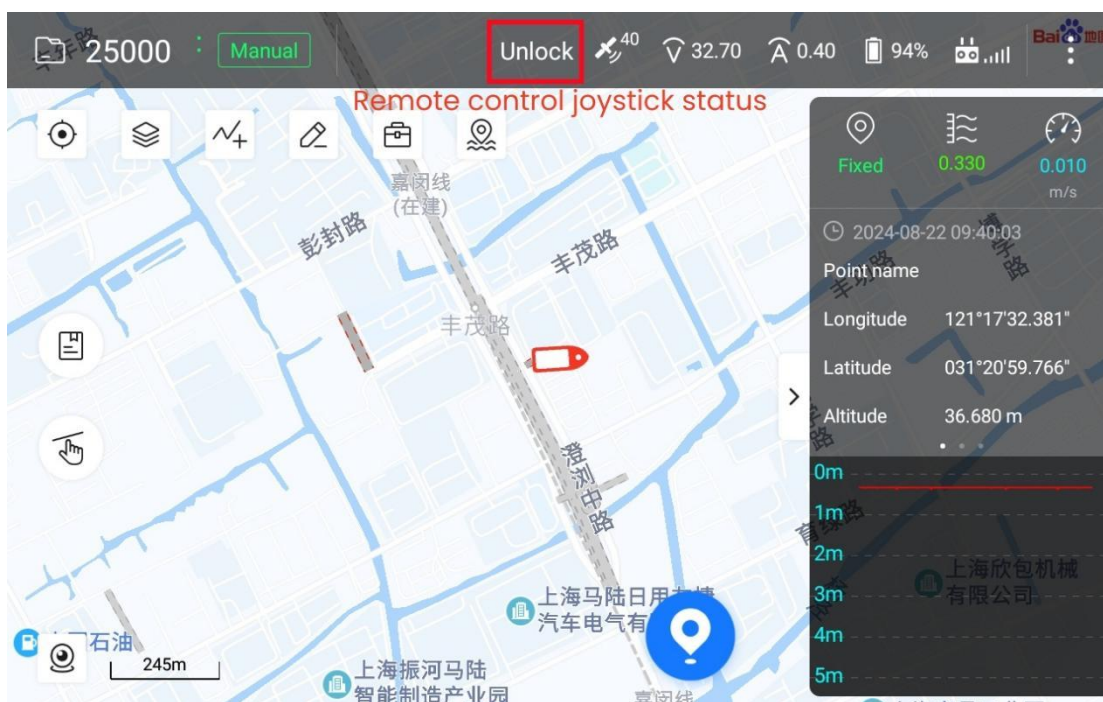


Figure 2-19 Remote Control Joystick Status

2.1.3.5 RTK Satellite Number

Display the current number of RTK satellites being tracked.

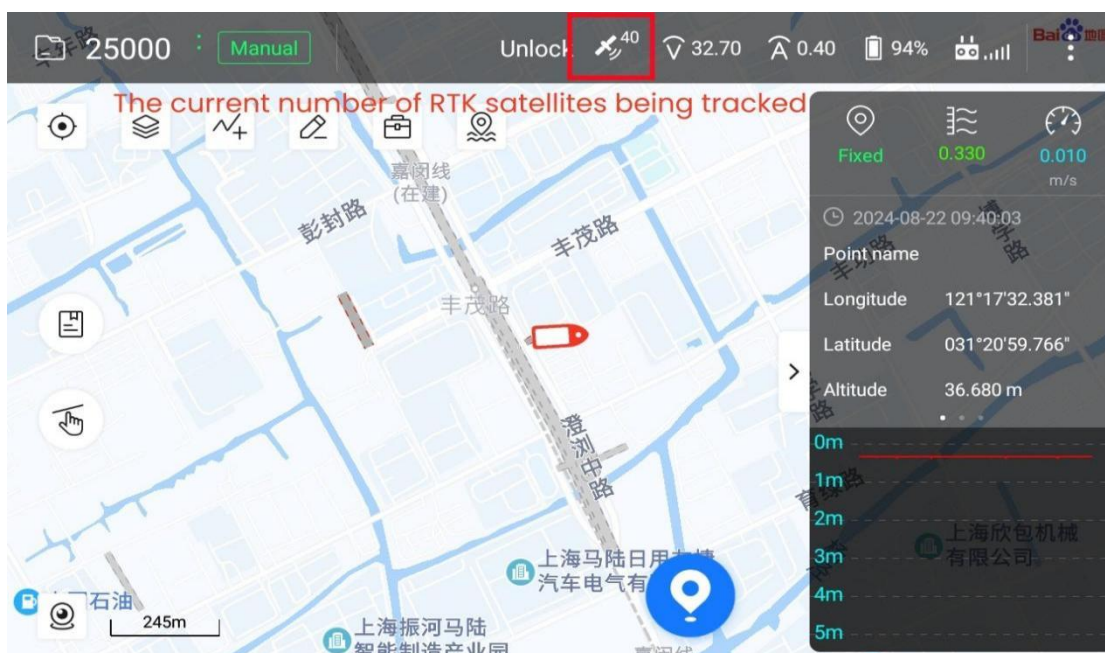


Figure 2-20 RTK Satellite Number

2.1.3.6 Hull Battery Power

In the red box on the main interface, the three icons represent the voltage, current, and battery power of the USV, respectively. These values help in assessing the status of the USV. The battery power of the remote control can be viewed in the toolbar.

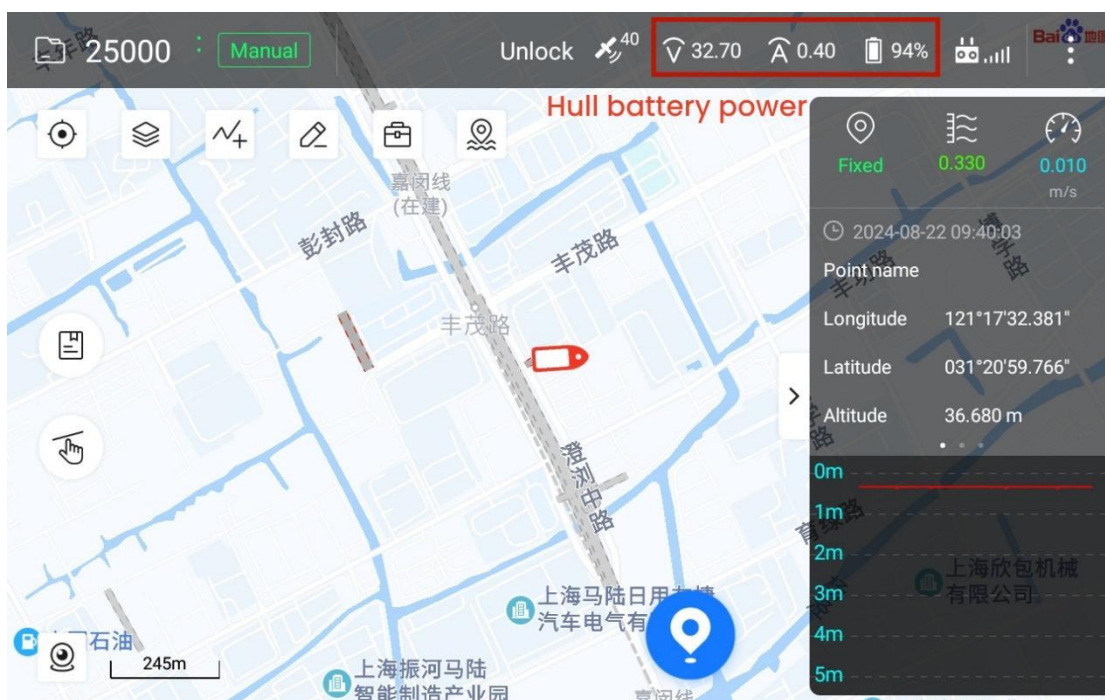


Figure 2-21 Hull Battery Power

2.1.3.7 Remote Control and Public Network Signal Strength

The default display shows the signal strength between the USV and the remote control. By clicking, you can view the signal strength of the public network.

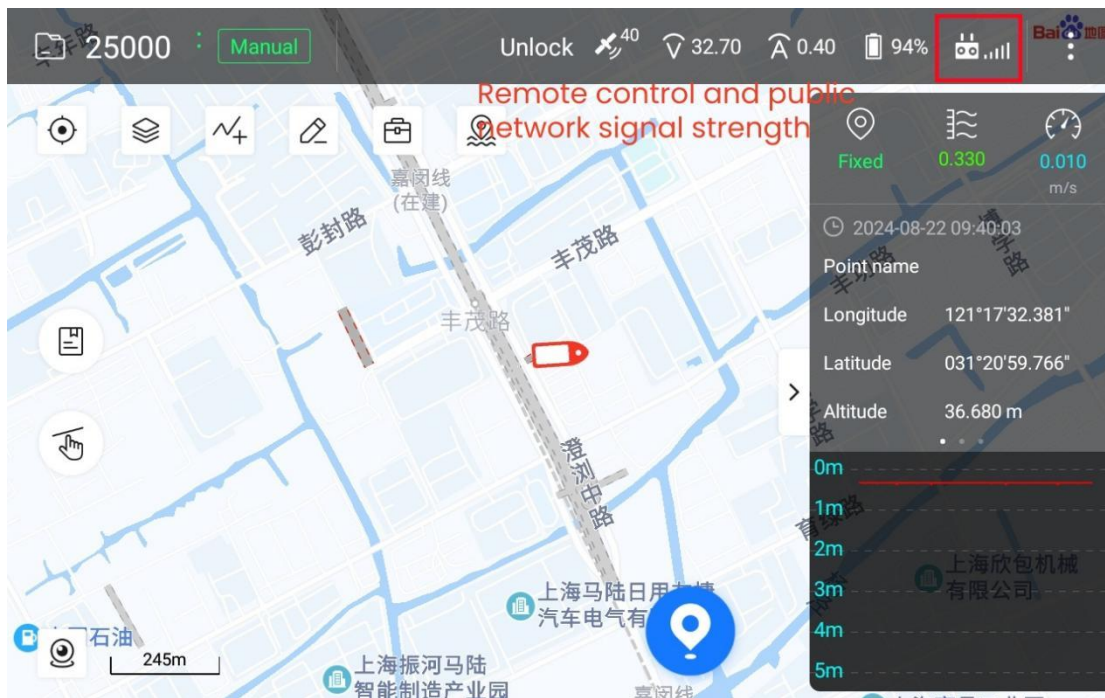


Figure 2-22 Signal Strength between the USV and the Remote Control

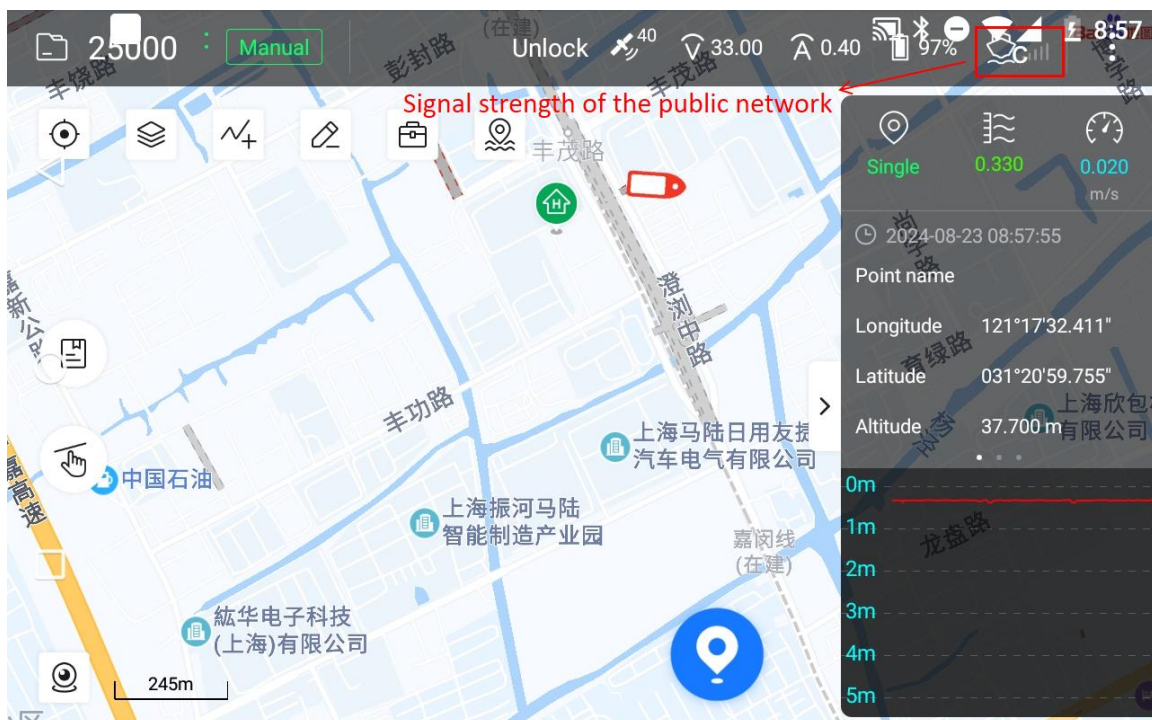


Figure 2-23 Signal Strength of the Public Network

2.3.2 More

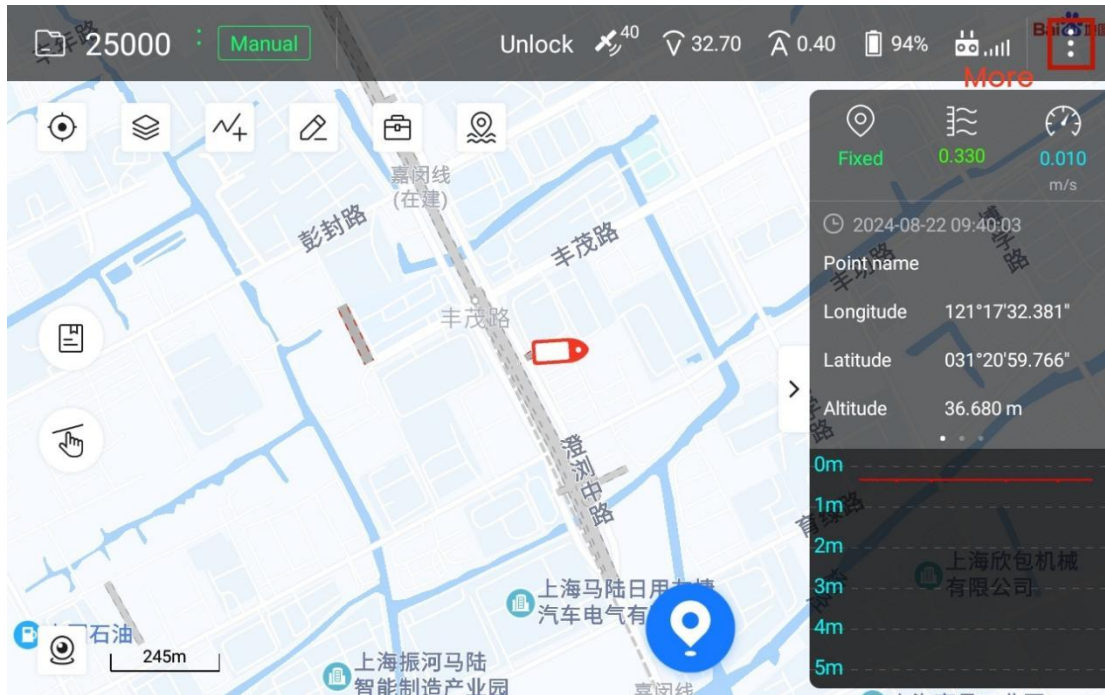


Figure 2-24 More

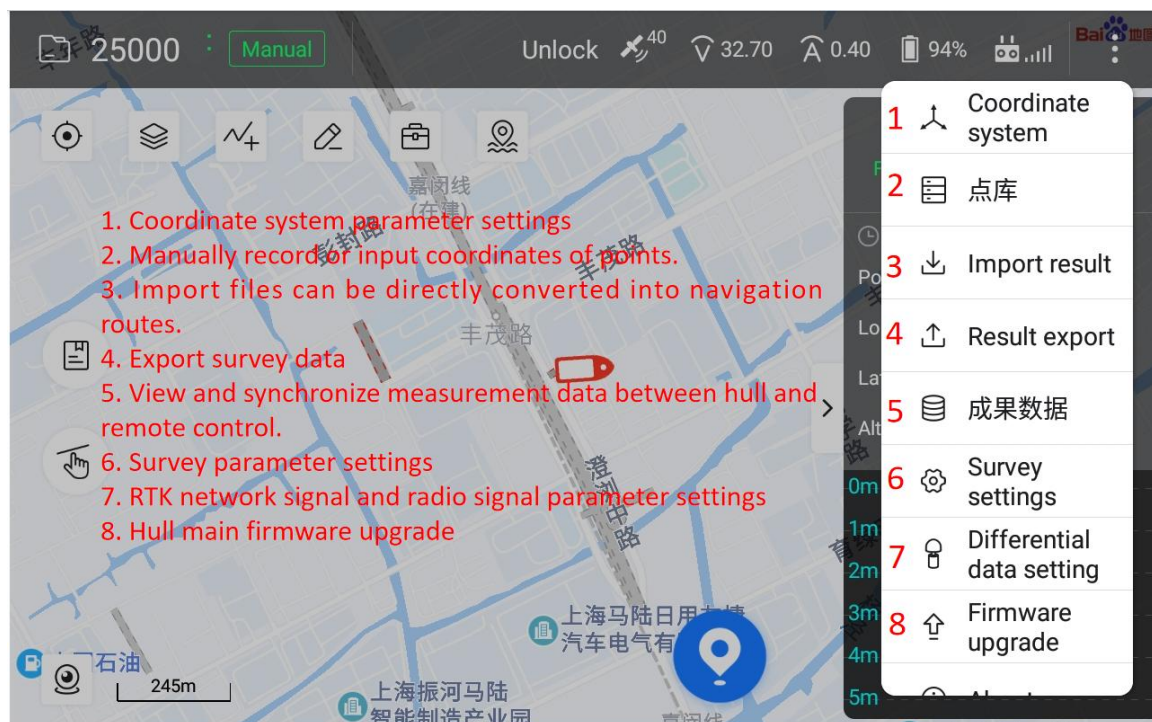


Figure 2-25 More

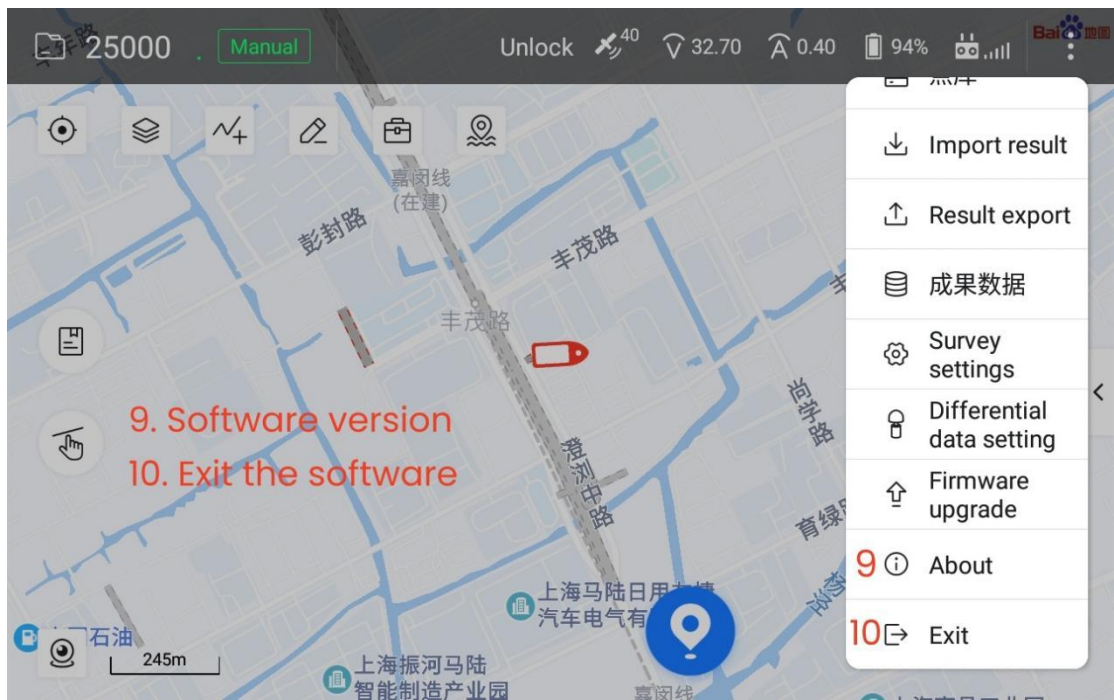


Figure 2-26 More

2.3.2.1 Coordinate System

Click the vertical three-dot icon in the top left corner of the main screen and select "Coordinate System". After configuring the required parameters, click "Confirm" to save and apply the settings.

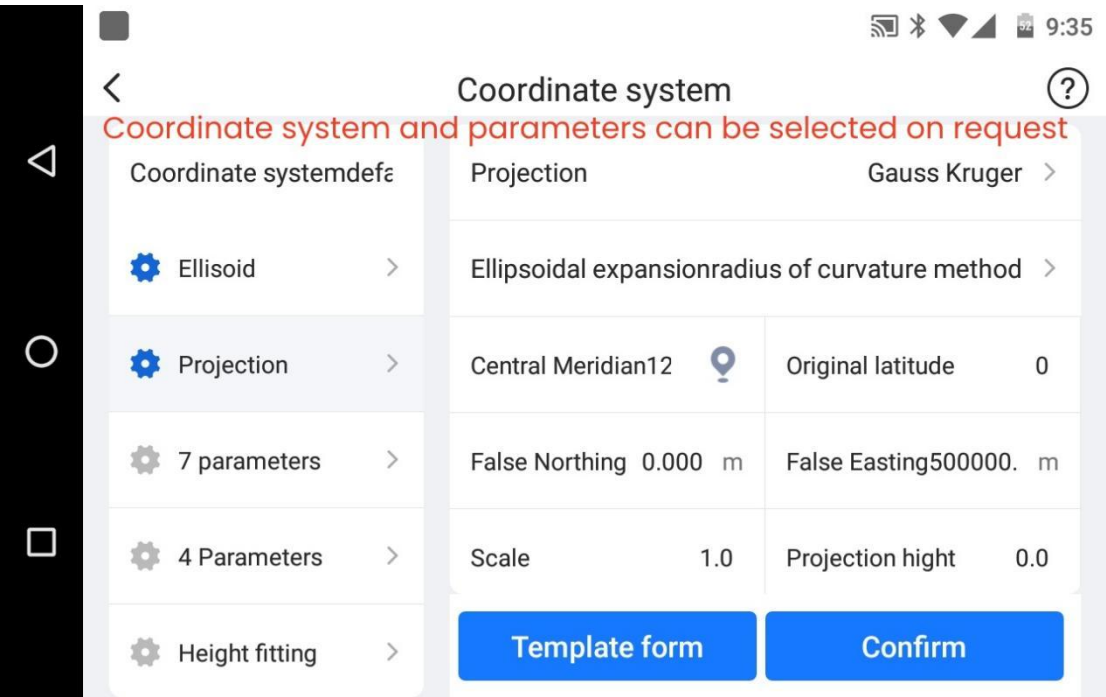


Figure 2-27 Coordinate System

2.3.2.2 Element

Click the vertical three-dot icon in the top left corner of the main screen and select "Element". You can manually input coordinate points or collect points manually. The recorded points can be used for planning the survey lines.



Figure 2-28 Element

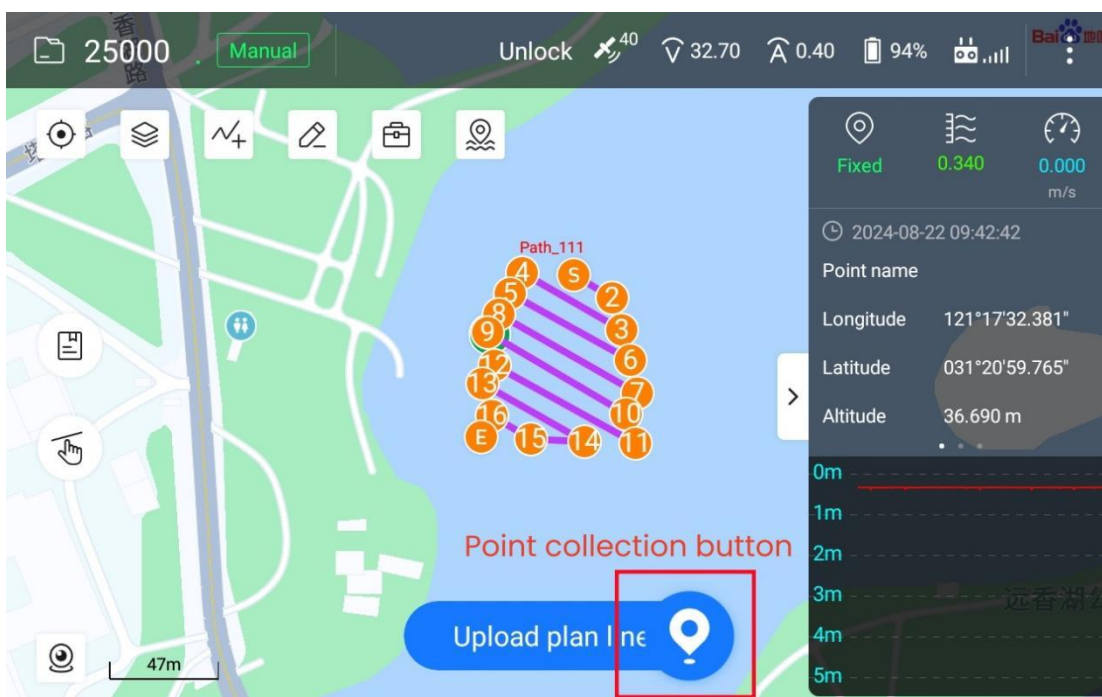


Figure 2-29 Point Collection Button

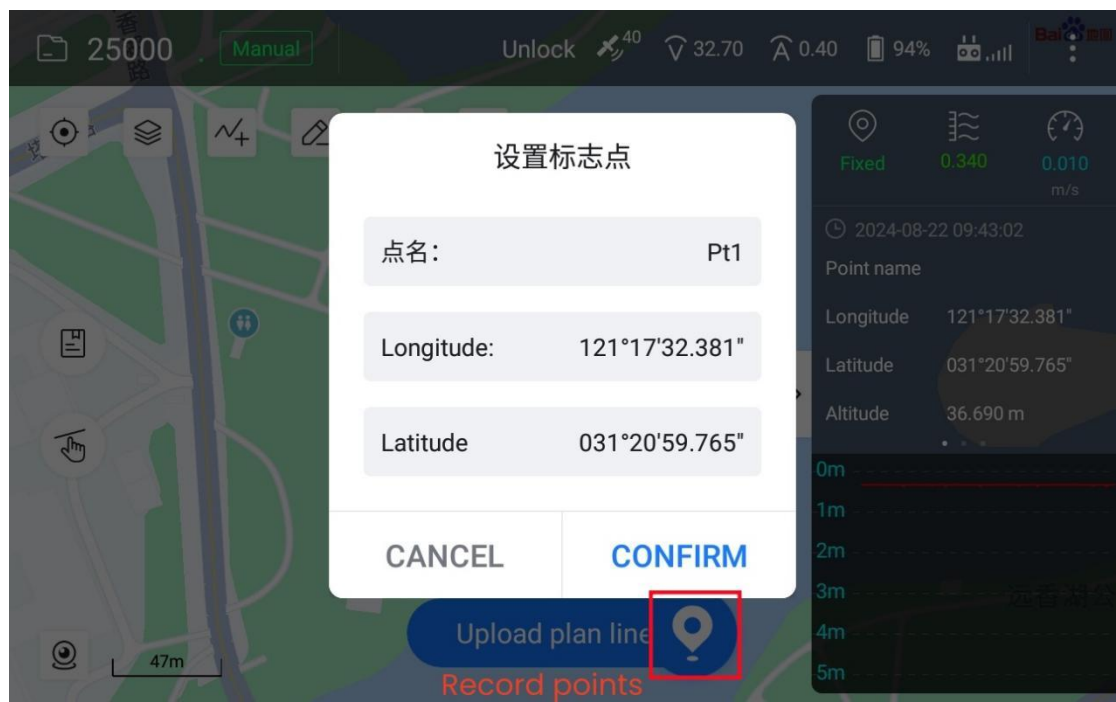


Figure 2-30 Element Data Collection

< 点库 +  

名称	显示	经度	纬度	东坐标	北坐标
Pt7		121.2925356	31.3498668	622994.495 m	3470486.767 m
Pt6		121.2923658	31.3495998	622978.684 m	3470456.970 m
Pt5		121.2923589	31.3497345	622977.852 m	3470471.899 m
Pt1		121.2923280	31.3499348	622974.651 m	3470494.076 m

Figure 2-31 Point Collection Record



Figure 2-32 Points from the Element can be Used to Set Up Routes

2.3.2.3 Import Result

Click the vertical three-dot icon in the upper left corner of the main interface and select "Import result". You can import DXF/KML/DWG files, which will be directly converted into navigation routes.

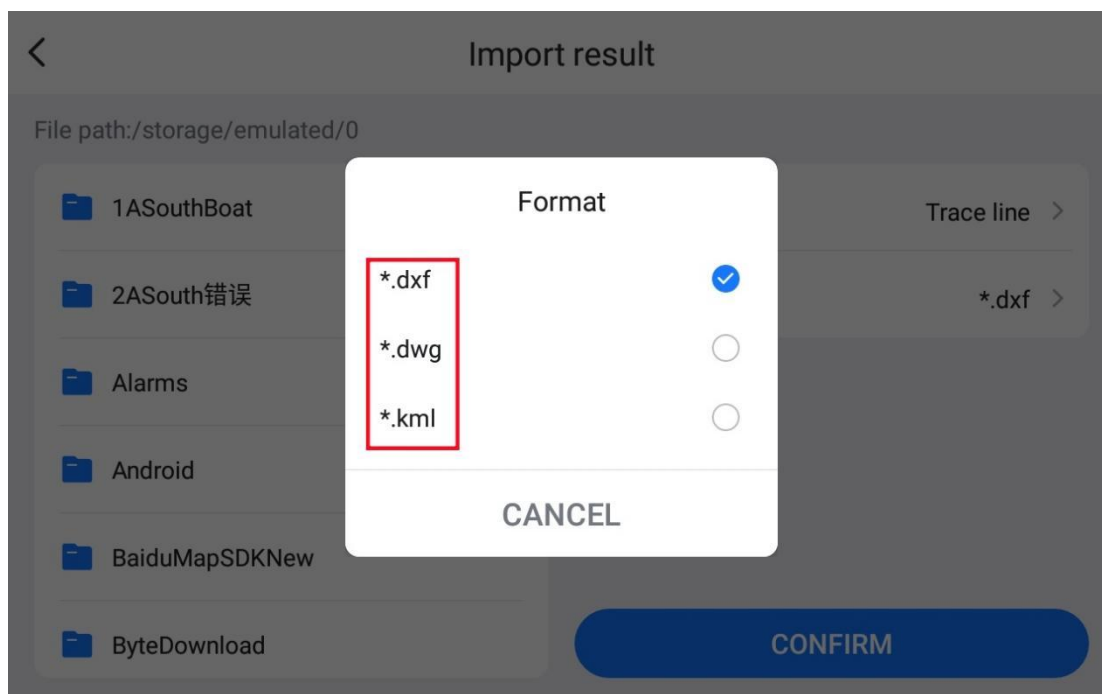


Figure 2-33 Import Result

2.3.2.4 Result Export

Click the vertical three-dot icon in the upper left corner of the main interface and select "Result export". Typically, choose "Result export" to export, which can then be processed using EchoSurvey software. Input a name for the exported result, click "Confirm," and wait for the export to complete. The exported file will be available in the selected path. Ensure that the result name is unique; if it is already in use, modify the name before exporting.

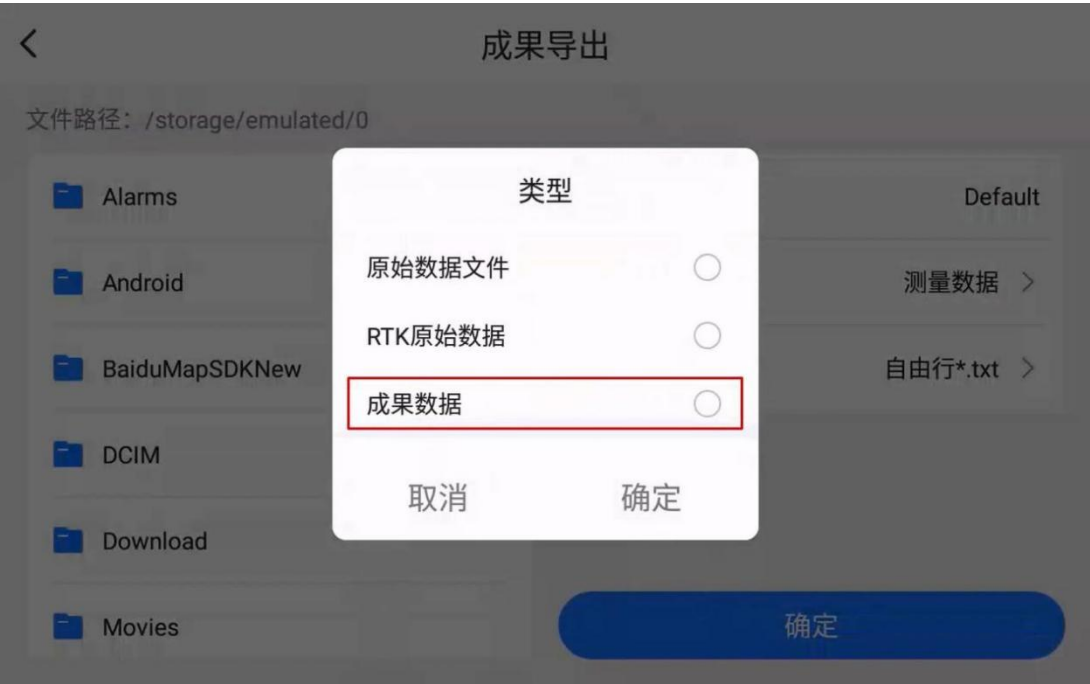


Figure 2-34 Select Data Format

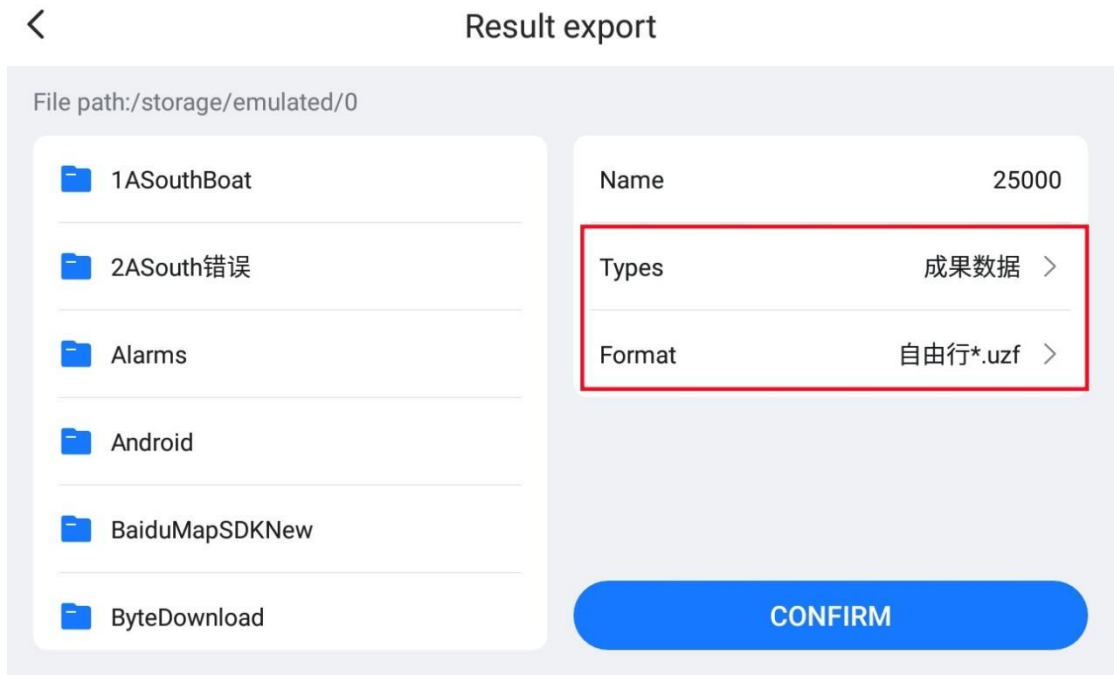


Figure 2-35 Select Data Format

2.3.2.5 Result Data

Click the vertical three-dot icon in the upper left corner of the main interface and select "Result Data". Before exporting data, make sure to synchronize the result data. To export the results data, click the "Result export".

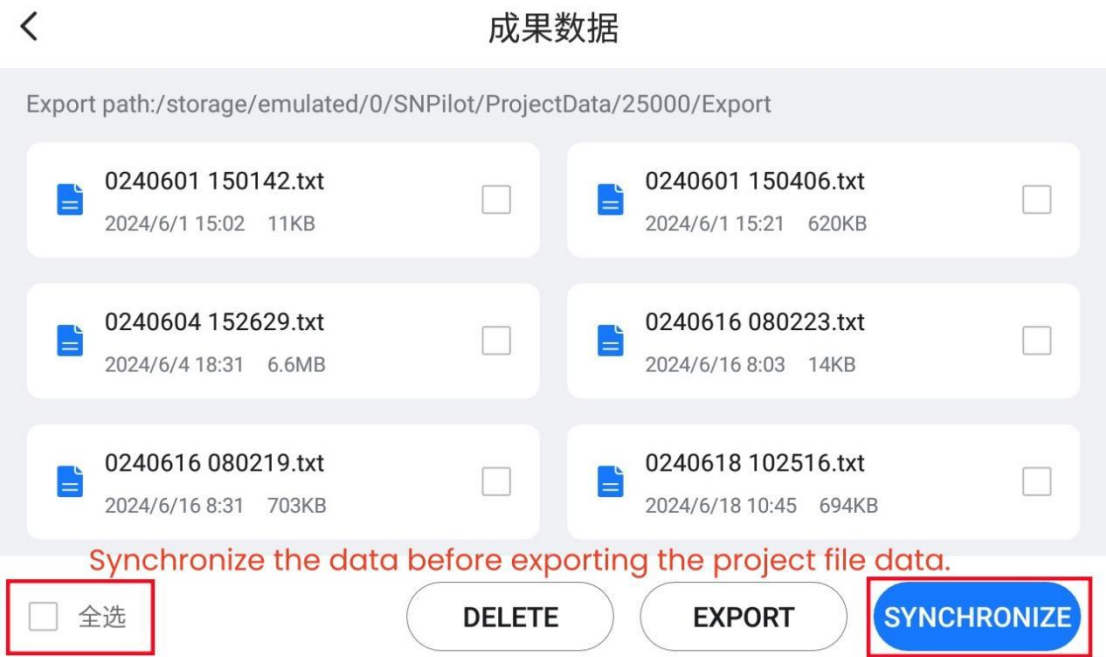


Figure 2-36 Synchronize Result Data

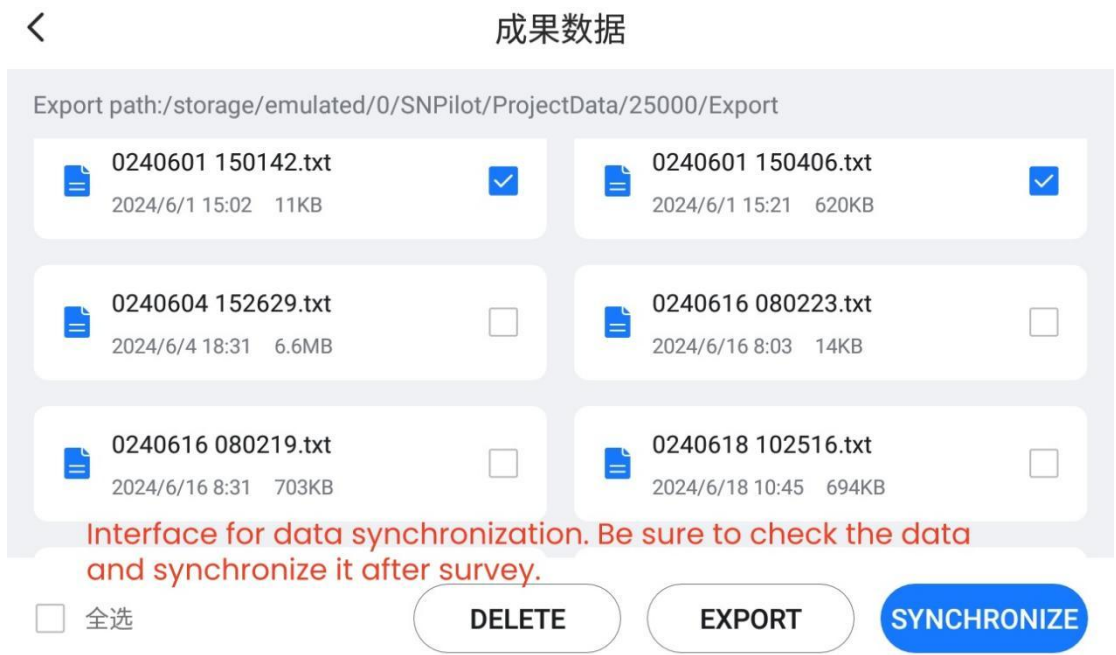


Figure 2-37 Synchronize Result Data

2.3.2.6 Survey Settings

Click the three-dot icon in the upper-left corner of the main interface and select "Survey settings." Configure the relevant parameters according to the work requirements and field conditions. This interface allows you to configure settings related to the data collection process, including collection settings, echo sounder, boat, and unit settings. Ensure that the collection conditions are met before saving points. The antenna height should be measured based on the type of equipment. The echo sounder's draught and sound velocity should be obtained from relevant equipment; the draught corresponds to the USV's draught, and the sound velocity is typically measured with a sound velocity sensor or obtained from empirical data.

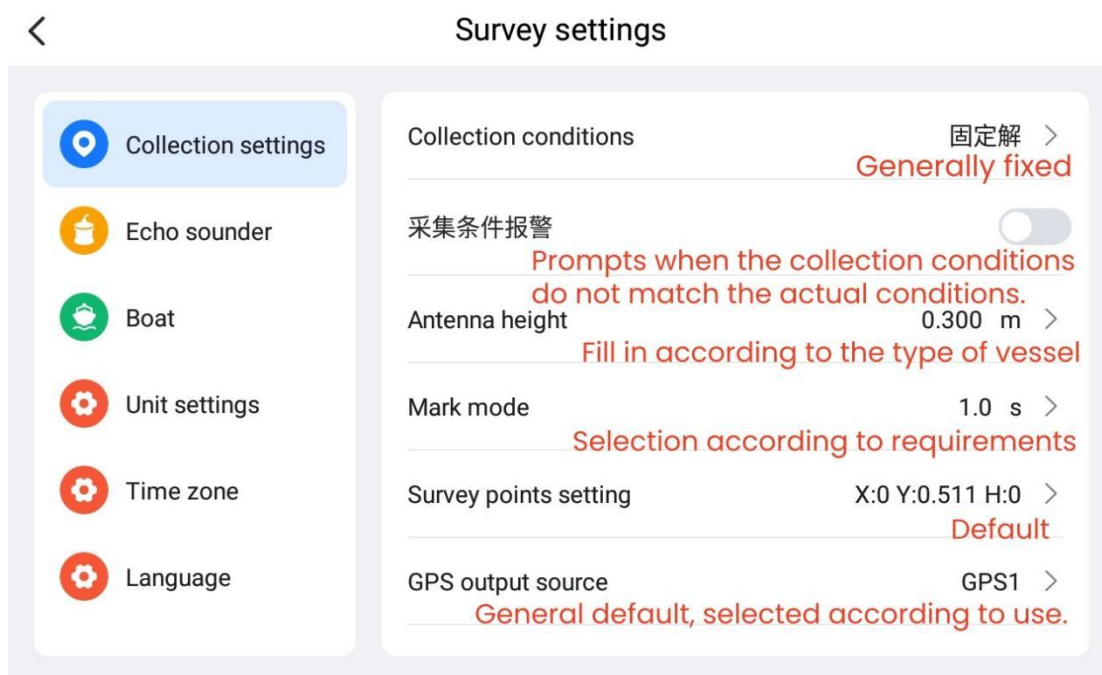


Figure 2-38 Collection Settings

Note: When using the hull's RTK, select "Internal RTK"; when using an external RTK, select "External RTK". If there is no positioning information, verify that the RTK output source is correctly selected.

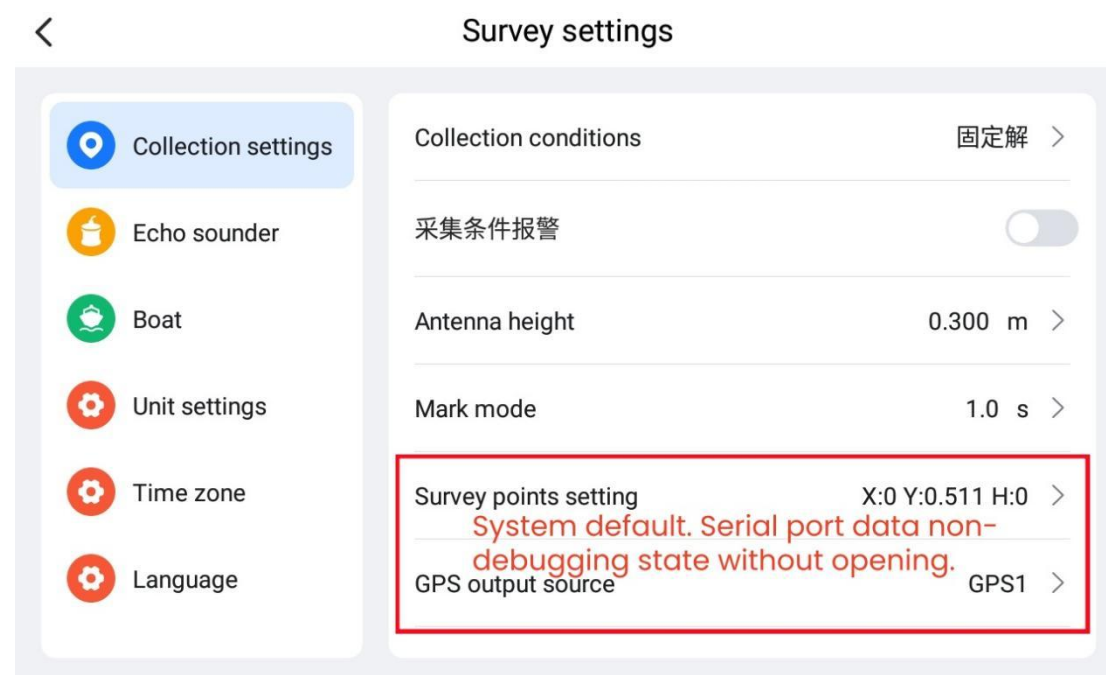


Figure 2-39 Collection Settings

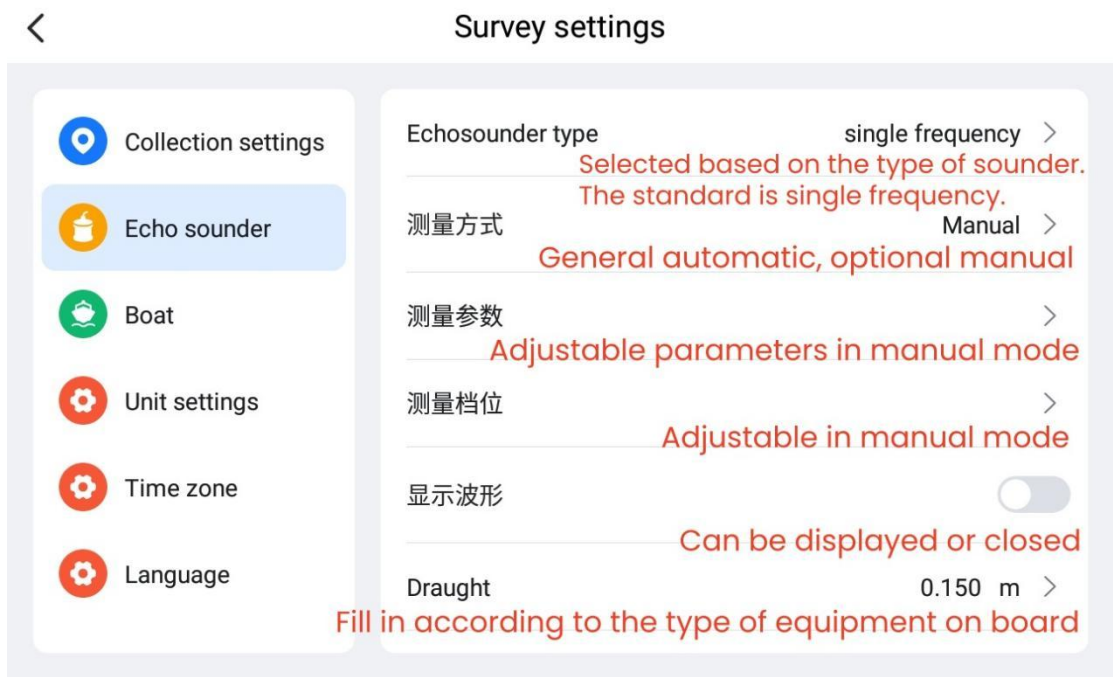


Figure 2-40 Echo Sounder Settings

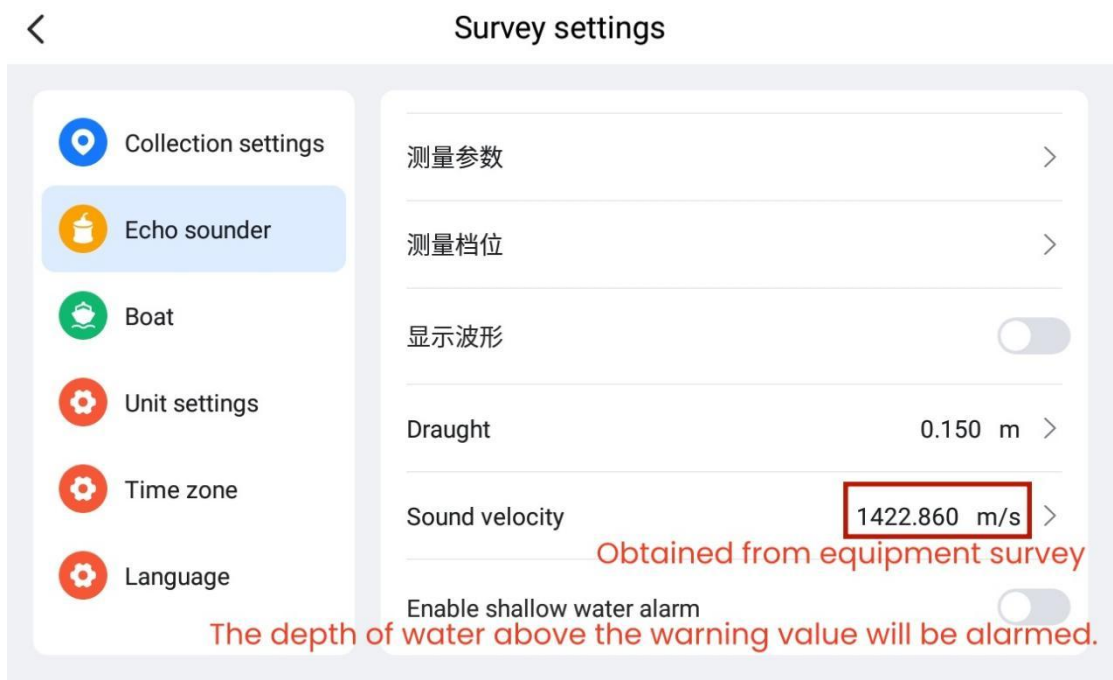


Figure 2-41 Echo Sounder Settings



Figure 2-42 Echo Sounder Parameter Settings

Note: If the bathymetry curve shows significant fluctuations, adjust the echo sounder parameters accordingly. The specific parameters should be tailored to the site environment.

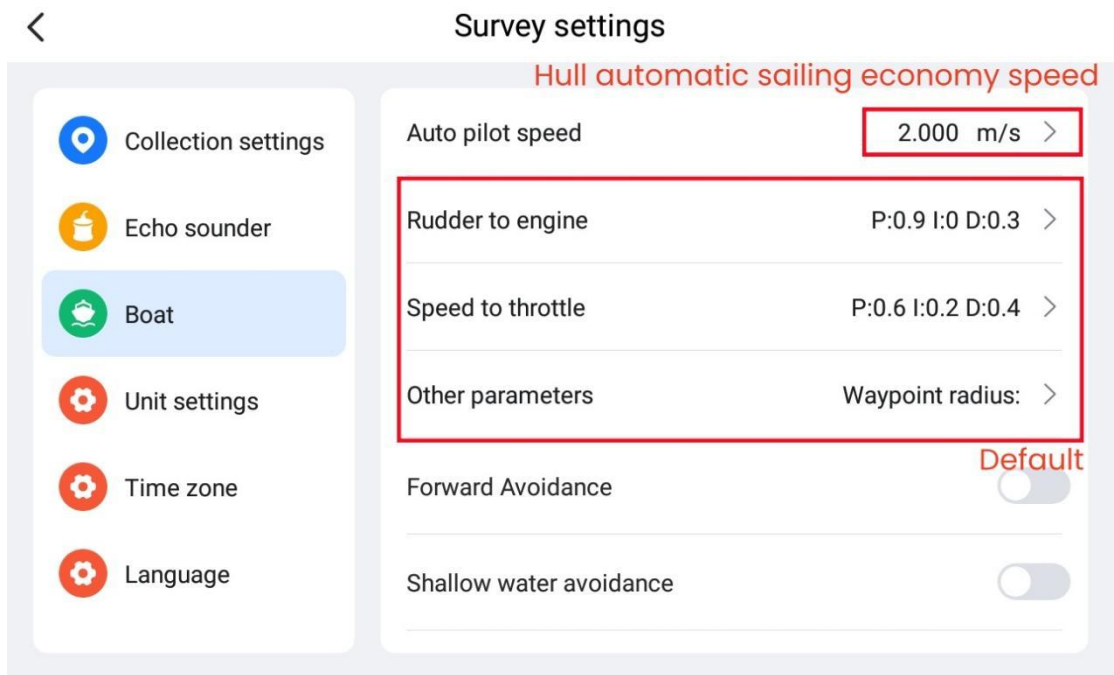


Figure 2-43 Boat Parameter Settings

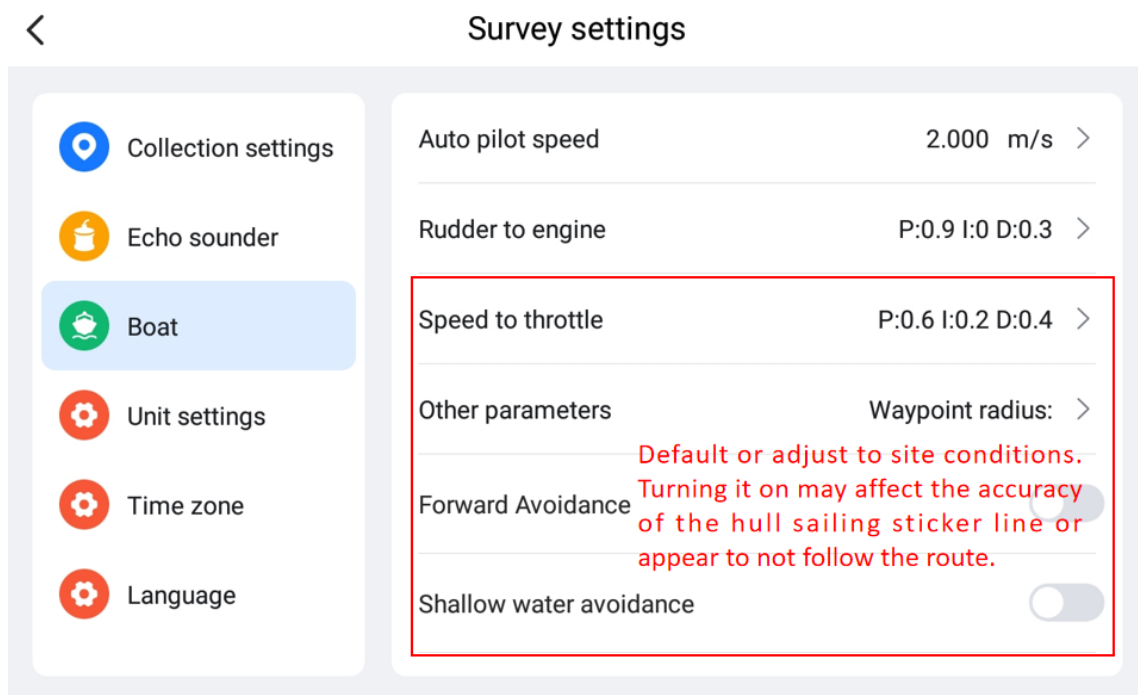


Figure 2-44 Boat Parameter Settings

Note: If the USV does not follow the planned route, try disabling the forward obstacle avoidance and shallow water avoidance functions, or adjust the relevant settings.

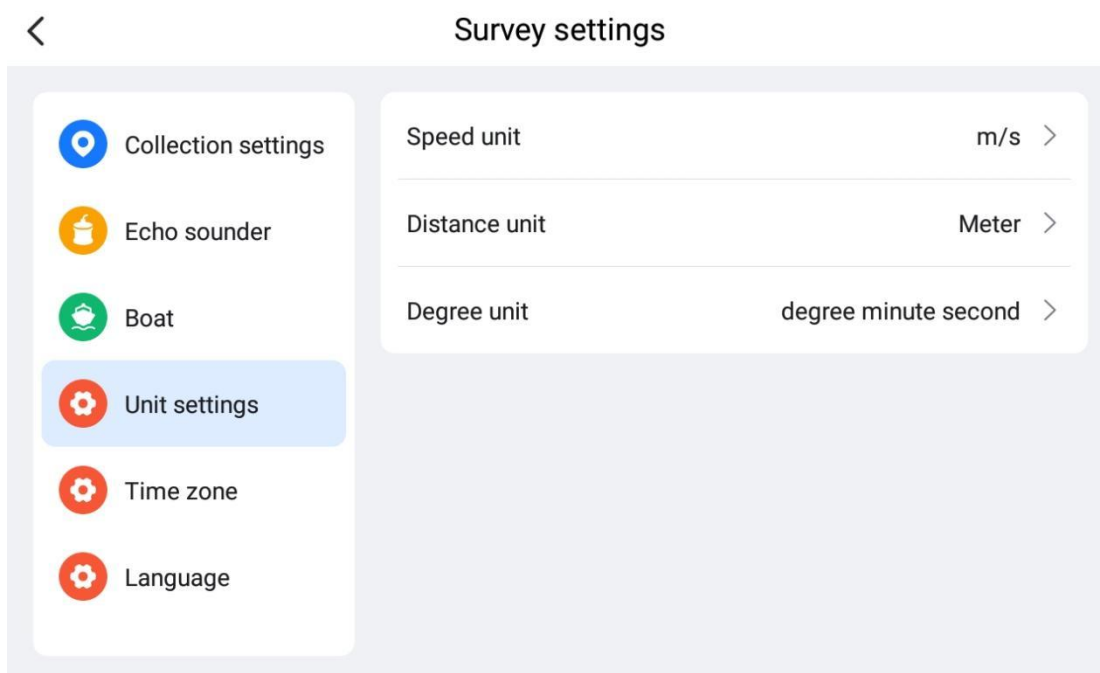


Figure 2-45 Unit Settings

Note: Set units according to your preferences to avoid configuration errors.

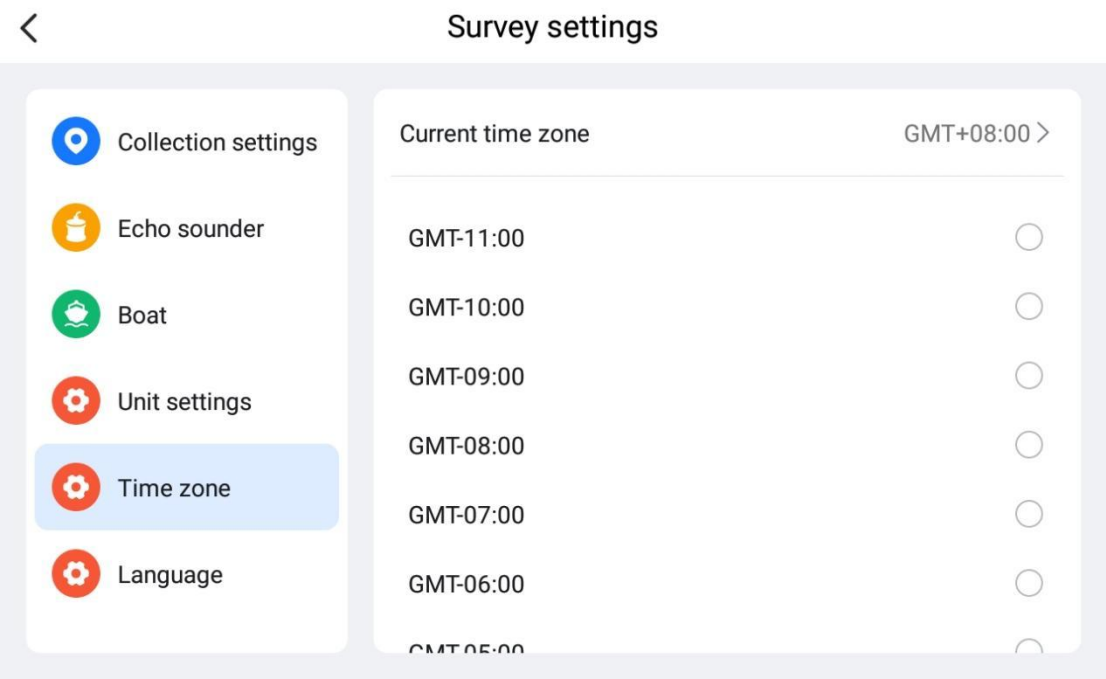


Figure 2-46 Time Zone Settings

Note: Set the time zone according to the location's time zone; the default setting is usually sufficient.

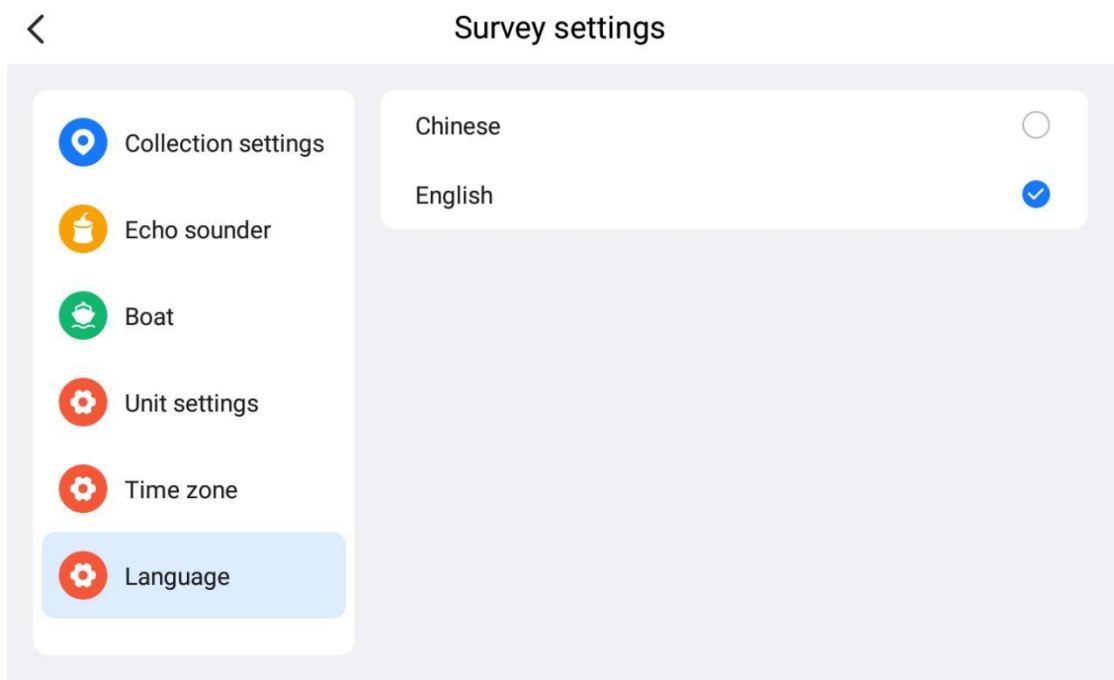


Figure 2-47 Language Settings

2.3.2.7 Differential Data Settings

Click the vertical three-dot icon in the upper-left corner of the main interface and select "Differential data settings." Input the name, IP, Port, User name, and password. Click "Obtain" and choose the access point (the access point can be automatically selected or manually entered). Click "Save" to successfully store the account information. Name must be unique; if a duplicate name is detected, you will need to rename it before saving. Ensure that the radio settings, including channel setting, air baud rate, and radio protocol, match those configured on the base.

<

CORS settings

New

CORS settings

Radio setting

South

sinognss

IP

172.16.10.74

Port

6600

User name

south

Password

.....

Access points

RTCM23

Obtain

SAVE

CONNECT

Figure 2-48 CORS Settings

<

Radio setting

CORS settings

Radio setting

Channel setting

1 >

Power range

low >

Air baudrate

9600 >

Redio protocol

south >

Figure 2-49 Radio Settings

2.3.2.8 APN configuration

First, turn on the remote control and SV600, and then connect the remote control and SV600 through a [network cable](#).

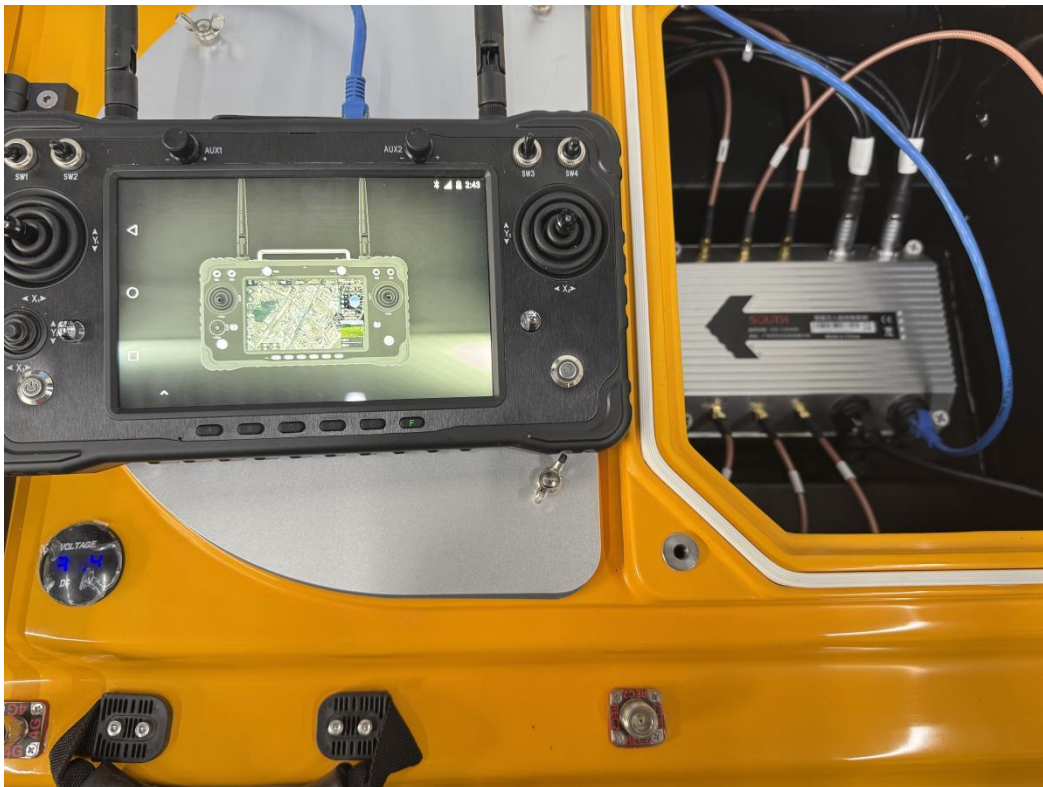


Figure 2-50 Internet cable connection

Then open [Settings](#), click [More->Tethering&portable hotspot](#) in sequence, and then turn off [Ethernet tethering](#).

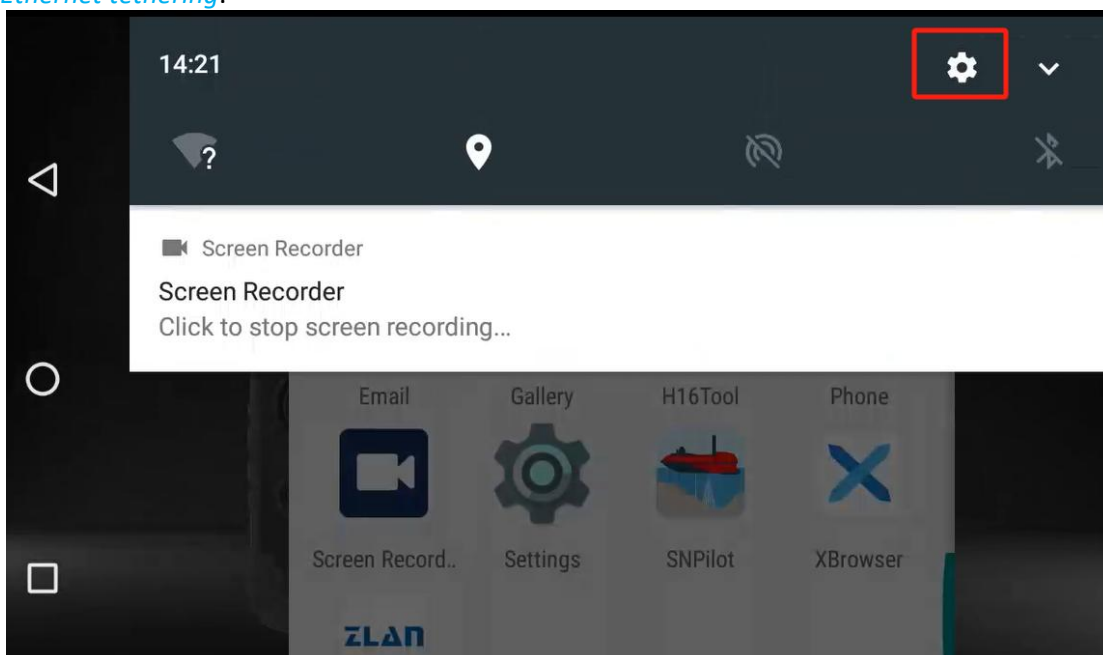


Figure 2-51 Settings

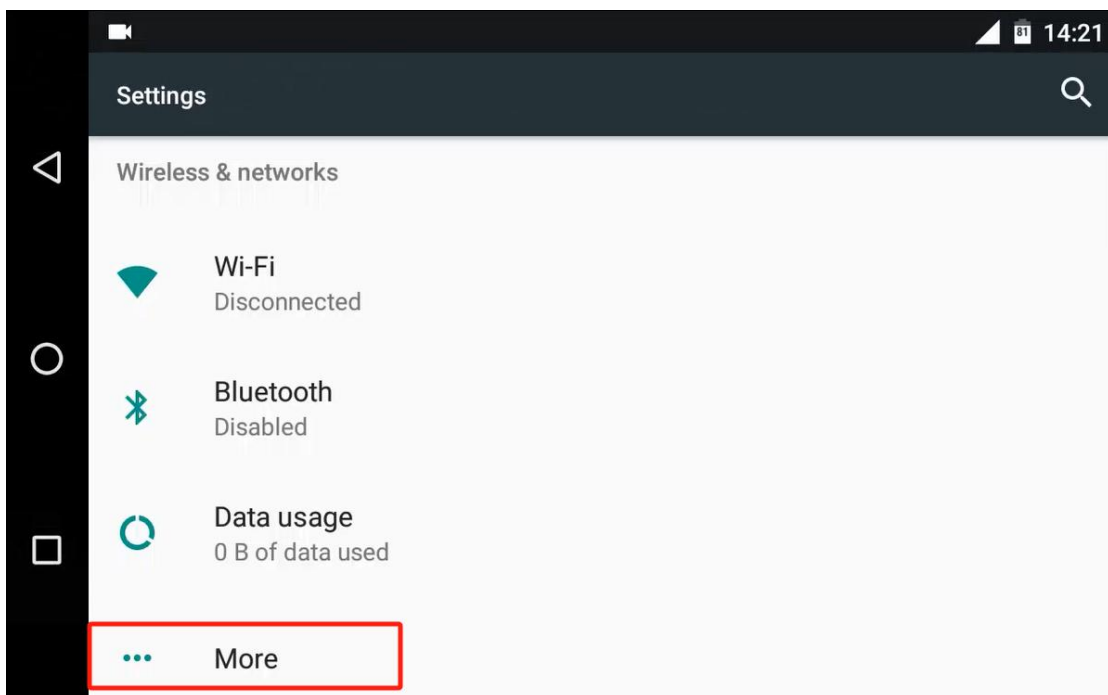


Figure 2-52 Settings

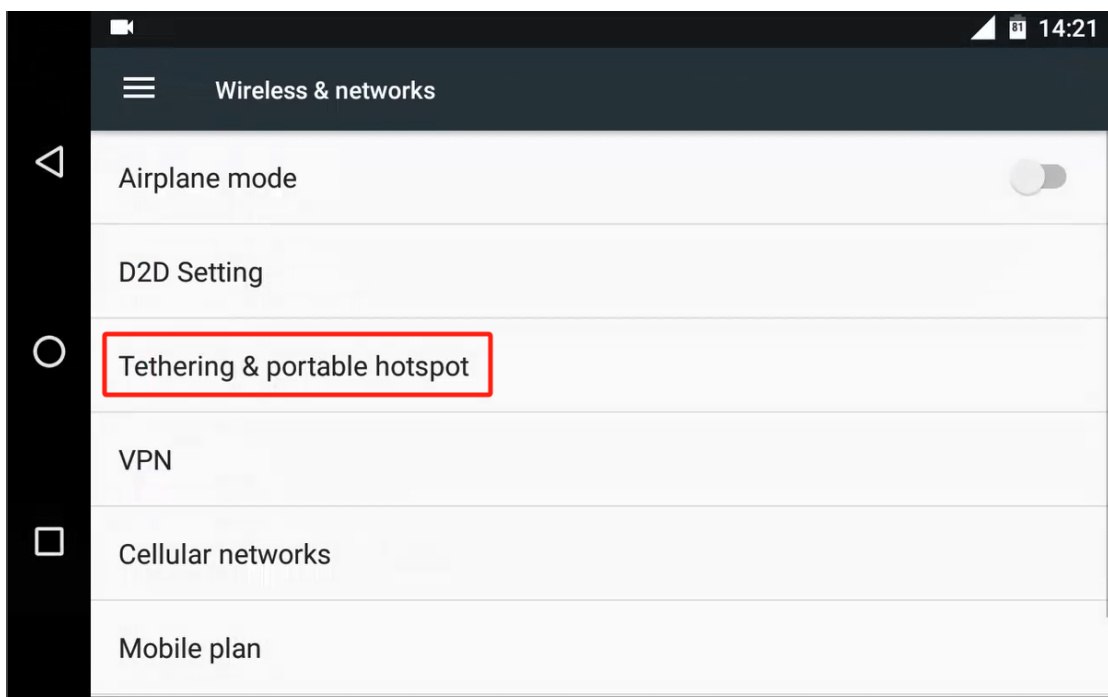


Figure 2-53 Settings

After that, the symbol in a red box will appear in the list at the top of the screen.

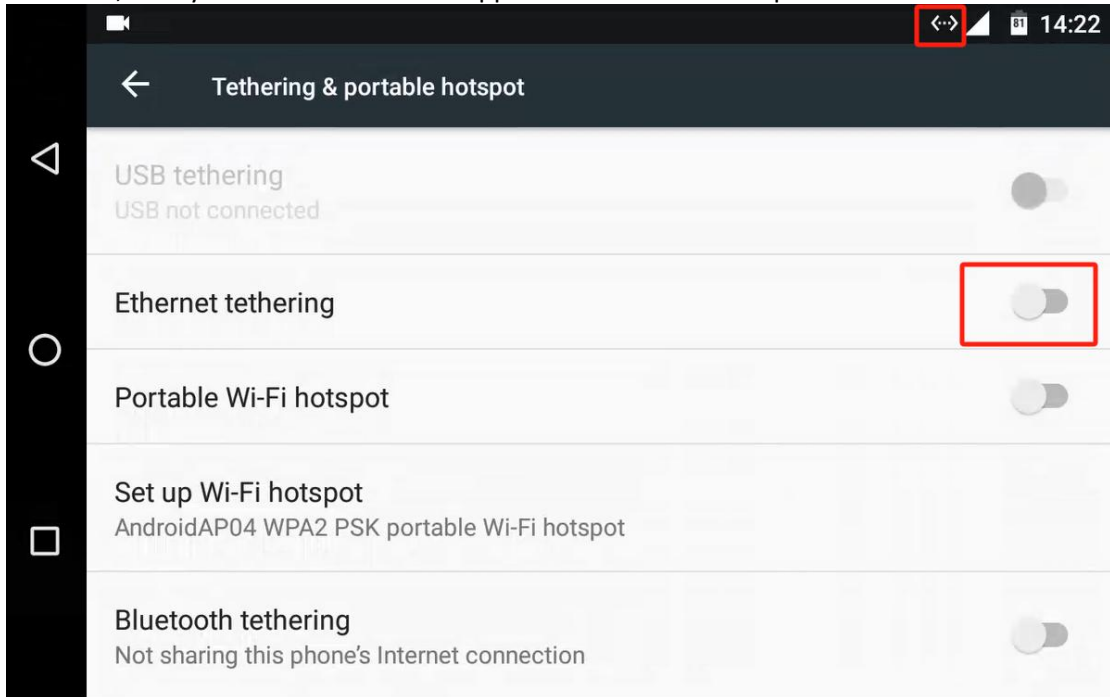


Figure 2-54 Settings

Then open [XBrowser](#) from the home page, and directly enter [192.168.10.1](#) in the search bar to enter the configuration interface.

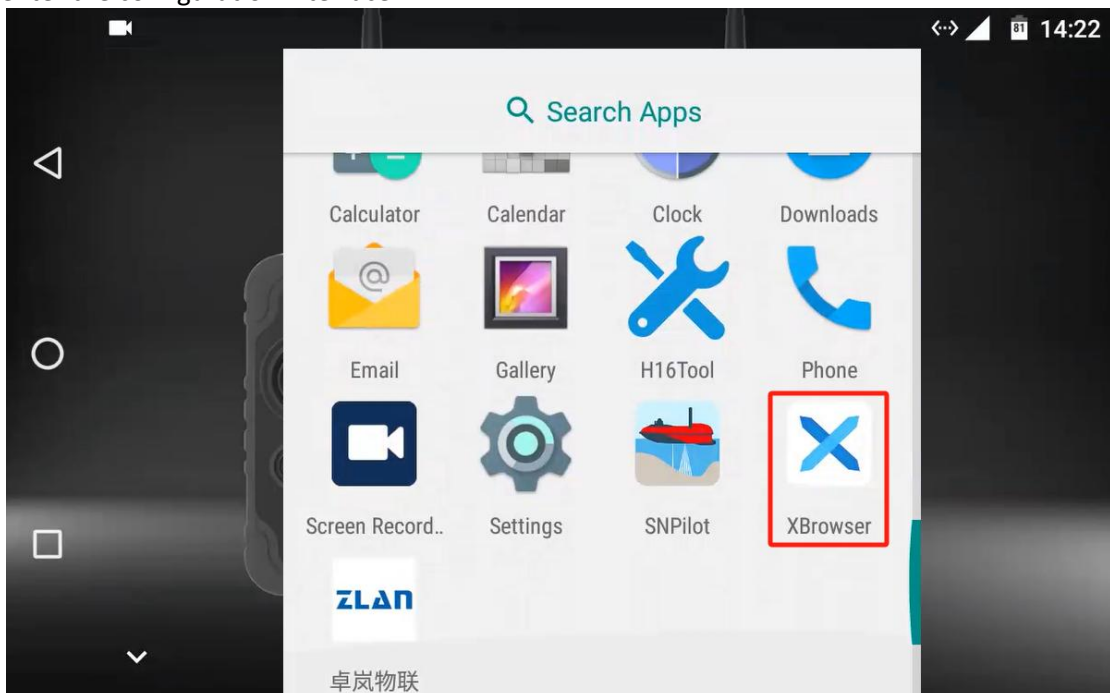


Figure 2-55 XBrowser

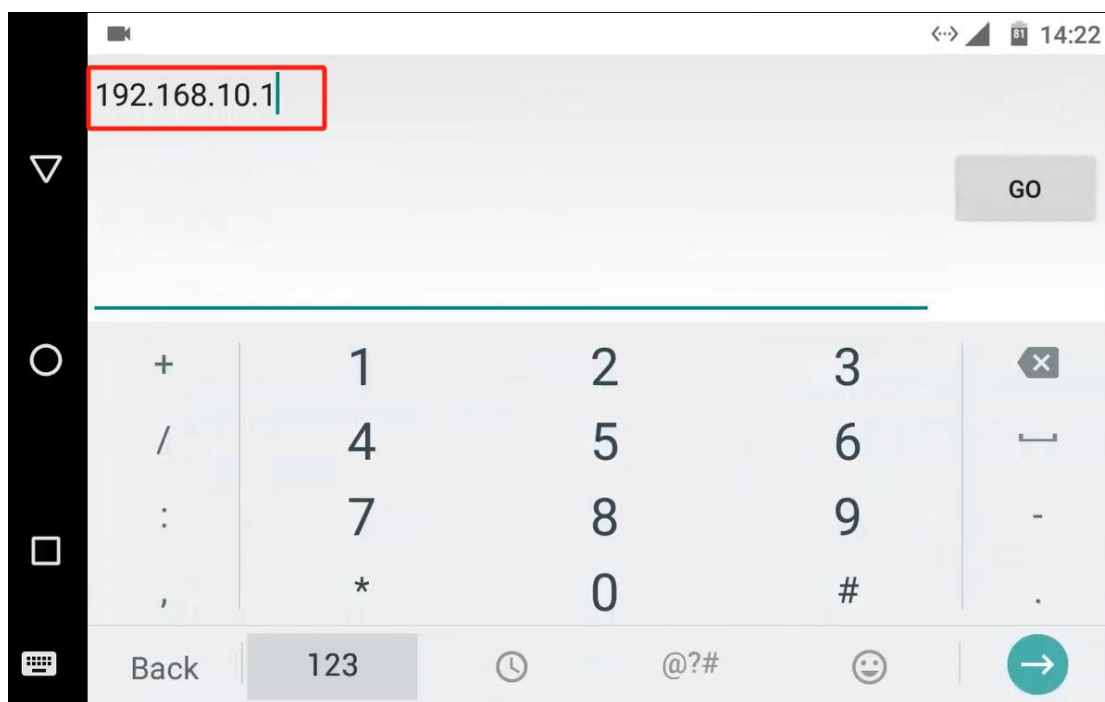


Figure 2-56 Enter IP

Click [4G/5G->Setup](#) in sequence, check off [Auto select 4G/5G ISP](#). .

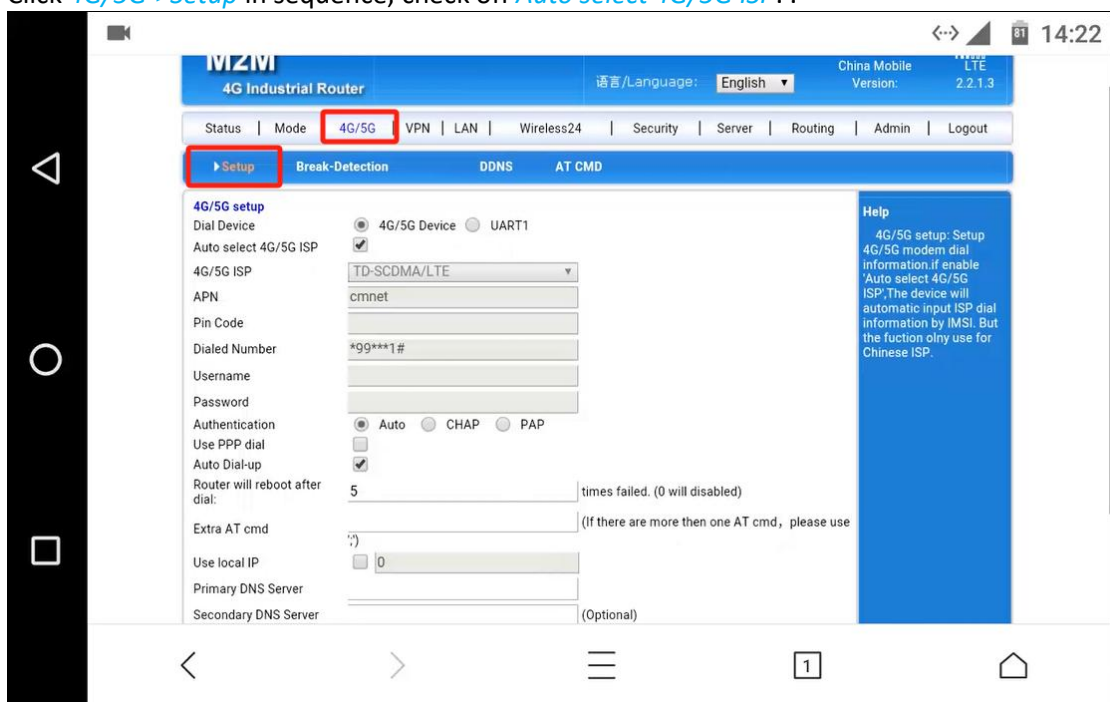


Figure 2-57 APN Settings

Select [User defined](#) in [4G/5G ISP](#), enter the name of APN. If you need an account password, just enter it in the corresponding place. When all the configuration inputs are completed, click ["APPLY"](#).

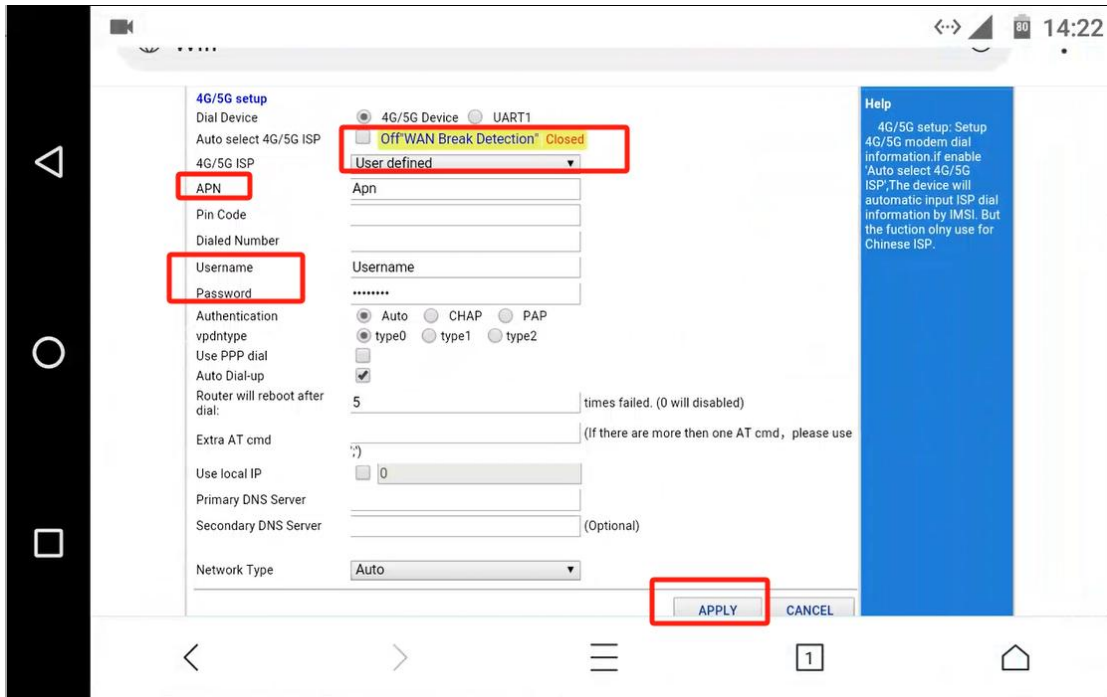


Figure 2-58 APN Settings

Then click [Status->Summary](#) in sequence, [WAN Info](#) can check whether the configuration is effective on this page.

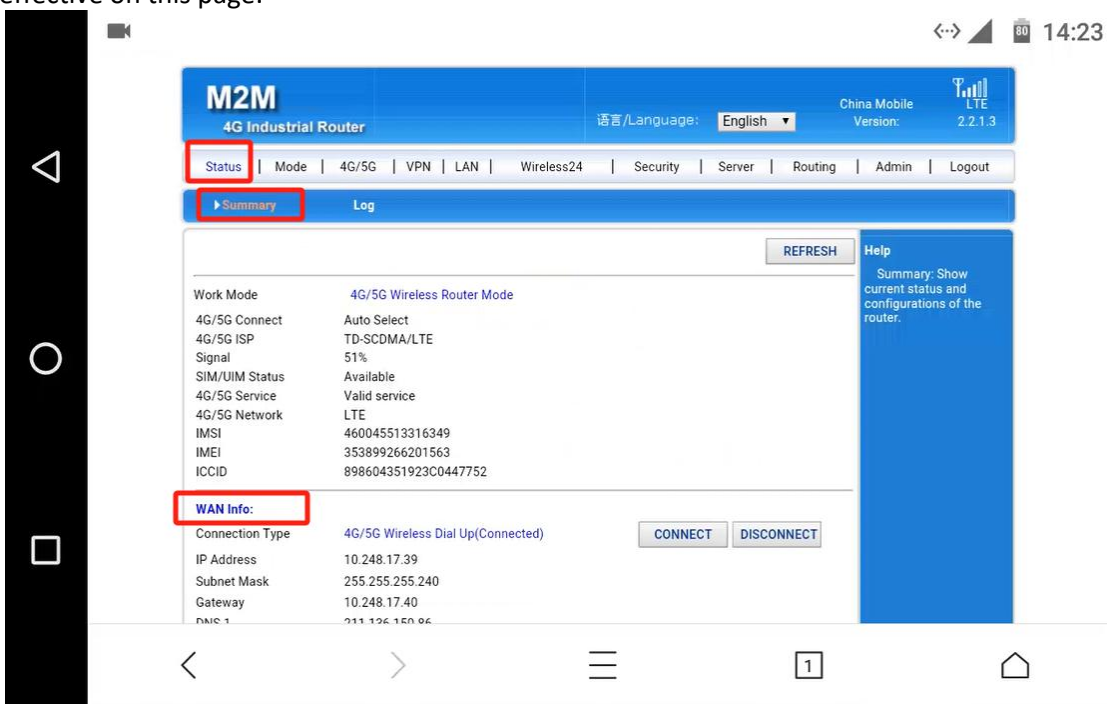


Figure 2-59 APN Settings

2.3.2.9 Firmware Upgrade

Click the vertical three-dot icon in the upper-left corner of the main interface and select "Firmware upgrade." This function is used for upgrading the firmware of the USV (ensure the firmware file is copied to the remote control). In the firmware upgrade settings interface, select the location of the firmware file to be upgraded on the left side, while the right side shows the upgrade progress. To perform the upgrade, repeatedly click the "Connect" button in the lower-right corner during the USV's reboot process until a connection is established, allowing you to select the appropriate firmware for the upgrade. If the USV still fails to connect after starting up, restart the

USV and repeat the steps. During the upgrade, the progress bar will continuously update. If the progress bar indicates "Upgrade successful," the firmware upgrade has been completed successfully. If "Upgrade failed" is displayed, the upgrade process needs to be repeated. Note that 100% on the progress bar indicates the file transfer progress, not the overall upgrade success.

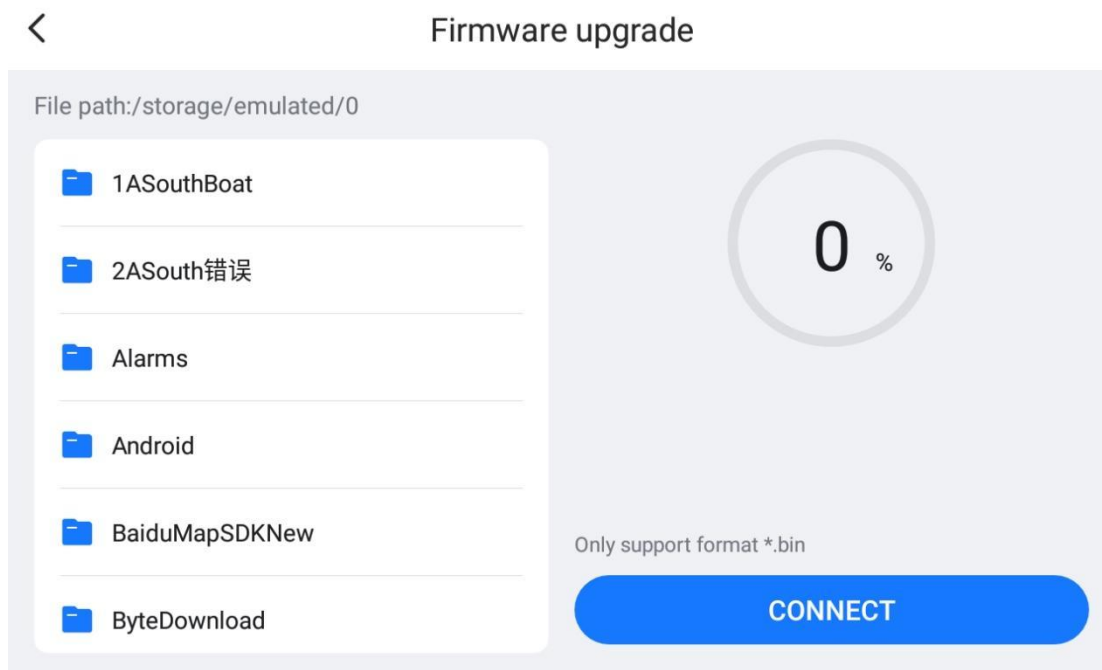


Figure 2-60 Firmware Upgrade

2.3.2.10 About

In the software's main interface, click the "More" at the top right and select "About". Here, you can view the software version. Click "Check update" to see if a newer version is available.

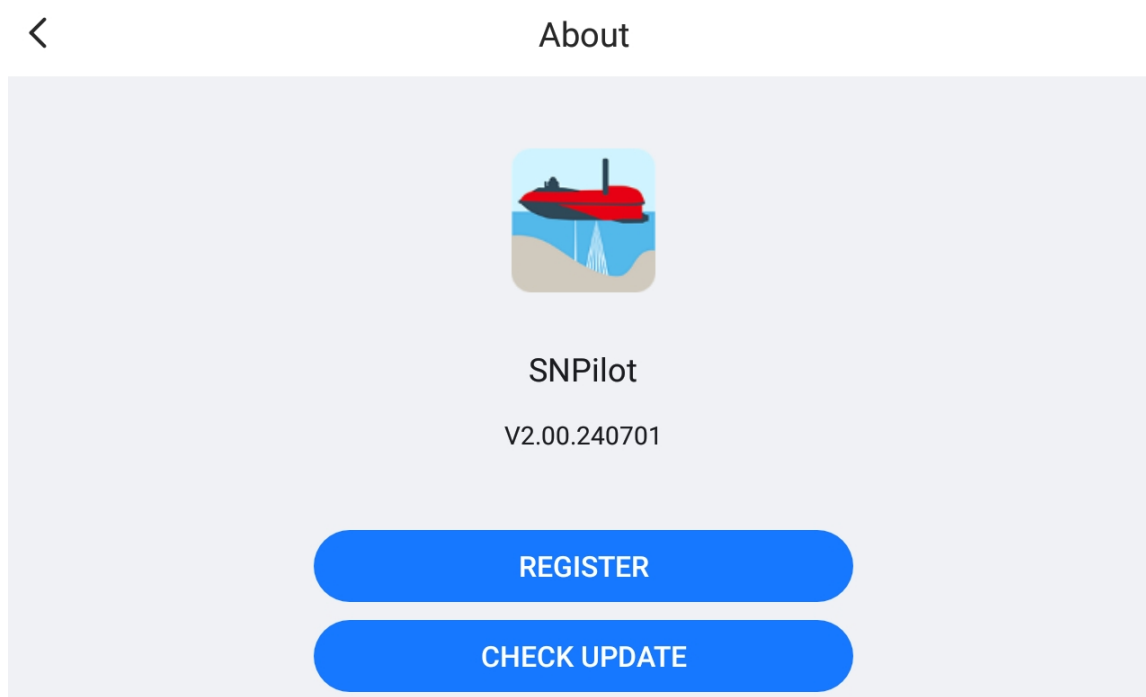


Figure 2-61 Software Version

<

Boat SN

SU20E5149200246

Sounder SN

S2218200918

Control SN

51474B2E1430323931363937

Firmware version

1.01.240627.SBOAT_T

Expire time

20250514

注册码

|

input register code

REGISTER

Figure 2-62 Software Registration

2.3.3 Toolbar



Figure 2-63 Toolbar

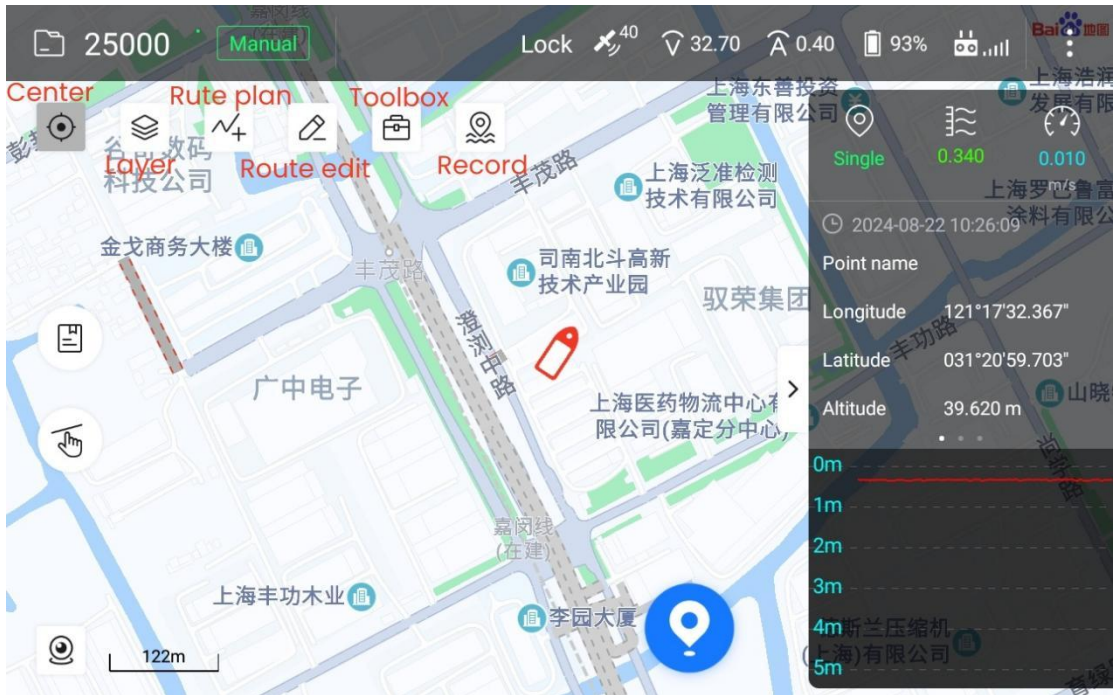


Figure 2-64 Toolbar Functions

2.3.3.1 Center

Click "Center" to enter the center settings. The USV's position will be displayed in the center of the screen. To exit this function, simply click anywhere on the survey interface.

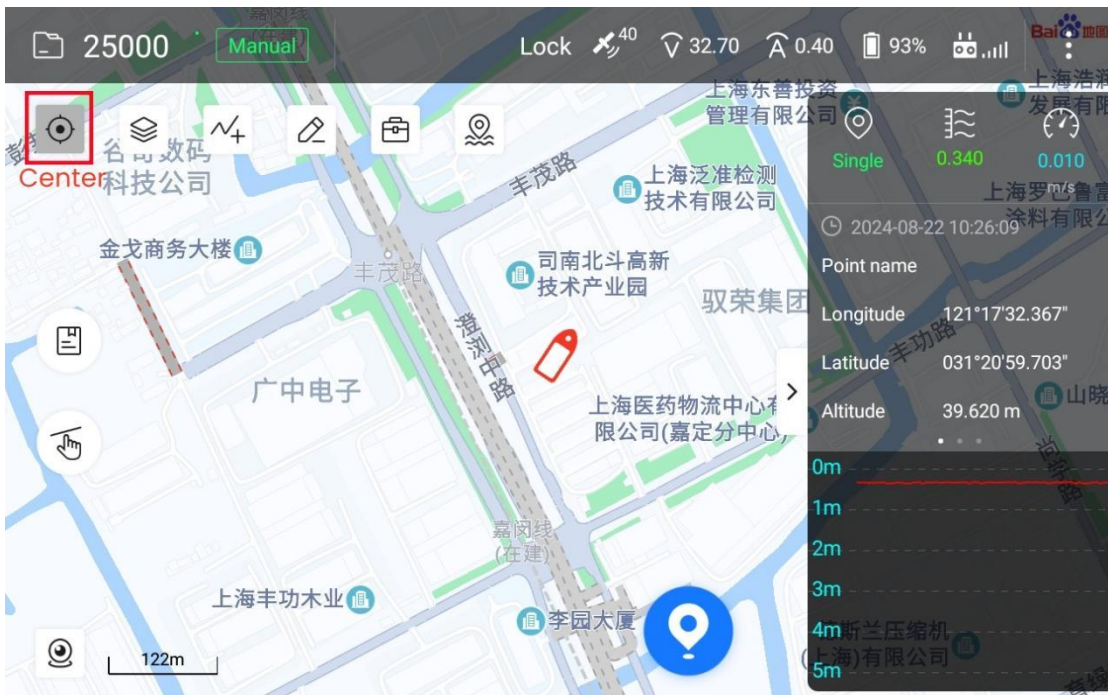


Figure 2-65 Center

2.3.3.2 Layer

Clicking the "Layer" button will enter the layer setting interface. This feature is used to configure the displayed map. The default layers in the layer setting are Baidu map, Tianditu map and Tianditu map image, etc. You can delete, or hide imported DXF/DWG/KML layers. On the left side of the layer setting interface, available basemap layers are displayed, while the right side shows other layers. Imported files can be selected during the routing process.

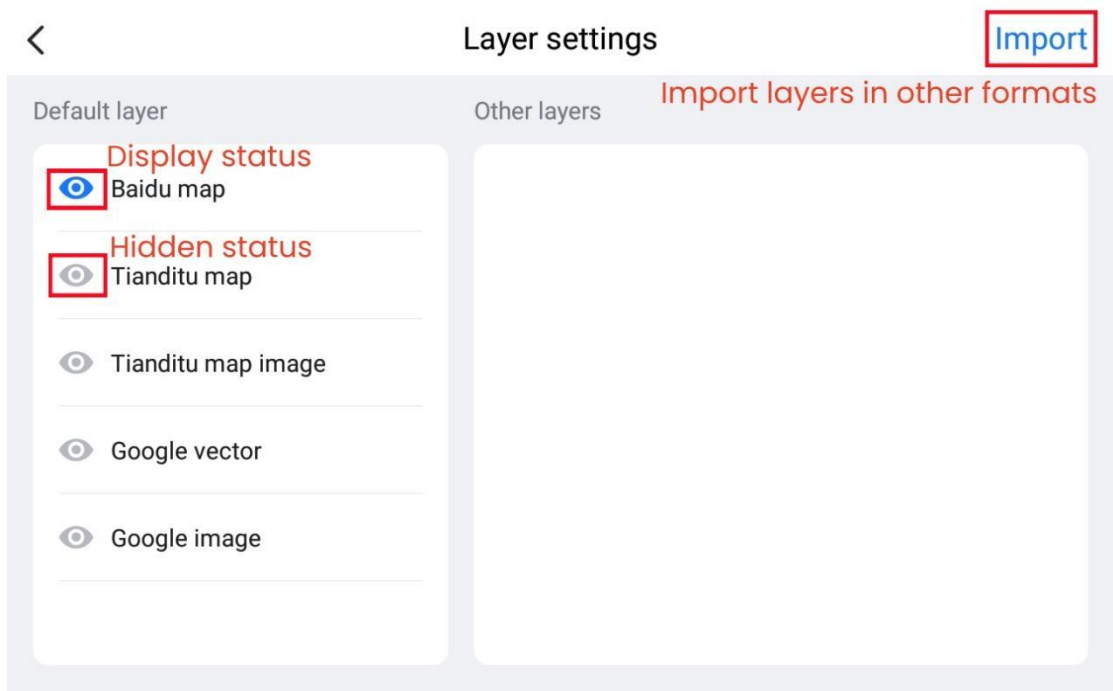


Figure 2-66 Select Basemap

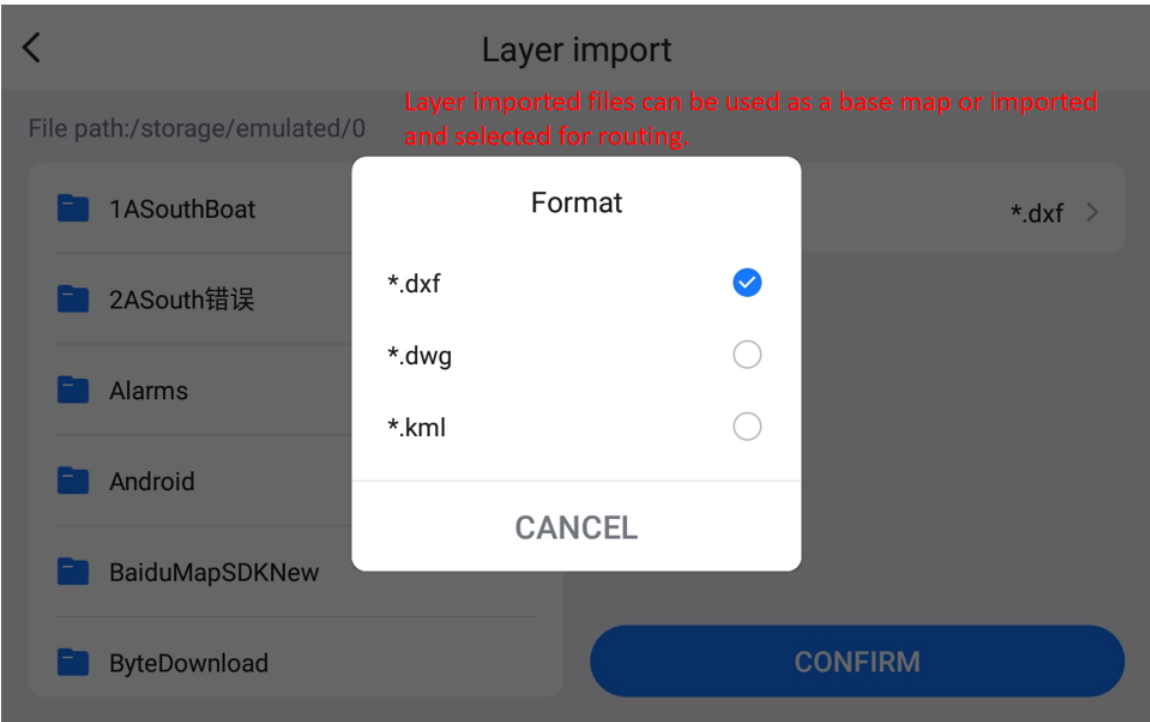


Figure 2-67 Select Layer

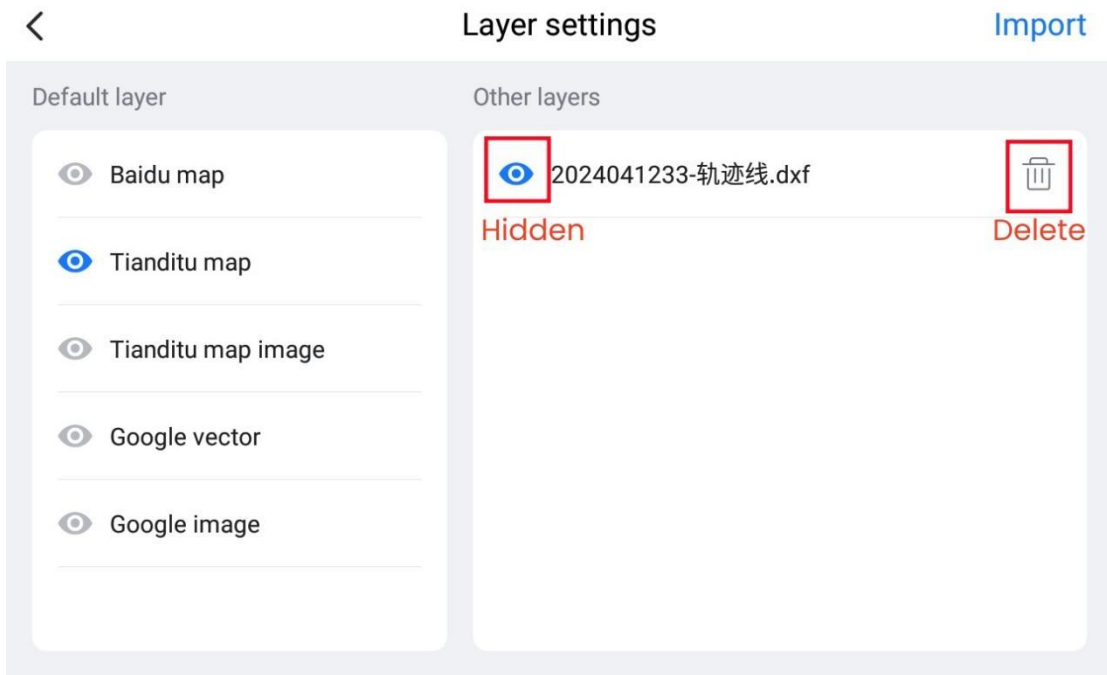


Figure 2-68 Delete or Hide Imported Layer

2.3.3.3 Route Plan

Clicking the "Route plan" button on the toolbar will pop up the route plan window. In the pop-up window, choose the appropriate route based on the site conditions. The relevant parameters should be configured according to the specific site requirements. The following examples are provided only to illustrate the operation and may not be suitable for all work environments.

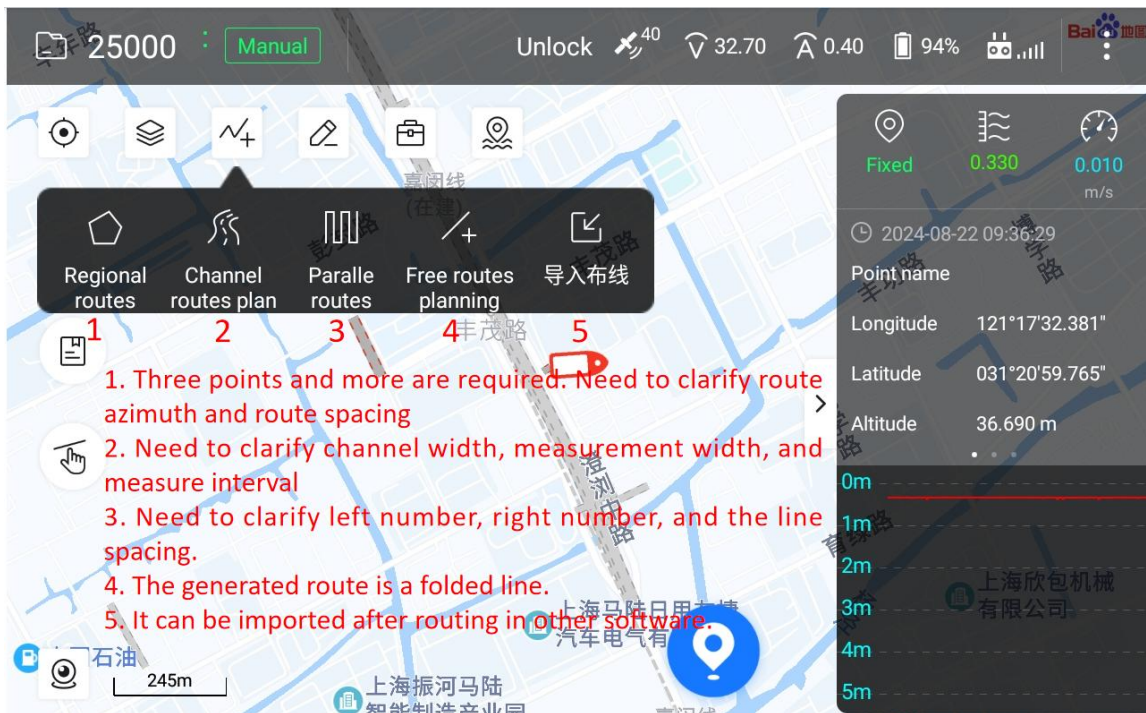


Figure 2-69 Route Plan

1. The setting parameters for regional routes include tilt angle and line spacing.

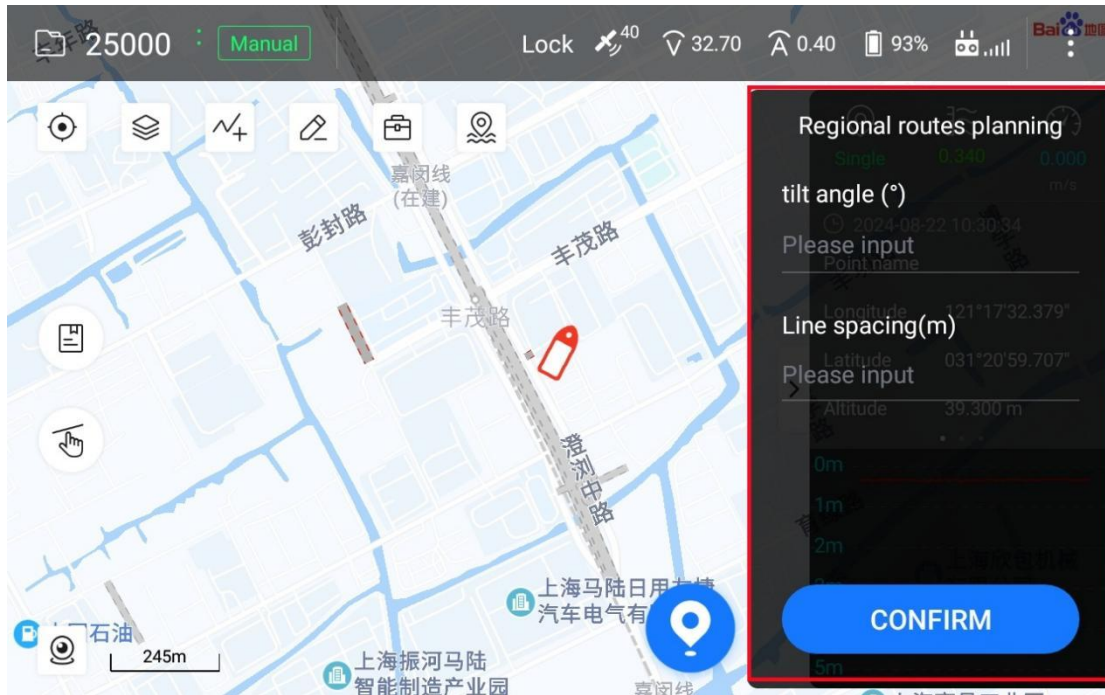


Figure 2-70 Regional Routes Parameter Settings

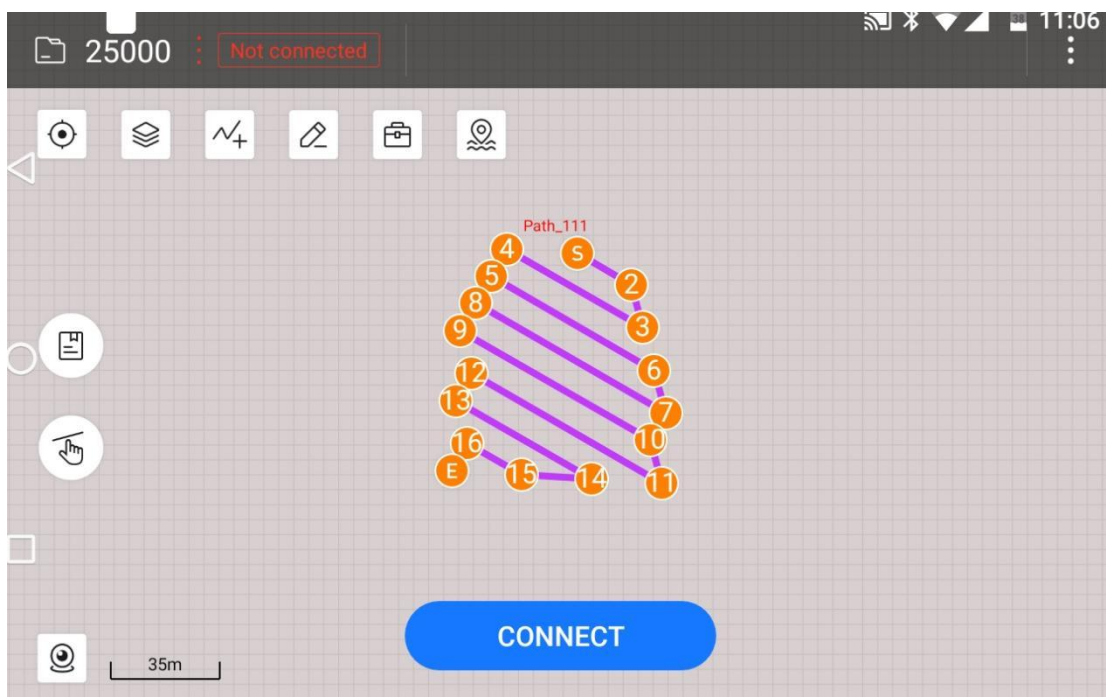


Figure 2-71 Regional Routes Result

2. The setting parameters for channel routes plan include channel width, measurement width, and measure interval.

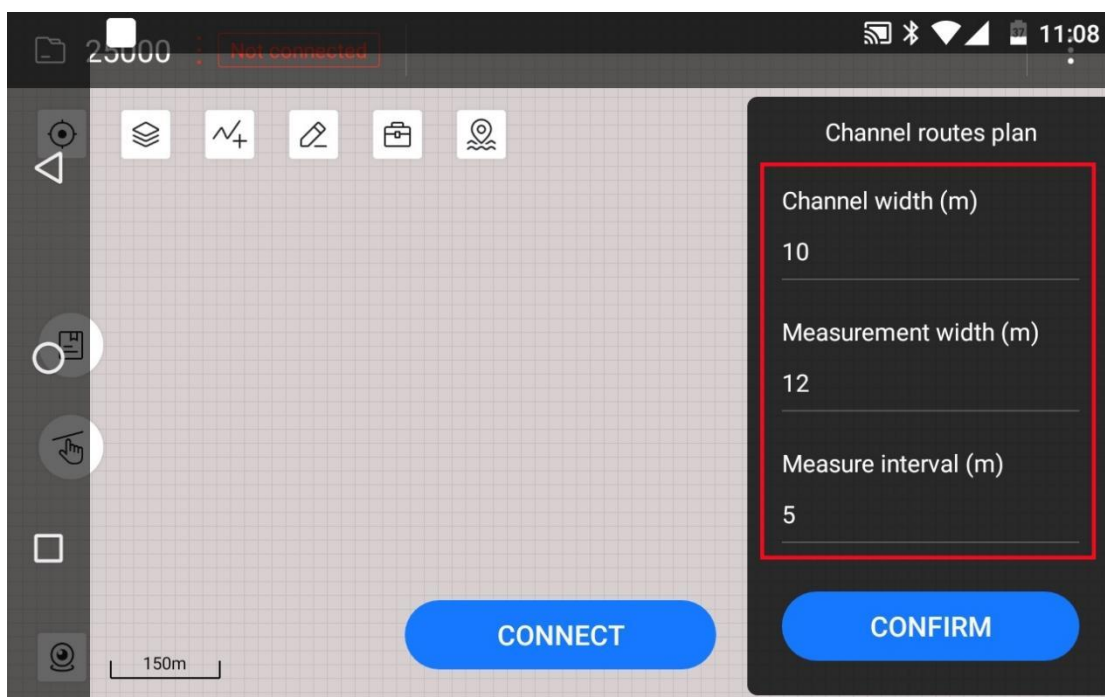


Figure 2-72 Channel Routes Plan Parameter Settings

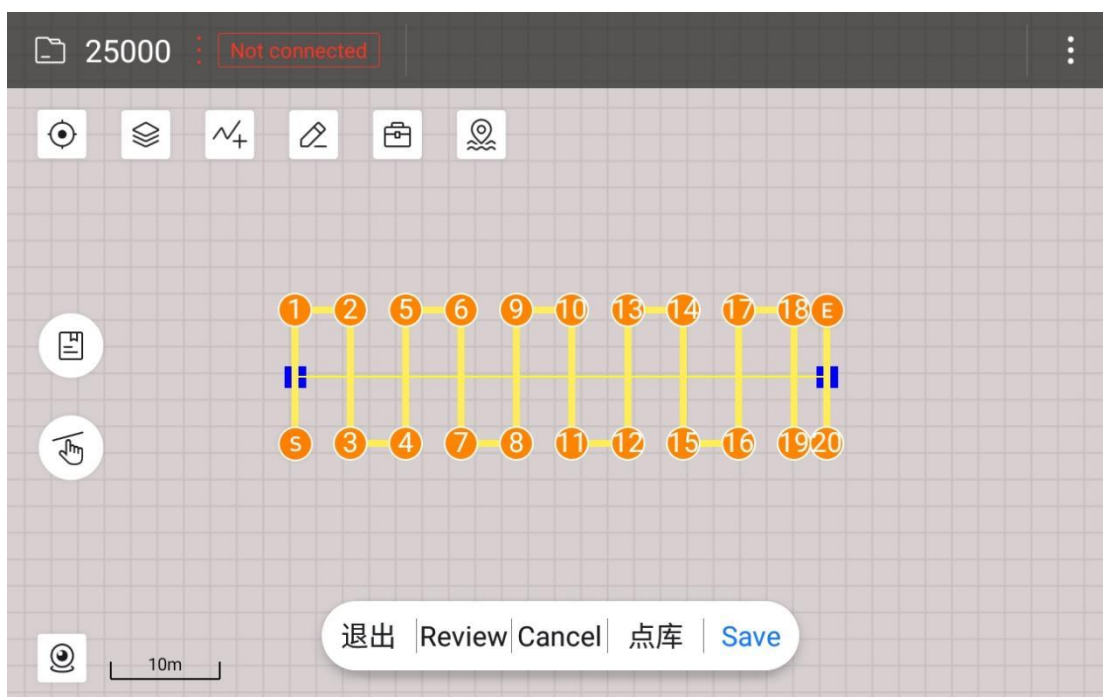


Figure 2-73 Channel Routes Plan Result

3. The setting parameters for parallel routes planning include left number, right number, and the line spacing.

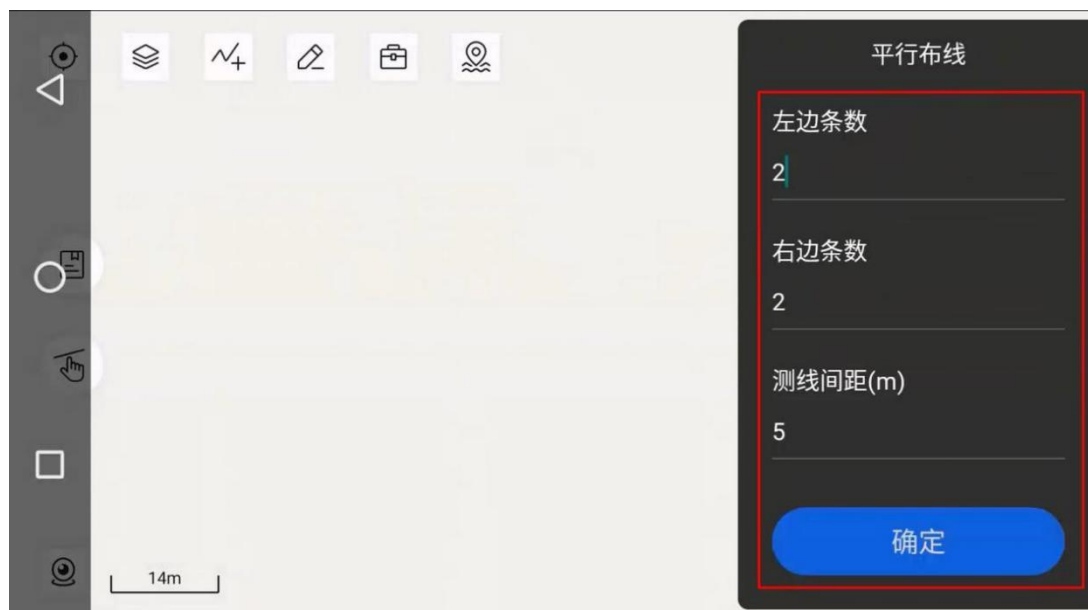


Figure 2-74 Parallel Routes Parameter Settings



Figure 2-75 Parallel Routes Result

4. Free routes planning is point selection and the route consists of the selected points.

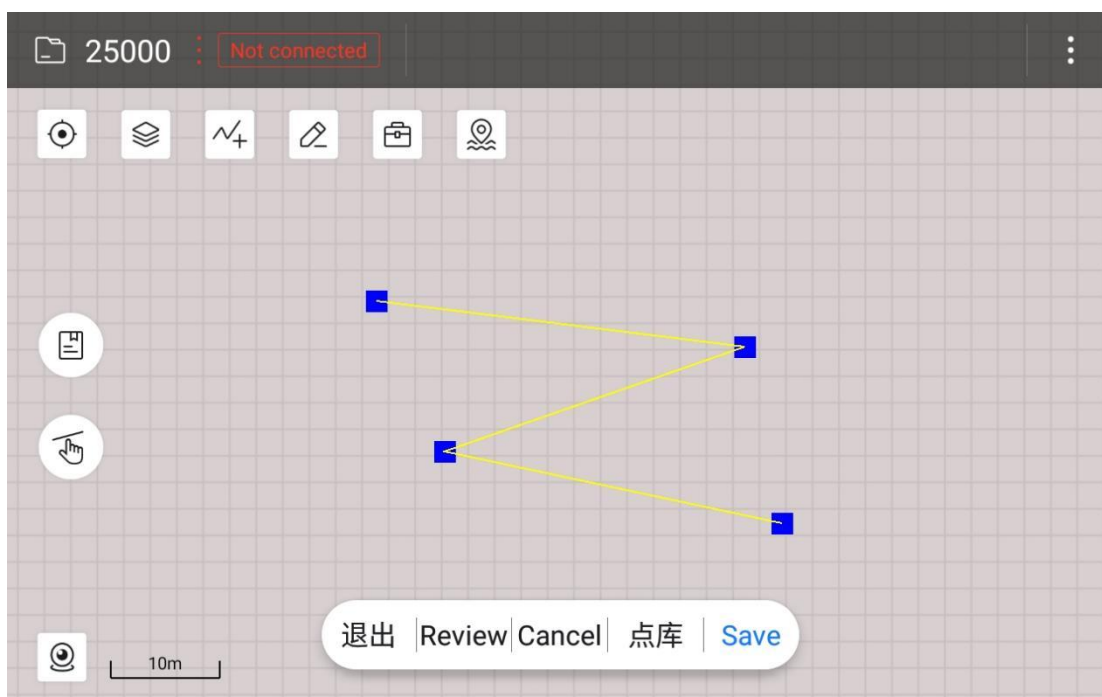


Figure 2-76 Free Routes Planning

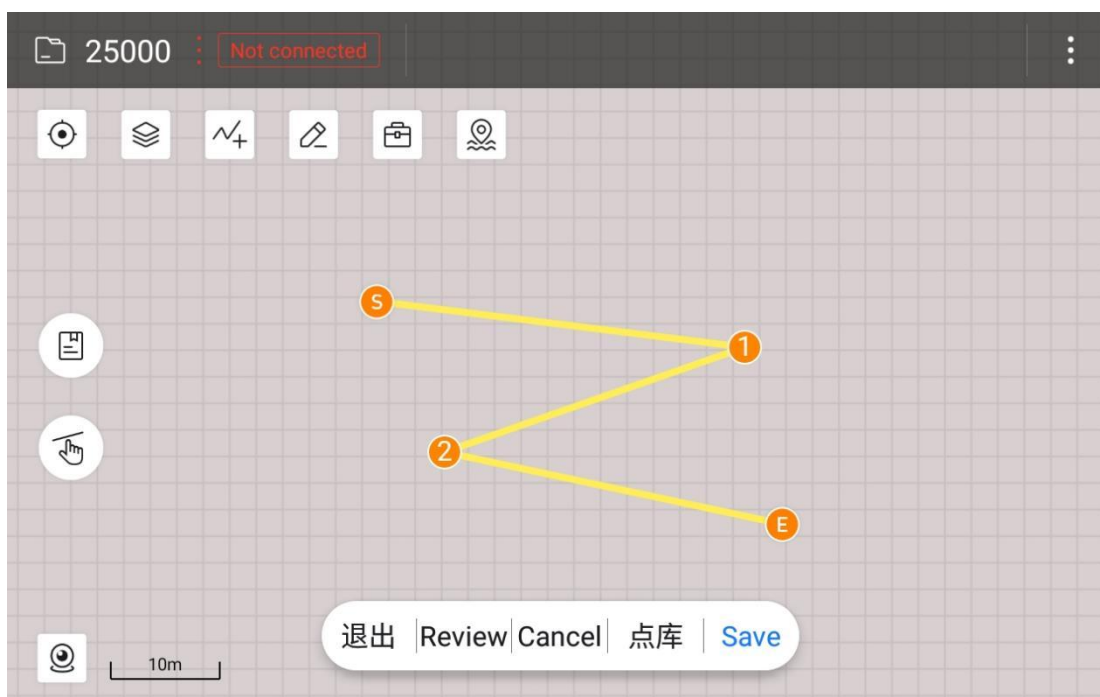


Figure 2-77 Free Routes Planning Result

5. Import route involves importing pre-designed flight paths. You can plan the routes in EchoSurvey and then import them into the remote control.

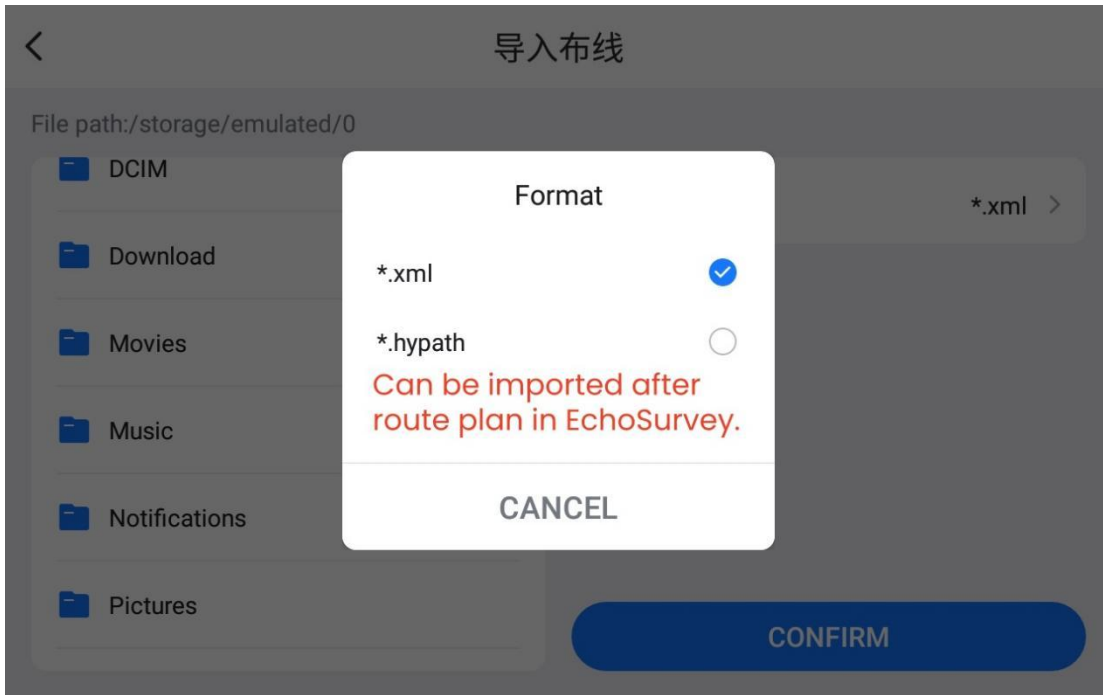


Figure 2-78 Import Route

Note: After importing DXF/DWG/KML files into the layers, you may receive the following prompt during routing. If you wish to use the imported file as the boundary for routing, select "Screen line selection" and then choose the imported route for planning. Imported files can serve as either boundary lines or basemaps. Files imported from "Import result" can be directly converted into routes, so be sure to make this distinction.

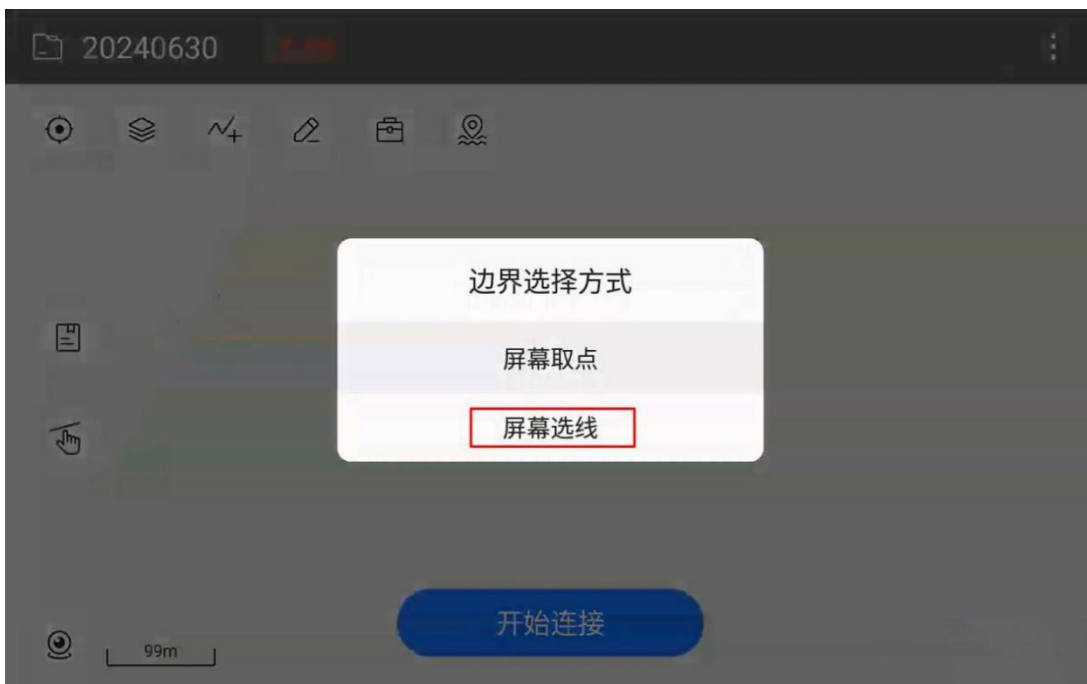


Figure 2-79 Route Plan Prompt for Imported Layers

2.3.3.4 Route Edit

Clicking the "Route edit" button on the main interface will pop up the route edit window. This feature is used to modify pre-planned routes. There are six edit options: Rotate line, Movement point, Delete point, Reversal line, Add points, Route edit.

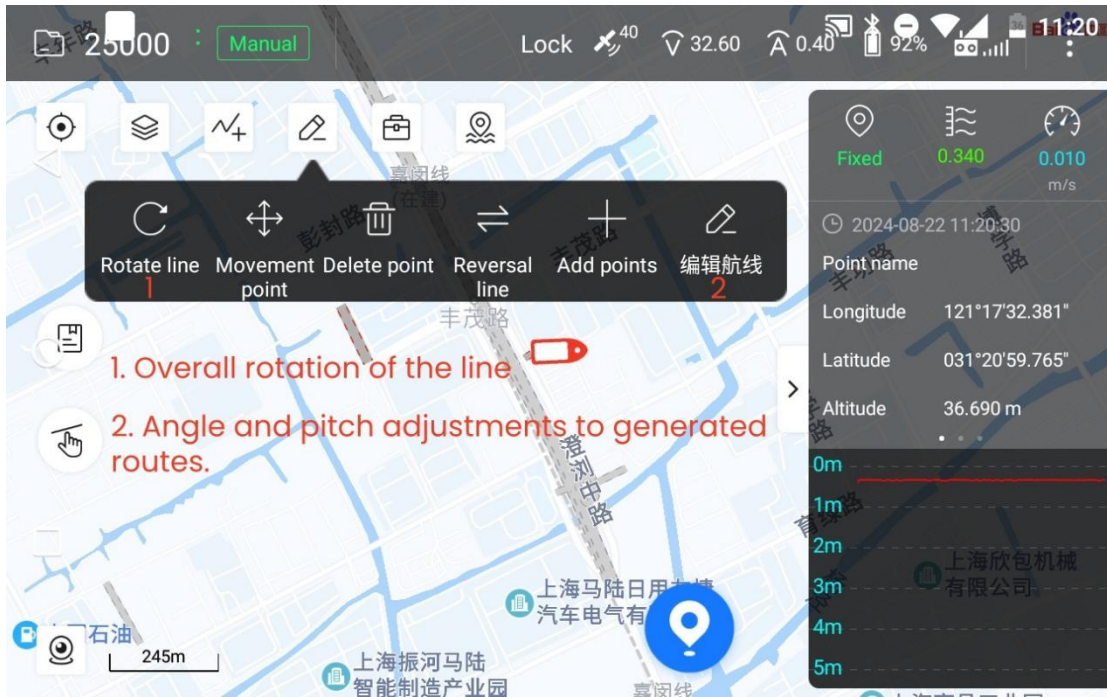


Figure 2-80 Route Edit

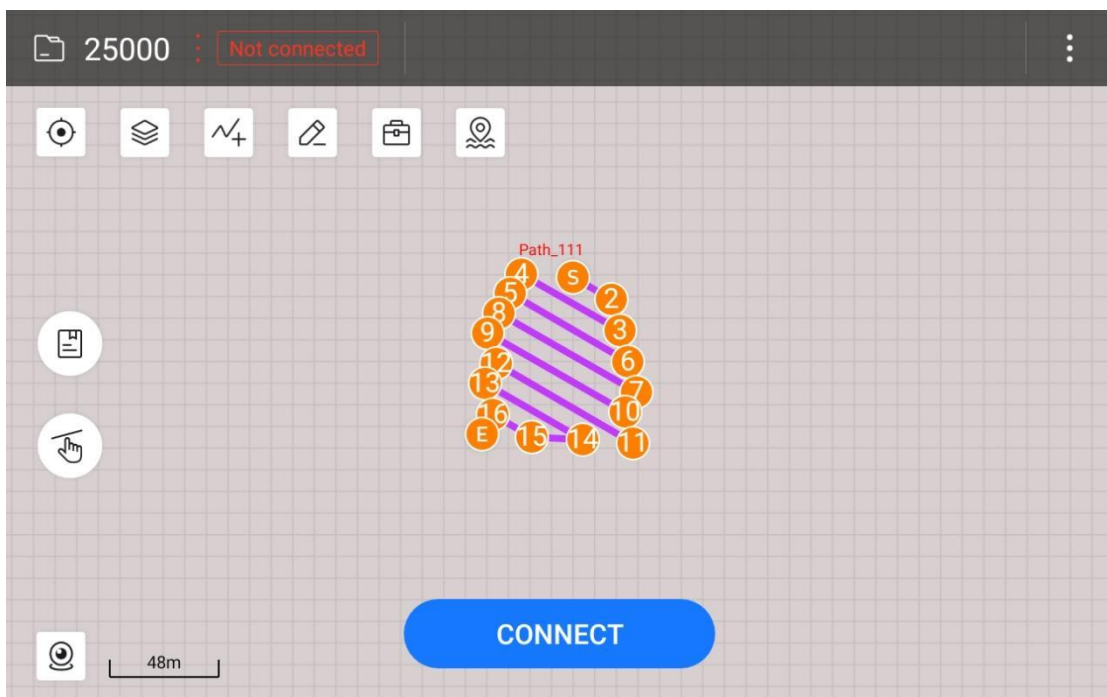


Figure 2-81 Original Route

1. Rotate Line

Rotate line is the rotation of a selected line. The line can be rotated clockwise or anti-clockwise. The center of rotation is the average of all points and is a rotation of the line, not a rotation of the previous range.

Steps:

- (1) Select the route to be rotated.
- (2) Click the “Rotate line” icon.
- (3) Press and hold the screen, move your finger up to rotate counterclockwise and down to rotate clockwise.

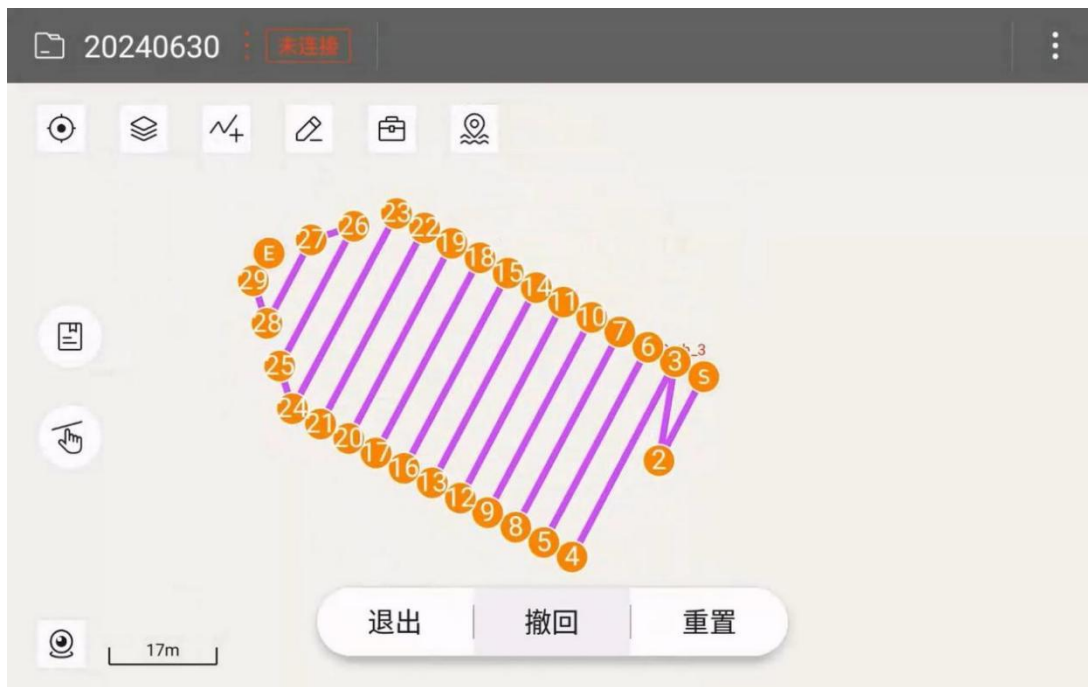


Figure 2-82 Rotate Line

2. Movement Point

Movement point is the movement of the survey point for the selected route.

Steps:

- (1) Select the route with the survey points you wish to move.
- (2) Click the "Movement point" icon.
- (3) Click the survey point you want to move; the point's circular frame will turn red.
- (4) Select the location on the screen to move to, and the point is successfully moved.
- (5) Move can be repeated, click on the exit to save.

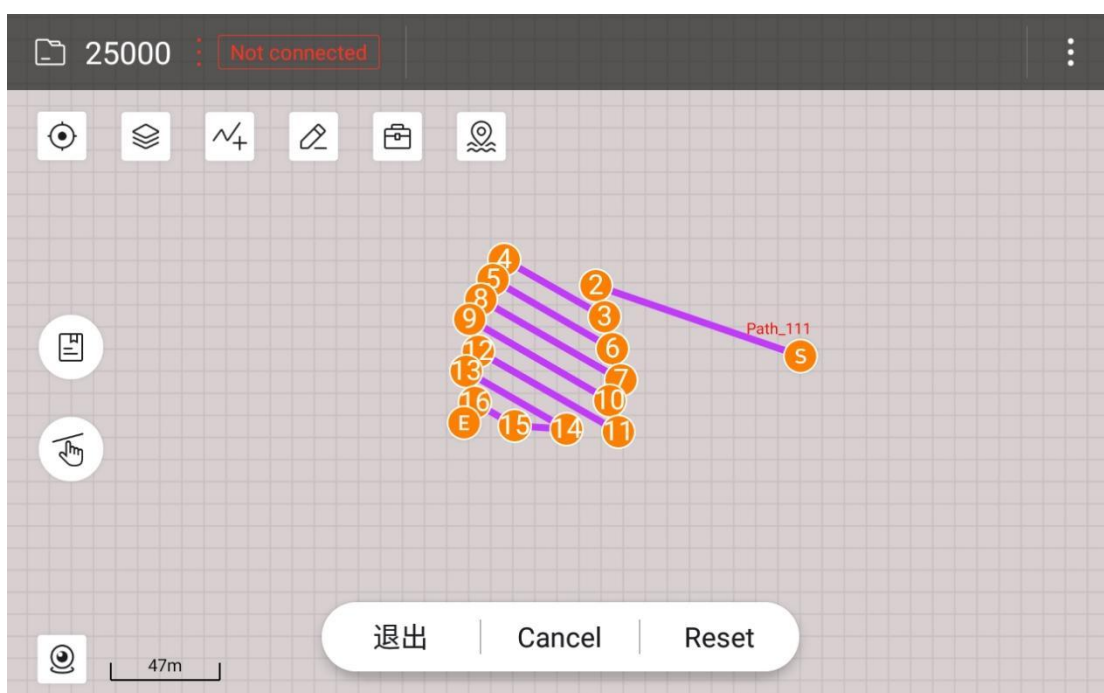


Figure 2-83 Point movement

3. Delete Point

Delete point is the deletion of a survey point from a route. After deletion, the corresponding route is redrawn.

Steps:

- (1) Select the route from which you want to delete survey points.
- (2) Click the “Delete point” icon.
- (3) Click the survey point you want to move, then the survey point box will turn red. A prompt box will pop up to confirm the deletion. Click “Confirm” to delete the survey point.

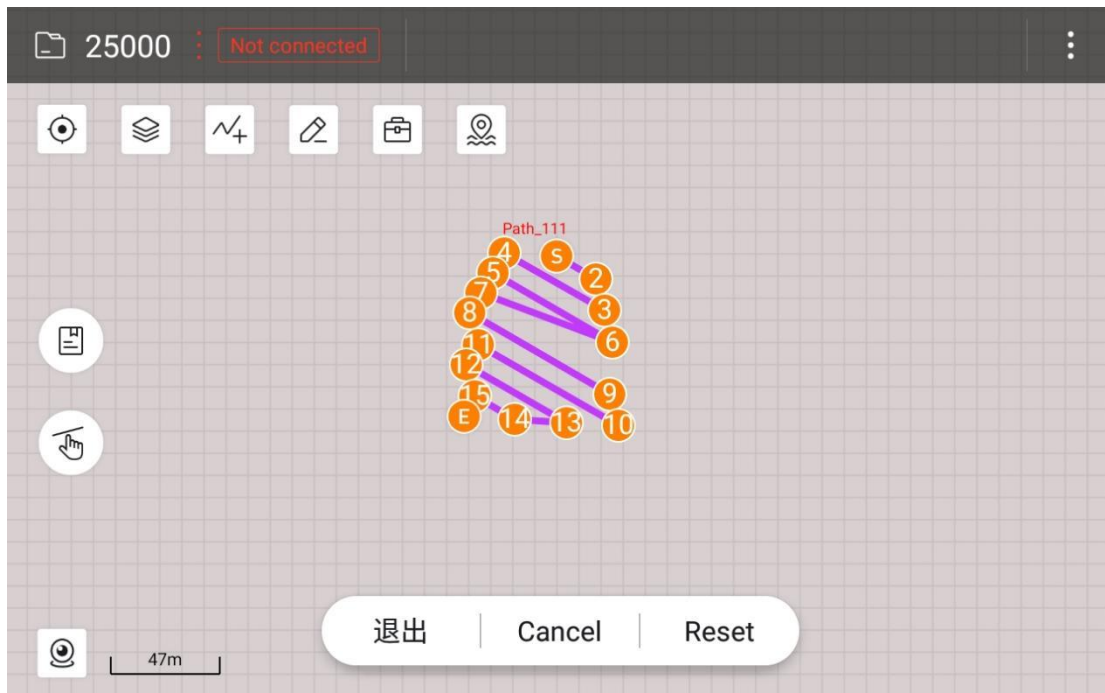


Figure 2-84 Delete Point

4. Reversal Line

Reversal line is the reversal of the sequence of all points of a selected course. For example, the start point becomes the end point.

Steps:

- (1) Select the route to be reversed.
- (2) Click the “Reversal line” icon.

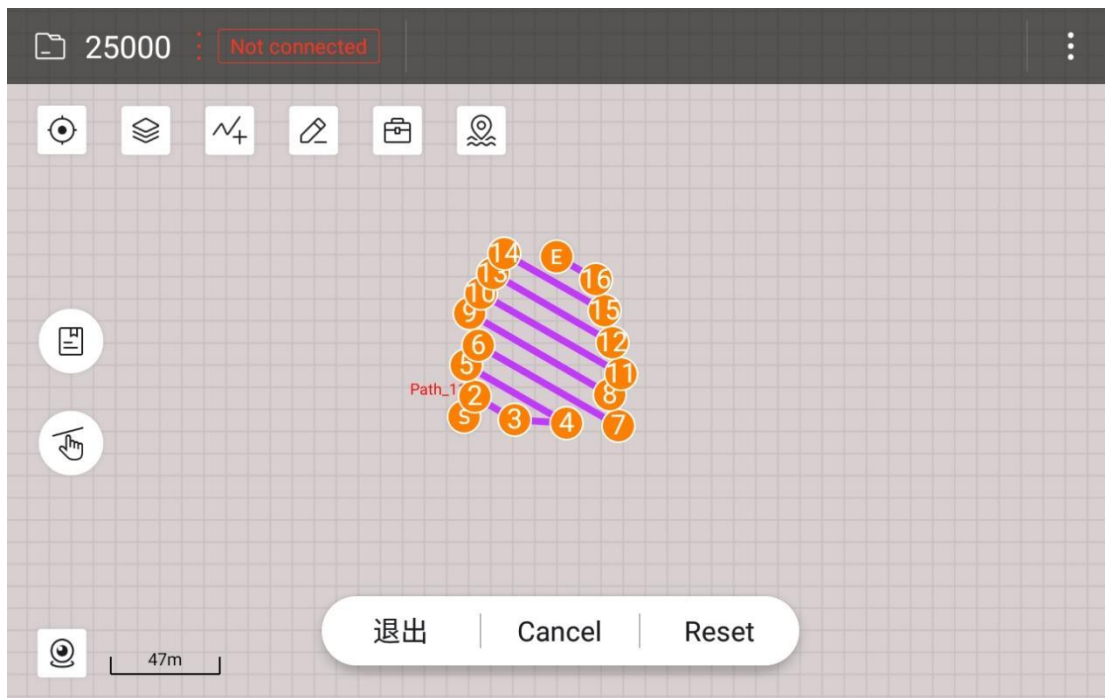


Figure 2-85 Reversal Line

5. Add Points

Add points is to insert points where they are needed for the selected route.

Steps:

- (1) Select the route where points need to be inserted (e.g., the route 3-4).
- (2) Click to exit.

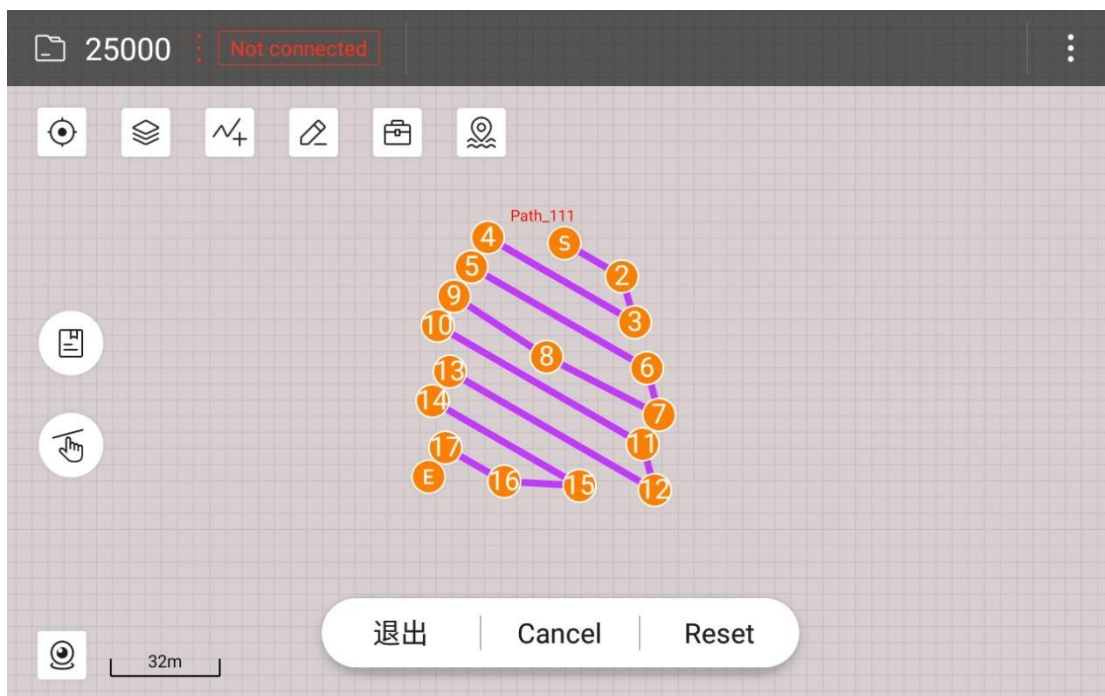


Figure 2-86 Add Points

6. Route Edit

Route edit allows you to modify the parameters of an already laid regional routes, channel routes plan, or parallel routes, such as angle, line spacing.

Steps:

- (1) Select the route to be edited.
- (2) Click the “Route edit”.
- (3) Input the corresponding parameters to change.

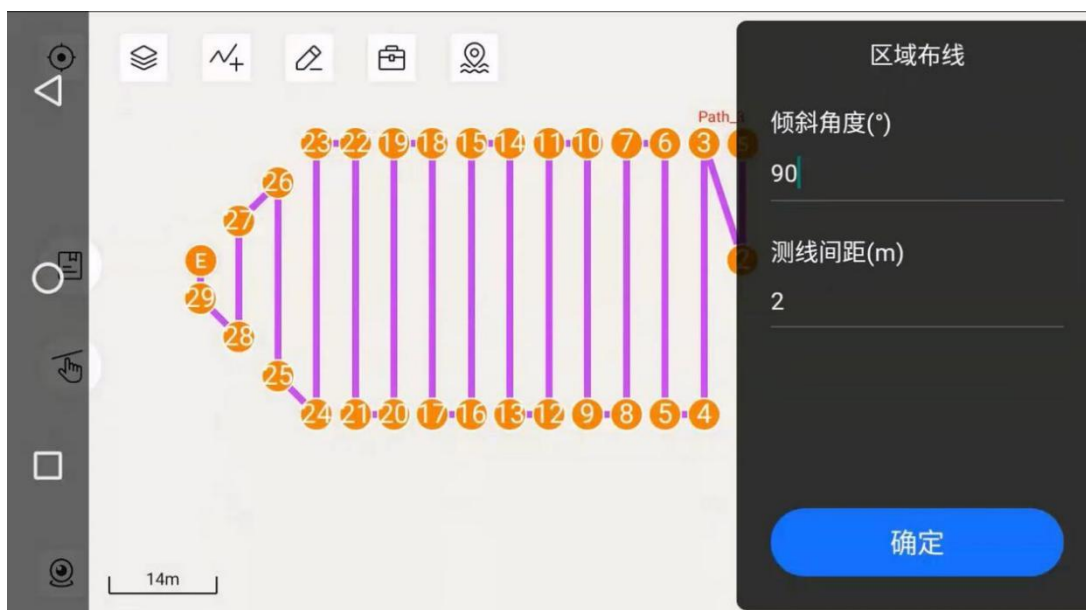


Figure 2-87 Route Edit

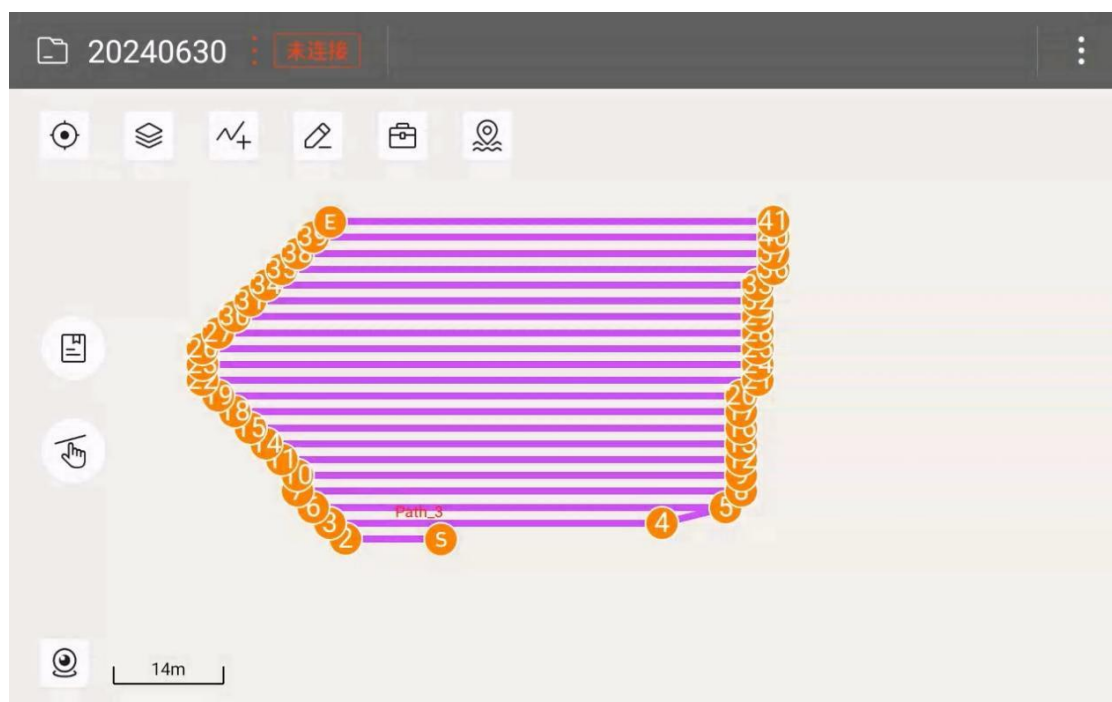


Figure 2-88 Route Edit

2.3.3.5 Toolbox

The Toolbox includes seven functions: Switch mode, Azimuth distance, Set the home point, Set the start point, Virtual boat control, One click return, and Map notice. Clicking the fifth icon in the toolbar will bring up seven functions. Switch mode and Virtual boat control can be used when the remote control joystick is faulty, please pay attention to safety when operating.

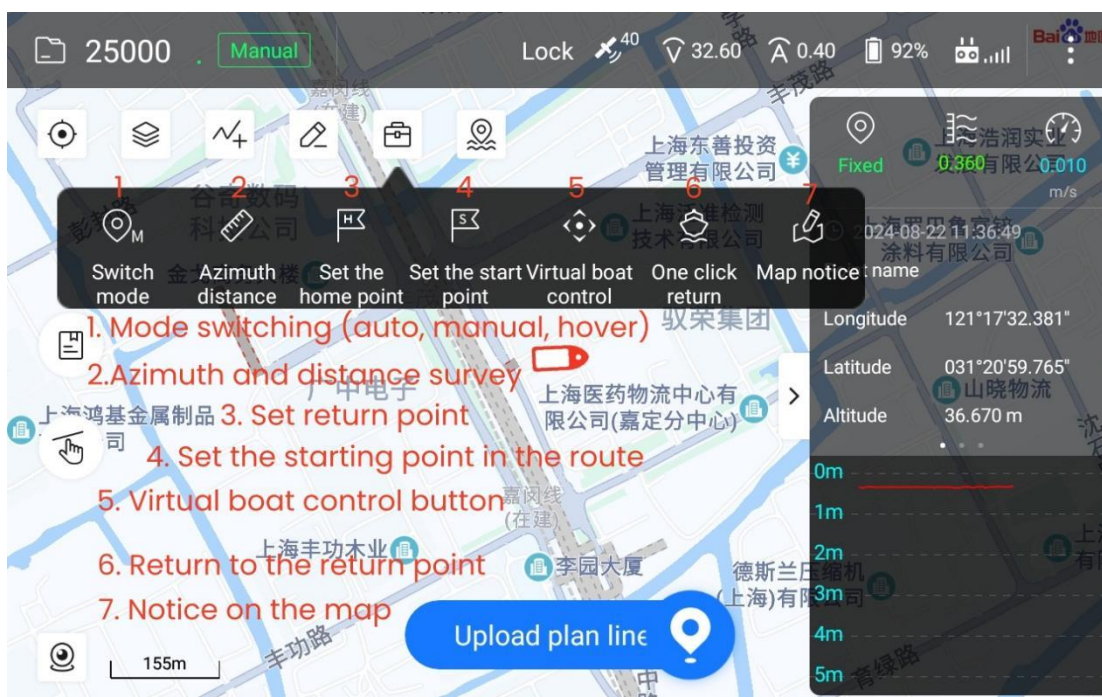


Figure 2-89 Toolbox

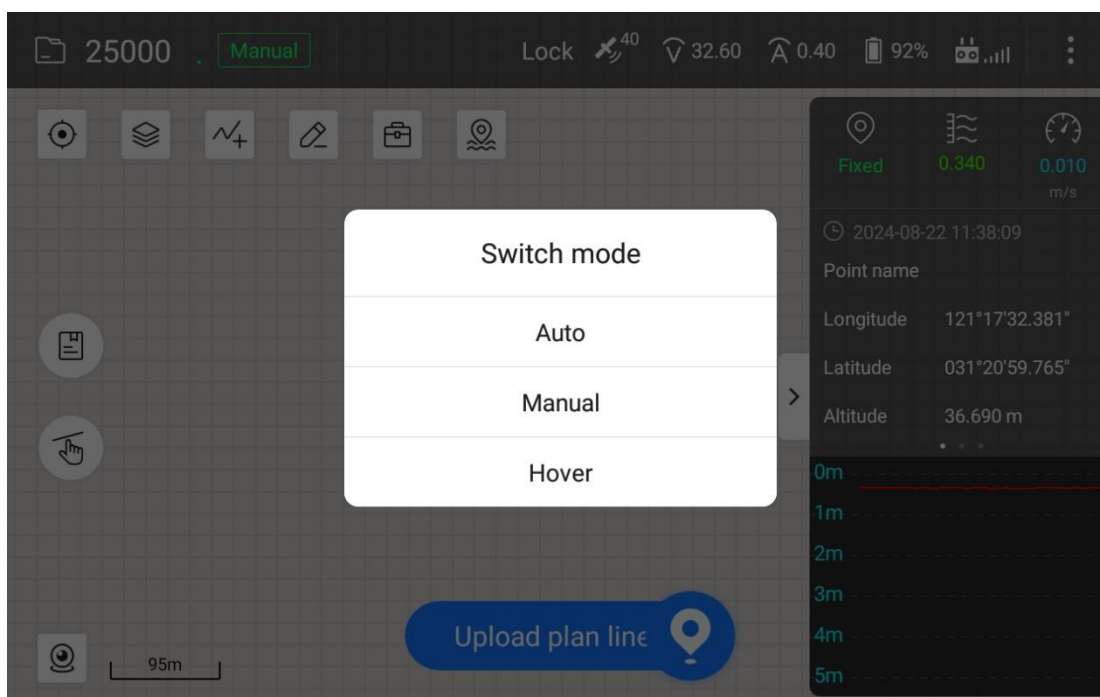


Figure 2-90 Switch Mode

The drawing should be ended when the azimuth distance is completed, and other functions can be operated only after exiting the mode.

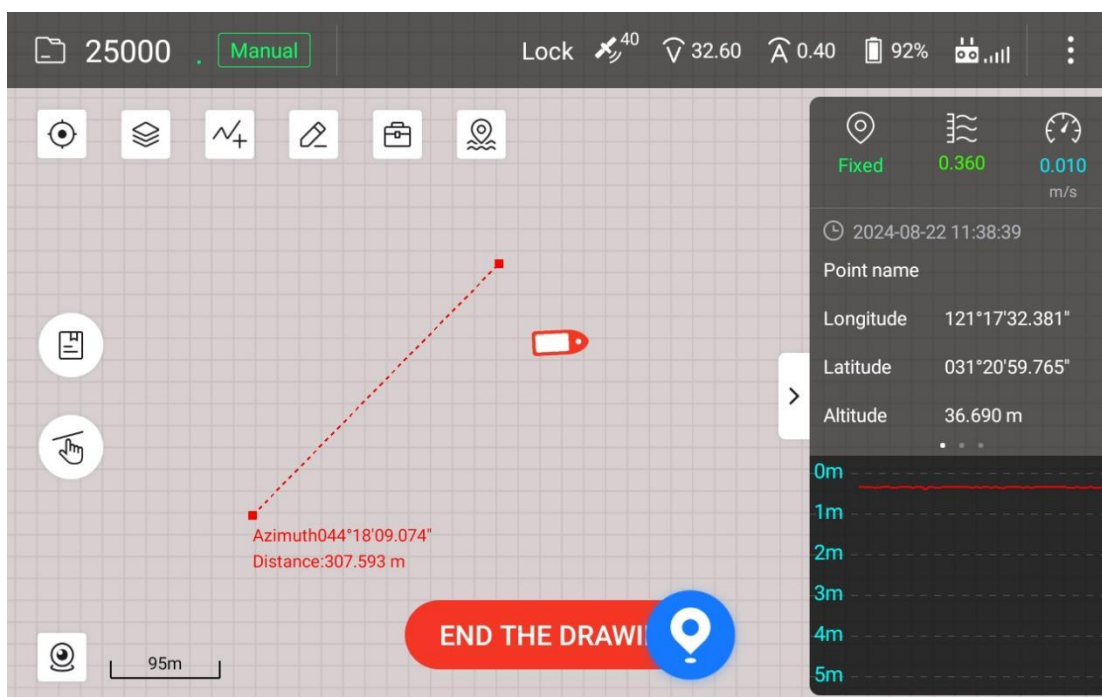


Figure 2-91 Azimuth Distance

When performing the one click return, the USV can return to the return point.

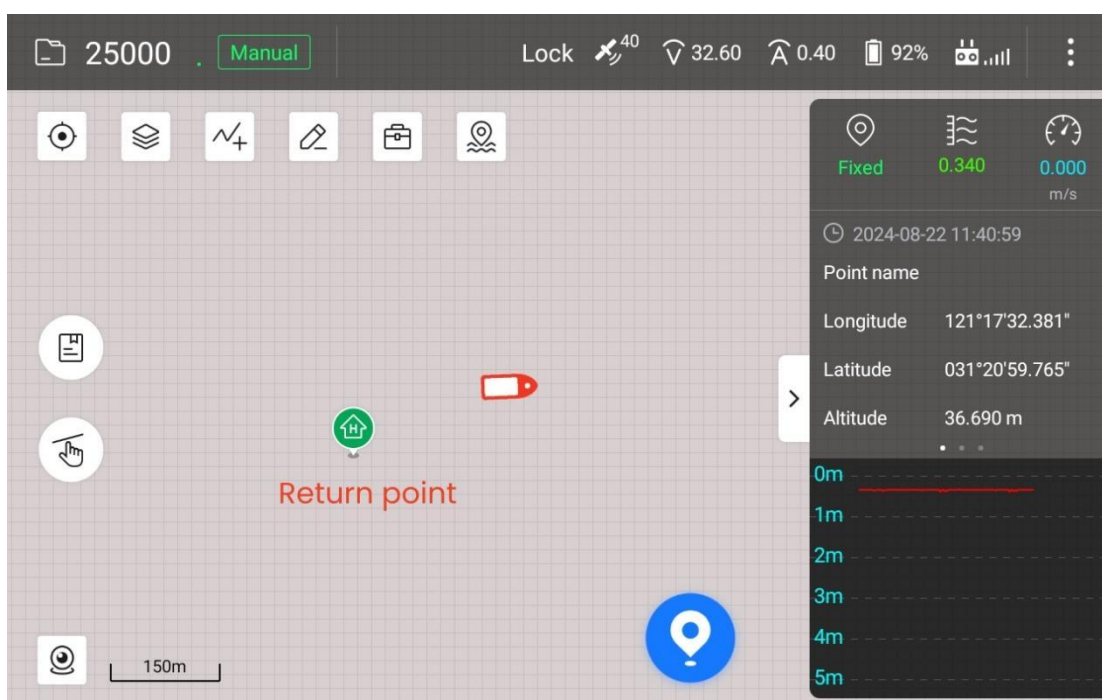


Figure 2-92 One Click Return Settings

After setting the starting point in the route and uploading it to the USV, the USV can start sailing from that point in the route.

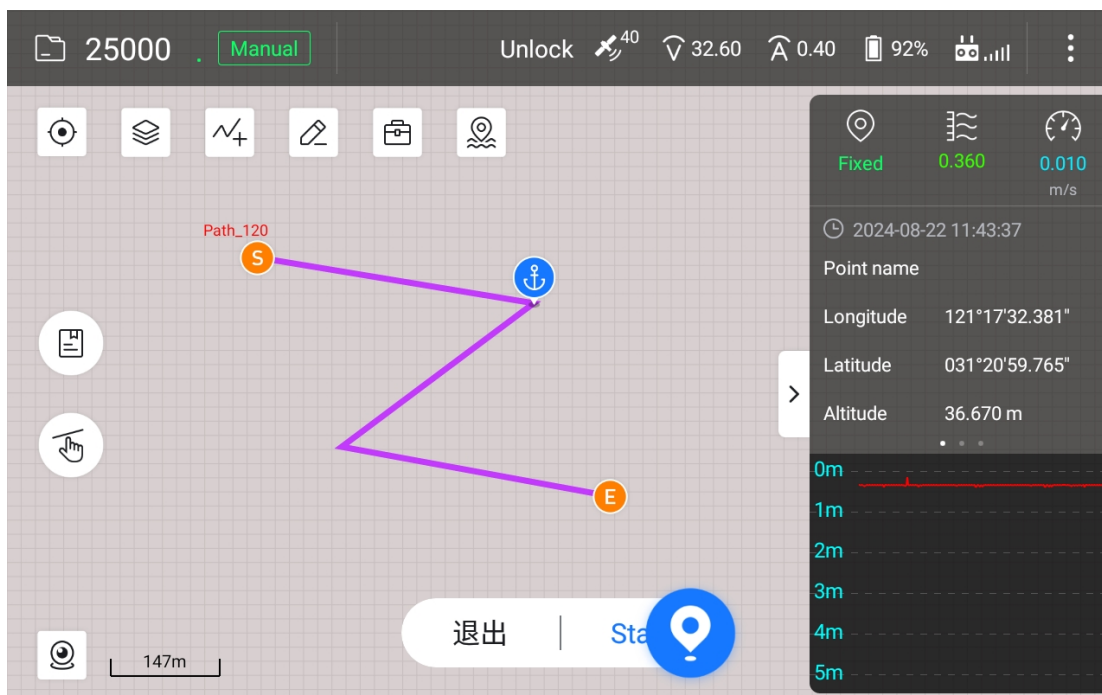


Figure 2-93 Starting Point Settings

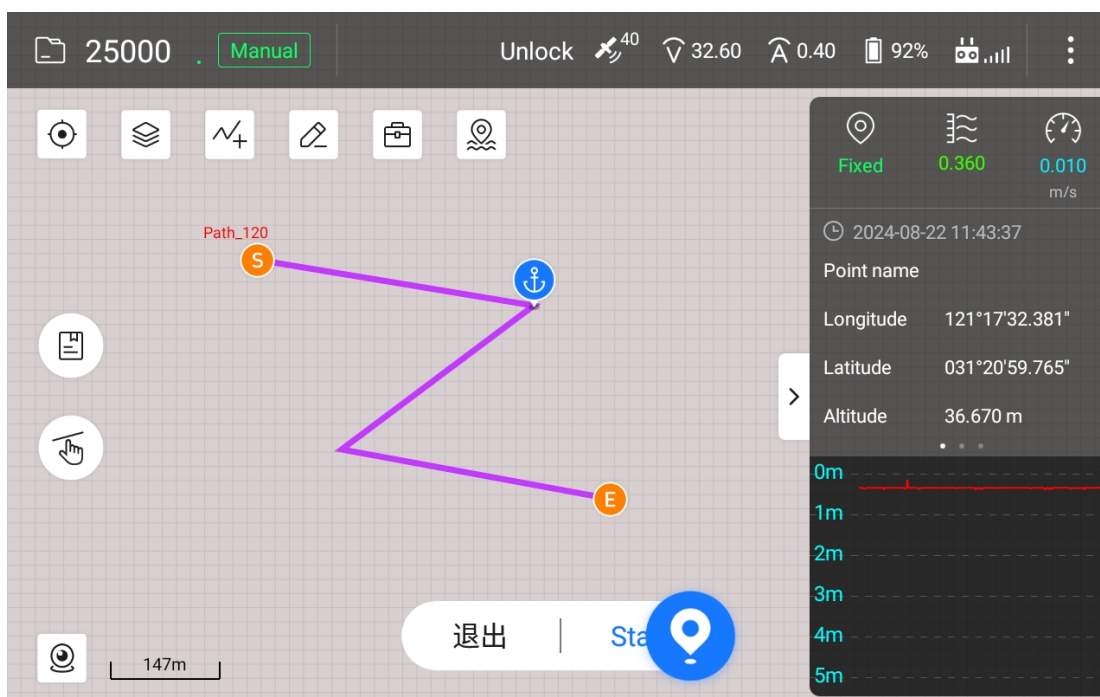


Figure 2-94 Starting Point Settings

In virtual boat control mode, clicking the direction buttons allows the USV to navigate in the selected direction. Press the center button to exit this mode. Please ensure safe while controlling it.

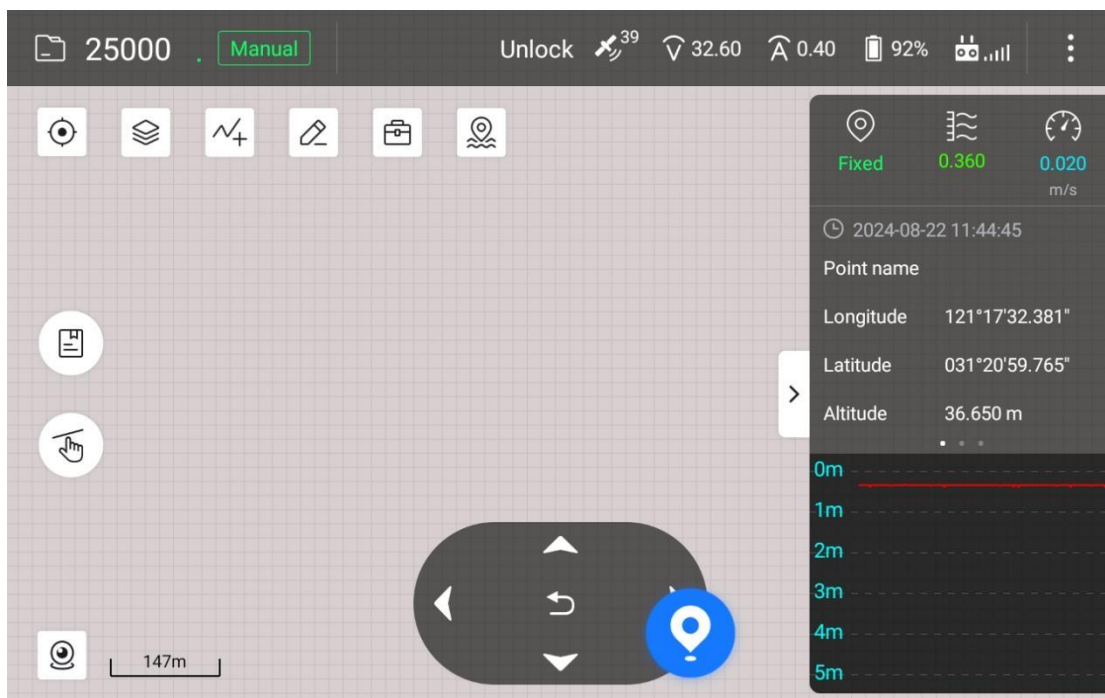


Figure 2-95 Virtual Boat Control

Map notice can be edited and deleted.



Figure 2-96 Map Notice



Figure 2-97 Delete Map Notice

2.3.3.6 Record

To start recording data, be sure to press the record button.



Figure 2-98 Survey Record

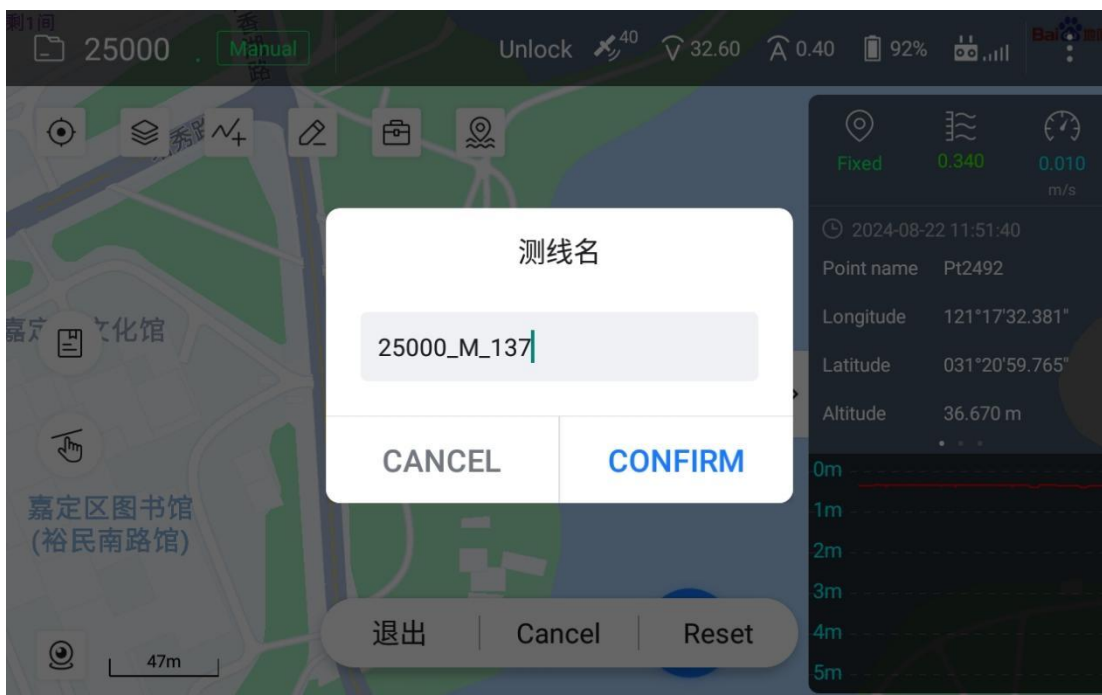


Figure 2-99 Survey Record

2.3.4 Sail Route List and Survey Line List

The functions of “sail route list and survey line list” include viewing historical route plan, toggling route visibility, selecting and deleting routes, as well as viewing and closing survey lines. Click the “sail route list and survey line list” icon on the main interface to display the sail route list and survey line list interface on the left side of the screen.

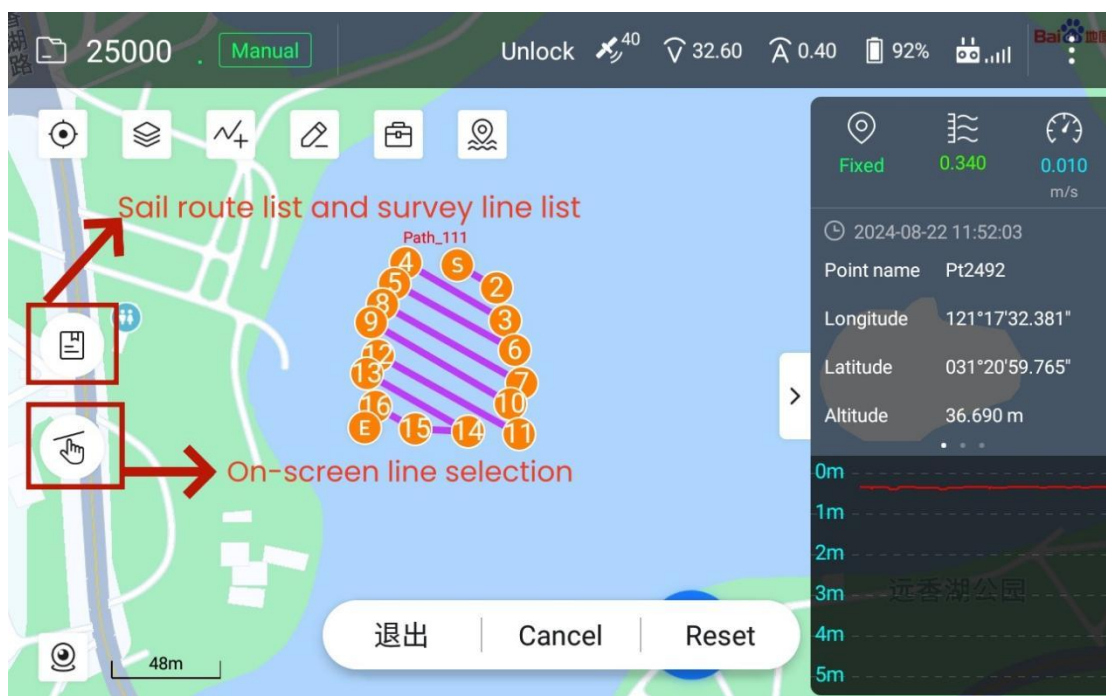


Figure 2-100 Sail Route List/Survey Line List and On-Screen Line Selection

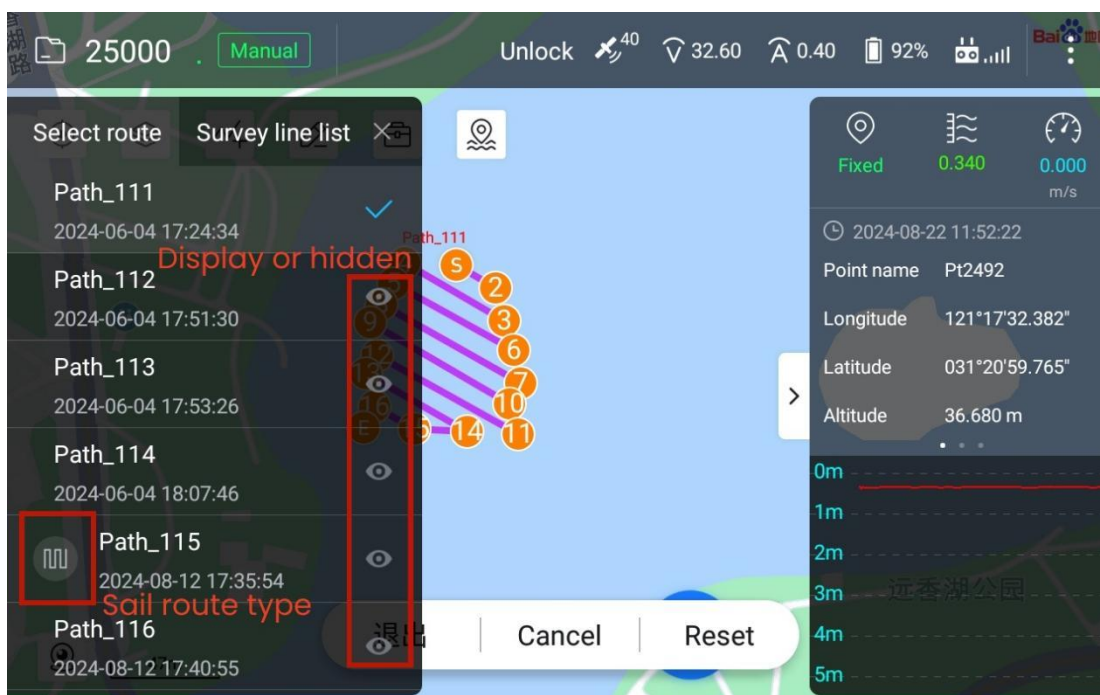


Figure 2-101 Sail Route List

Current sail route: The current sail route can be selected via the sail route list or the screen selection. A checkmark icon on the right side of the current sail route indicates that it is set to visible. The selected sail route is displayed in purple, while visible routes are shown in yellow.

Delete sail route: To delete a sail route, swipe right on the route you wish to remove to reveal the delete control. Clicking "Delete" will prompt a confirmation dialog to confirm. Once confirmed, the route will be successfully deleted. Note that the currently selected route cannot be deleted.

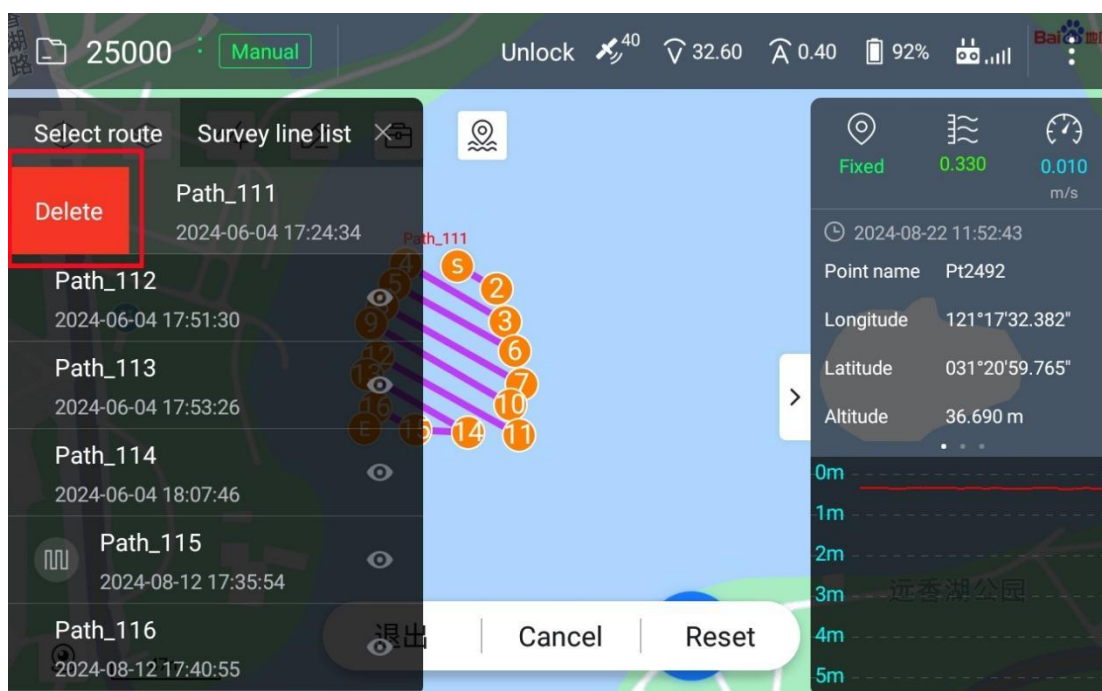


Figure 2-102 Delete Sail Route

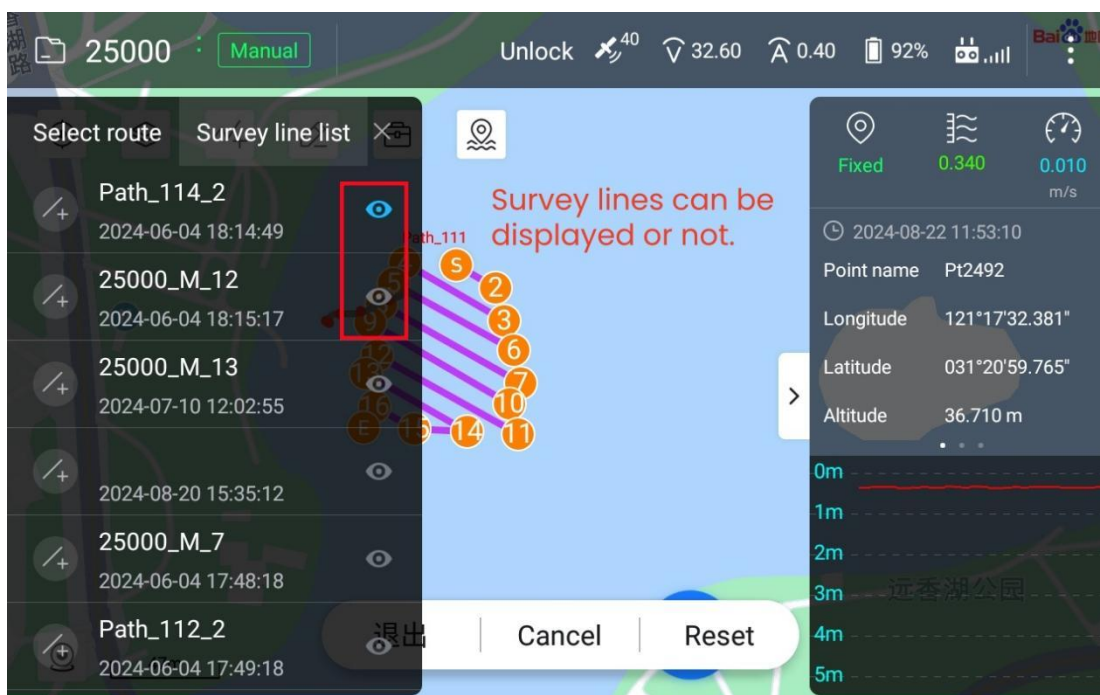


Figure 2-103 Survey Line List

2.3.5 Camera and Scale

Real-time image from the camera can be viewed. Click the “camera” icon at the bottom left of the main interface to enter the real-time image, and can capture pictures and save videos. The direction of the camera can be controlled by the arrow keys in the camera interface, pay attention to the restricted angle of steering. Scale changes can be seen when zooming in and out of the basemap. Cache the basemap by zooming the scale.

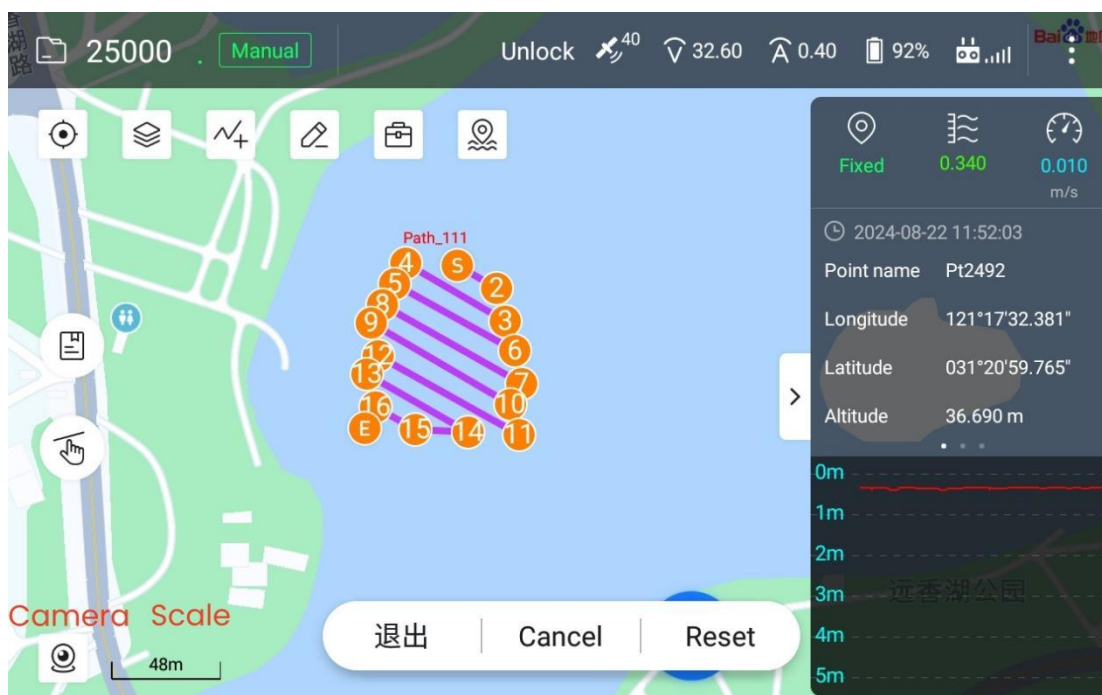


Figure 2-104 Camera and Scale



Figure 2-105 Camera and Scale

2.3.6 Survey Information

After selecting the sail route, click on “Start survey” to enter the formal survey process. The USV will automatically navigate to the route, navigate according to the sequence of points, and take measurements and markings, etc. At this time, a progress bar will appear at the top of the main interface, displaying the distance sailed so far and the total mileage of the route.

Stop: Temporarily halts automatic survey and switches to hover mode. The button will change to "Start".

Start: Resumes survey from where it was paused.

Exit: Exits the survey process. A confirmation window will appear; clicking "Confirm" will terminate the entire survey process.



Figure 2-106 Survey Information

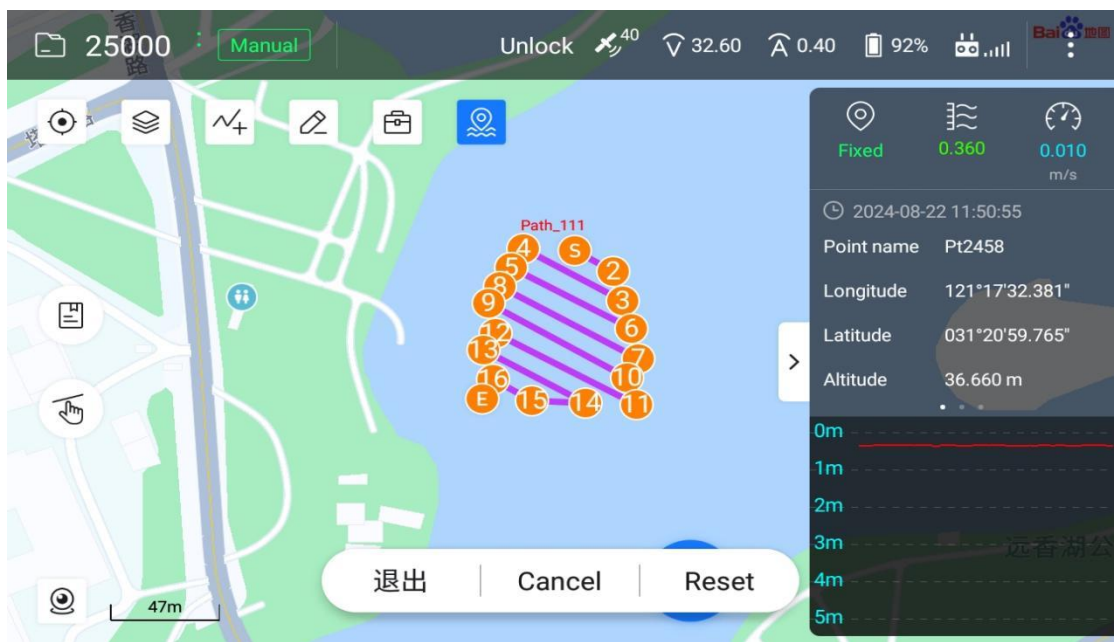


Figure 2-107 Survey Process

3 EchoSurvey Post-Processing Software

3.1 Software Registration

For trial use you can click on help - Trial Registration. For permanent use you need to use a dongle.

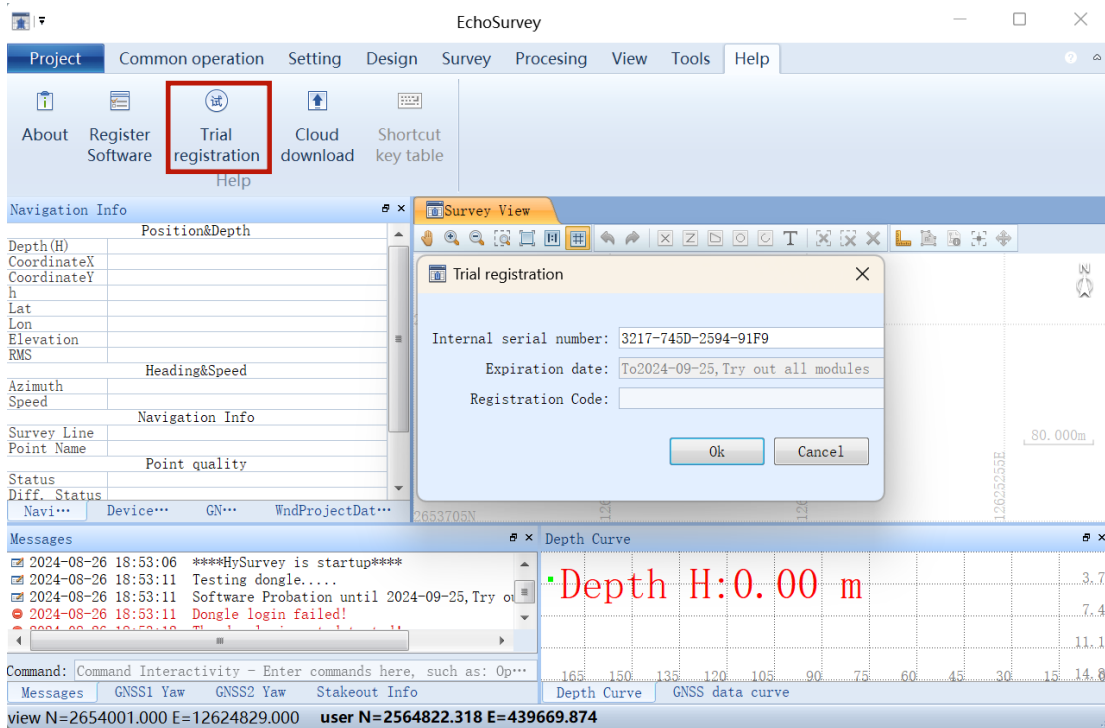


Figure 3-1 Software Registration

If using the white dongle, select V4.0 for the dongle driver; if using the blue dongle, select V5.0 for the dongle driver.

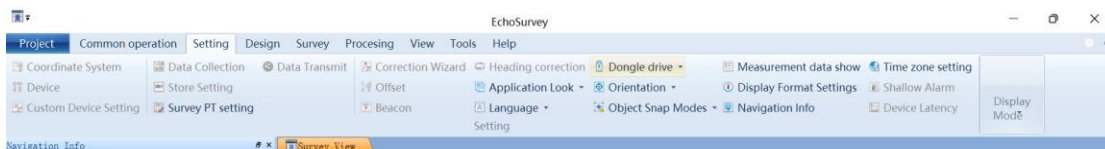


Figure 3-2 Software Registration

3.2 Data Import

Click "New Project", check "apply parameters from other project files," select the *.UZF or *.TXT format, and select the file exported from the remote control for post-processing.

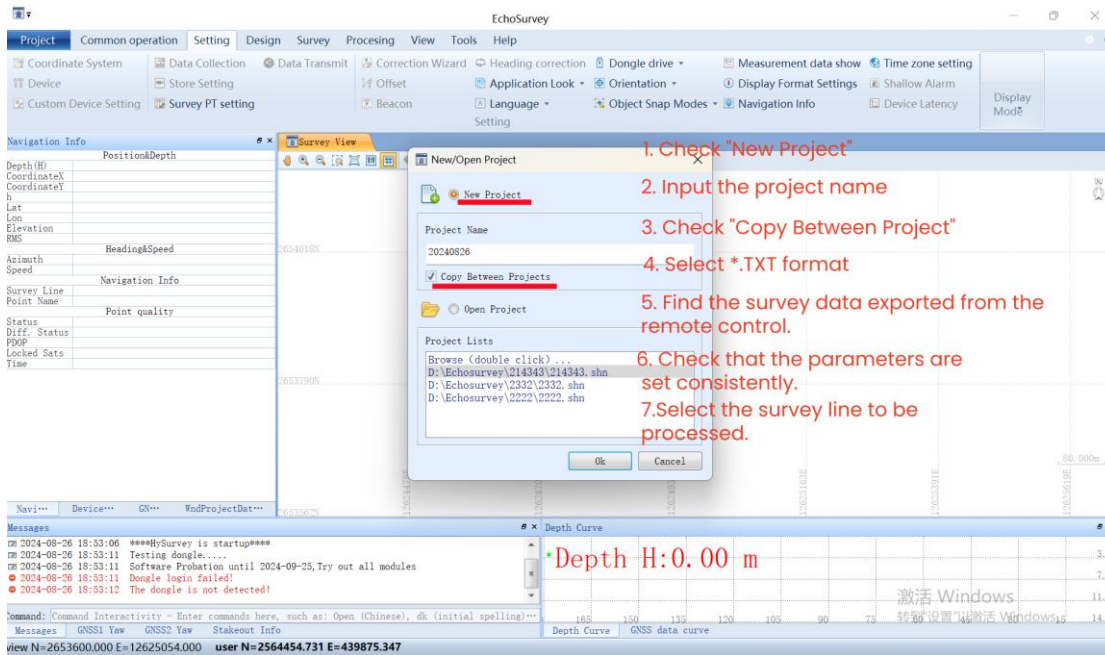


Figure 3-3 New Project

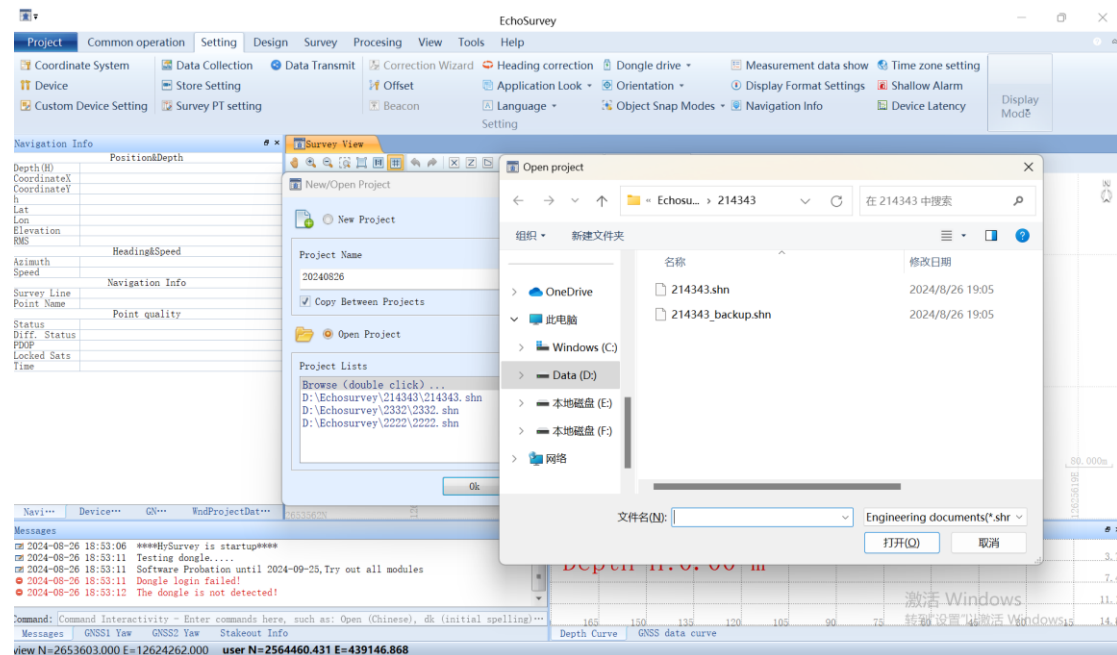


Figure 3-4 Data Import

Ensure that the project file parameters are consistent. If there are errors in the coordinate parameters during survey, you can enter the correct coordinate parameters here and make corrections subsequently. After verifying that all information is correct, click "Finish" to proceed to the next step.

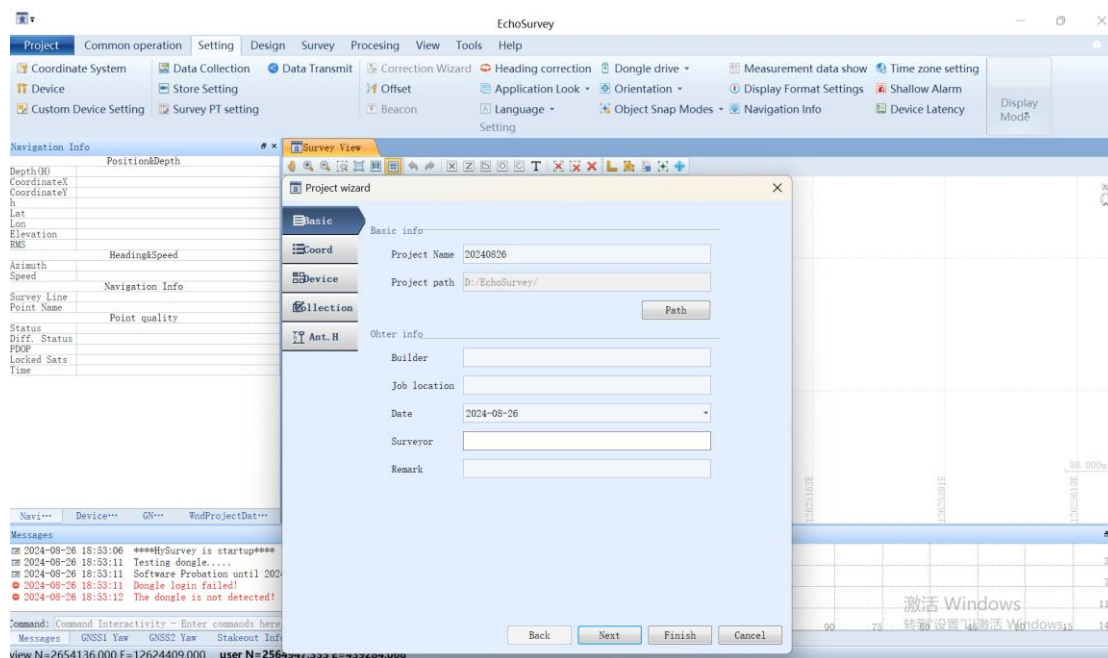


Figure 3-5 Parameter View

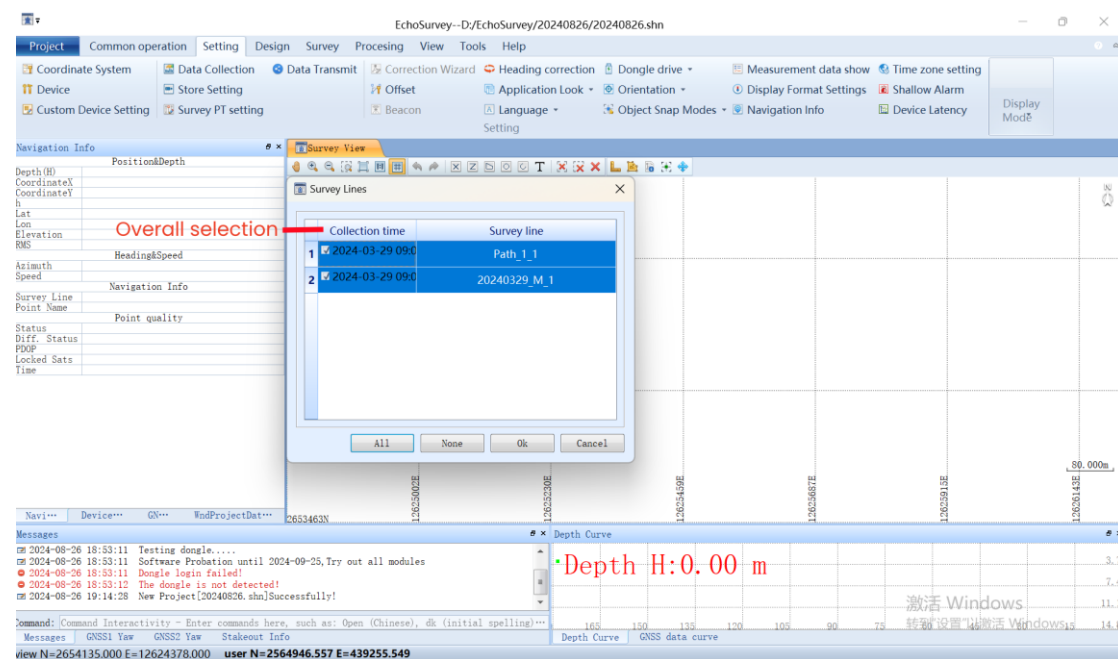


Figure 3-6 Line Survey

3.3 Post-processing

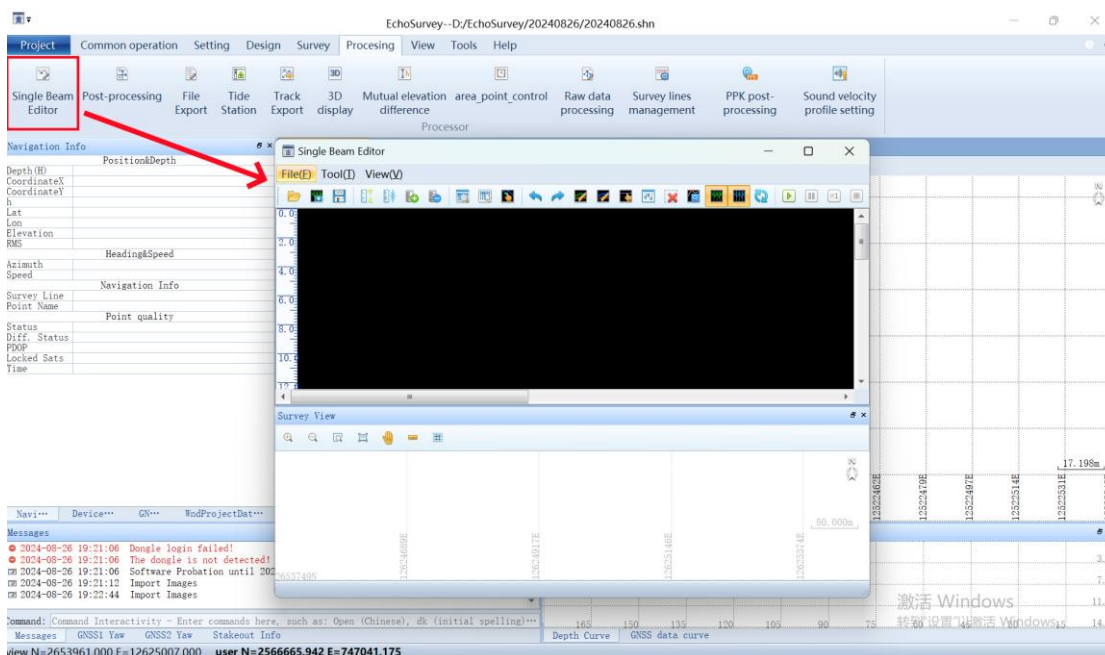


Figure 3-7 Bathymetric Survey and Sampling

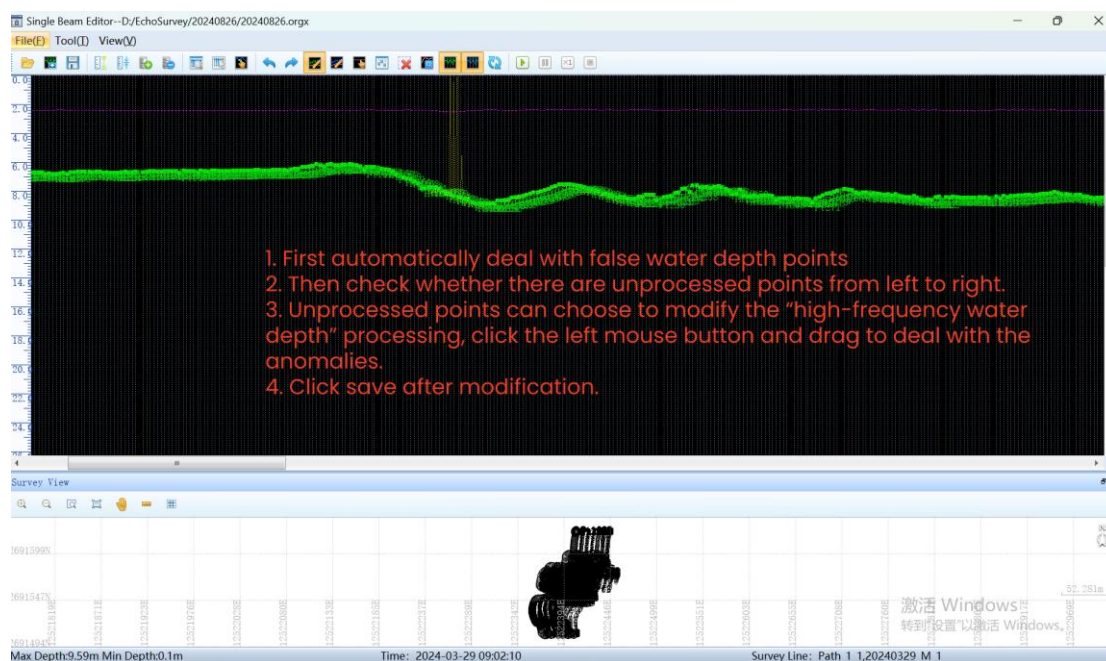


Figure 3-8 Bathymetric Survey and Sampling



Figure 3-9 Bathymetric Survey and Sampling

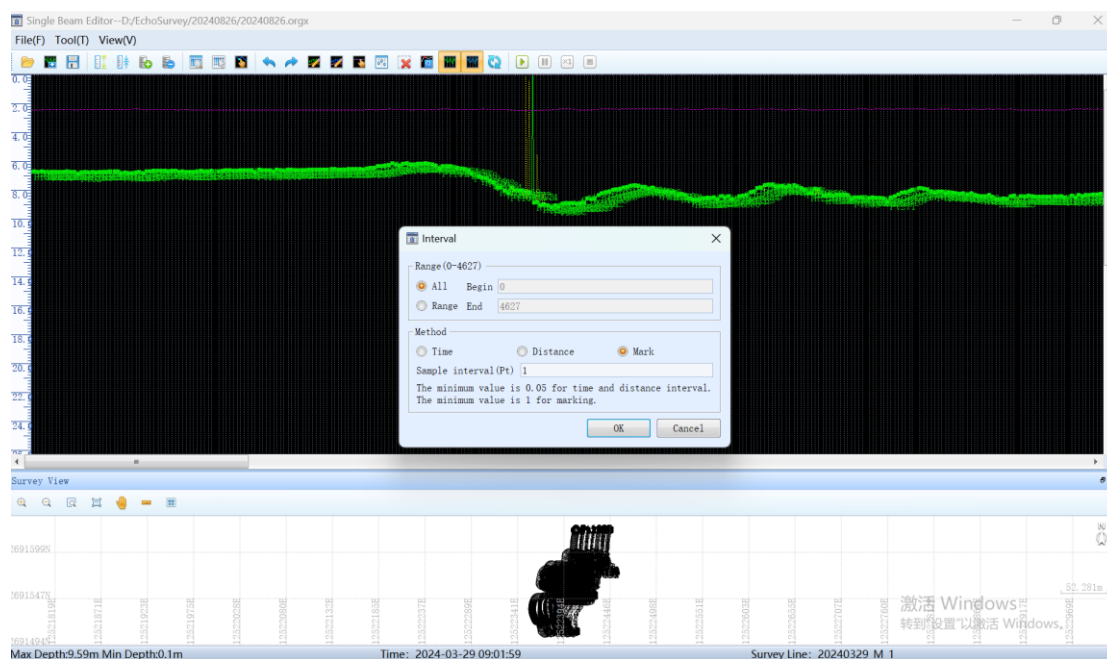


Figure 3-10 Bathymetric Survey and Sampling

If there is an issue with the coordinate parameters during survey, you can correct them by going to "Project" -> "Edit Project" and entering the correct coordinate parameters. Afterward, navigate to "Post-Processing" -> "Coordinate Data Post-Processing," select "Use the current project's parameters," choose all survey lines, and click "Confirm" to process. If the coordinate parameters are correct, this step is not necessary.

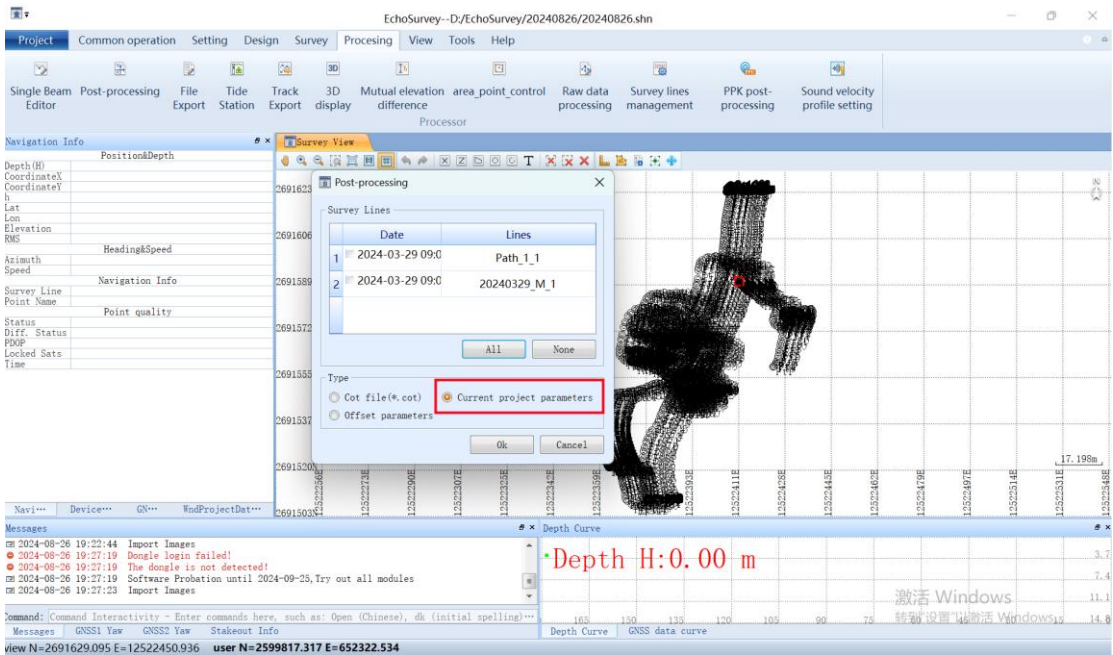


Figure 3-11 Coordinate Data Post-processing

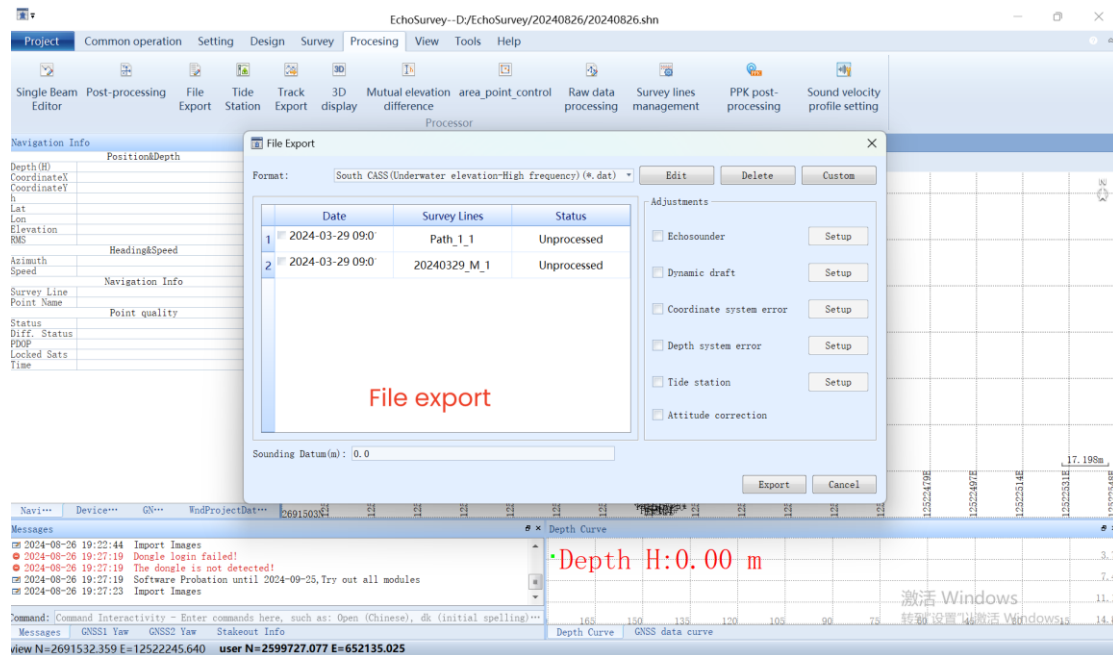


Figure 3-12 File Export

4 How USV Work

The basic principle of underwater topography surveying is to calculate the water depth by measuring the reflection time of sound waves. Currently, the single-beam echo sounder is widely used in China. A single-beam echo sounder emits only one beam of sound waves at a time, providing a single depth data point. By continuously surveying and recording these points, a line of connected data points is eventually formed. When using a single-beam echo sounder to survey the underwater topography of an area, it is necessary to pre-determine the spacing between points and lines based on the mapping scale and survey specifications. Then, the USV conducts continuous survey point by point, line by line. The collected data is processed to create a bathymetric map. This bathymetric map can then be used to draw contour maps or cross-sectional profiles of the underwater topography.

By integrating the echo sounder with GPS technology, and utilizing survey navigation software, data processing software, and marine mapping software, an automated bathymetric survey and mapping system can be established. This allows for the automation of external bathymetric survey, water navigation, and data collection, significantly improving the efficiency and cost-effectiveness of bathymetric survey. Users can leverage this powerful system to achieve high-efficiency and high-precision underwater topography surveying, meeting the technical requirements for dredging engineering surveys and underwater topography mapping.

The echo sounder works by using ultrasonic waves, which penetrate different media and reflect off their surfaces. The ultrasonic transducer (probe) emits the waves, and the time difference between the emitted and reflected waves is used to calculate the depth.

The speed of sound wave propagation in water is denoted as V . The transducer (probe) emits ultrasonic waves that travel to the seabed and reflect back to the probe. The time taken for the round trip is measured as t , and the depth Z is calculated using the formula: $Z = Vt / 2$. Additionally, the distance between the water surface and the bottom of the probe (the draft depth) is measured. The final water depth is the sum of these two measurements, as illustrated in the diagram below:

5 Cautions for the Use and Care of USV

5.1 Hull

1. Handle with care. Avoid dragging or bumping the hull, and protect the bottom of the sounder transducer.
2. Before using the USV, the working environment of the USV should be clarified. Install or deploy the USV under a technician's guidance and verify its functionality before operation.
3. Do not run the hull propeller or on-board instruments without load for extended periods.
4. Do not prolonged high-speed or backward driving. It is recommended to drive at economical speeds.
5. After working in seawater or mineral-rich areas, rinse the propeller and hull with fresh water.
6. Keep the cabin dry. Do not work with water in the cabin. After using the USV, it is necessary to check whether there is any collision on the hull, whether there is any debris in the propellers, and whether there is any water in the cabin. If there is any of the above phenomena, it is necessary to solve the problem and find out the reasons in time.
7. After using the USV, dry the USV thoroughly before storing it in its case. Ensure moisture protection and disconnect the battery during transportation.
8. Do not disassemble the parts of the USV. If a malfunction occurs, record the details and contact a professional for repairs.
9. Store the USV in a clean, dry, bright, and well-ventilated room with stable temperature. Implement strict moisture control. In winter, keep the USV away from heating devices. Equip the room with appropriate fire safety equipment, using liquid carbon dioxide or halon extinguishers instead of standard acid-base extinguishers. Avoid storing items with acidic or alkaline odors in the room to prevent corrosion of the instruments.

5.2 Battery

1. Use only the specified charger for charging.
2. Do not charge at night or when unattended. Disconnect the charger after charging is complete.
3. Do not connect the battery directly to a wall outlet or a vehicle's cigarette lighter socket for charging.
4. Do not use in combination with batteries of different capacities, models, or types.
5. If there is any odor when charging, stop charging immediately and contact our technical support team.
6. Do not use frayed or cracked charging cables.
7. If the short circuit protection is triggered by wrong operation, and the battery shows a voltage of 0V, use the specified charger to activate it. If it is invalid, please contact our technical support team.
8. If the USV is not in use for an extended period, perform regular maintenance on the battery. Charge every two months and ensure moisture protection.

9. When connecting or disconnecting equipment, ensure power is off. Only power on after installation is complete.

5.3 Care Instructions for Battery

1. Store battery in a cool and dry environment away from direct sunlight.
2. Do not store or transport the battery with other metals. Use only qualified logistics companies for transportation.
3. Do not use waterlogged, deformed or damaged batteries. Please contact our technical support team immediately.
4. Do not disassemble or open the battery housing in any way.
5. Do not squeeze, hit, throw or puncture the battery.
6. Do not reverse the positive and negative polarity of the battery.

6 Common Troubleshooting

Regularly inspect and clean the propeller to prevent debris from wrapping around it and affecting its normal operation. Generally, you don't need to remove the propeller from the vessel to clean common debris; simply remove the protective cover from the rear section of the propeller. If it becomes necessary to remove the propeller blades, you should determine whether the propeller needs to be removed from the boat based on the situation. When removing the blades, use a tool to secure the blades in place to prevent them from turning while you loosen the screws.

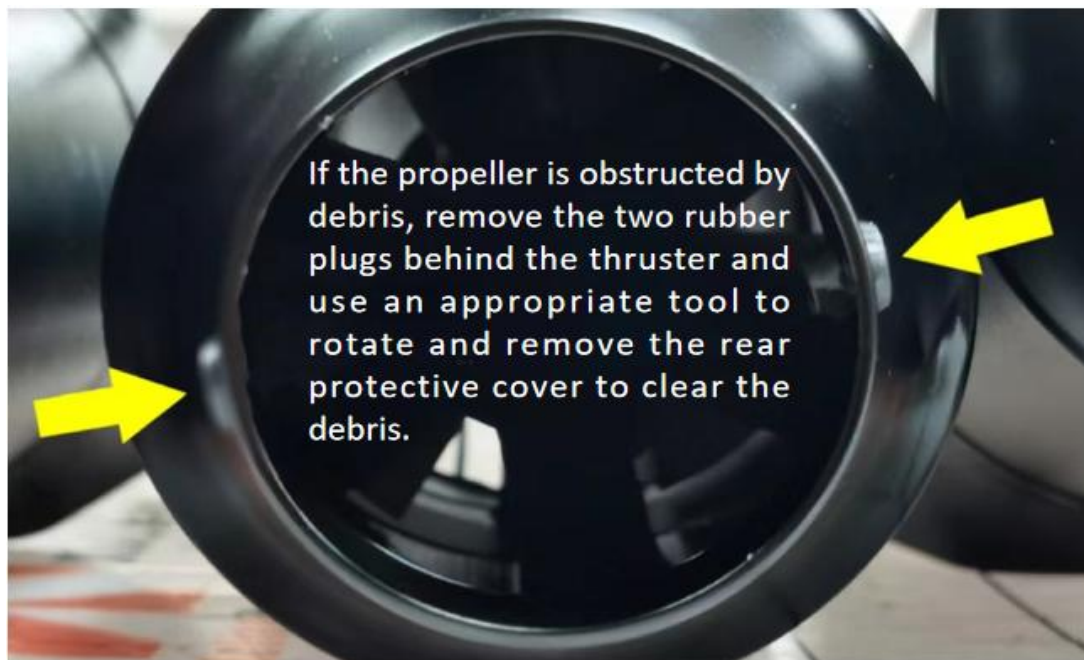


Figure 6-1 Front View of the Propeller

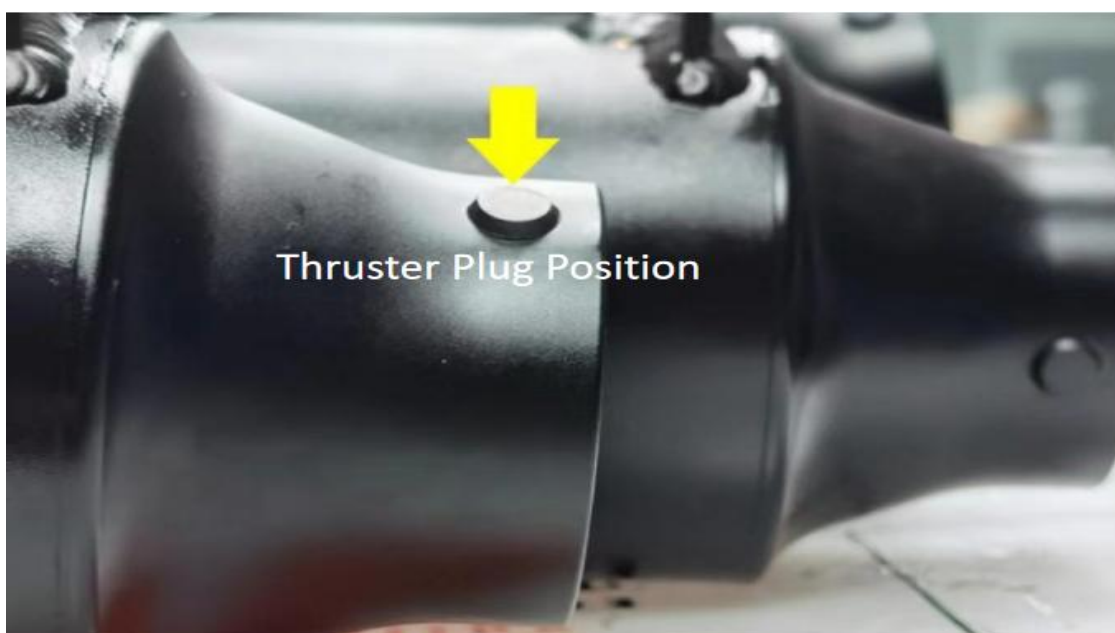


Figure 6-2 Thruster Plug Position



Figure 6-3 Direction of Rotation for Removing the Deflector

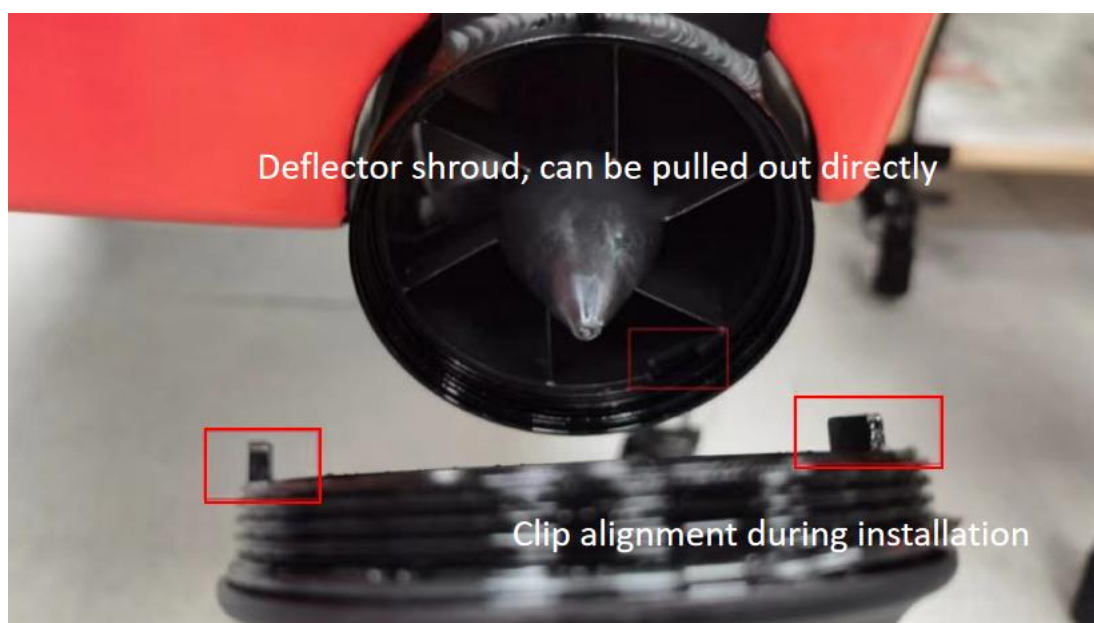


Figure 6-4 Propeller

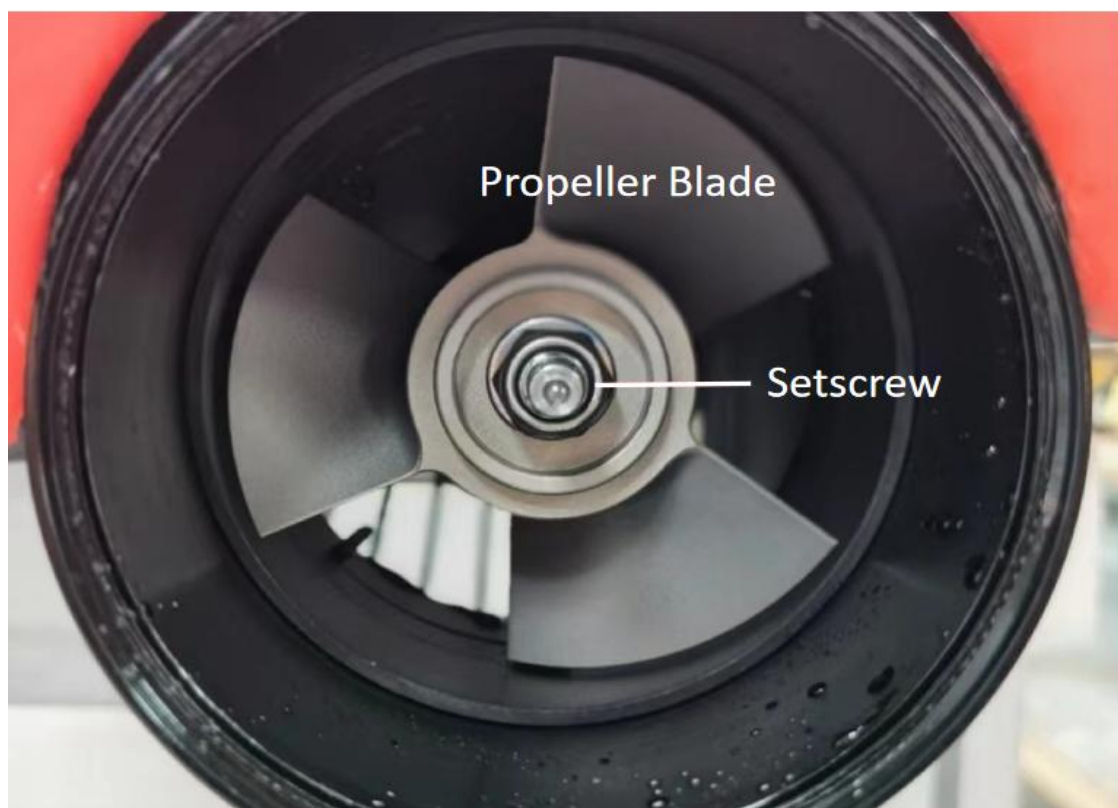


Figure 6-5 Propeller Blade



Figure 6-6 Propeller Blade Removal Tool

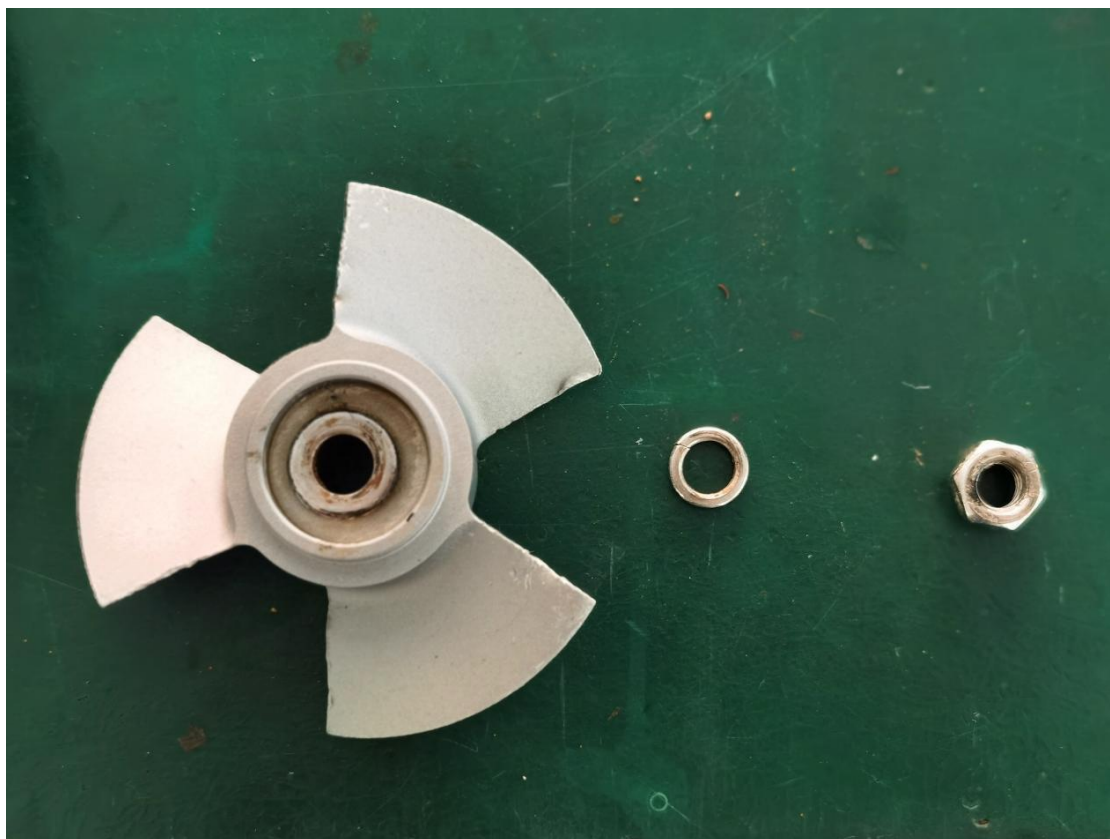


Figure 6-7 Propeller Blade Accessories



Figure 6-8 Securing the Propeller Blade Shaft



Figure 6-9 Securing the Propeller Screws



Figure 6-10 Securing the Propeller Screws