e-survey

VE115

USER GUIDE

Unmanned Vessel Control System

V1.0

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Contents

1 Before You Start

Dear customers,

Thank you for purchasing our product. Before starting your work, please carefully read the following:

- This user guide is for your product only. If the actual situation does not match with the situation in the user guide, the actual situation shall prevail.
- Improper use of the product can lead to death or injury to persons, damage to property and/or malfunction of the product. For safety and instructions on how to use this system, please carefully read the precautions for safe operation, exemptions from responsibility and instructions in the user guide and at all times comply with the same. *Remember that YOU are the key to safety.*
- The information in this user guide is subject to change without notice. We reserve the right to change or improve the device as well the content in the user guide without any obligation to notify you. For any questions, please contact us.

1.1 Precautions for Safe Operations

Precautions in this part are intended to minimize the risk of personal injury and/or damage to property, and all indicate **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**

Precautions can be divided into the following types according to the degree of loss or injury in case of negligence or omission:

	**CAUTION**	*Indicates a potentially hazardous situation that, if not avoided, may result in INJURY OR PROPORTY DAMAGE OR IRRETRIEVABLE DATA LOSS.*
	**WARNING**	*Indicates a potentially hazardous situation that, if not avoided, could result in SERIOUS INJURY OR EVEN DEATH.*
	**DANGER**	*Indicates an imminently hazardous situation that, if not avoided, will result in VERY SERIOUS INJURY OR EVEN DEATH.*

1.1.1 Caution

The following outlines the cautions that you must avoid when operating **VE115** and any of its components.

Environment

	Please choose the waters that are relatively clean and free of large floating objects to avoid the propeller entangling the garbage which may cause the vessel to stop sailing.

Installation / Maintenance

	To avoid accidental damage, please only use original supplied parts.
	Please find a suitable site with enough working space for installation.
	Please make sure all screws, bolts, nuts and cables are tightly connected before using the system to prevent the equipment from shaking and falling.

Data

	Please be careful when deleting data because this operation is permanent, and you cannot undo the deletion or restore the data.
	Please do not remove the USB drive from the socket while the application is copying data. Otherwise, it will corrupt the data.

GNSS Interference

	The GNSS antenna may experience interference if you operate the vessel within 100 m (300 ft) of any power line, radar dish or cell phone tower. Please be careful.

Remote Control Screen

	Please do not apply glass cleaner directly to the screen of the remote control.
	Please do not press on the screen with a sharp object such as a pencil. This could damage the surface of the screen.

1.1.2 Warning

The following outlines the warnings that you must avoid when operating **VE115** and any of its components.

Operating Safety

	Please keep alert and aware of the surroundings at all times.
	Please do not drink alcohol or drugs which can affect your alertness or coordination. If you are on prescription or over-the-counter drugs, please seek medical advice on whether or not you can properly operate the equipment.

Battery

	To protect the battery life, please make sure the battery voltage is not lower than 24 V after each operation. Otherwise, the battery may be scrapped.
	When charging, please turn on the power and unplug the propeller connector.
	After finishing your surveying works, please fully charge the battery before storing it.
	It is forbidden to charge at night and unattended. And please disconnect the charger after the battery is full.
	If the battery is not used for more than six months, please recharge the battery.
	If the battery has not been charged for more than one year, please replace it with a new one or consult the supplier.
	Please use the original charger. The use of third-party chargers is strictly prohibited.
	Please use the battery within the ambient temperature -10℃-45℃.
	If the battery encounters water, deformation and other abnormal conditions, please contact our technician in time.
	It is forbidden to disassemble the battery shell and disassemble the battery in any way.

1.1.3 Danger

The following outlines the danger that you must avoid when operating **VE115** and any of its components.

Environment

	It is forbidden to operate the vessel in the routes and waters where sailing is forbidden by relevant departments.

Operating Safety

	Please make sure you are adequately trained and qualified to operate the vessel, and remain in complete control of the vessel at all times.

1.2 Disclaimer

It is your responsibility to exercise common sense and navigational judgment while using **VE115**.

We assume no responsibility or liability for any damages to property (including direct or indirect damage), personal injuries or death caused by the following conditions:

- Damage caused by both physical and mental conditions of the operator, including alcohol, drugs, drug anesthesia, dizziness, weakness, nausea and other physical or mental conditions.
- Personal injuries or property loss caused by the operator's subjective intention, and any compensation related to moral damage followed by such condition.
- Damage caused by failure to assemble or operate this product in accordance with the proper guidance in this guide.
- Damage caused by refitting or replacing the original accessories or parts with that not produced by eSurvey so as to make the unmanned vessel operate badly.
- Damage caused by use of products not produced by our company or imitation of our products.
- Damages caused by the operator's operation error or subjective judgment error.
- Poor operation of the vessel due to the natural wear and tear, decay and corrosion of the vessel and the aging of cables.
- Damage to the vessel due to the operator's ignorance of abnormal warning that the vessel should return back.

- Damage caused by forcibly operating the vessel when one of the following occurs:
  - When the vessel is in an abnormal status, such as water or unknown substances in the vessel, poorly assembly, obvious malfunction of main parts, obviously defective accessories, etc.
  - When the vessel is in unsuitable conditions, such as it is in the magnetic interference zone, radio interference zone, the prohibited zone stipulated by the government, the operator's vision is in the backlight or blocked by obstacles, or the operator has blurred vision or poor eyesight.
- Damage caused by operating the vessel in bad weather, such as rain, wind, snow, hail, etc.
- Damage caused by collision, capsizing, fire, explosion, lightning, storm, tornado, heavy rain, flood, tsunami, land subsidence, ice subsidence, avalanche, hailstorm, mudslide, landslide, earthquake, etc.
- Damage caused by using unauthorized battery and charger.
- Damage caused by conditions, like the vessel not away from electromagnetic interference, friction and collision with other items, no timely replacement and maintenance of aging or damaged parts.
- Losses caused by illegal operations (not compliant with the local regulation and legislation requirements).
- Any damage or losses resulting from installation or operation not in accordance with the precautions and instructions in this user guide.
- A change of data, loss of data, etc.
- Wrong transport.
- Use of non-original parts.
- Usage not explained in the user guide.
- Any purpose other than the intended purpose.
- Accuracy, integrity, continuity, or availability of the GNSS signal.

2 VE115 at a Glance

VE115 Unmanned Vessel Control System (hereinafter referred to as **VE115**) is the remotely-operated hydrographic survey vessel. With unmatched usability, good stability, rugged hulls, exceptional design, and high performance, **VE115** incorporates depth sounders, GNSS positioning, live video, and wireless transmission technology. With the advanced route planning algorithm, **VE115** can help automatically realize autonomous navigation surveys according to the planned route.

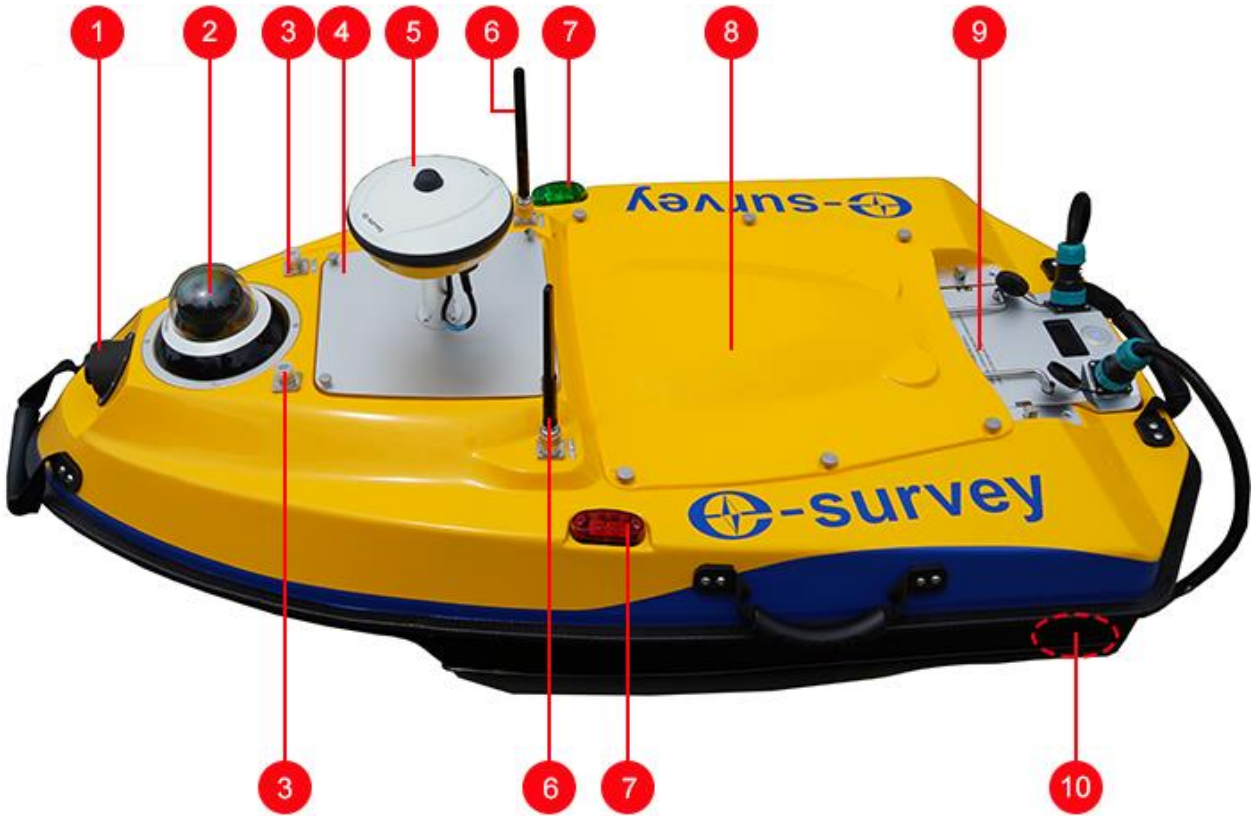
VE115 consists of the following:

- Hardware: vessel and remote control
- Software: **USR-VCOM** software, **VEC** software and **Navigator** software.

2.1 Hardware

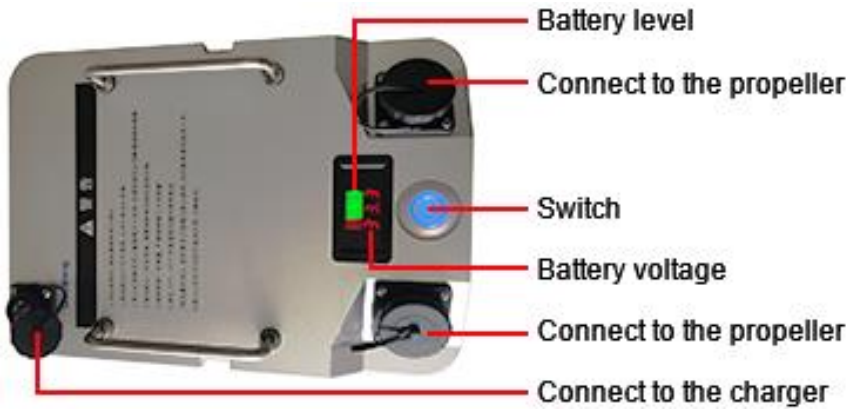
2.1.1 Vessel

Each part of the vessel is as follows:



1. Obstacle avoidance system
2. Camera
3. 4G antenna
4. Vessel control unit
5. GNSS receiver
6. 2.4G antenna
7. Navigation light
8. Echosounder unit

9. Battery unit



The charger indicator is red during charging, and turns green when fully charged (about 6 hours).

> **WARNING:** To protect the battery life, please make sure the battery voltage is not lower than 24 V after each operation. Otherwise, the battery may be scrapped.

10. Propeller

2.1.2 Remote Control

The remote control is a radio communication device with 2.4GHz band. Its maximum communication distance is 5000 - 7000 m.

> **CAUTION:** There must be no obstacle between the remote control antenna and receiver antenna. Otherwise the control distance of the remote control will be greatly shortened.

The function of each switch/rocker is as follows:

- Power switch: to turn on or turn off the power of the remote control by long pressing the switch.
- Propeller control rocker: to control the vessel forward, backward, left or right by pushing the rocker.
- Switch for locking/unlocking: to lock or unlock the remote control and vessel:
    - When the lever is at the top, the vessel is in the locked state (the motor will stop immediately). That is, the remote control cannot control the vessel.
    - When the lever is in the middle or at the bottom, the vessel is in the unlocked state. That is, the remote control can control the vessel.
- Switch for navigation light: to turn on/off the navigation light for working at night:
    - When the lever is at the top, it indicates that is navigation is off.
    - When the lever is at the bottom, it indicates that the navigation is on.
- Switch for mode selection: to set the vessel mode:
    - When the lever is at the top, it indicates automatic return. That is, the vessel will automatically returns to HOME point.
    - When the lever is in the middle, it indicates sailing at fixed speed. That is, the vessel will move forward at the set speed. And at this time, you can control the forward direction of the vessel by the direction control lever.
    - When the lever is at the bottom, it indicates manual control. That is, the vessel will be manually controlled by the operator.
- Direction control rocker: to control the vessel left or right.

2.2 Software

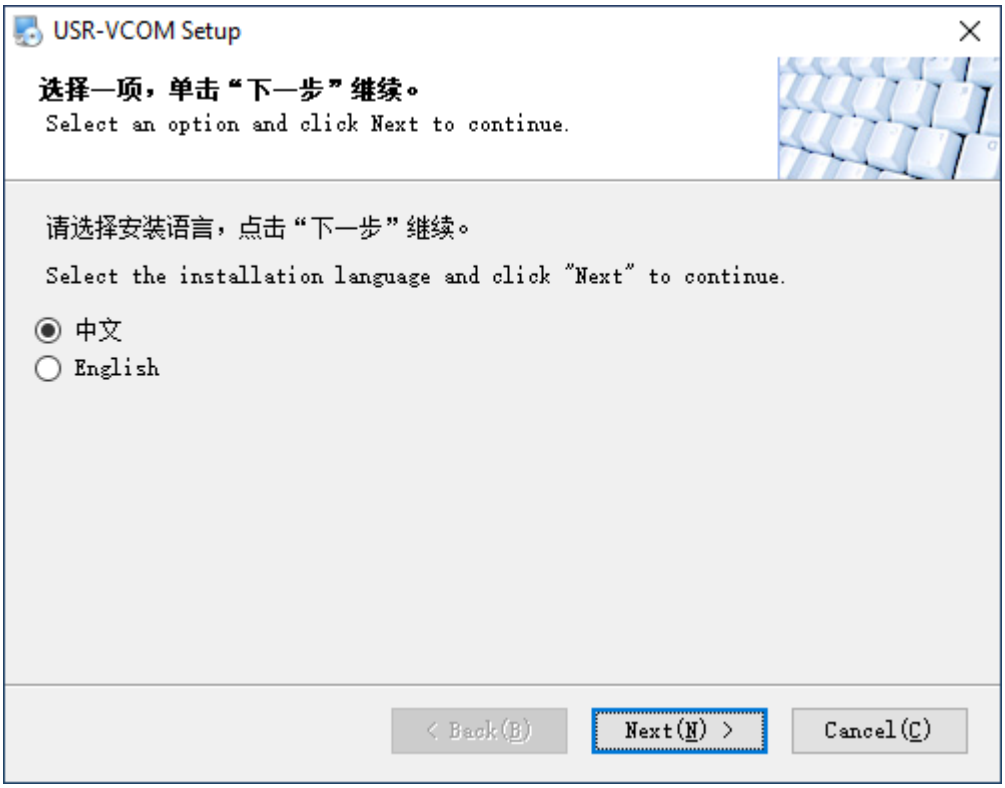
2.2.1 USR-VCOM software

The **USR-VCOM** software is mainly used to set the virtual serial ports for the vessel control, GNSS receiver and echosounder.

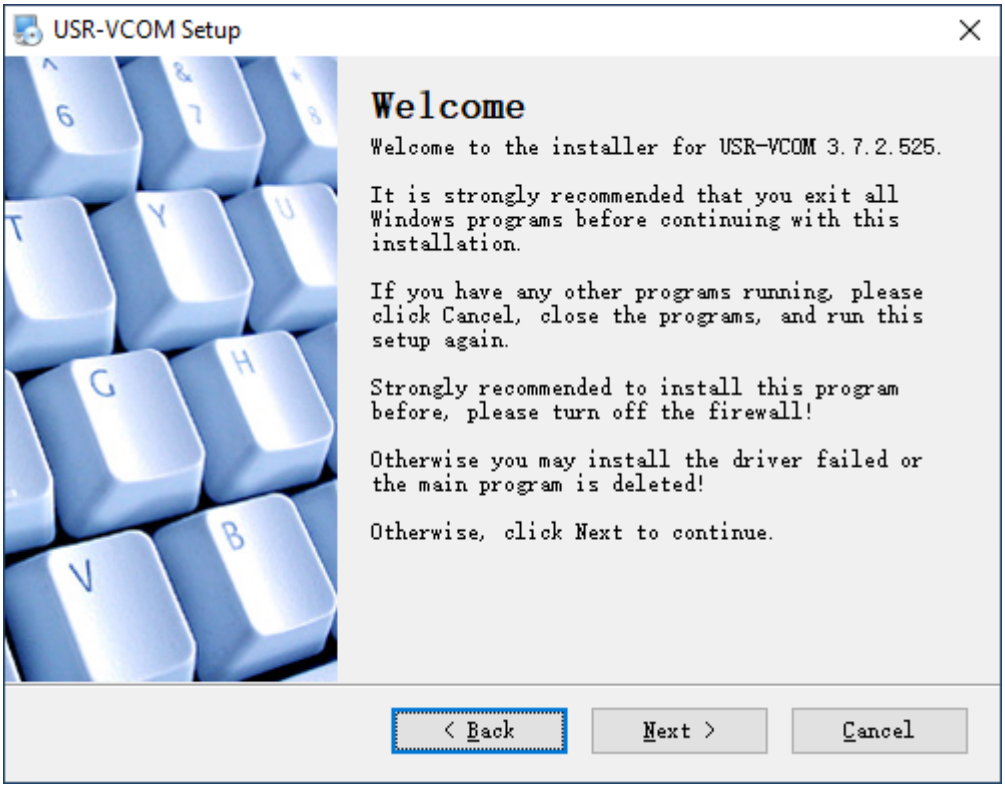
2.2.1.1 Installation

To install **USR-VCOM** software, do the following:

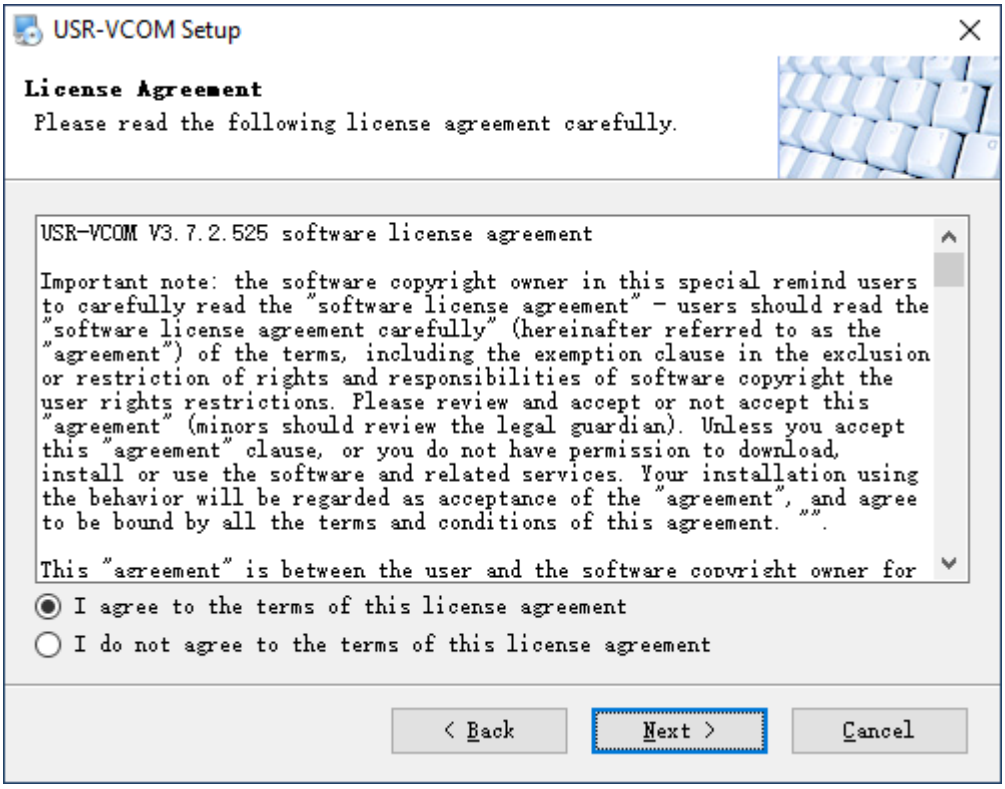
1. Double click program  :



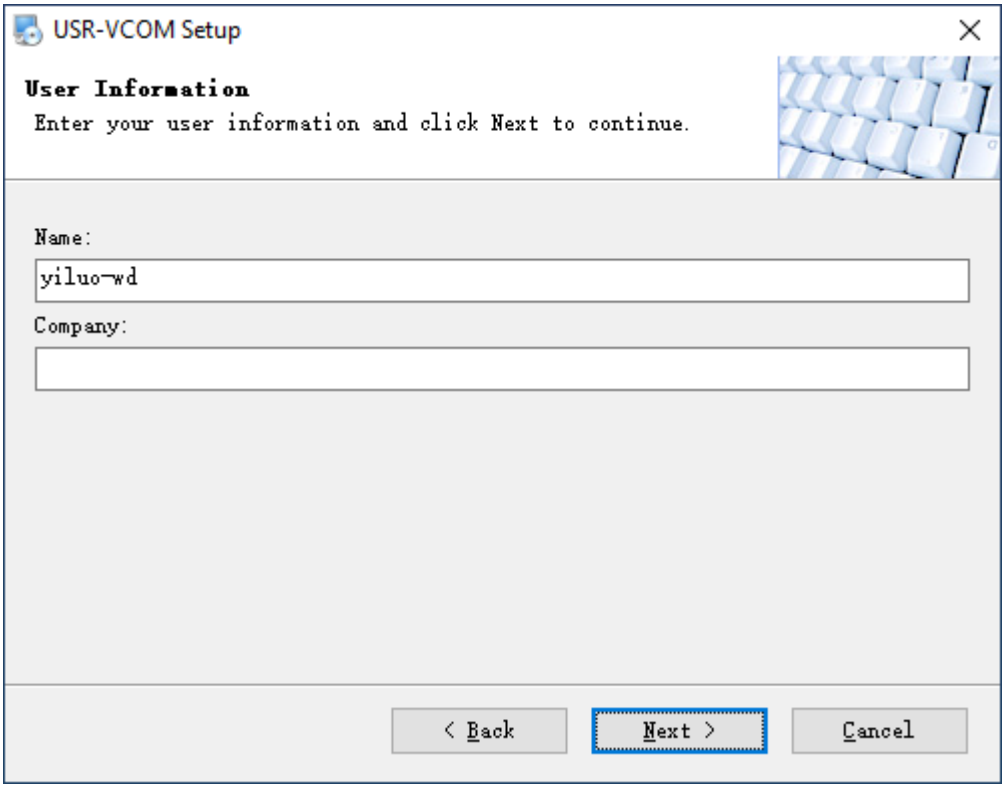
2. Select **English**, and click **Next**:



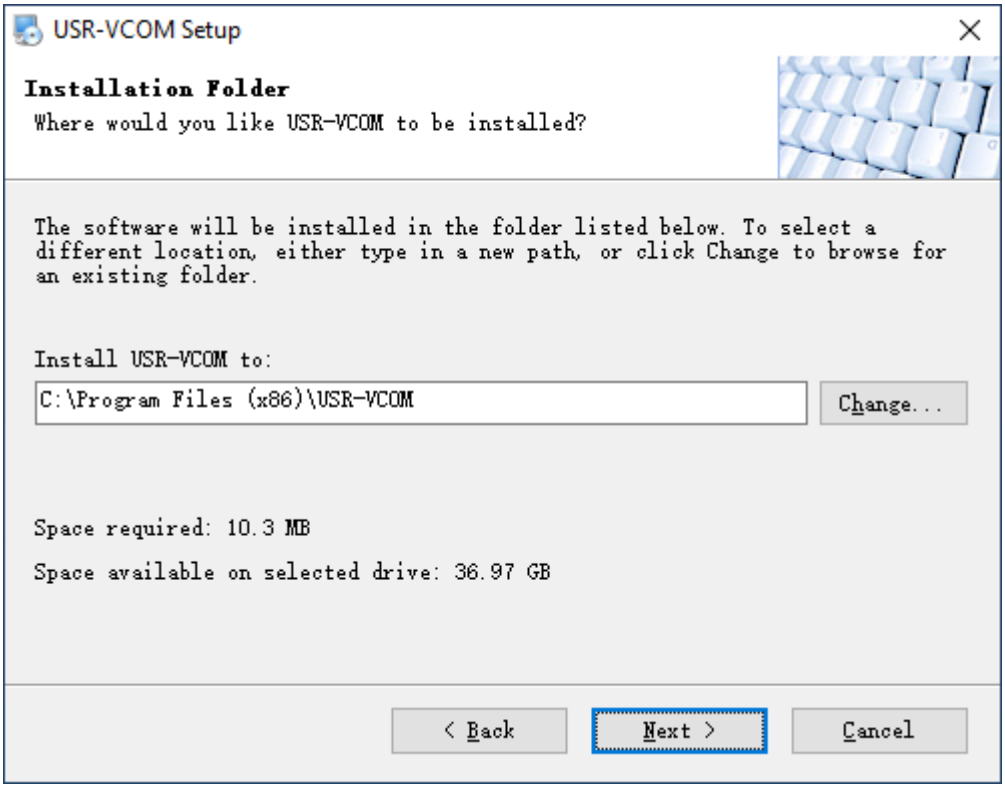
3. Click **Next**:



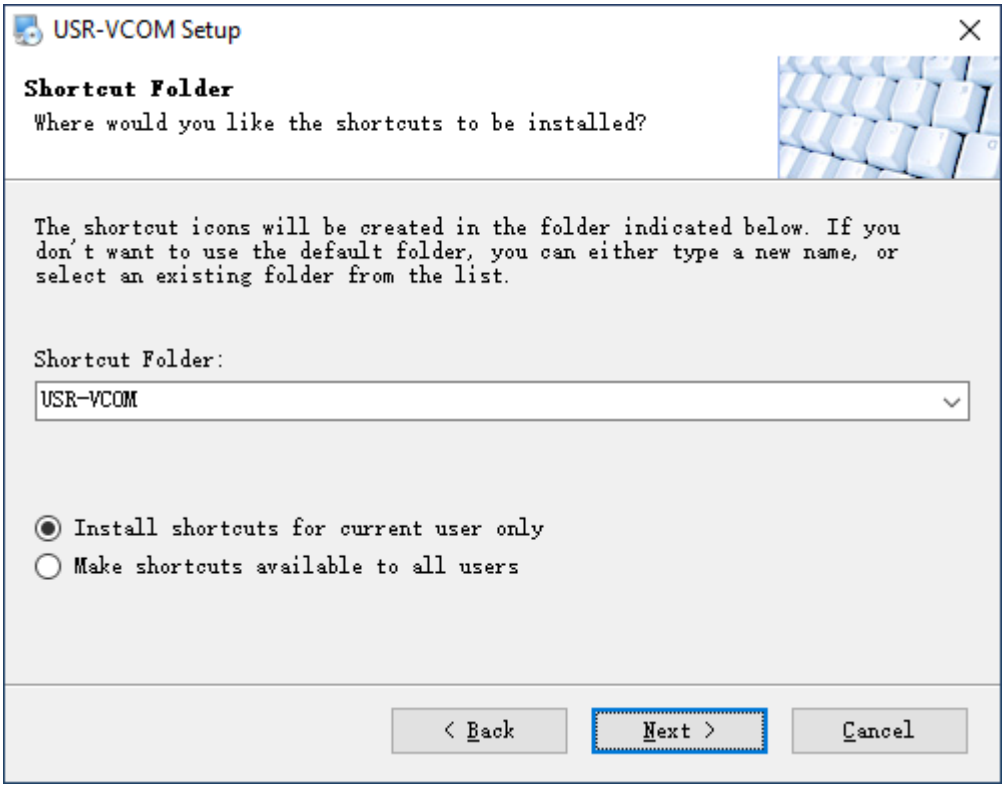
4. Select **I agree to the terms of this license agreement**, and click **Next**:



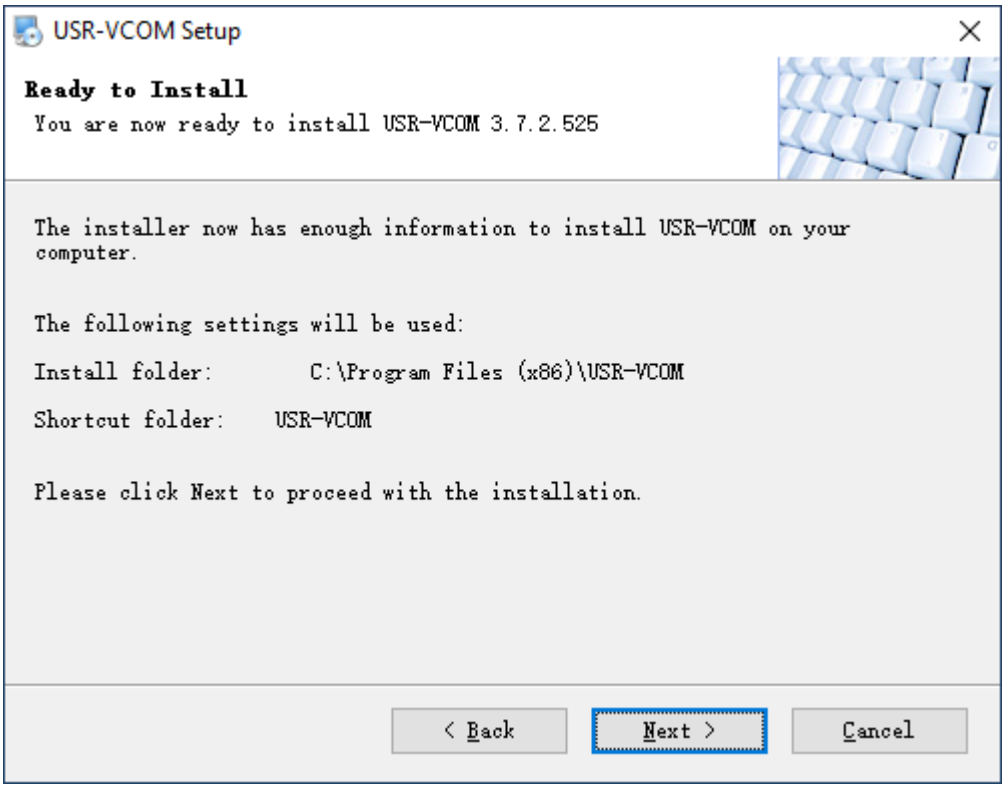
5. Input user information, and click **Next**:



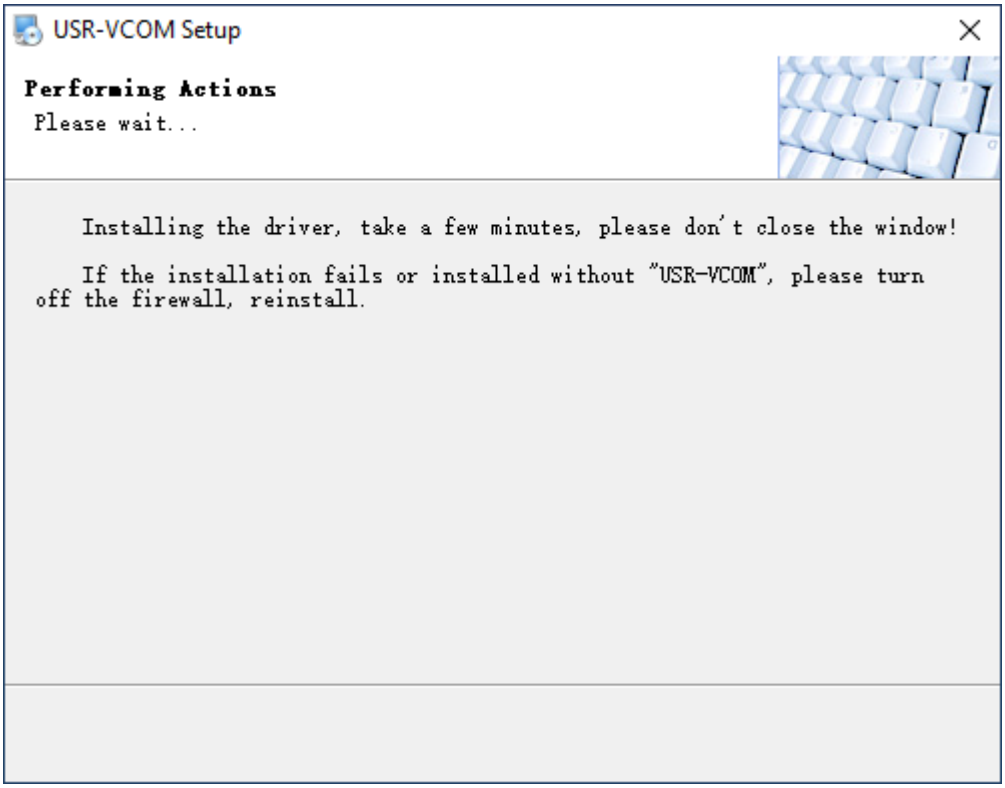
6. Select the target installation path to install the software, and click **Next**:



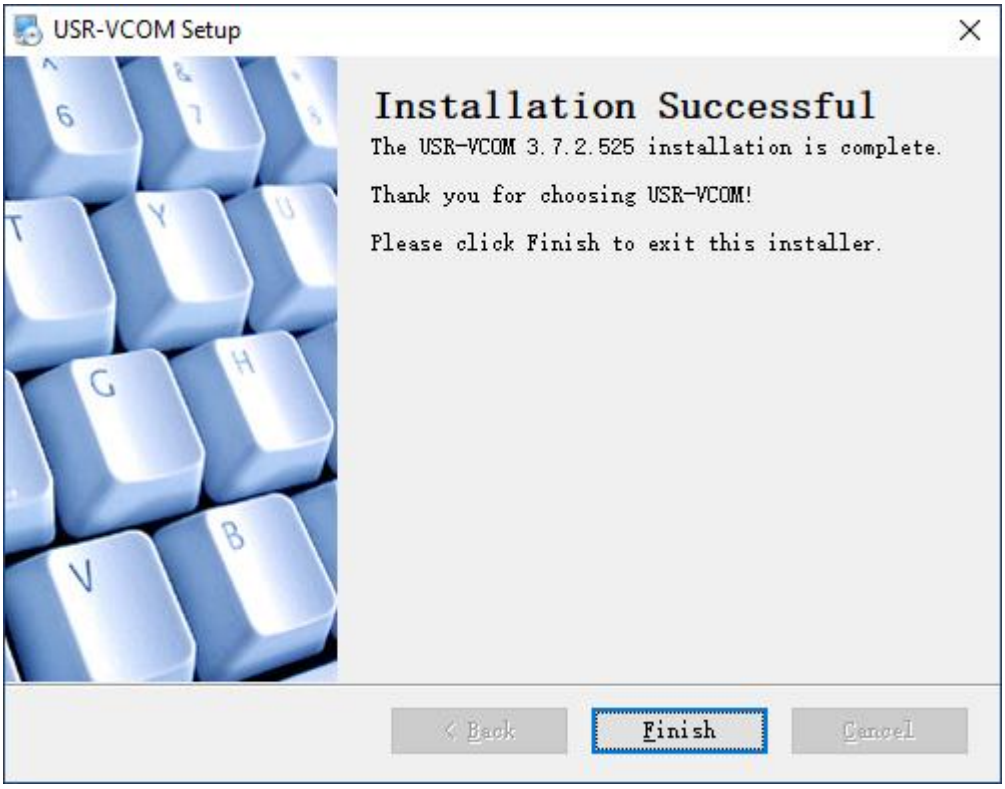
7. Select the shortcut folder, select **Install shortcuts for current user only** or **Make shortcuts available to all users**, and click **Next**:



8. Click **Next**. The software automatically starts to install:



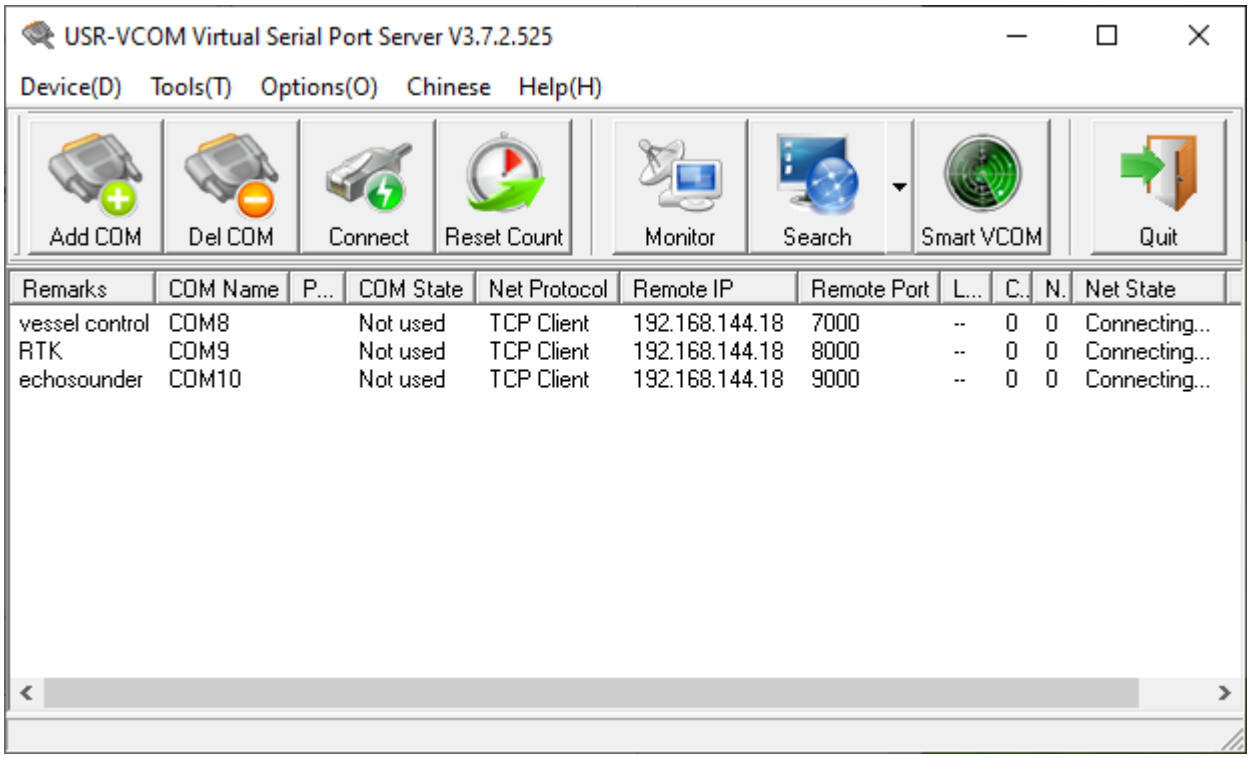
After installing, the following dialog box shows:



9. Click **Finish**.

2.2.1.2 Main Interface

The main interface of **USR-VCOM** software is as follows:



In **USR-VCOM** software, the main operation you need to do is to set the virtual serial ports. See Set the Virtual Serial Port for details.

2.2.2 VEC Software

The **VEC** software is used to control the vessel, monitor the vessel status, monitor the remote video and do planning.

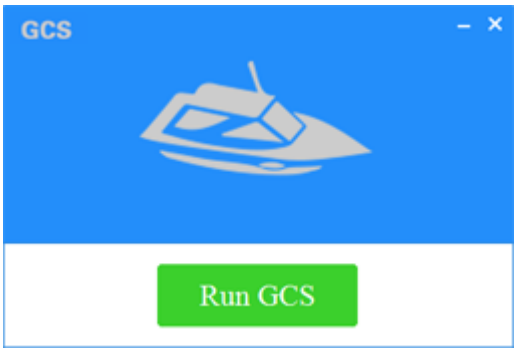
2.2.2.1 Installation

Before installing the **VEC** software, insert the vessel control dongle into your computer.

Otherwise, the **VEC** software will not work normally. When the dongle is working normally, its indicator will be on.

To install the **VEC** software, do the following:

1. Double click program  :



2. Click **Run GCS**.

2.2.2.2 Main Interface

The **VEC** software is user friendly and easy to use. It mainly contains the following pages:

- **Mission** page
- **Setting** page

2.2.2.2.1 Mission Page

The **Mission** page is as shown as follows:

1. Point planner area

- 

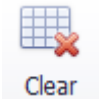
:

Name		What it does
	Auto	To automatically generate mission data according to the set interval and angle within the planned area.
	Edit WP	To generate waypoints or the sailing area by directly clicking on the map.
	Edit RTL	To set the position of the vessel to return after the mission.
	Edit track	To automatically generate waypoints according to the sailing track.

- 

:

Name		What it does
	Write	To save the planned waypoints and sailing routes to the vessel control unit.
	Read	To read waypoints and sailing routes stored in the vessel control unit and display them on the map.
	Save	To save the planned waypoints and sailing routes to your PC.
	Load	To load the waypoint file saved on your PC and display waypoints on the map.

- 

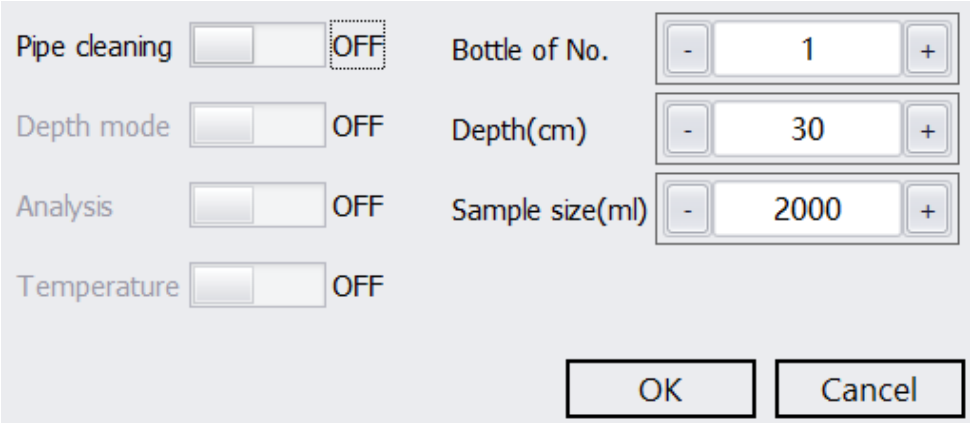
:

Name		What it does
	Clear WP	To clear waypoints.
	Clear RTL	To clear the return waypoint.
	Clear range	To clear the planned sailing area.
	Clear all	To clear all waypoints and return waypoints.

In the setting of waypoints, if you click **Advanced**, the following icons will show:

NOTE: The change of waypoint order may change the sailing route.

- : to delete the selected waypoint(s).
- : to set the current waypoint as the start point.
- : including waypoint and sampling.
- : if you select **Sampling**, set the following:



2. RTL area: to select a way of making the vessel automatically return:
   - STL : straight line (default)

     CAUTION: Please be careful when there is an obstacle in a straight line between the current location of the vessel and the home point.
   - RTL : backtracking
   - RAPTL : planning route
3. Set area
   - Cruising speed (m/s): to set the sailing speed of the vessel.
   - Set current waypoint: to set the start point for the interrupted mission if the mission is not complete last time.

4. Tool area
   - Auto pan: to make the map move with the location of the vessel.
   - Measure distance: to measure the distance between two points on the map.
   - 

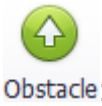
: to save the current map for offline use when the network is unavailable.
   - 

: to import DXF or KML files of the sailing route.
5. Other group area
   - 

: to start real-time monitoring.
   - 

: to clear the sailing track in the map area.
   - 

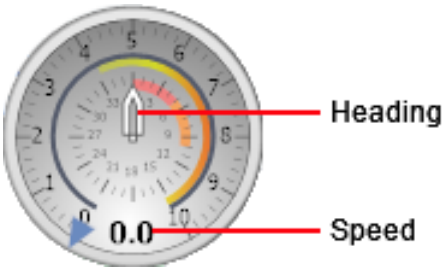
: to load the sailing track saved before.
6. Keys area

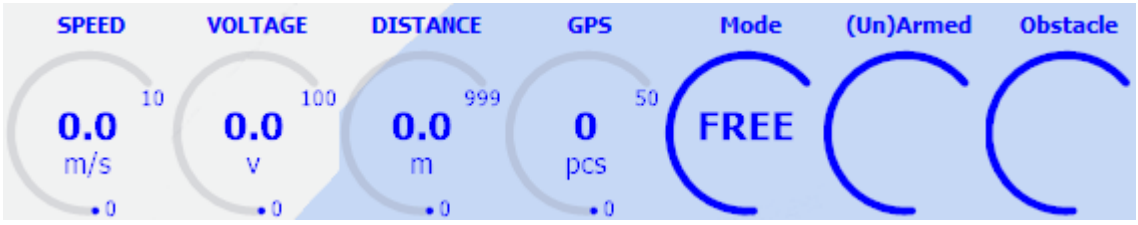
: to enable or disable obstacle avoidance.

	**CAUTION:** Please disable obstacle avoidance before automatic sailing.

7. Connection setting area: to establish communication between the vessel and **VEC** software, so that the **VEC** software can control the vessel.
8. Sailing route area: to check the sailing route and the current position of the vessel in the sailing route in real time.
9. Dashboard: to show the heading and sailing speed of the vessel:

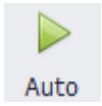


10. Status area:

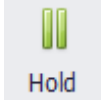


- **Speed**: the current sailing speed of the vessel.
- **Voltage**: the current voltage of the vessel, which can be used to check the battery level in real time. It is the same with the battery voltage shown in the battery unit.
- **Distance**: the distance between the current point and the next sailing point. Unit: m / km
- **GPS**: the number of tracking satellites.
- **Mode**: the sailing mode of the vessel, which reflects the switch for mode selection on the remote control, including RTL, steer, manual, free (no connection with the vessel control unit) and auto (the vessel is in automatic mode). See Remote Control for details.
- **(Un)Armed**: the current status of the remote control, including armed (locked) and disarmed (unlocked), which reflects the switch for locking/unlocking on the mote control. See Remote Control for details.
- **Obstacle**: the status of obstacle avoidance function, including enable, disable and wait when encountering obstacles.

11. Control panel

- 

: to start the mission. After clicking it, the vessel will start sailing as the planning route.
- 

: to make the vessel automatically return as a straight line.
- 

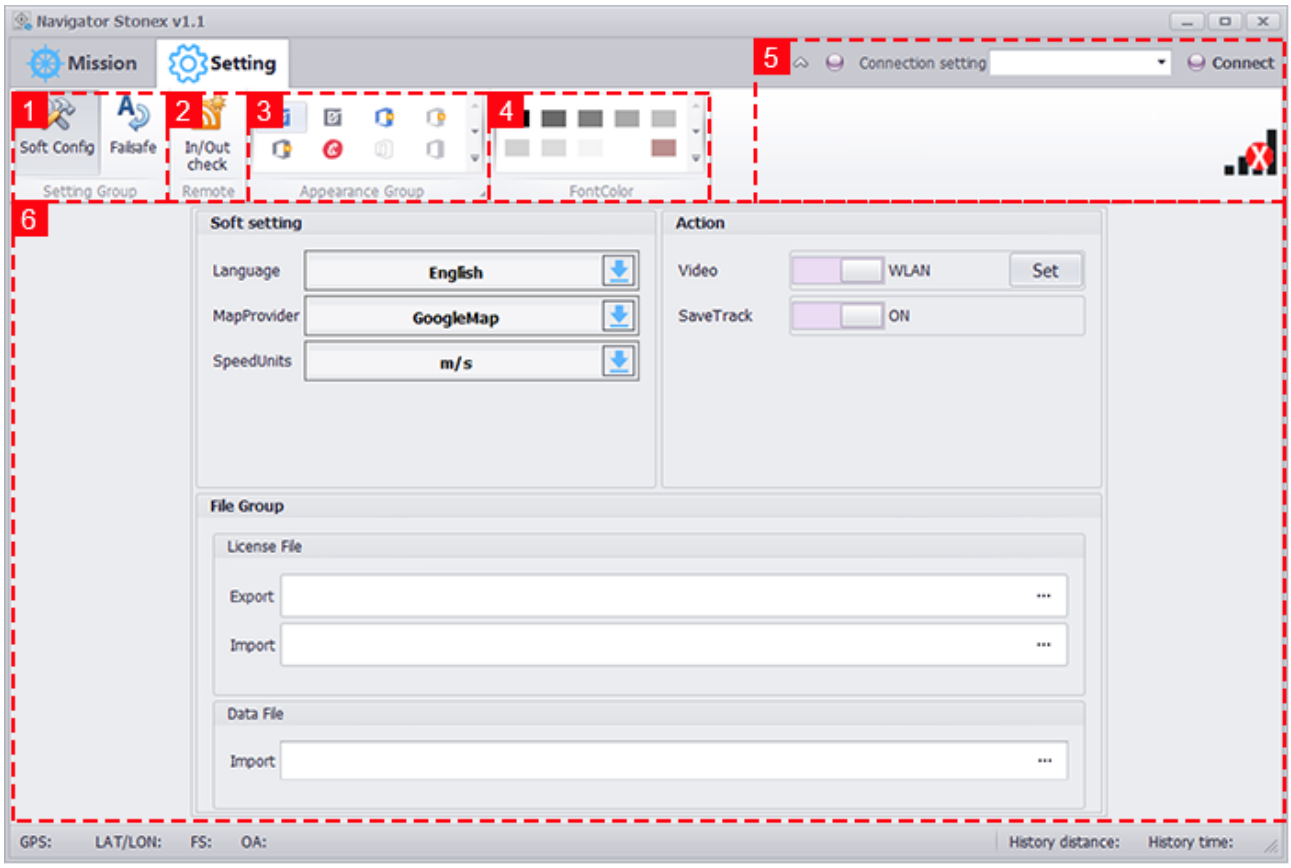
: to pause the mission.
- 

: to reset the mission.

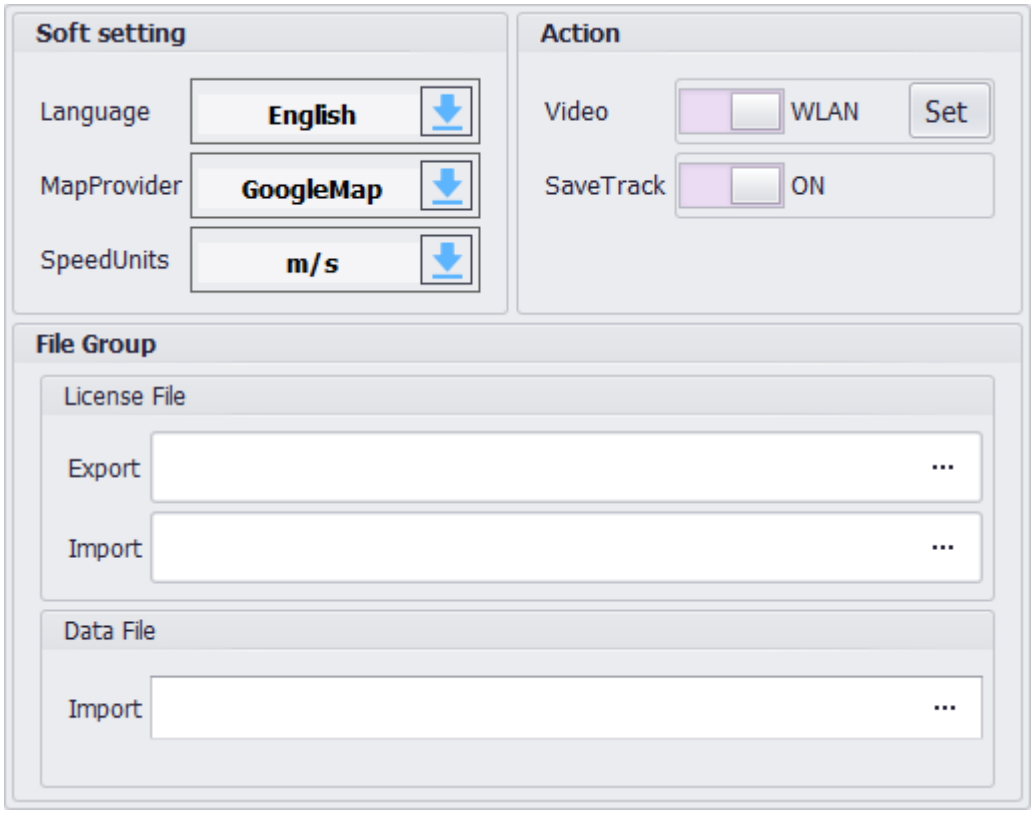
12. Map zoom area: to zoom out or zoom in the map. Scale: 3 - 16

2.2.2.2.2 Setting Page

The **Setting** page is as shown as follows:



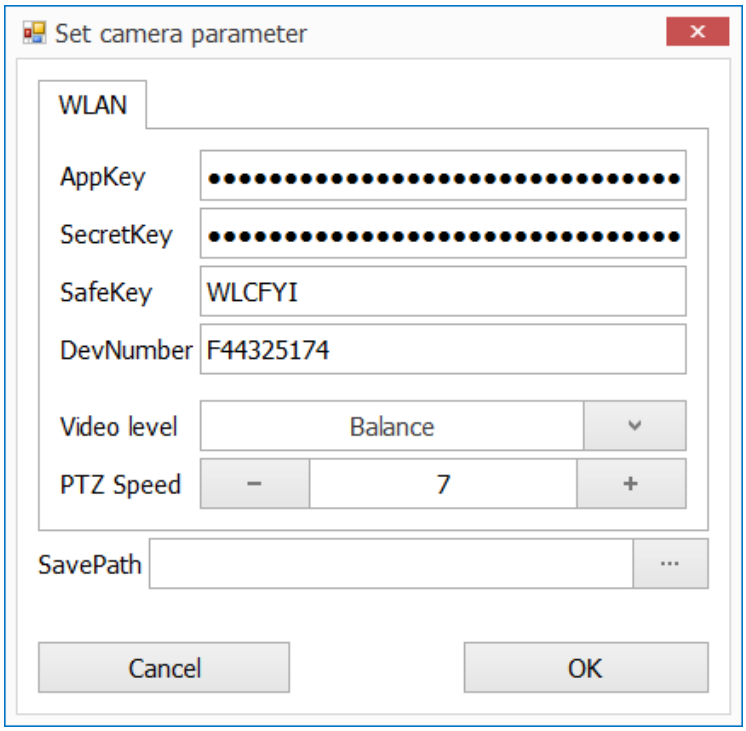
1. Setting group area
   - 



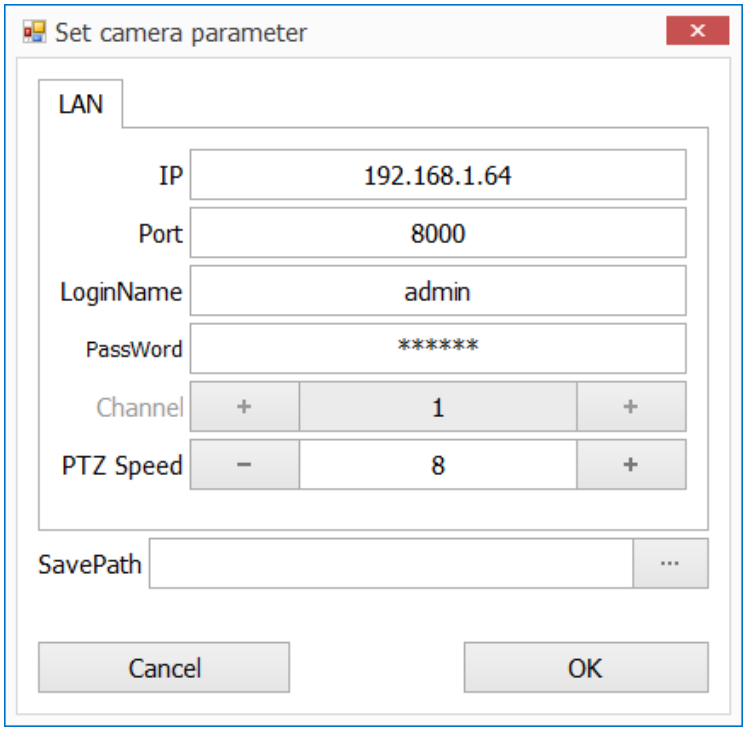
In this area, you can do the following:

- Select a software language: English and 中文
- Select a map provider: AMap, AMapSatellite, GoogleMap, GoogleSatelliteMap, GoogleHybridMap, GoogleChinaMap, GoogleChinaSatelliteMap and GoogleChinaHybridMap
- Select a speed unit: m/s, fps, kph, mph and knots

- Select the video network:
  - To select **WLAN**, click **LAN** and **Set**, and set the following:



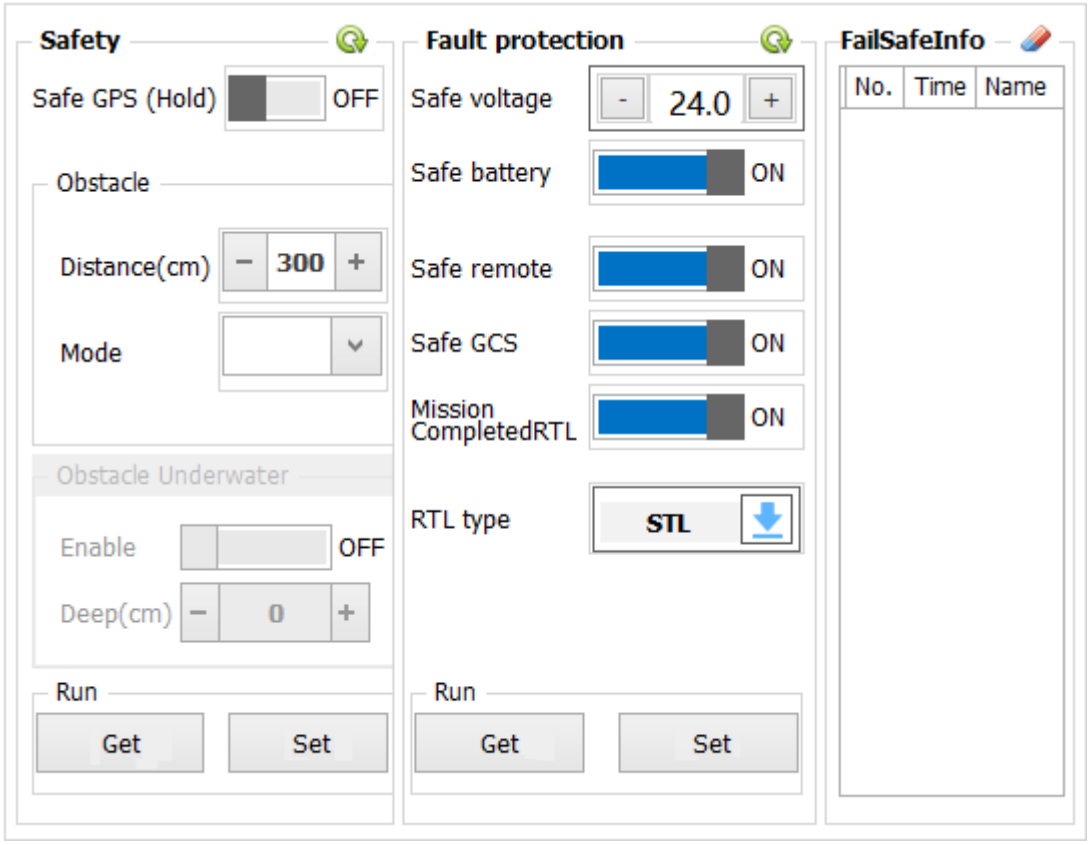
  - To select **LAN**, click **WLAN** and **Set**, and set the following:



- Select whether to automatically save the sailing tracks.
- Export/import a license file (user authorization file).
- Import a data file.

- Failsafe

In this area, you can do the following:

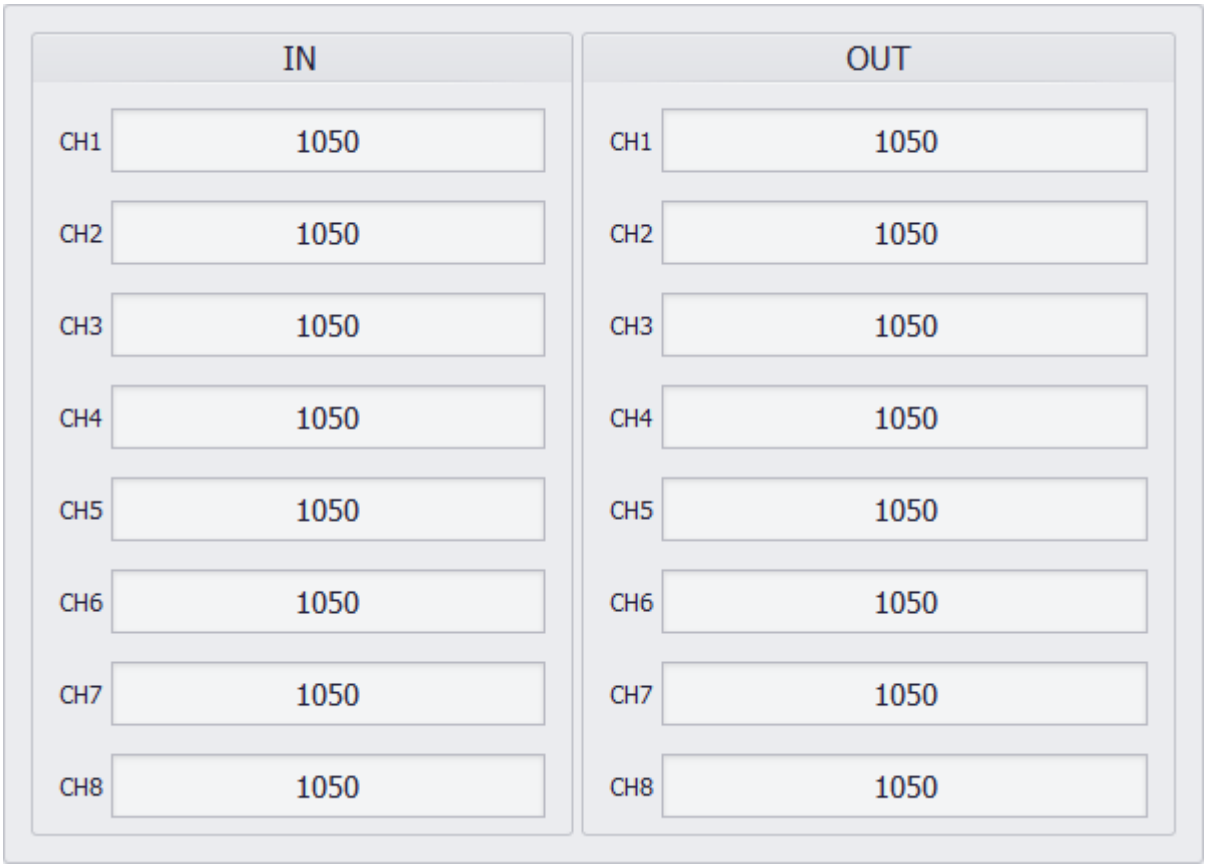


- **Safe GPS (Hold)**: to select whether to make the vessel stop work when the GNSS receiver cannot receive any satellite signals.
- **Obstacle distance**: to set the distance between the vessel and target obstacle. The vessel will automatically avoid the obstacle whose distance from the vessel is the set value.
- **Obstacle mode**: to set a way of avoiding the obstacle. To enable the obstacle avoidance system, please set it to **Hold**.
- **Obstacle underwater**: not available for **VE115**.
- **Run**:
  - **Get** - to read parameters from the vessel when the vessel is connected.
  - **Set** - to apply settings when parameter settings change.
- **Safe voltage**: to set the voltage limit. Once the voltage is less than the limit and **Safe battery** function is enabled, the vessel will automatically return. It is suggested to set it to **24 V**.
- **Safe battery**: to select whether to automatically make the vessel return when the voltage is low.
- **Safe remote**: to select whether to automatically make the vessel return when the vessel loses connection with the vessel control unit.

- **Safe GCS**: to select whether to automatically make the vessel return when the vessel loses connection with the network bridge (2.4G Wi-Fi).
- **MissionCompletedRTL**: to select whether to automatically make the vessel return when the vessel mission finishes.
- **RTL type**: to select a way of making the vessel return, including STL (straight line), RAPTL (planning route) and RTL (backtracking).
- **FailSafeInfo**: to show the information about alerts and warnings.

2. Remote control

: to observe the feedback information of control unit input and servo output, so as to judge if the remote control is working properly and observe the sailing track.



3. Appearance group: to customize the interface skin.
4. Font color: to customize the color of interface font.
5. Connection area: to establish communication between the vessel and **VEC** software, so that the **VEC** software can control the vessel.
6. Detail area: it varies with the selection in area 1, 2, 3, and 4.

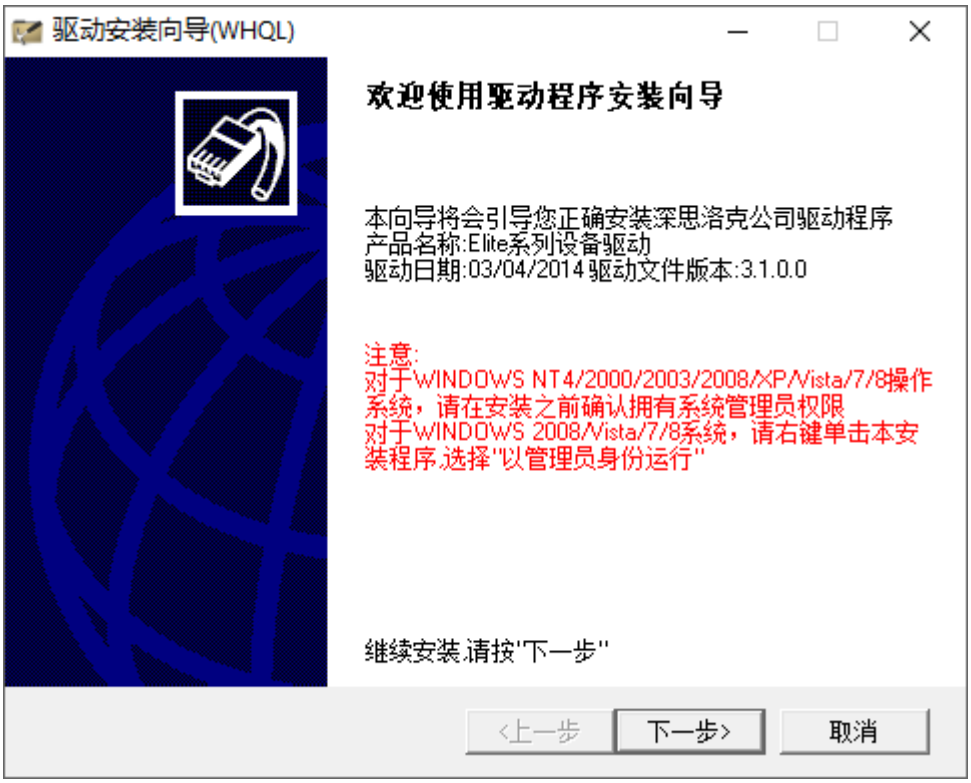
2.2.3 Navigator Software

The **Navigator** software is mainly used for data collection, design, survey, data processing of GNSS data and echosounder, etc.

2.2.3.1 Installation

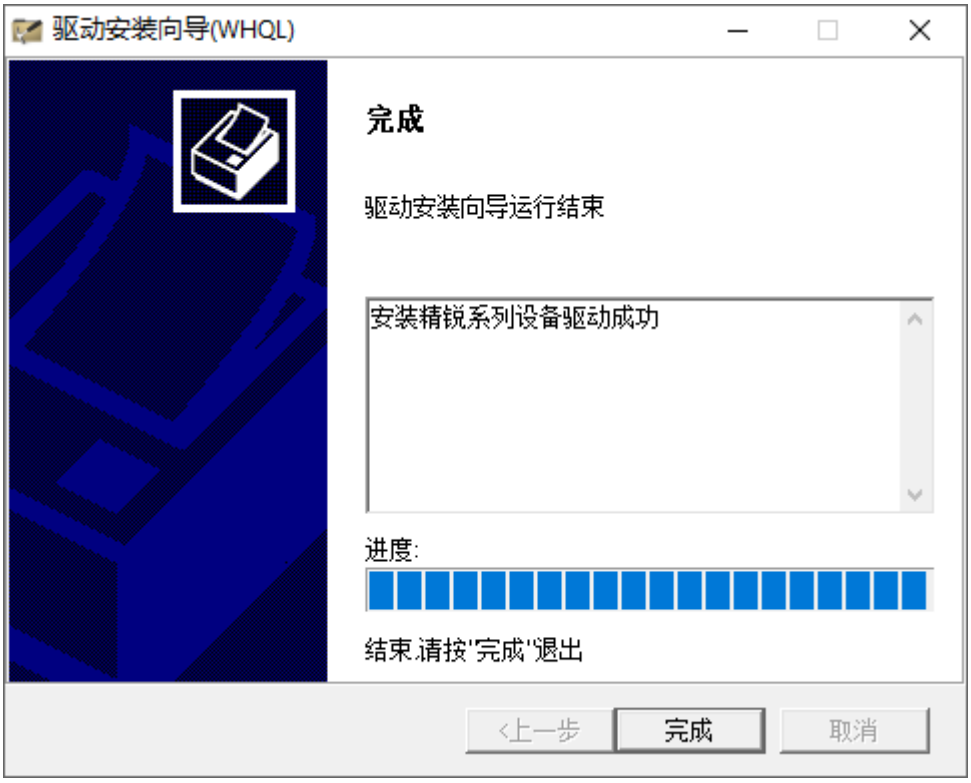
Before installing the **Navigator** software, do the following:

1. Insert the navigator dongle into your computer.
2. To install the dongle driver, double click program  :



3. Click 下一步:

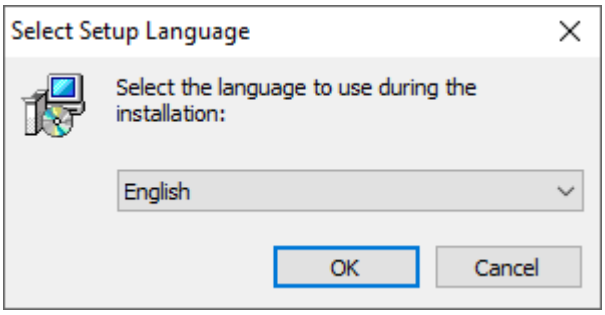
4. Click ..., select the target installation path, check 安装驱动程序, and click 下一步. The dongle driver starts to install, and the following dialog box pops up after installing:



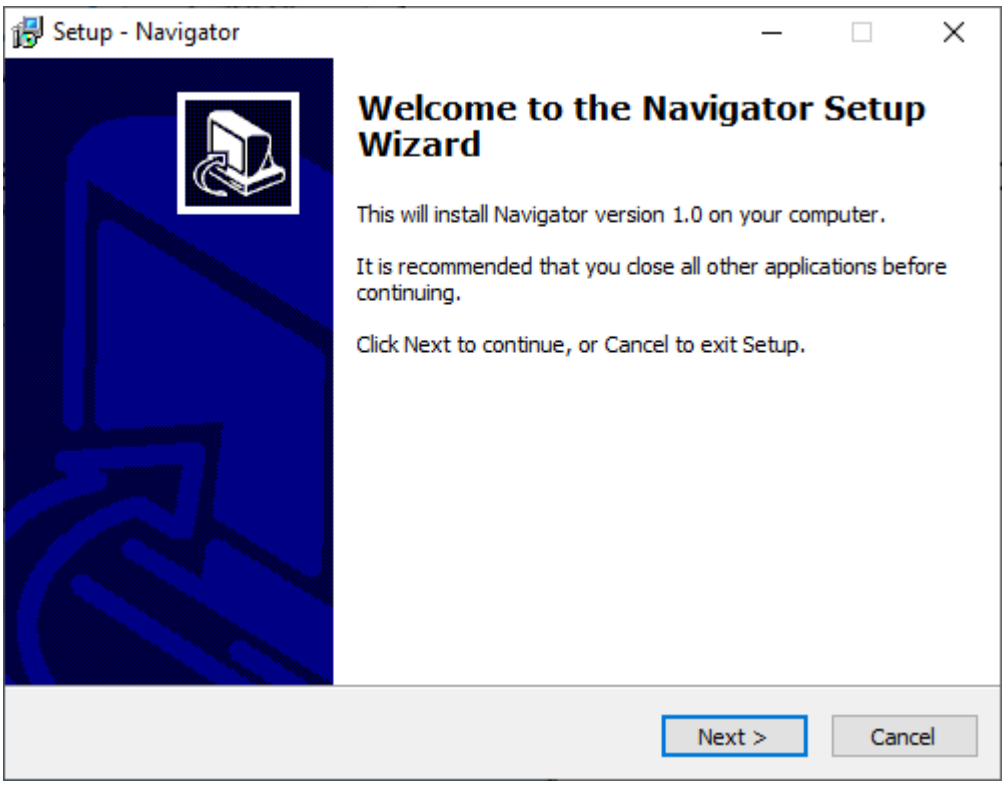
5. Click 完成.

To install the **Navigator** software, do the following:

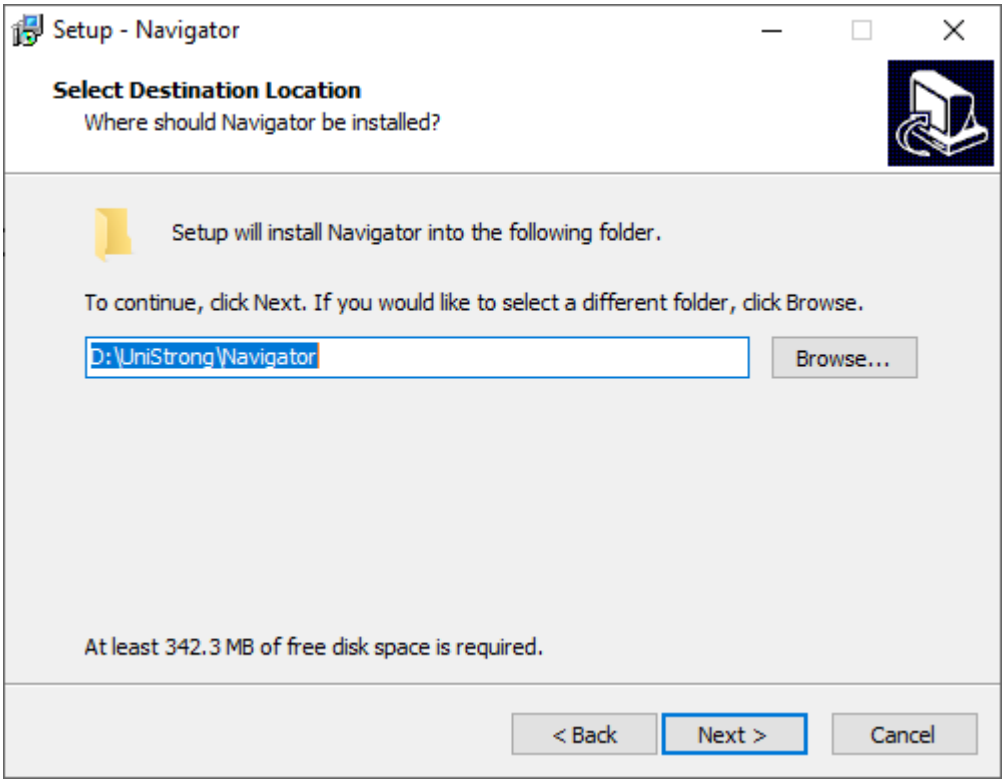
1. Double click program  . **Select Setup Language** dialog box pops up:



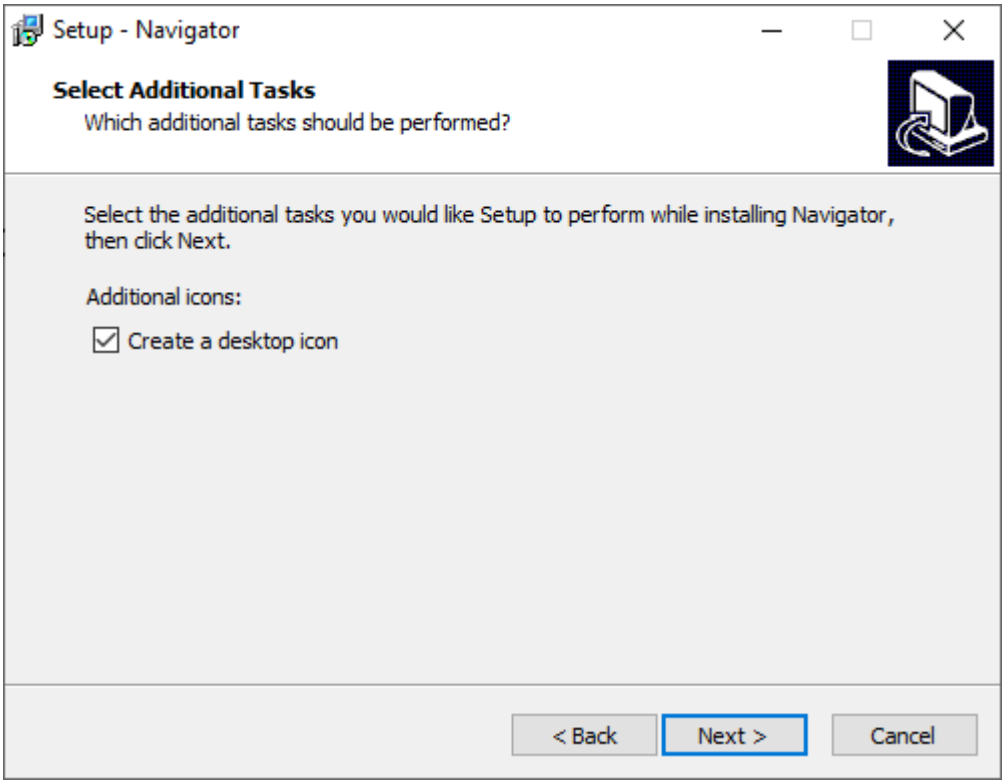
2. Select **English**, and click **OK**. The navigator setup wizard dialog box pops up:



3. Click **Next**. The dialog box of selecting the installation path pops up:

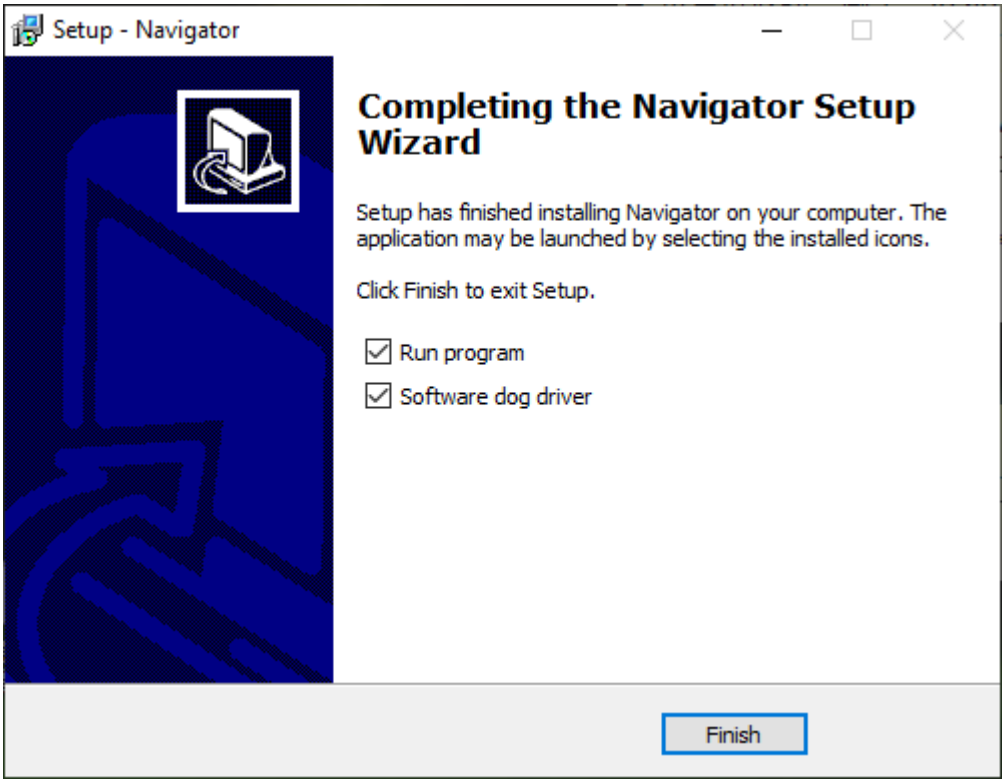


4. Click **Next**. The dialog box of additional tasks pops up:

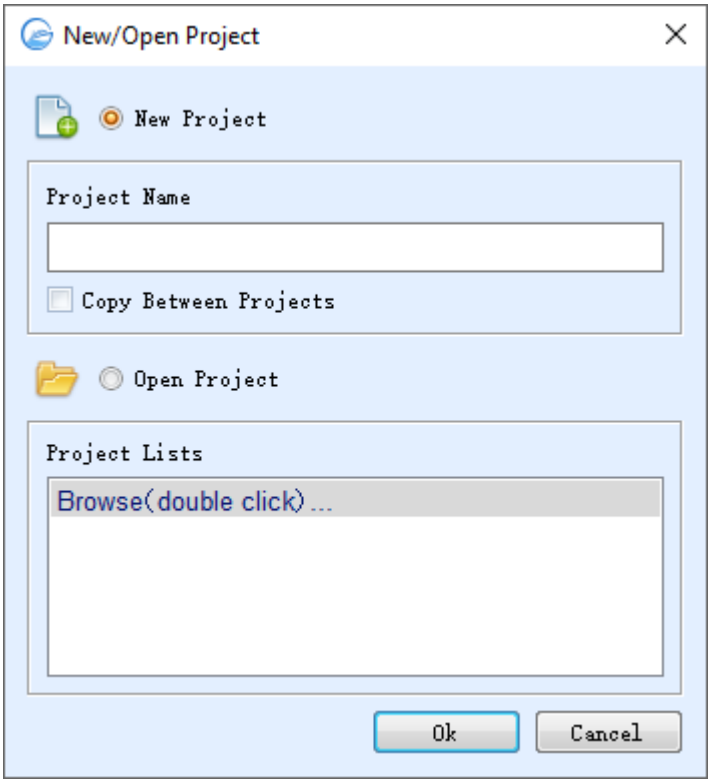


5. Click **Next**, and select whether to create desktop icon.

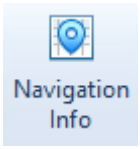
6. Click **Next**. The software installation start. After finish installation, the following dialog box pops up:



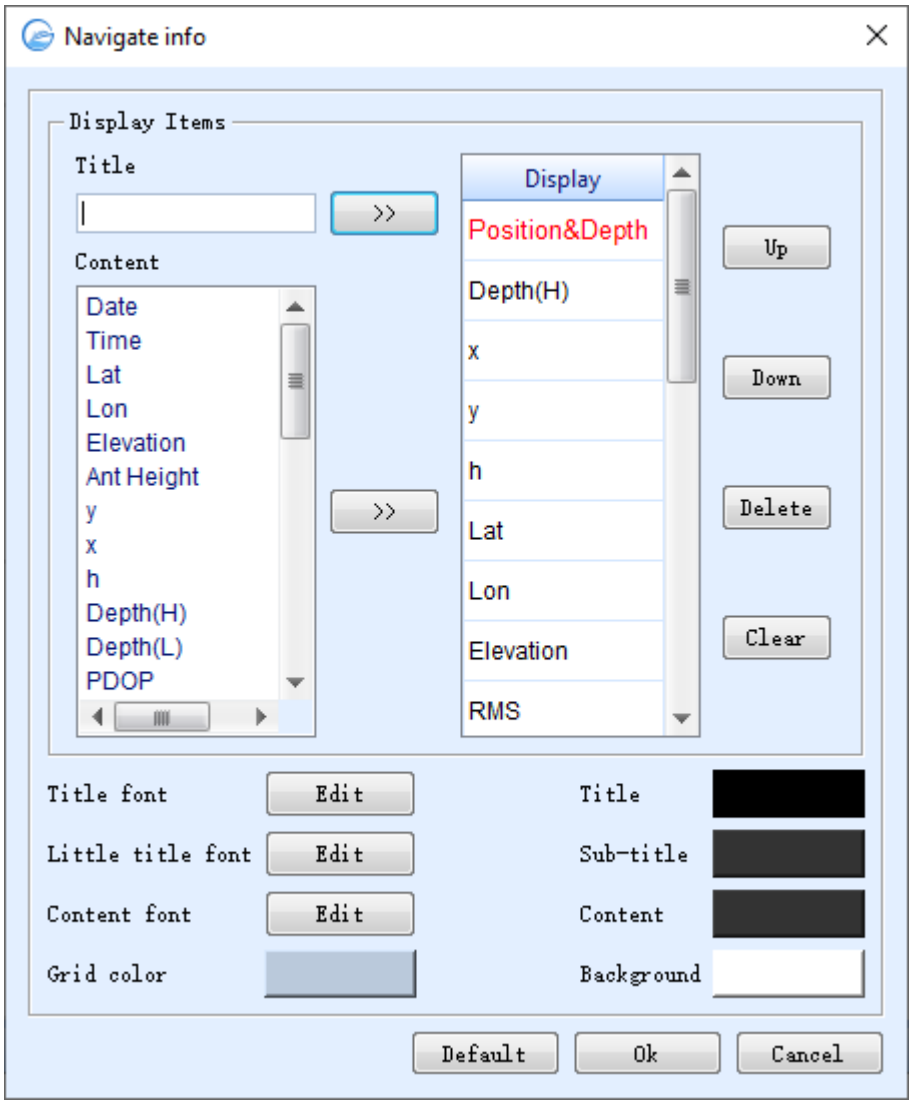
7. Click **Finish**. The main interface of eSurvey data collection software shows, and **New/Open Project** dialog box shows:



About how to load or create a project, see Create or Load a Project for details.

8. **Optional:** To change the default font, do the following:
   a. Click **Cancel**.
   b. In the menu bar of eSurvey data collection software, click **Setting** → 

. **Navigation Info** dialog box pops up:

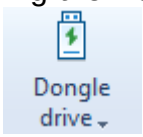


c. Click **Edit** after **Title font**, and select a font in the dialog box of selecting a font:

Arial is suggested.

d. Click **Edit** after **Little title font**, and select a font.

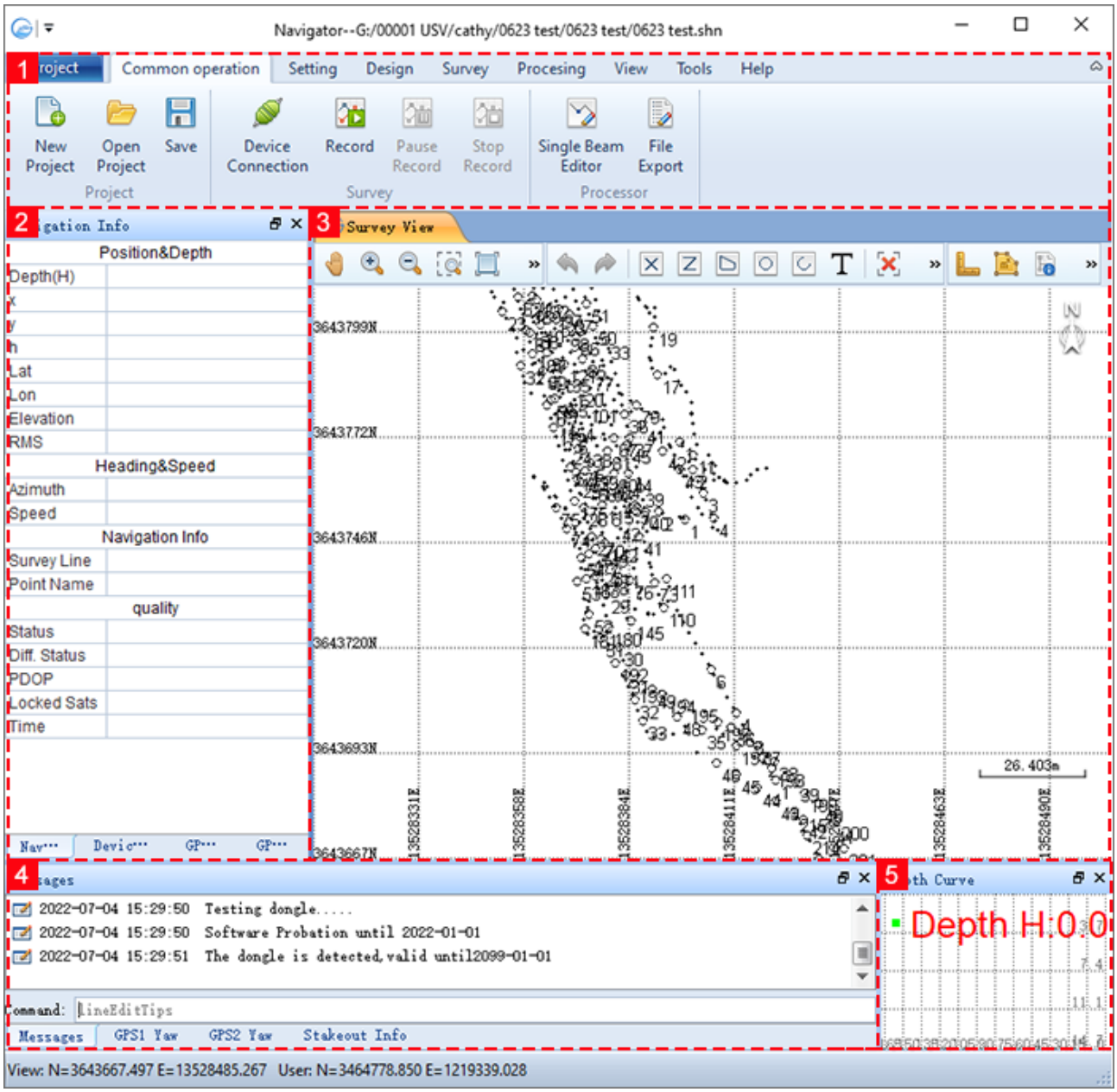
e. Click **Edit** after **Content font**, and select a font.

After installing the **Navigator** software, if the software fails to work, in the menu bar, click **Setting** → 

, and select **Dongle V4.0**.

2.2.3.2 Main Interface

The main interface of **Navigator** software is as follows:

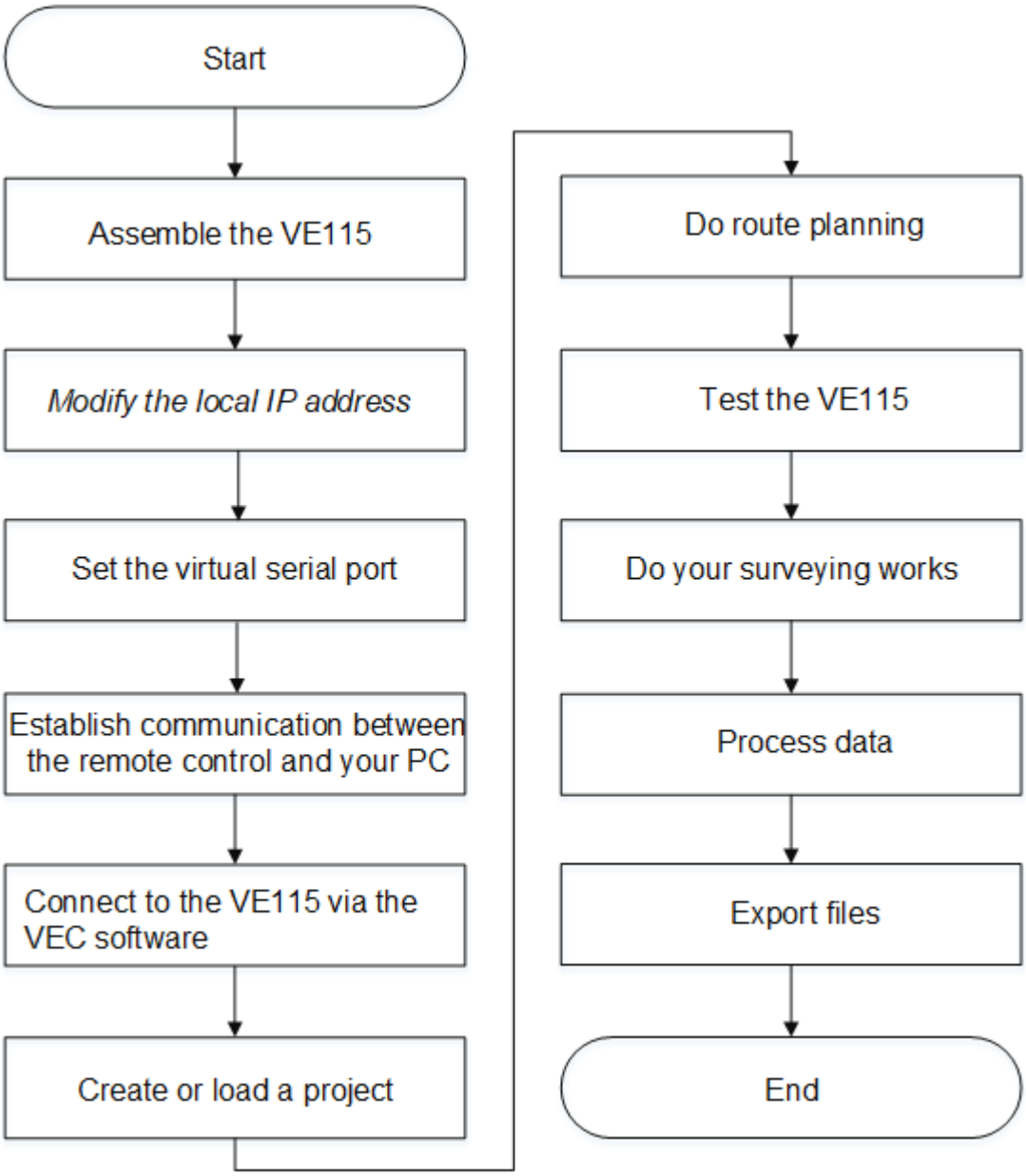


1. Menu bar:
    - **Project** menu: to load or create a project, modify the target project, etc.
    - **Common operation** menu: you can find all detailed operation steps for operations in this menu in chapter Quick Start.
    - **Setting** menu
    - **Design** menu
    - **Survey** menu
    - **Processing** menu: to process data.
    - **View** menu: to set view related settings.
    - **Tools** menu
    - **Help** menu

2. Navigation information / device monitoring (GNSS receiver and echosounder) / GPS skyplot bar
3. View area: including survey view and tide station view.
4. Messages / GPS yaw / stakeout info bar
5. Depth line: to view the depth line in real time.

3 Quick Start

The basic process of quickly starting your surveying work is as follows:



NOTE: The operation in Italic is optional.

3.1 Assemble the VE115

To assemble the **VE115**, do the following:

1. Charge the battery:
    a. Dissemble the cover of the echosounder unit.
    b. Connect the charge cable to the charge interface on the battery unit.

    When the value of voltage is greater than 33V, unplug the charge cable, and assemble the cover of the echosounder unit.
2. Install the 2.4G antenna or 4.0G antenna.
3. Install the GNSS receiver, and connect the GNSS data cable.

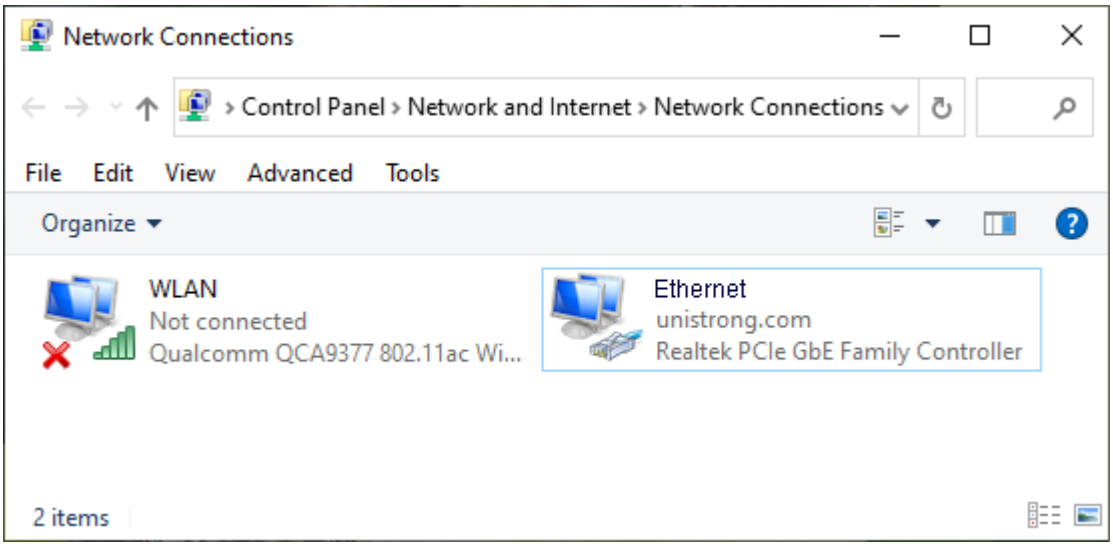
After assembling the **VE115**, the vessel is as follows:

3.2 Modify the Local IP Address

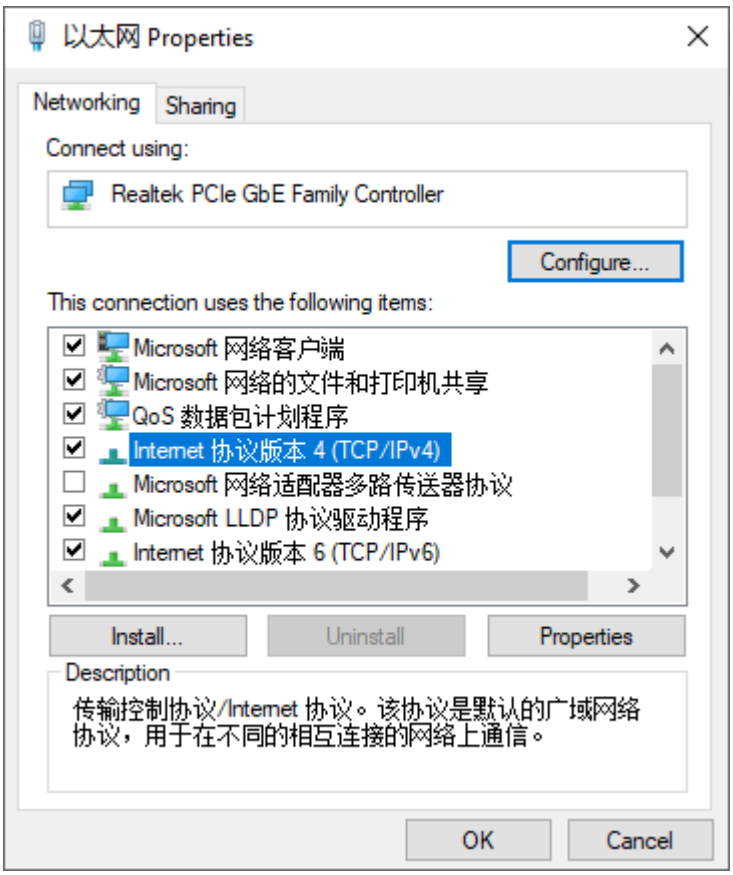
Generally, the local IP address will be automatically obtained. If it fails, please manually modify the local IP address.

Taking windows 10 as an example, to modify the local address, do the following:

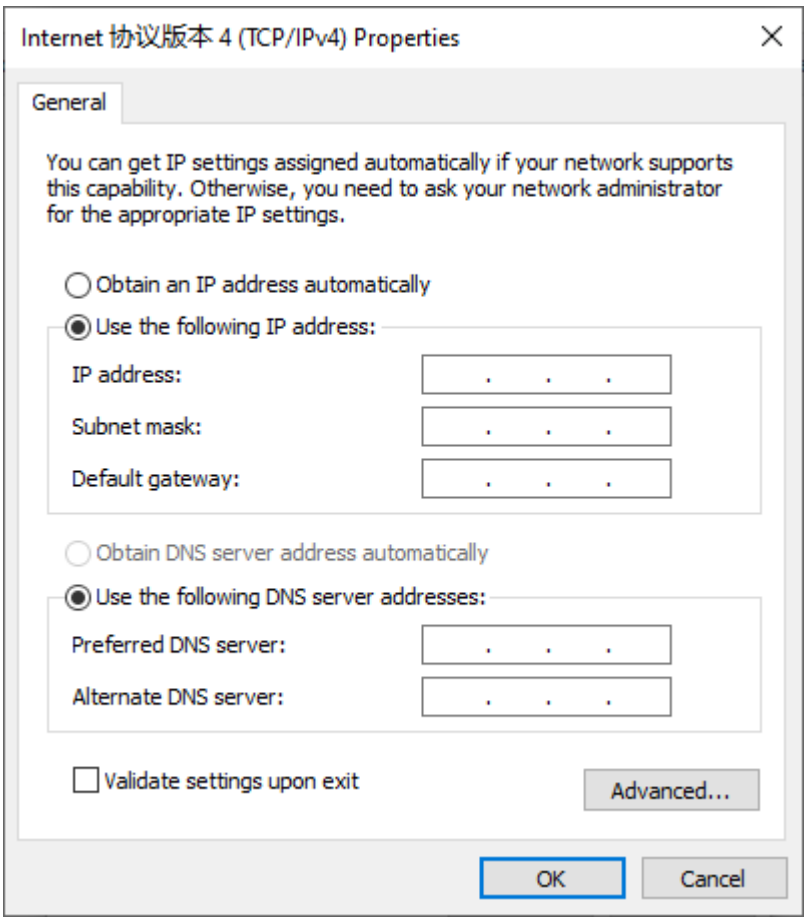
1. Open the control panel, select **Network and Internet** → **Network and Sharing Center**.
2. In the left column, select **Change adapter settings**. **Network Connections** dialog box pops up:



3. Right click on **Ethernet**, and select **Properties**:



4. Click **Properties**:



5. Select **Use the following IP address**, set the following, and click **OK**:
   - IP address: 192.168.1.XX
   - Subnet mask: 255.255.255.0
   - Default gateway: 192.168.1.1

3.3 Set the Virtual Serial Port

To set the virtual serial port, do the following:

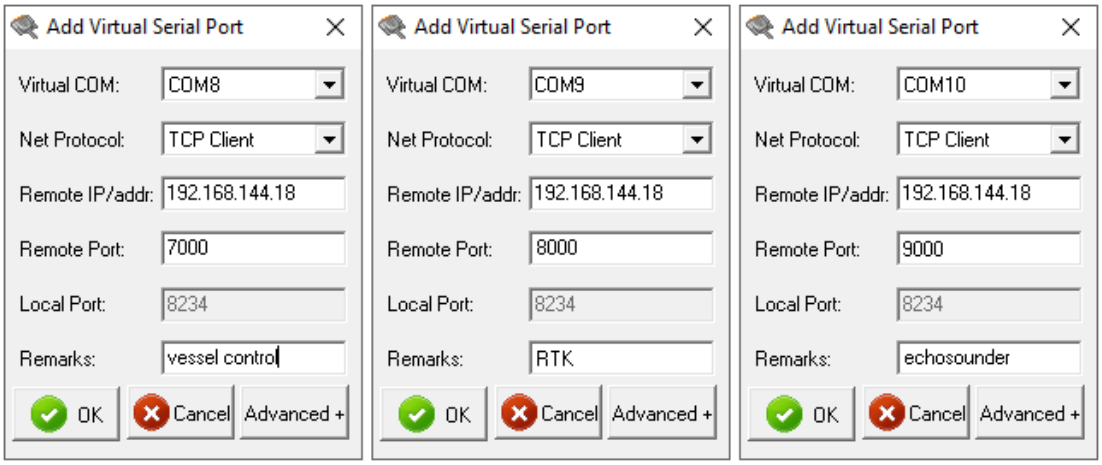
1. Run **USR-VCOM** software.

2. Click 

, and set the following in **Add Virtual Serial Port** dialog box for the virtual port for vessel control, GNSS receiver, and echosounder:

> **NOTE:** You can freely choose the serial port number for both 2.4G network and 4G network as long as the serial port is not occupied. It is recommended to choose the larger number.

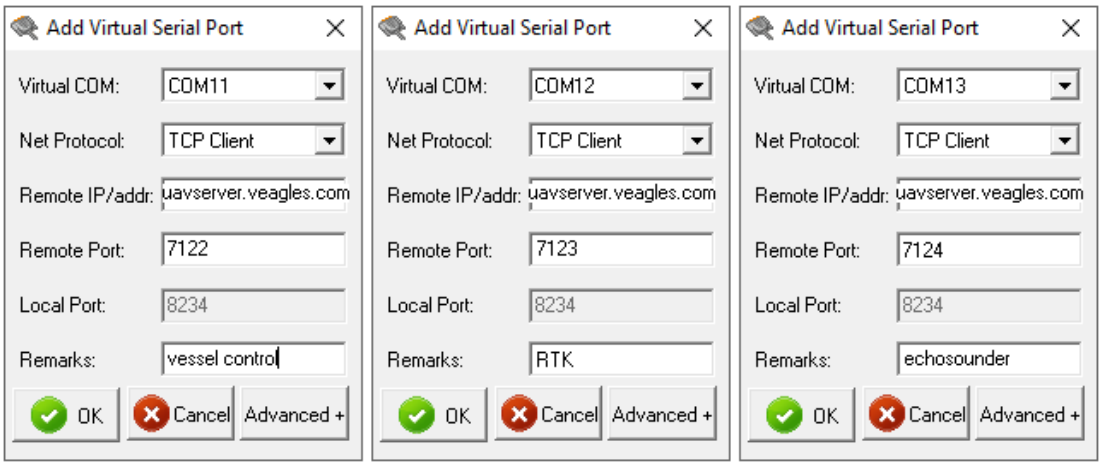
- If you use 2.4G network, set as follows:



Vessel control port | GNSS receiver port | echosounder port

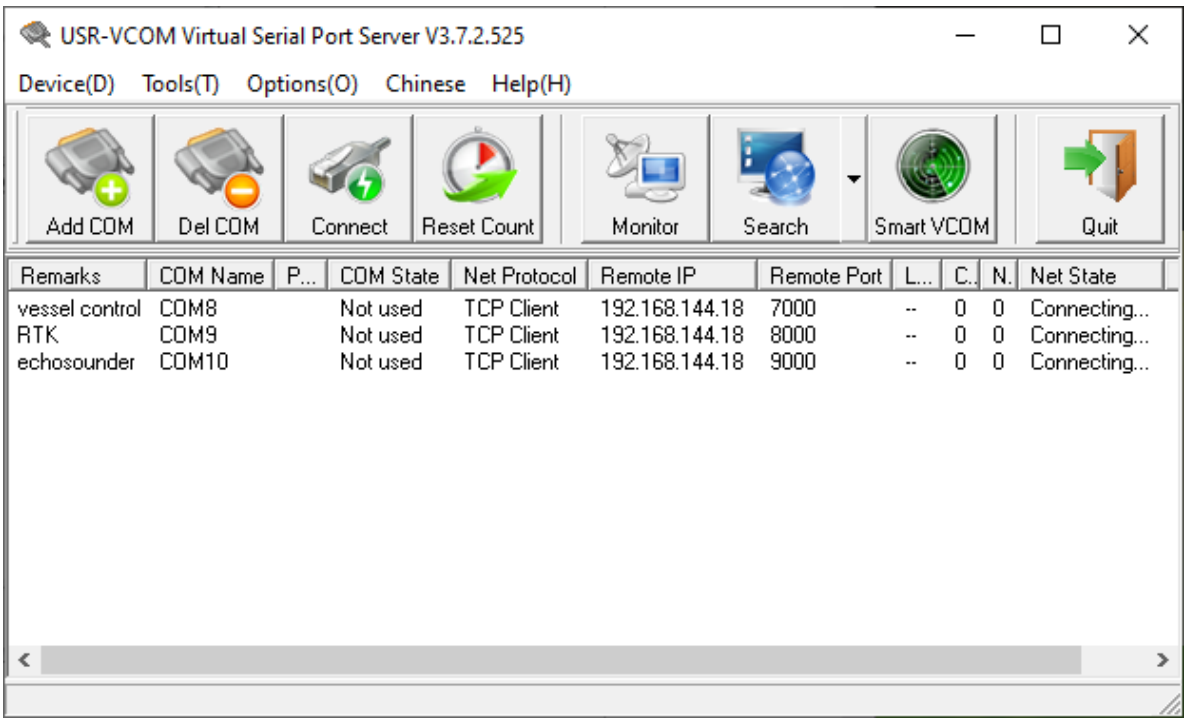
> **NOTE:** When setting the remote port, please check the information on the sticker on the vessel control unit.

- If you use 4G network, set as follows:



Vessel control port | GNSS receiver port | echosounder port

Taking 2.4G network as an example, the result is as follows:



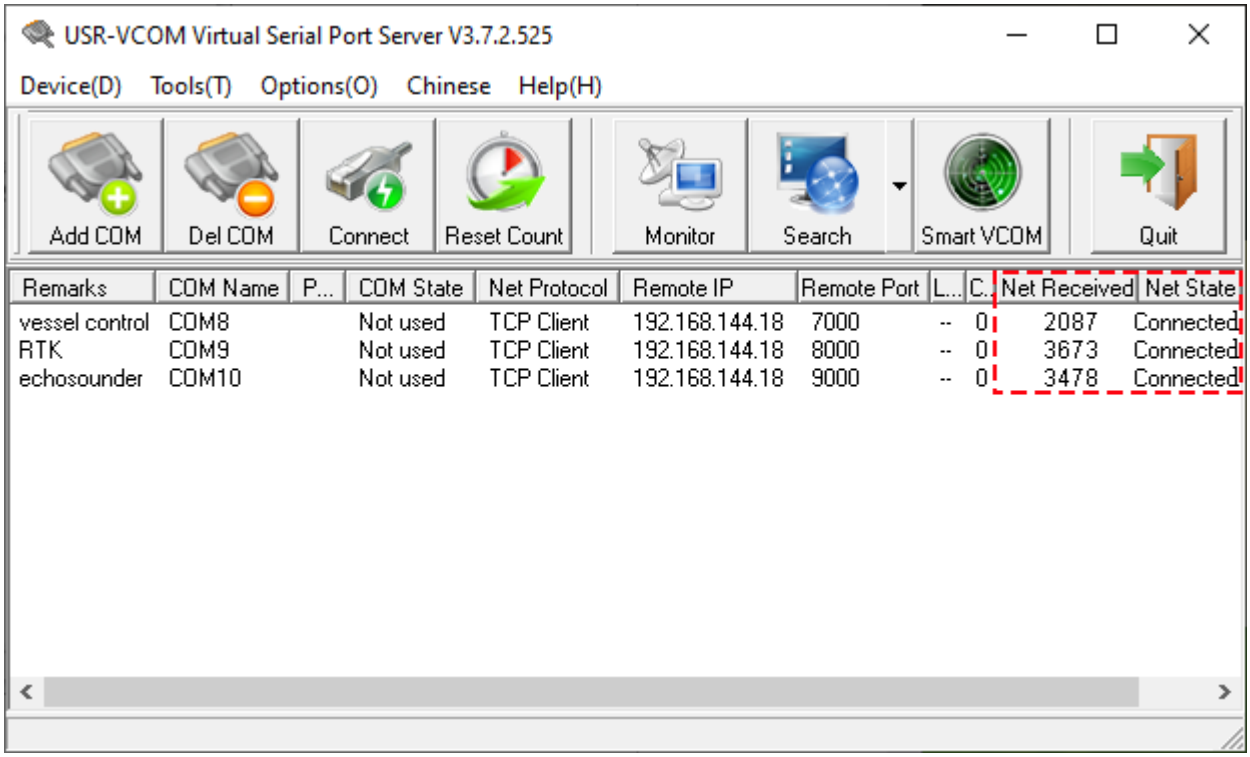
3.4 Establish Communication between the Remote Control and Your PC

To establish communication between the remote control and your PC, do one of the following:

- If you use 2.4G network, do the following:
  a. Turn on the remote control.
  b. To turn on the hotspot of the remote control, slide your finger down on the screen, and press 

.
  c. Connect your PC to the Wi-Fi of the remote control.
     - Wi-Fi name: SN of the remote control (the SN is on the sticker on the remote control.)
     - Password: hzsz12345678
- If you use 4G network, connect your PC to any available Wi-Fi, and make sure you can surf the internet via your PC.

After successfully establishing communication between the remote control and your PC, to check if the data is received normally, go back to **USR-VCOM** software:

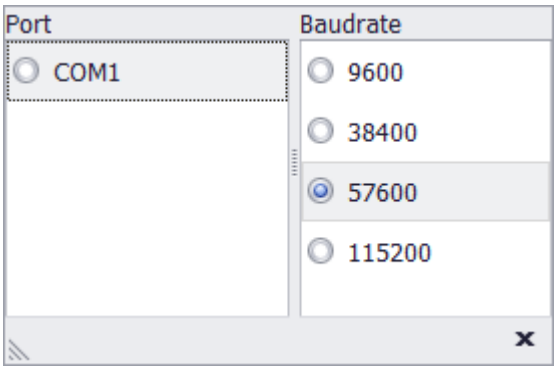


If there is received data in **Net Received** column, and the net state in **Net State** shows **Connected**, it indicates that the communication is successful.

3.5 Connect to the VE115 via the VEC Software

To connect to the **VE115** via the **VEC** software, do the following:

1. Run the **VEC** software.
2. In the connection setting area (upper right corner), click the dropdown box of **Connection setting**:

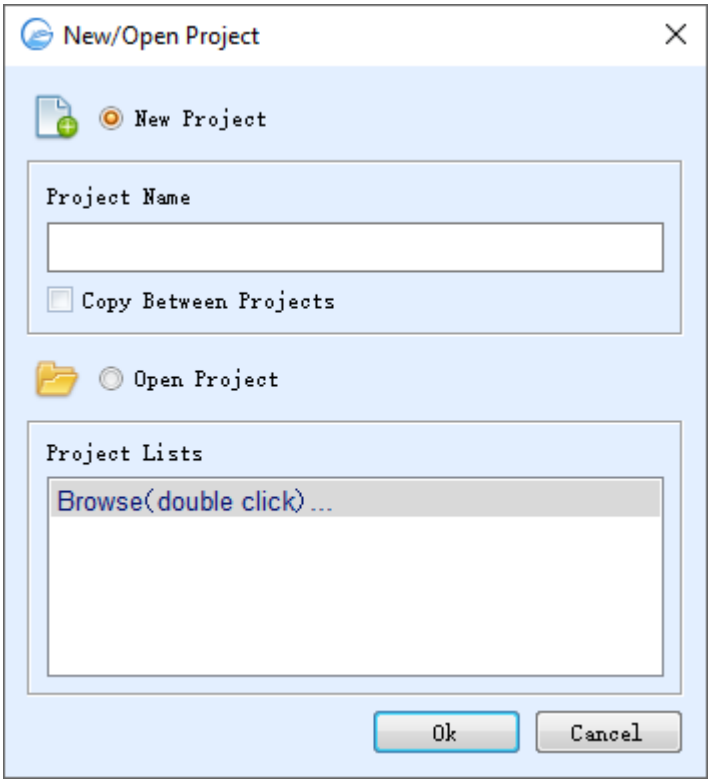


3. Select the remote port for vessel control, and set the baud rate to **57600**.
4. Click **Connect**.

3.6 Create or Load a Project

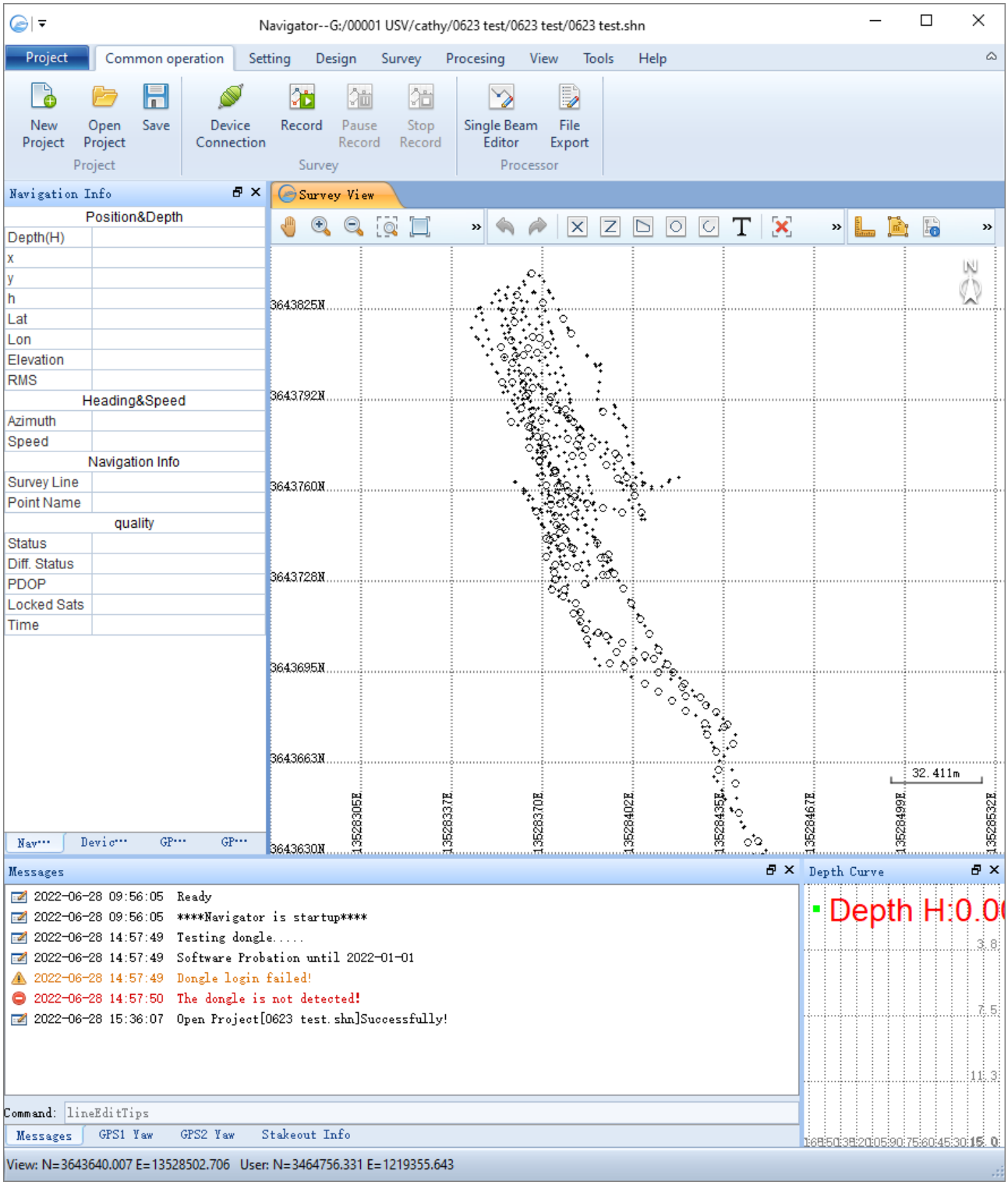
To create or load a project, do the following:

1. Run the **Navigator** software. **New/Open Project** dialog box pops up:



2. Do one of the following:
   - Create a new project.
   - Load a project.

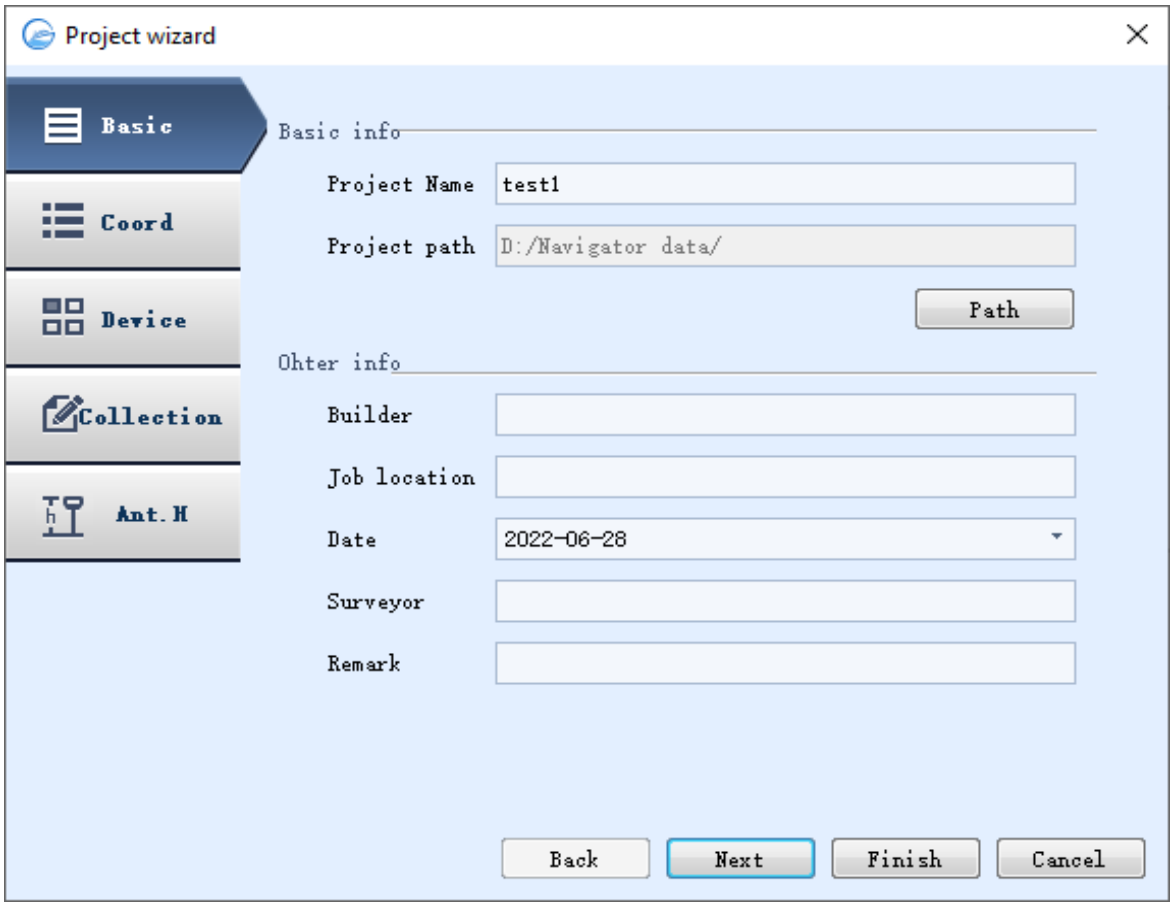
After loading a project, the track shows in the **Survey View** area:



3.6.1 Create a New Project

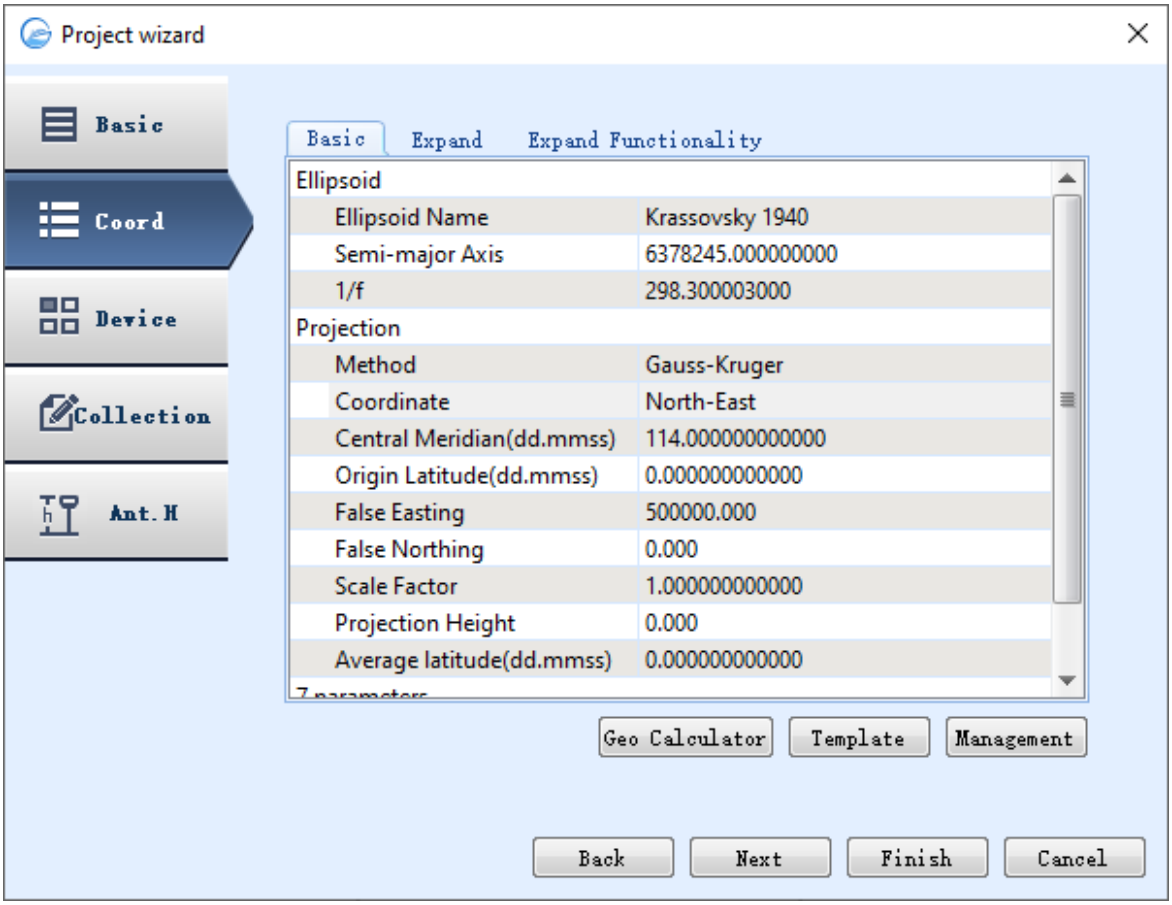
To create a new project, do the following:

1. In **New/Open Project** dialog box, select **New Project**.
2. In the input box **Project Name**, input a project name, and click **OK**. **Project wizard** dialog box pops up:



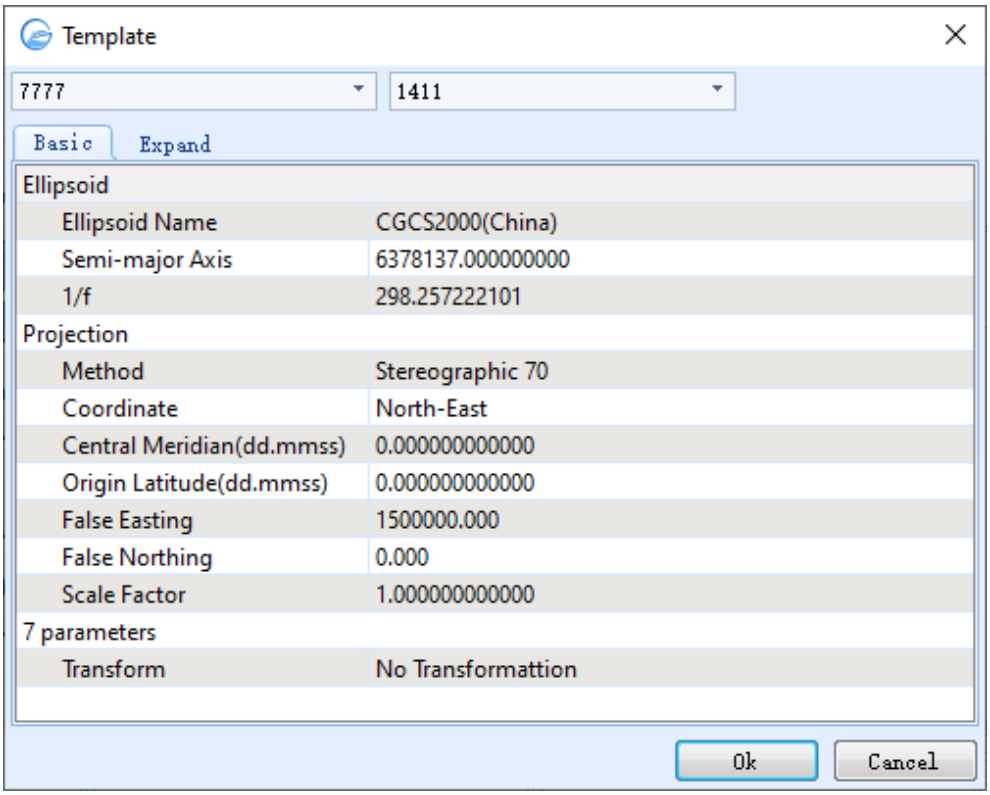
3. In **Basic** page, set the following basic information:
   - Project name
   - Project path
   - Builder
   - Job location
   - Date
   - Surveyor
   - Remark

4. In **Coord** page, do the following:



a. To set a template of the coordinate system, do the following:

i. Click **Template**:



ii. Select an ellipsoid name in the dropdown box of **Ellipsoid Name**.

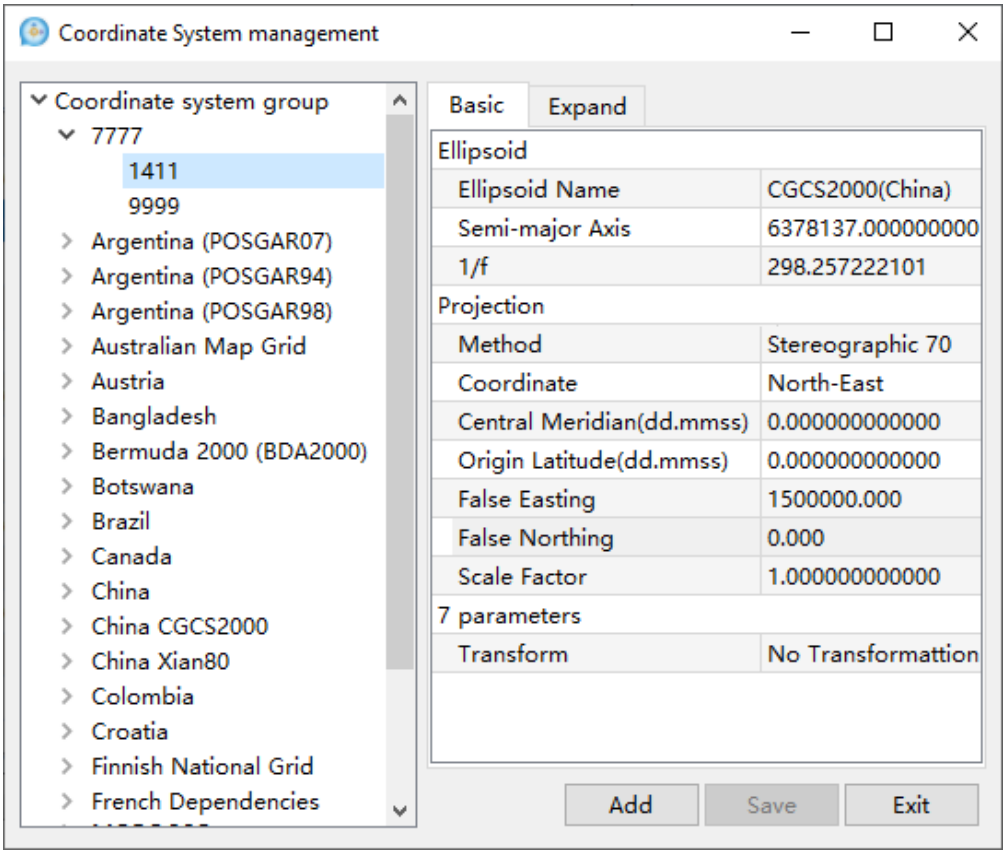
iii. Select a projection method in the dropdown box of **Method**.

iv. Input your local central meridian in the input box of **Central Meridian**.
Format: dd.mmss. e.g. for 113°9′3″, please input 113.0903.

v. **Optional:** To correct the X coordinate and Y coordinate, separately input the correction value into input boxes of **False Easting** and **False Northing**.

b. To customize the coordinate system, do the following:

i. Click **Management**:

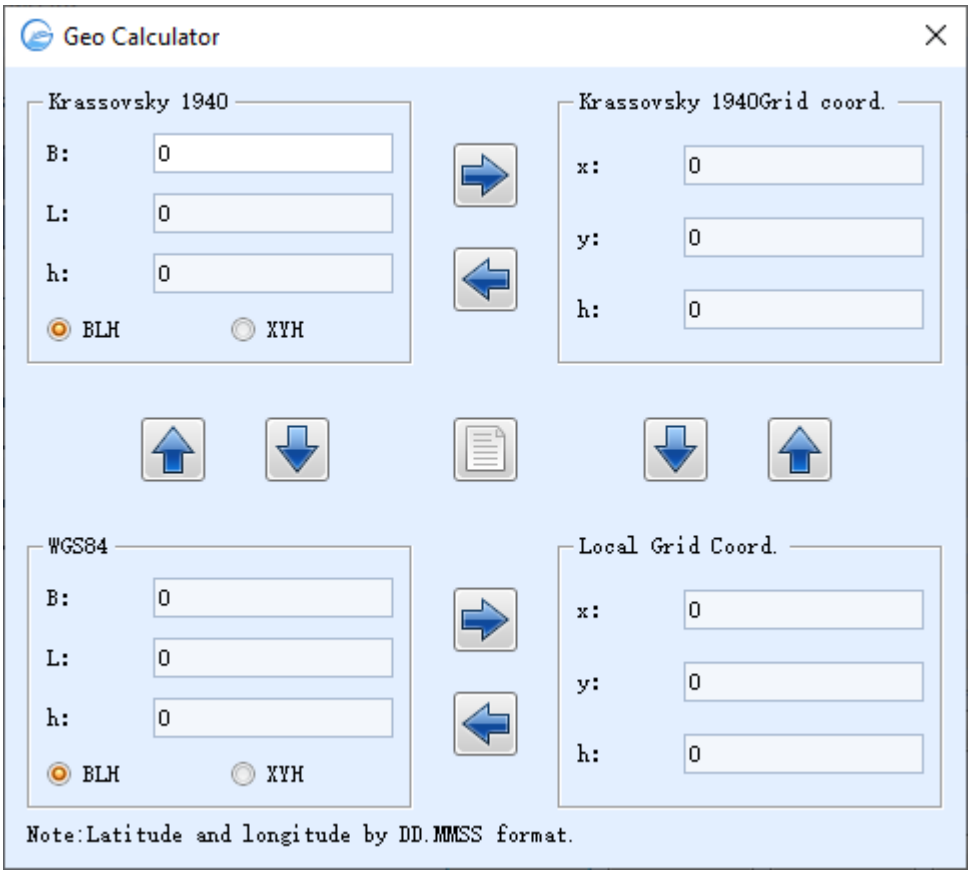


ii. In **Coordinate system group** column, right click, and select **Add coordinate system**.

iii. Input a name for the coordinate system.

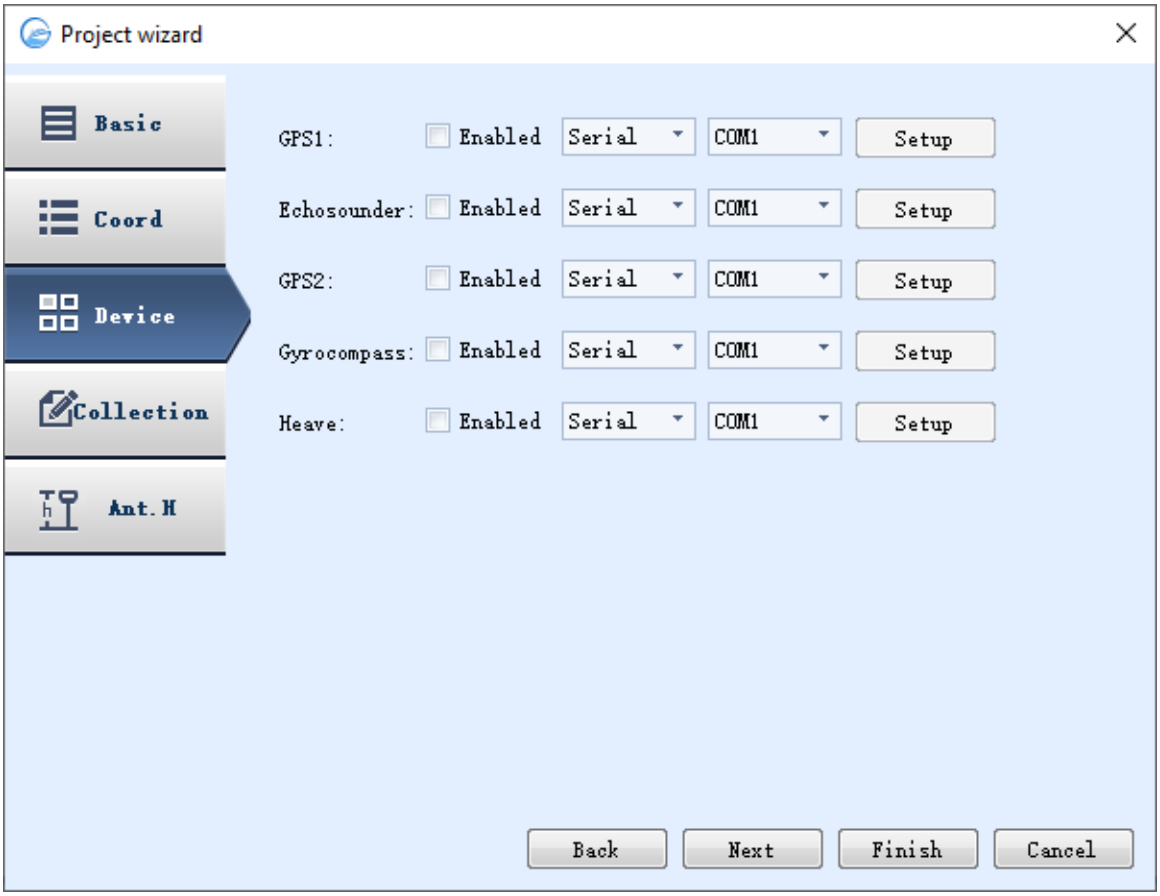
c. To convert parameters, do the following:

i. Click **Geo Calculator**:



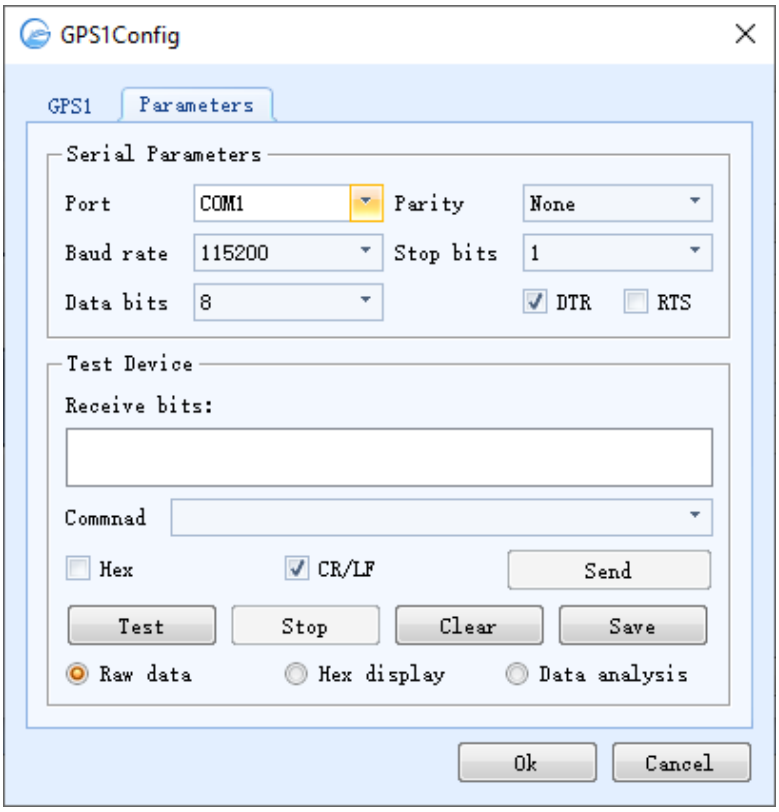
ii. Covert parameters.

5. In **Device** page, do the following:



a. To configure the GPS, do the following:

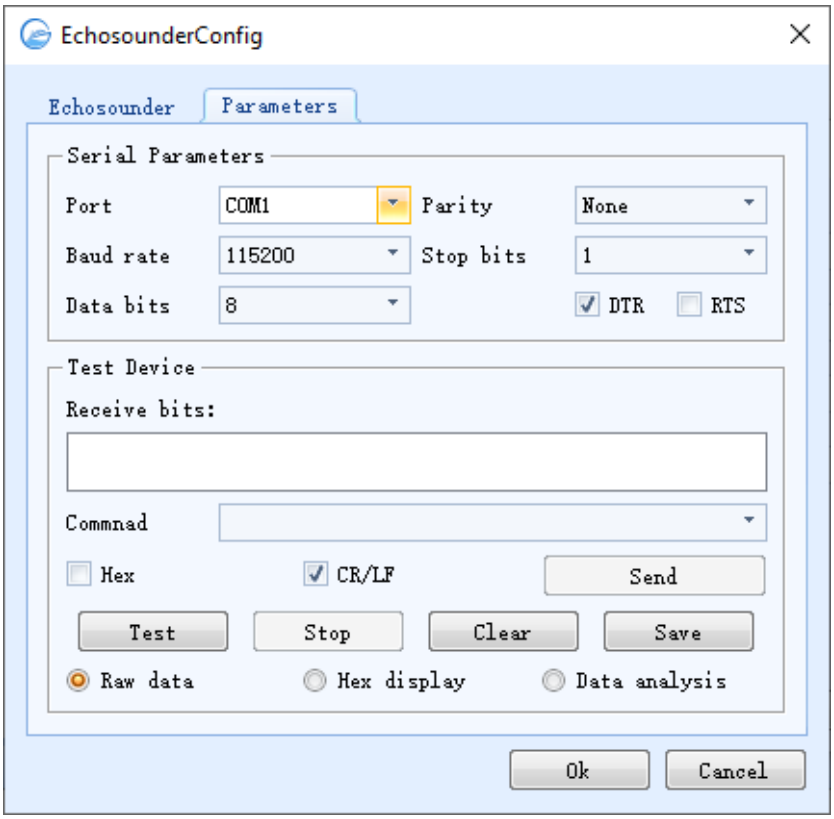
i. Enable GPS1, click **Setup**, and switch to **Parameters** page:



ii. Set the port and baud rate, and click **Test** to check if the communication is normal.

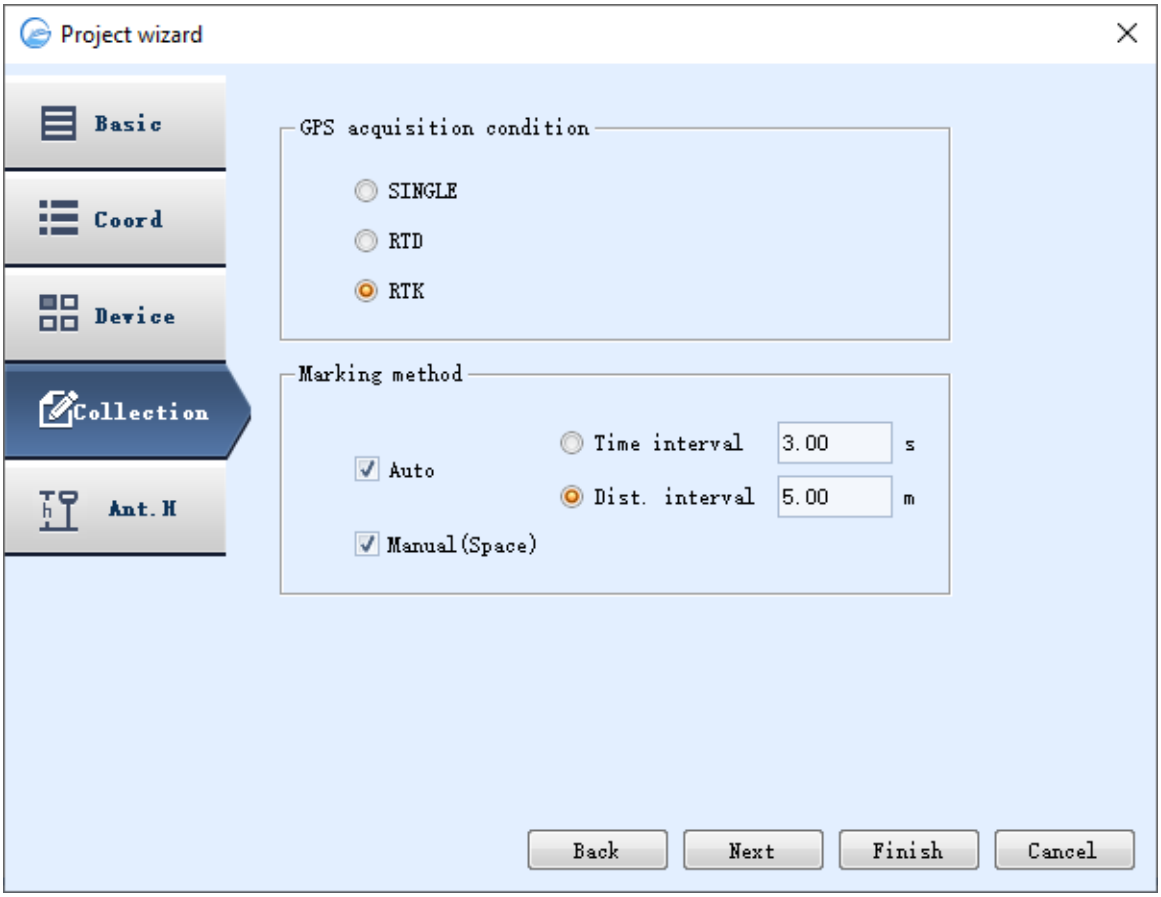
b. To configure the echosounder, do the following:

i. Enable echosounder, click **Setup**, and switch to **Parameters** page:



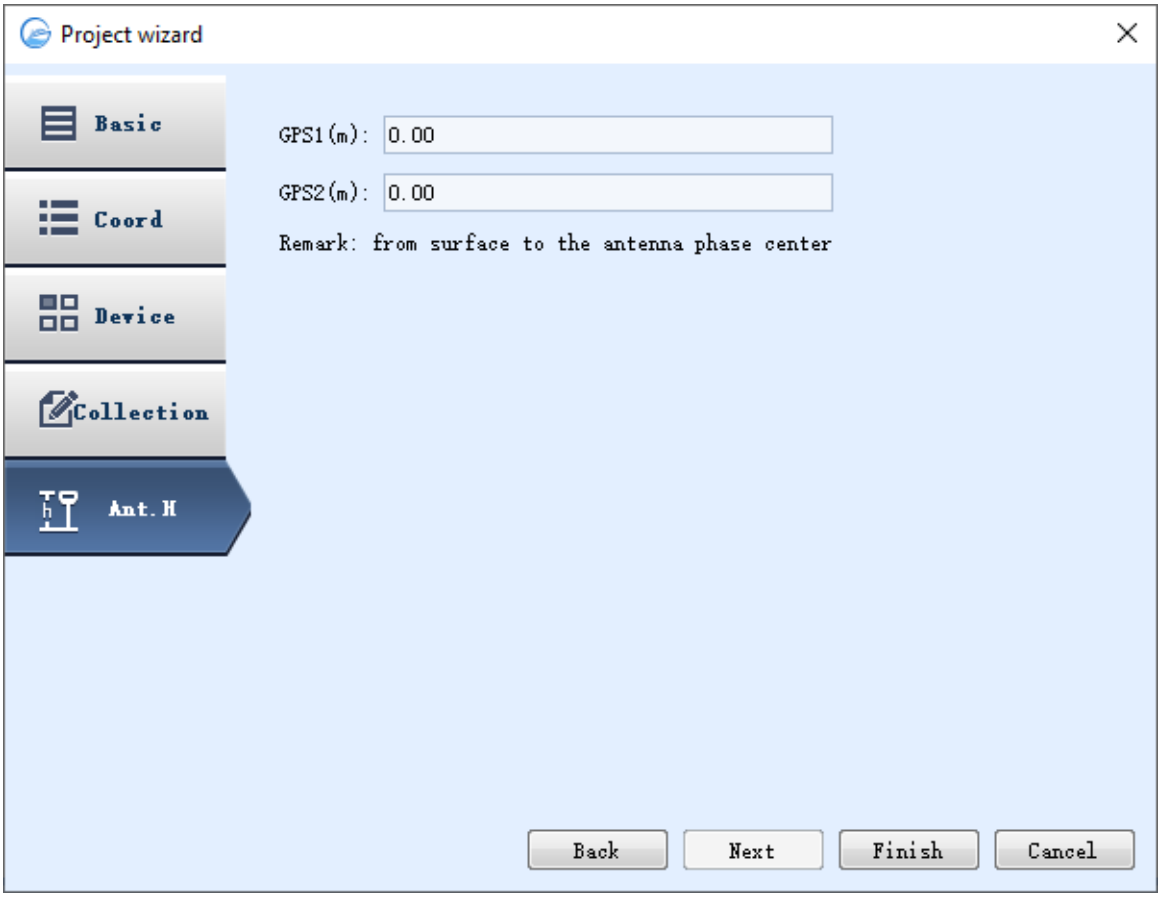
ii. Set the port and baud rate, and click **Test** to check if the communication is normal.

6. In **Collection** page, do the following:



a. Select the GPS acquisition condition (single, RTD and RTK).
b. Select the collection type, and set the interval:
   - Time interval: coordinate data and depth data will be collected after the specified time.
   - Distance interval: coordinate data and depth data will be collected when the measurement point moves a specified distance.
c. Select a marking method:
   - Auto
   - Manual
   - Auto and manual

7. In **Ant.H** page, do the following:



   a. Set the antenna height of GPS1.

      The distance between the water surface and the antenna phase center.

      > **NOTE:** The antenna height of **VE115** is 0.426 m; the bottom of the echosounder to the top of the GNSS receiver pole is 0.406 m, the bottom of the GNSS receiver to the phase center is 0.04 m, and the swirl marks at the top of the GNSS receiver pole is 0.02 m.

   b. Click **Finish**.

3.6.2 Load a Project

To load a project, do the following:

1. Select **Open Project**.
2. Do one of the following:
   - Directly select the target project in the project lists.
   - If the target project is not in the project list, double click **Browse (double click)** in the project list, and select the target SHN file in your PC.

3.7 Do Route Planning

To do route planning, do one of the following:

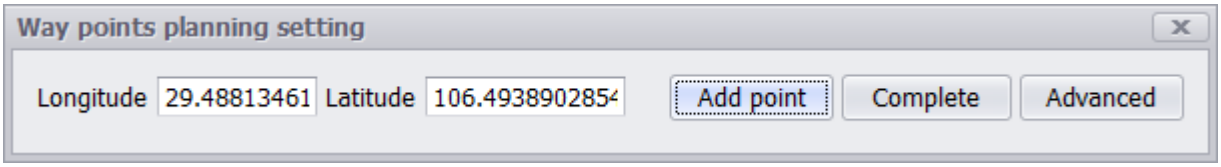
- Manually do route planning.
- Automatically do route planning.

3.7.1 Manually Do Route Planning

To manually do route planning, do the following:

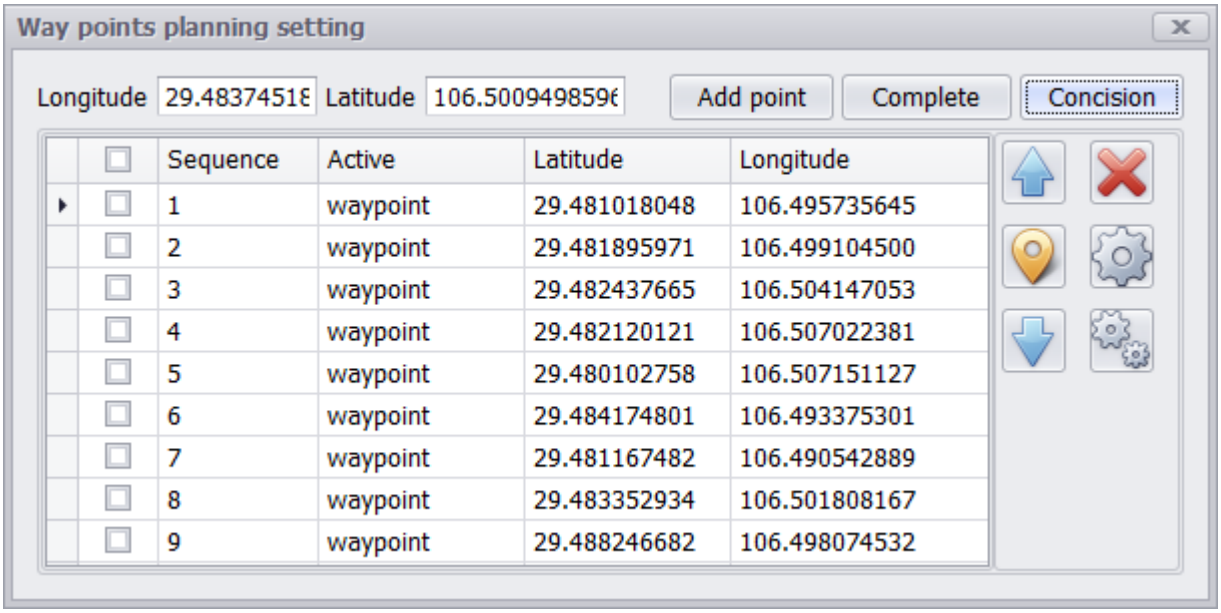
1. In **Point Planner** area, click 

→  **Edit WP**:



2. To set a waypoint, do one of the following:
   - Directly click the target position on the map.
   - Manually input longitude and latitude of the target waypoint.

   The sailing route automatically shows on the map according to the drawn waypoint order.
3. **Optional:** To check all the longitudes and latitudes of the waypoints, click **Advanced**.

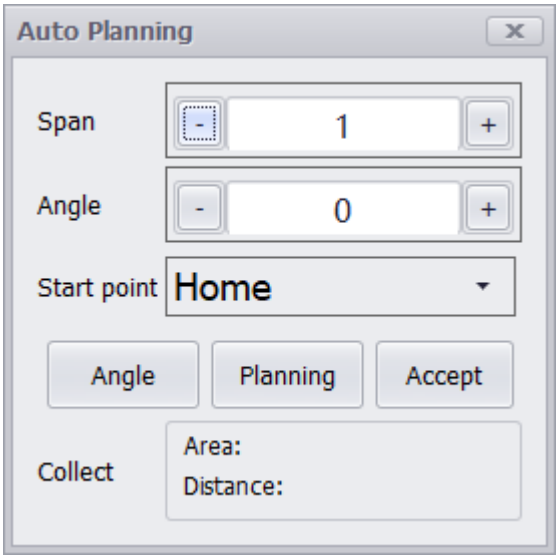


4. **Optional:** To modify the longitude and latitude of the target waypoint, click the target input box in **Latitude** or **Longitude** column, and input the target value.
5. After setting all waypoints, click **Complete**.
6. To save all waypoints to the vessel control system, click  .

3.7.2 Automatically Do Route Planning

To automatically do route planning, do the following:

1. In **Point Planner** area, click Edit → **Auto**. **Auto Planning** dialog box pops up:



2. In map zoom area, select a suitable scaling.

   Suggested scaling: 16 or above

3. To determine the sailing range, click the target position on the map.
4. In **Auto Planning** dialog box, set the following:
   - Space: the space among each sailing route.
   - Angle:
   - Start point: the start position of your mission. You can select among home, left top, left bottom, right top and right bottom.
5. Click **Planning**. The planning points and routes automatically show.
6. After confirmation, click **Accept**. The planning points and routes are automatically converted into sailing waypoints and routes.
7. To save all waypoints to the vessel control system, click .
8. In control panel, click Auto. The vessel automatically start sailing along the planned routes.

3.8 Test the VE115

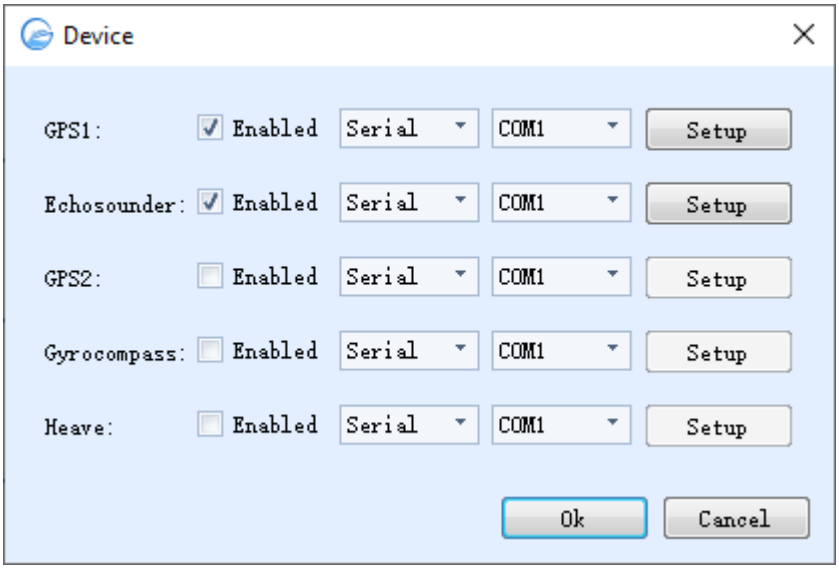
Before moving the **VE115** into the water, you need to test if the **VE115** work can work normally.

Before testing the **VE115**, make sure each switch of the remote control is in the following states:

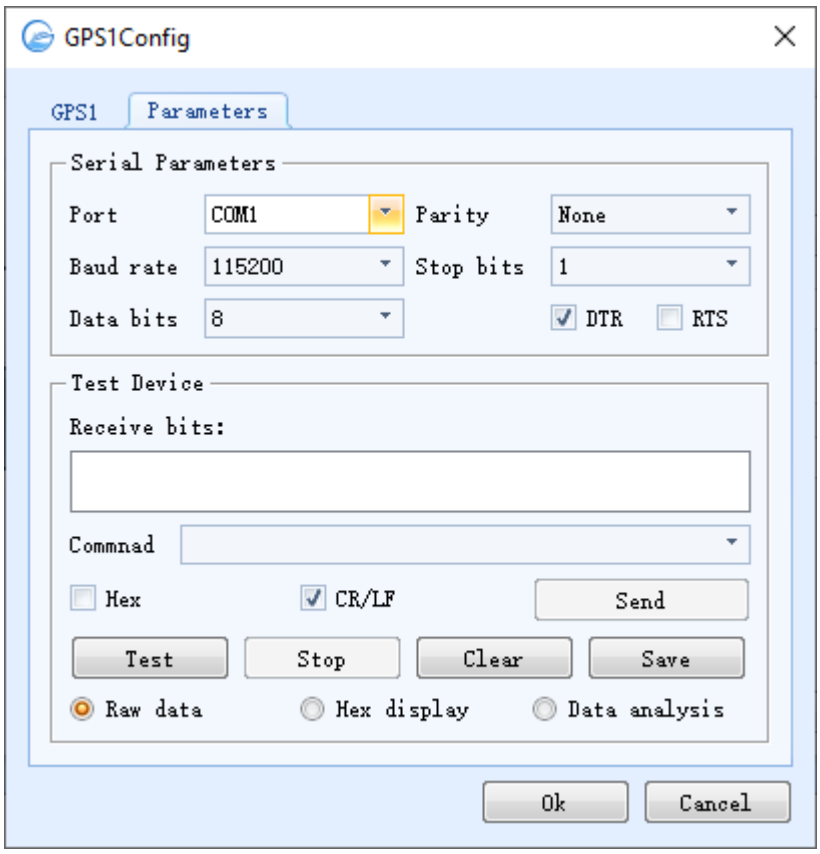
- The propeller control rocker is in the original state.
- The lever of the switch for locking/unlocking is in the middle or at the bottom.

To test the **VE115**, do the following:

1. Power on the GNSS receiver, **VE115** and the remote control.
2. Run the **Navigator** software, and in menu bar, click **Setting** → **Device**:

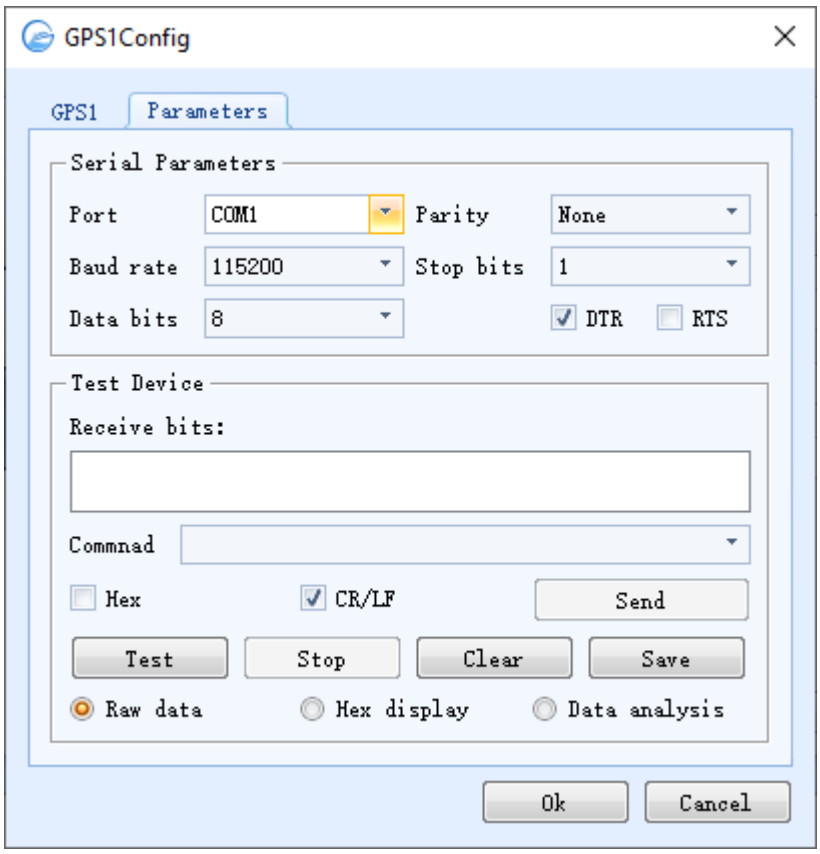


3. To test the GPS, do the following:
   a. Check the checkbox in front of **Enabled**, click **Setup**, and switch to **Parameters** page:

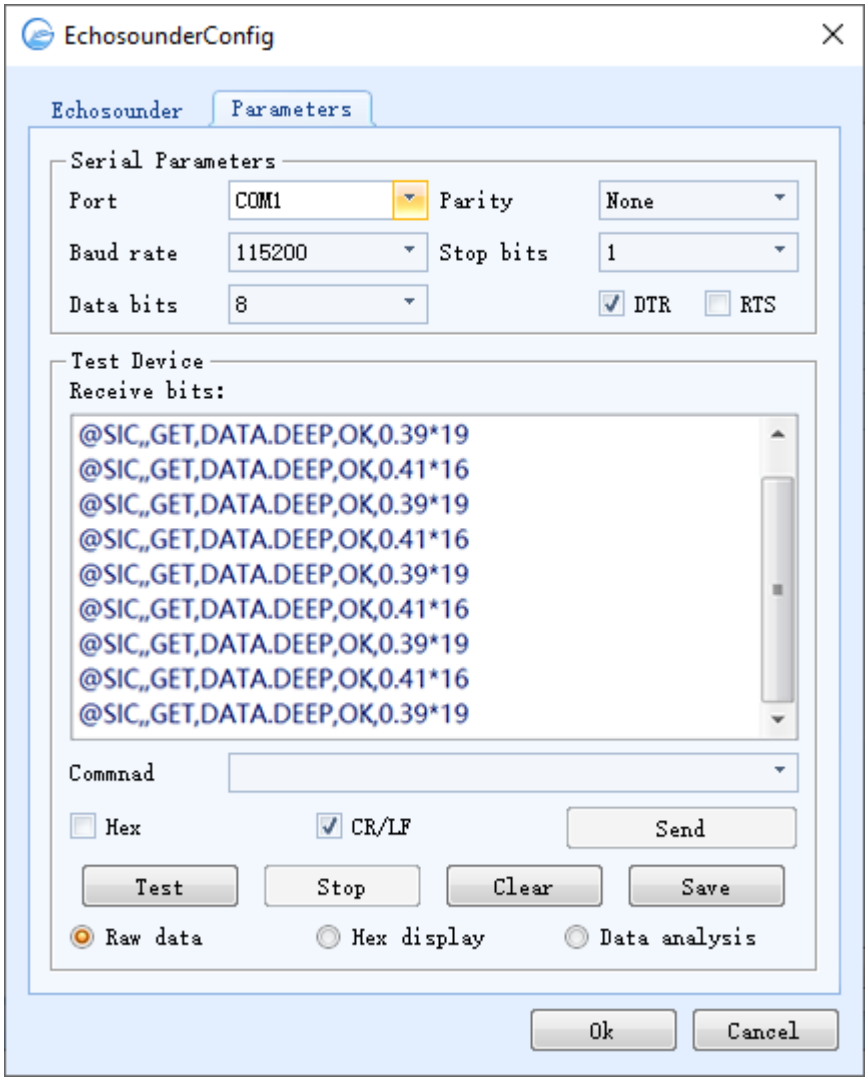


   b. Click **Test**. The result shows in **Receive bits** area.

4. To test the echosounder, do the following:
    a. Check the checkbox in front of **Enabled**, click **Setup**, and switch to **Parameters** page:



b. Click **Test**. The result is as follows:



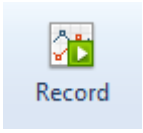
5. Push the propeller control rocker of the **VE115**, and check if the motor of the vessel works normally by hearing the sound of the motor.

After making sure that the **VE115** can work normally, move the vessel into the water.

3.9 Do Your Surveying Works

To do your surveying works, do the following:

1. To establish communication between the **Navigator** software and **VE115**, do the following:
    a. Make sure that the port and baud rate of GPS and echosounder are correctly set.
    b. Run the **Navigator** software.
    c. In the menu bar, click **Common operation** → 

.
    d. To start recording, click 

.
2. To start your surveying works, do one of the following:
    - If you select automatic route planning, click 

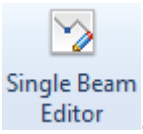
 in the lower right of **VEC** software. The vessel automatically starts surveying and returns to the set return point after surveying.
    - If you select manual route planning, operate the remote control and control the vessel.

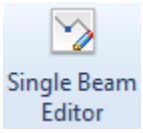
After finishing your surveying works, take the vessel back.

3.10 Process Data

This operation is used to modify the problematic values in the measured depth data, and take the required coordinates and depth values according to the set sampling method and interval.

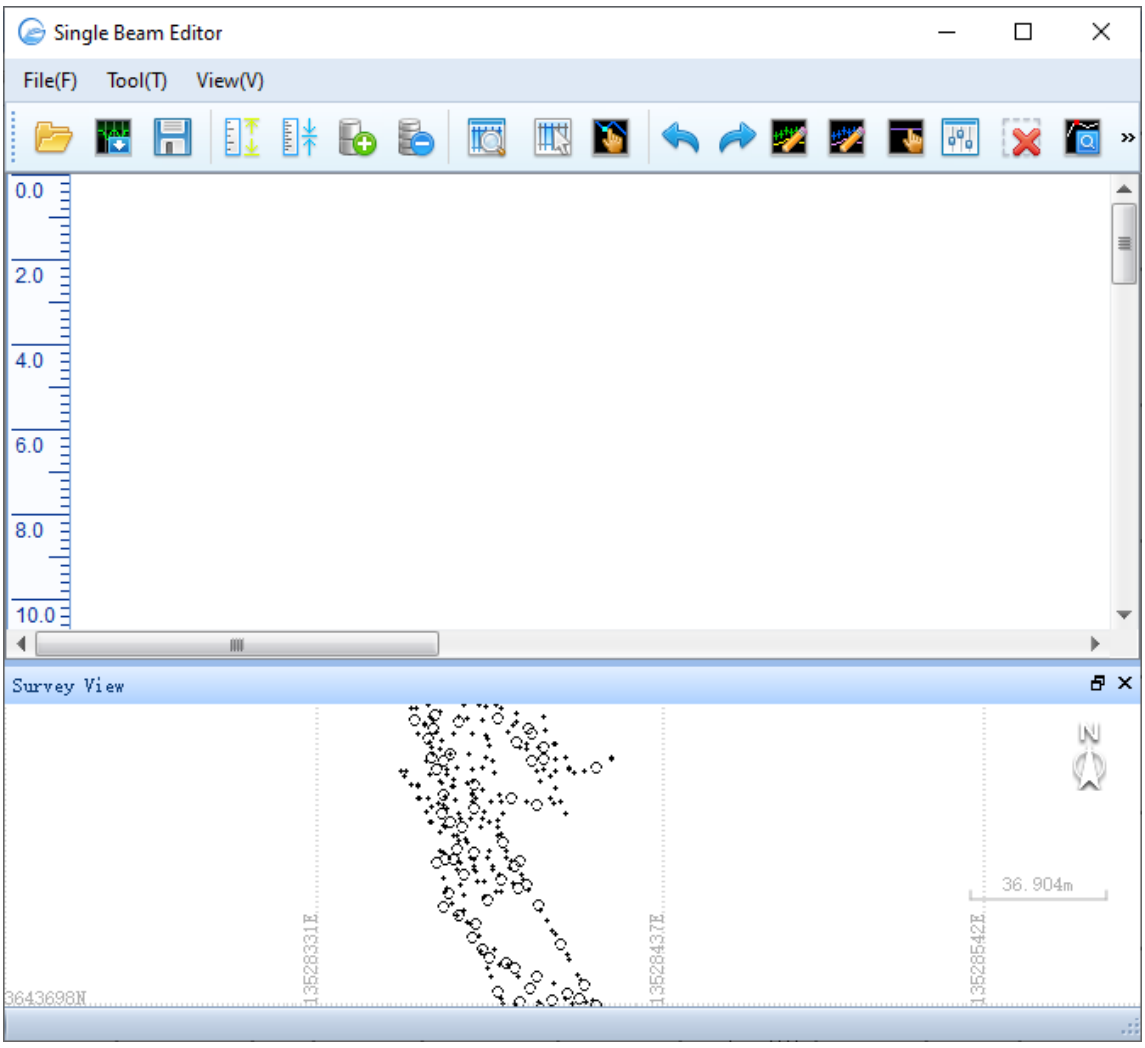
To process data, do the following:

1. In the menu bar, do one of the following:
   - Click **Common Operation** → 

.
   - Click **Processing** → 

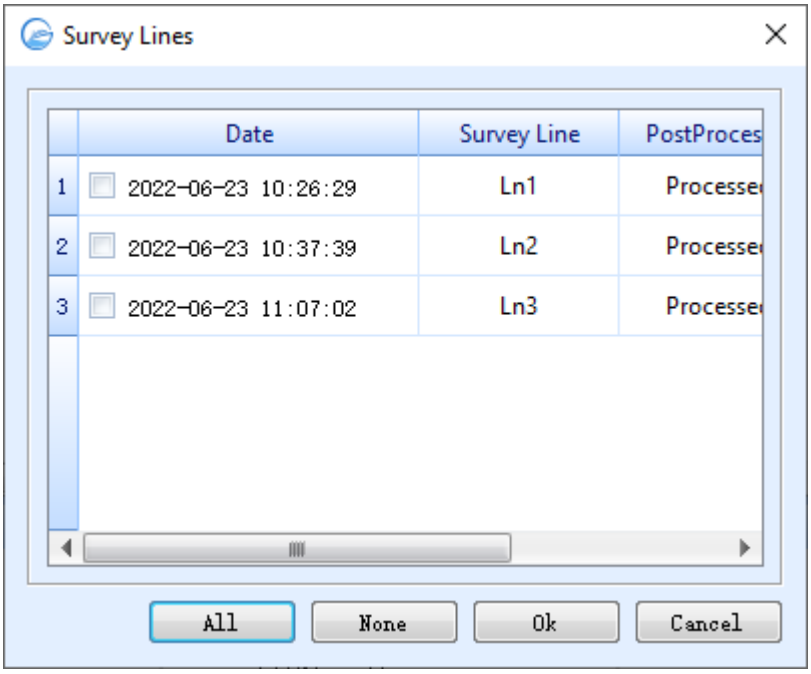
.

Single Beam Editor dialog box pops up:



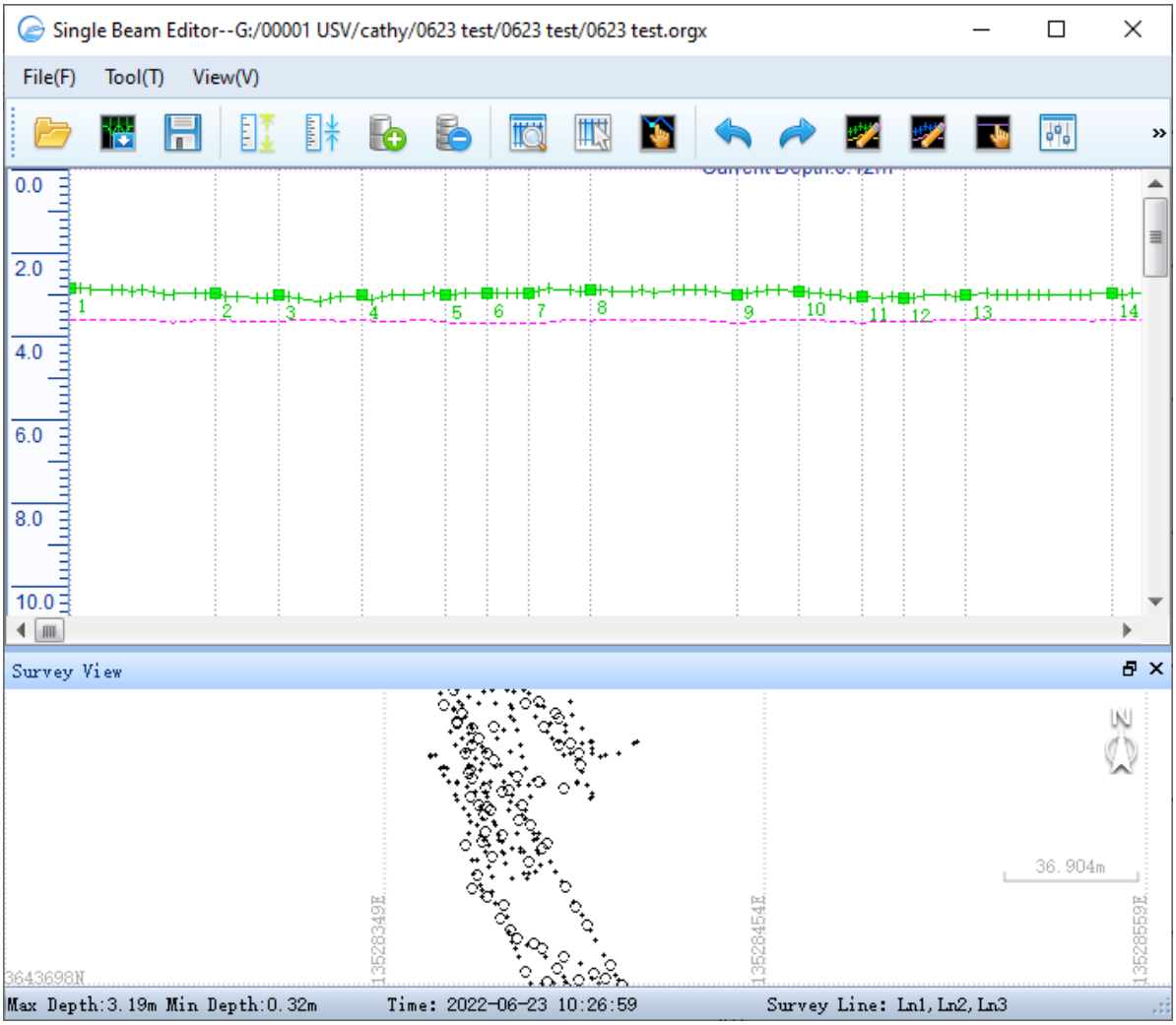
2. To open a depth file, do one of the following:
   - Click **File** → **Open**.
   - Click  .

Survey Lines dialog box pops up:



NOTE:  and  are not available for unmanned surface vessels.

3. Check the survey lines that needs to be processed, and click **OK**. The following interface shows:



4. To modify the view of the depth file, do one of the following:

   - To scale up the view of water depth, click  or click **View** → **Zoom In (V)**.

     The larger the display scale, the smaller the scale range on the left.

   - To scale down the view of water depth, click  or click **View** → **Zoom Out (V)**.

     The smaller the display scale, the larger the scale range on the left.

   - To enlarge the display range of the water depth, click  or click **View** → **Zoom In (H)**.

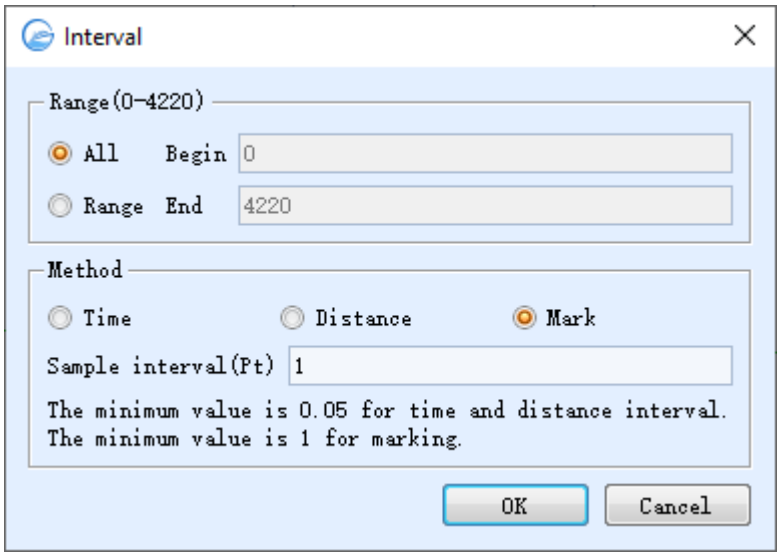
     The larger the display range, the larger the proportion of data displayed and the less data displayed.

   - To reduce the display range of the water depth, click  or click **View** → **Zoom Out (H)**.

     The smaller the display range, the smaller the proportion of data displayed and the more data displayed.

5. To select a sampling method, do the following:
   a. Do one of the following:
      - Click  or click **Tool** → **Sampling Methods**.
      - Click  or click **Tool** → **Set Sample Range**, and select the start point and end point of the target sampling range.

      Interval dialog box pops up:



   b. To select / modify a range for sampling, select one of the following:
      - All: sampling in the selected depth file.
      - Range: sampling in a certain part of selected depth file.

        If you click  , the range will be the start point and end point you selected.

   c. To select a sampling method, select one of the following, and input a value in input box **Sample interval**:
      - Time: the software takes a depth value at the set interval (time), and estimates the coordinates of the sampling point based on the marking coordinates of the two adjacent points.
      - Distance: the software takes a depth value at the set interval (distance), and estimates the coordinates of the sampling point based on the marking coordinates of the two adjacent points.
      - Mark: the software takes a depth value at the set interval (marking), eliminates the depth of the middle point, and rarefies the depth data.

Note: The minimum interval for sampling by time and distance is **0.05**, and for sampling by marking is **1**.

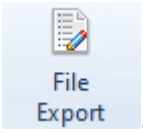
6. To modify the depth line, do the following:
   - To reverse the action of an earlier action, click  or click **Tool** → **Undo**.
   - To restore any actions that were previously undone using an undo, click  or click **Tool** → **Redo**.
   - To manually smooth the abnormal water depth, click  or click **Tool** → **Edit Depth H**, hold down the left mouse button, and draw the track to be modified on the abnormal line segment. The abnormal segment turns to be the target track.

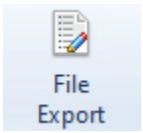
     If your vessel is equipped with the dual frequency single beam echosounder, please modify the abnormal depth at low frequency by clicking  or clicking **Tool** → **Edit Depth L**.
   - To automatically smooth the abnormal depth, click  or click **Tool** → **Auto**.

      **NOTE:** After automatically smooth the abnormal water, please check if there are missing depth points and manually smooth them.
   - To move the elevation line of water surface (the purple dotted line), click  or click **Tool** → **Moving Surface Line**, hold down the left mouse button, and drag the elevation line to the target position.
     - When the elevation of water surface is between 0 m and 9.9 m, the scale where the elevation line is located is the elevation value.
     - When the elevation of water surface is greater than 9.9 m, the scale where the elevation line is located is the digit and decimal of the elevation value.
   - To delete the problematic depth points and use the surrounding depth to interpolate the region, click  or click **Tool** → **Delete Data**, select a region on the depth line, and click **OK** in the confirmation popup.
   - To jump to the point with zero depth so as to conveniently process data, click  or click **Tool** → **Next 0 Depth Value**.
   - To refresh all depth data, click  or click **Tool** → **Refresh**.
7. To play the depth line, do the following:
   - To automatically start playing the depth line, click  .
   - To pause playing the depth line, click  .
   - To speed up or slow down the playing speed, click  and modify the speed among 1, 2 times, 4 times and 8 times.
   - To stop playing the depth line, click  .
8. To save the modification, click  , click **OK** in the confirmation popup.

3.11 Export Files

To export files, do the following:

1. In the menu bar, do one of the following:
   - Click **Common Operation** → 

.
   - Click **Processing** → 

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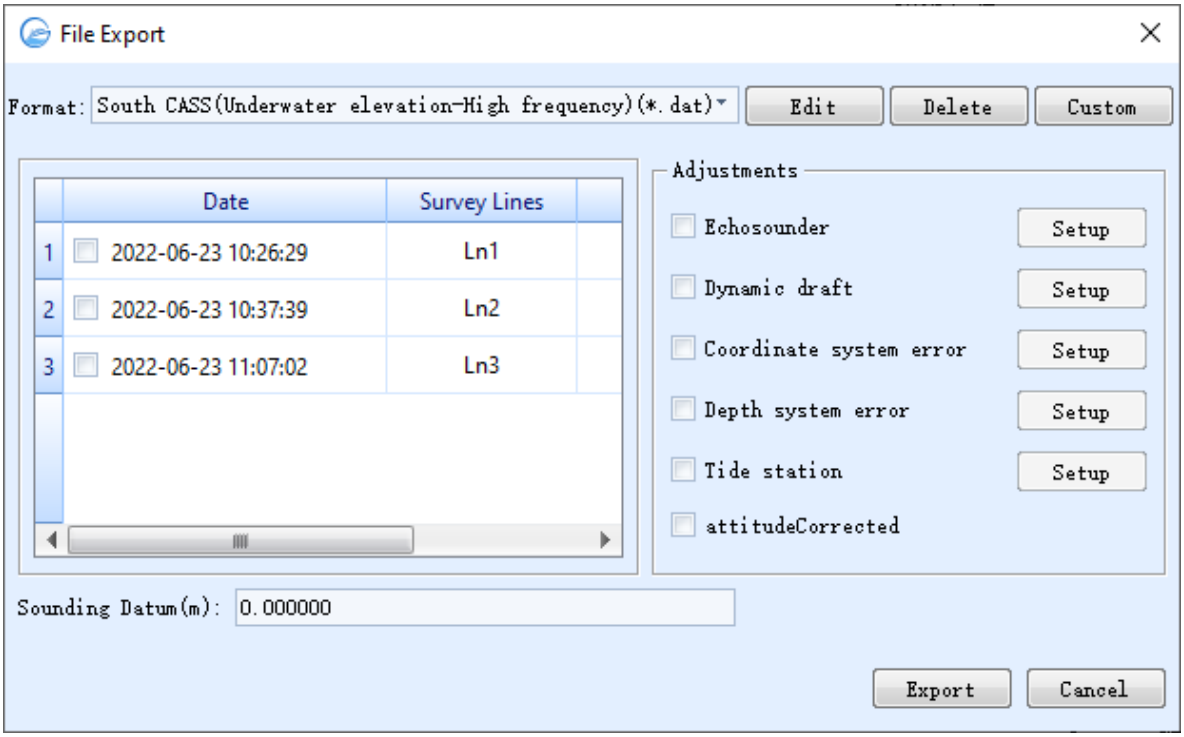
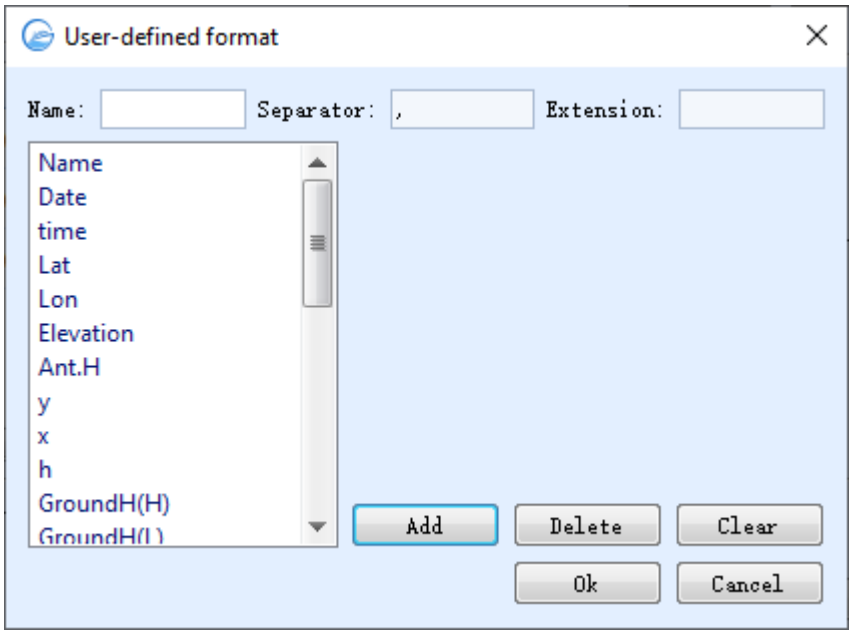
File Export dialog box pops up:



2. To add a customized format, do the following:
   a. Click **Custom**. **User-defined Format** dialog box pops up:



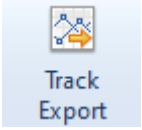
   b. Set the same, separator and extension.
   c. Select the file format in the left list, and click **Add**.
   d. After adding all your required formats, click **OK**.
3. Select the target format in the dropdown box of **Format**.
4. **Optional:** To modify the customized format, click **Edit**, and make the modification.

> **NOTE:** Only customized formats can be modified.

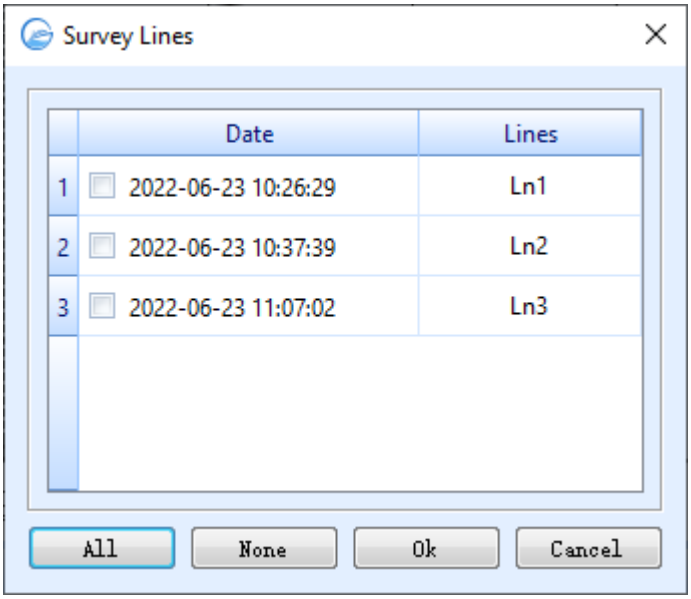
5. **Optional:** To delete the customized format, click **Delete**, and click **Yes** in the confirmation popup.

> **NOTE:** Only customized formats can be deleted.

6. Click **Export**, and select the target storage path.

7. **Optional:** To only export the track, click 

, select the target survey lines, click **OK**, and select the target storage path:



To be the leading provider of high-precision professional, solution & service in the global geospatial industry

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