



# HydroSonar Software User Manual

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Beijing Hydro-Tech Marine Technology Co., Ltd.

V1.3      May 2021

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# 1. HydroSonar Introduction

This manual introduces the functions, user interface and operation process of HydroSonar, which is the data acquisition software of Hydro-Tech side scan sonar products.

## 1.1. HydroSonar Installation

### 1.1.1. Software Running Environment Requirement

Computer configuration and OS requirements are listed as below.

- (1) CPU: Central processor above 1.8GHz.
- (2) Memory: At least 2GB of memory, more than 4GB is recommended.
- (3) Hard disk: Space is more than 200GB.
- (4) Video memory: More than 256MB. If you prefer faster speed, it is recommended to use more than 1GB video memory.
- (5) Display: Graphics card shall have minimum 1366×768 resolution display capability. Not recommend to bigger than 1920×1080 resolution.
- (6) This software can be applied to Windows XP, win7 and above operating systems.

### 1.1.2. HydroSonar Installation

- (1) Run "HydroSonarSetupChs.msi" to enter installing dialog box as shown in Figure 6.1.

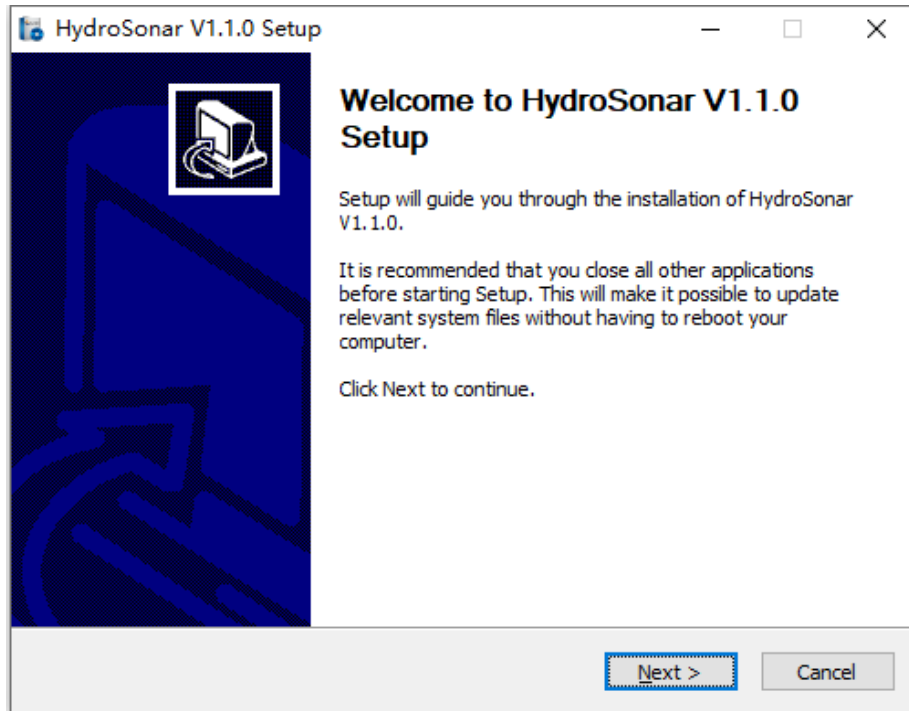


Figure 6.1 HydroSonar Installation Guidance

(2) Click the "Next" button in Figure 6.1 to enter the Installation Guidance dialog box and select the installation path as shown in Figure 6.2.

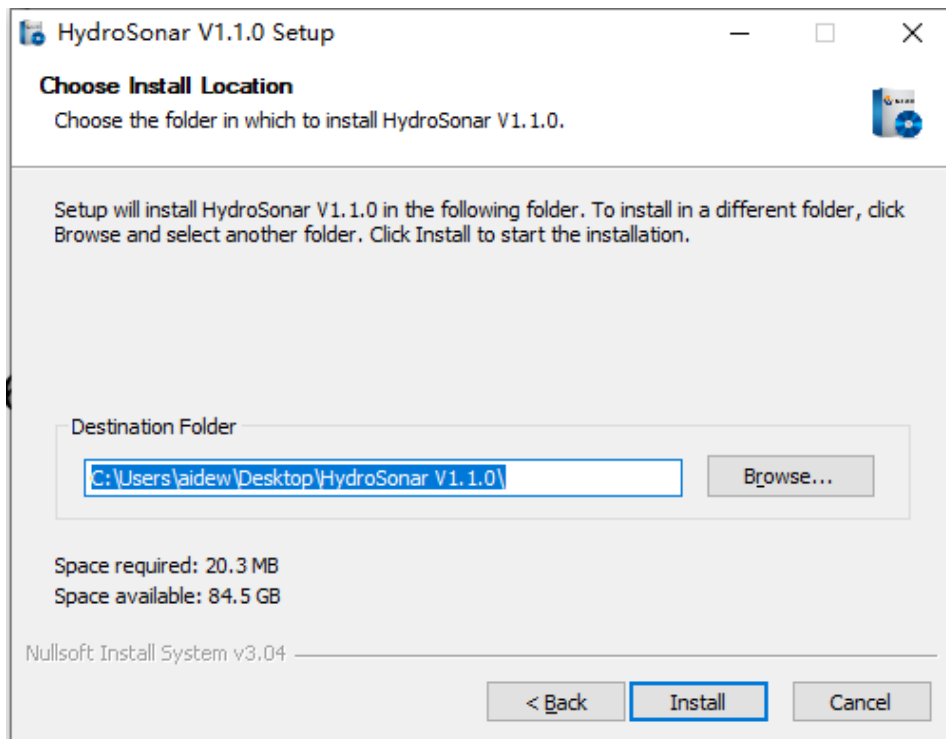


Figure 6.2 Installation Path

(3) Click "Next" in Figure 6.2 to pop up the installation confirmation interface, then click "Next" one more time finish the installation.

### 1.1.3. Set up IP Address

A network connection is required before starting work. The data transmission between the computer, where HydroSonar software is running, and side scan sonar is connected through a network cable.

First, make sure the IP address of computer is 192.168.1.\*\*, any IP between 21 ~ 255 section, as shown in Figure 6.3. The setting method is as below (take Windows 7 as an example):

Start Menu → Control Panel → Network and Internet → Network and Sharing Center → Change Adapter Settings → Local Network, click right button, show up Properties → Internet Protocol Version 4 (TCP/IPv4) → Properties. There will be a dialog box popping up. Set up Internet Protocol's (TCP/IP) properties according to the values as shown in Figure 6.3. This step can be stepped over if the computer had been set up already.

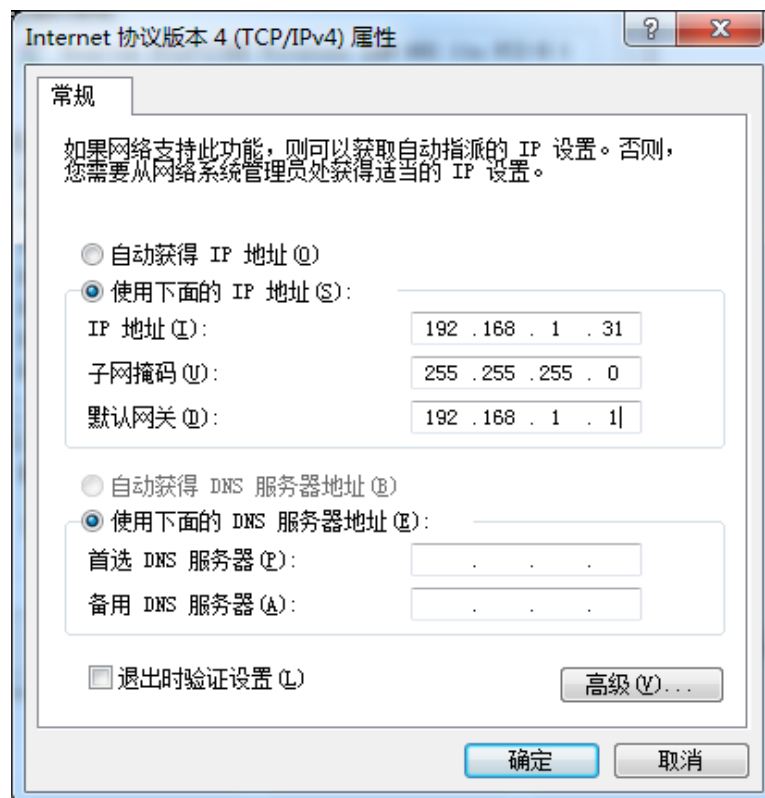


Figure 6.3 Internet Setting

## 1.2. HydroSonar Software Function

HydroSonar software has two major functions. One is sonar sounding

data retime display and collection, the other is data playback.

The detailed work includes working parameter setting, data display setting and status information. The configuration can use to set up range, pulse, gain & loss etc.

### 1.3. HydroSonar Interface Introduction

HydroSonar interface is as Figure 6.5 and consists of menu toolbar, data display window, navigation window, objective window, control panel and status column.

- (1) Menu Toolbar: Zone 1;
- (2) Data Display Window: Zone 2;
- (3) Navigation Window: Zone 3;
- (4) Objective Window: Zone 4;
- (5) Control Panel Window: Zone 5;
- (6) Status Column: Zone 6.

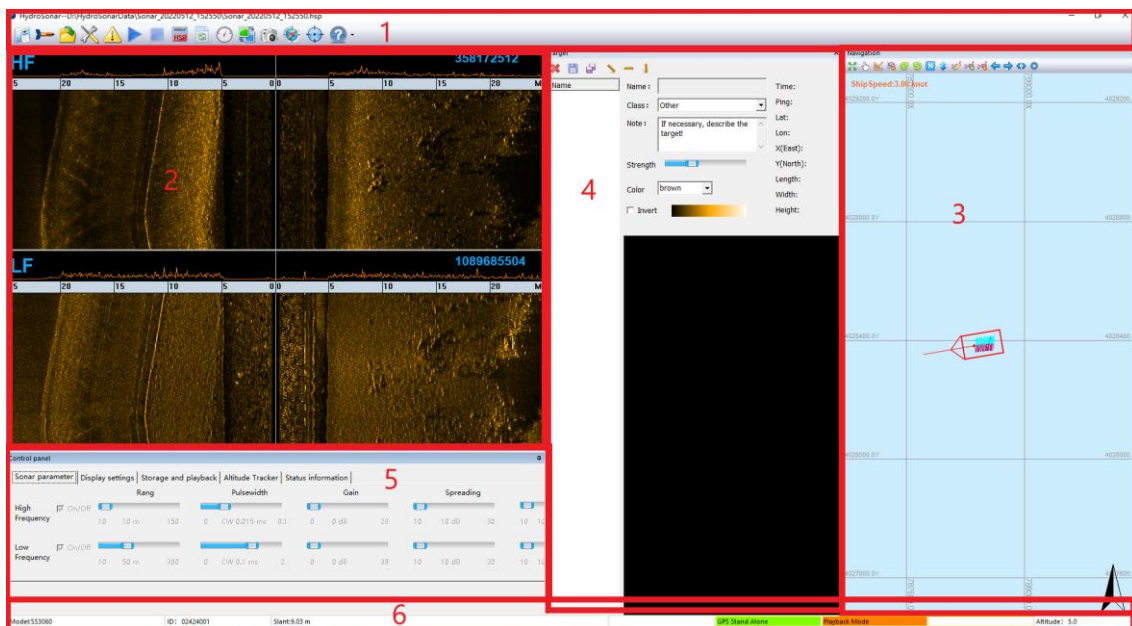


Figure 6.5 Software Interface

#### 1.3.1. Menu Toolbar

The menu toolbar includes "Project", "Connect Device", "Open File", "Device Parameter Setting", "Alarm Setting", "Start Work", "Stop Work", "Start/Stop Storing HSF File", "Calibrate Pressure", "Switch Window", "Print



Screen", "Navigation Window", "Target Window", "Help" several tool buttons as shown in Figure 6.6.



Figure 6.6 Menu Toolbar

- (1) The "Project" button is to select a project or create a new project;
- (2) The button of "Connect Device" is to connect the side scan sonar;
- (3) The "Open File" button is used to select the playback file. After clicking, the software automatically pops up the "Select Playback File" dialog box as shown in Figure 6.7. Just select the file want to playback.

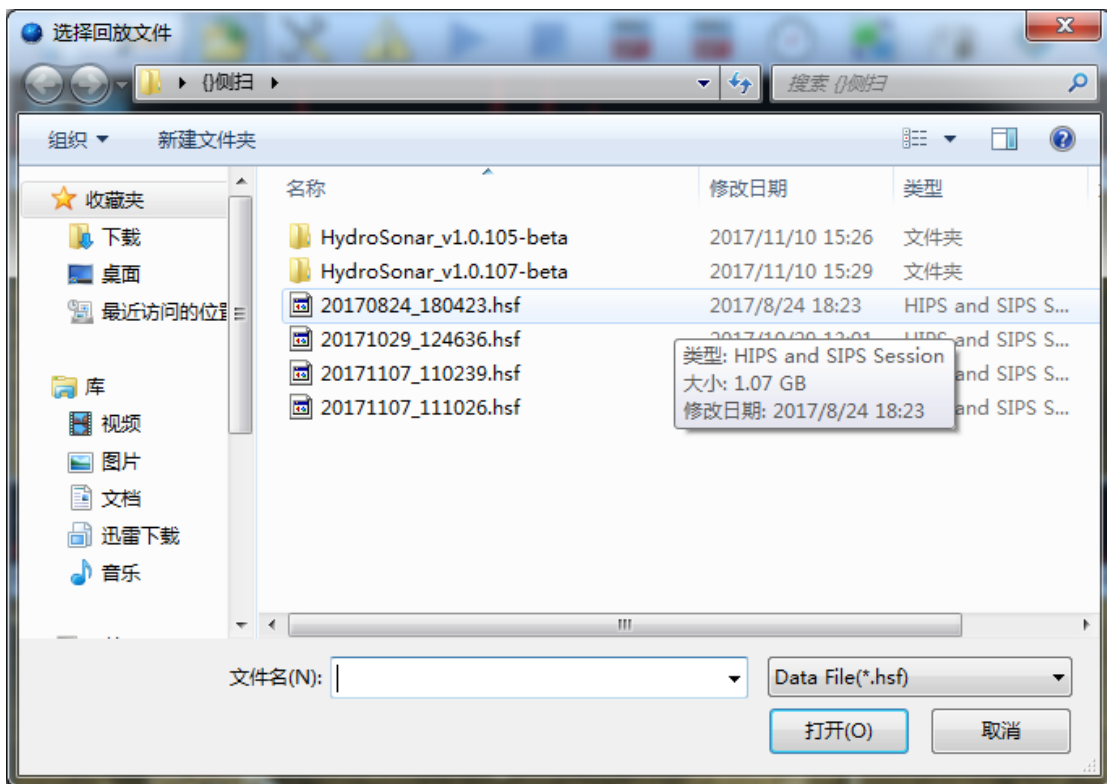


Figure 6.7 "Open File" Dialog

- (4) The "Device Parameter Setting" button is mainly used to set basic parameters such as external GNSS settings, such as coordinate system settings, GPS installation position, towline length, tow point height, ship speed and sound speed during the side scan sonar operation process as shown in Figure 6.8.

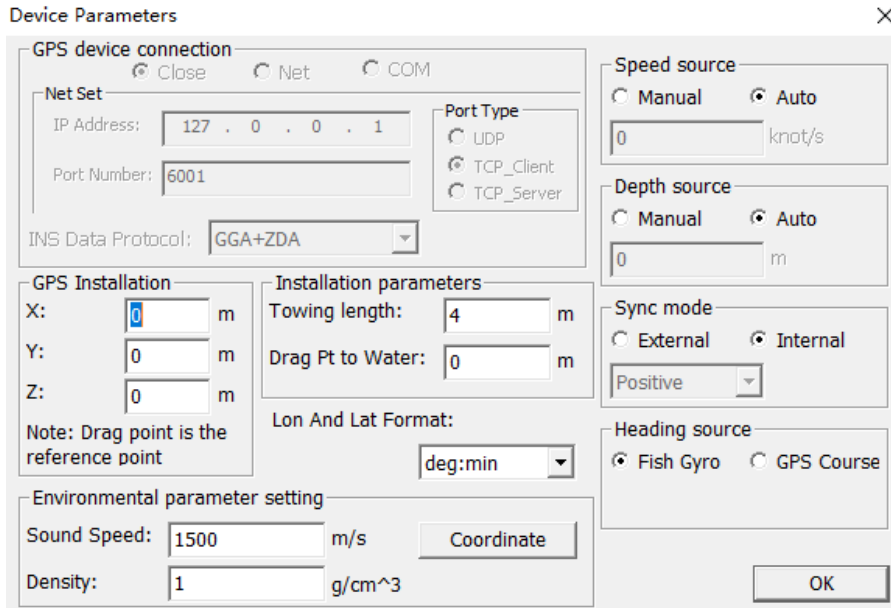


Figure 6.8 Device Parameters Setting

Notice: GNSS connection requires the PC computer having RS232 serial port in order for data acquisition. Then it is necessary to set up the corresponding serial port which connect the GNSS receiver to the computer. The baud rate should be the same as the baud rate output by the external GNSS device. The setting of stop bit, data bit and check bit generally do not need to be changed.

More settings such as GNSS installation position, towline length, and towfish depth are mainly used for accurate position calculation of underwater objects or terrain. If you don't need absolute position, but only understand the relatively nature, you need not connect GPS and input the setting parameter.

(5) The "Alarm Setting" button is mainly used to set up to alarm the project status especially when the data quality (GNSS) during the operation is not good. Just as shown in Figure 6.9 for the alarm setting dialog window. (SS900F's altitude alarm is not available)

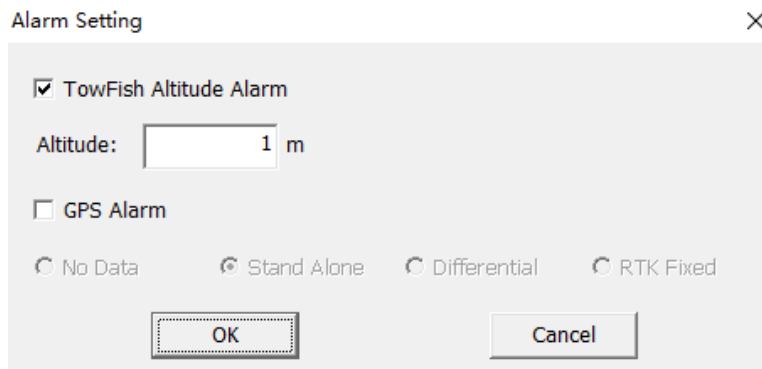


Figure 6.9 Alarm Setting

(6) The button of "Start Work" is used to control the sonar start working under the current setting, and HydroSonar start to receive data from it;

(7) The button of "Stop Work" is used to control the sonar stop working, and HydroSonar also stop receiving data from the side scan sonar;

(8) "Start/Stop Storing HSF File" button is used for HydroSonar software to start or stop storing the received data as HSF data file. Click continuously to switch between start and stop storage;

(9) The "Calibrate Pressure" button is used to calibrate the built-in pressure sensor of the side-scan sonar, so as to obtain the accurate depth value when the system works underwater (SS900F does not have a built-in pressure sensor);

(10) The "Switch Window" button is used to control the switching display from High Frequency Window Display only, or Low Frequency Window only to High & Low Frequency Display at the same time;

(11) The "Print Screen" button is used to capture the full screen of computer and automatically save it as a JPG format picture. The file name is the current computer time and it is saved in the current project path;

(12) The "Navigation Window" button is used for the HydroSonar software to open the navigation window. When the navigation window has been activated and opened, it is not response to click this button;

(13) The "Target Window" button is used for the HydroSonar software to open the target window. When the target window has been activated and opened, it is not response to click this button;

(14) The "Help" button is used to provide the software copyright information and the function of switching between Chinese UI and English UI;

### **1.3.1.1. Coordinate System Setting**

Click the "Coordinate System Setting" button, it will pop up the coordinate system setting dialog window as shown in Figure 6.10. Then we can set up the coordinate system and projection method as we need.

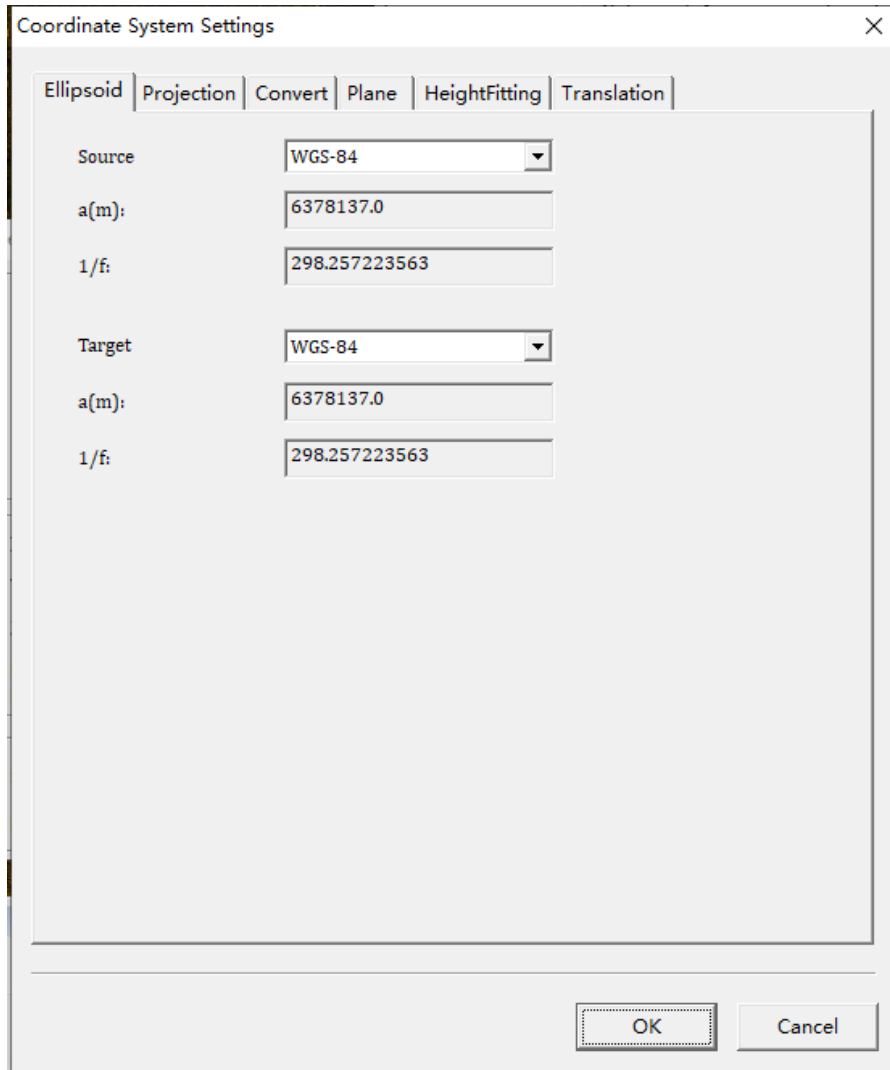


Figure 6.10 Coordinate System Setting

(1) Ellipsoid Parameters.

a) Source Ellipsoid: The default is WGS-84. Its drop-down menu has the common coordinate system ellipsoid option, which can be changed according to the actual usage;

b) Target Ellipsoid: In the target ellipsoid, HydroSonar provides options of WGS-84, Beijing 54, Xi'an 80 and National 2000 coordinate systems, PRS92 and User Defined as shown in Figure 6.11.

c) a (Meter) (Major Semi-axis): According to the selected target ellipsoid system, the major semi-major axis value of the corresponding target ellipsoid is automatically displayed. It can be modified when customized only.

d) 1/f (Reciprocal of Flattening): According to the selected target ellipsoid system, the reciprocal of flattening of the corresponding target ellipsoid is automatically displayed. It can only be modified when customized.

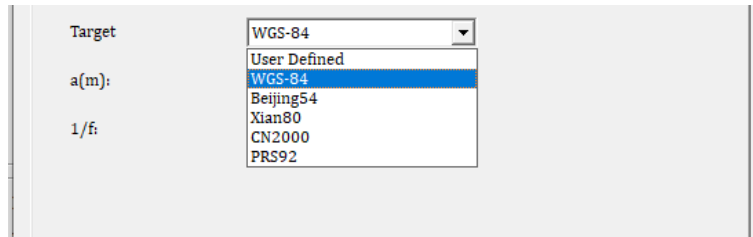


Figure 6.11 Target Ellipsoid Setting

### (2) Projection Setting

If user had set up ellipsoid parameters, then user can select projection parameters, which mainly include Projection, Central Meridian, False Northing, False Easting, Scale Meter and Projection Height, etc. It is same as shown in Figure 6.12:

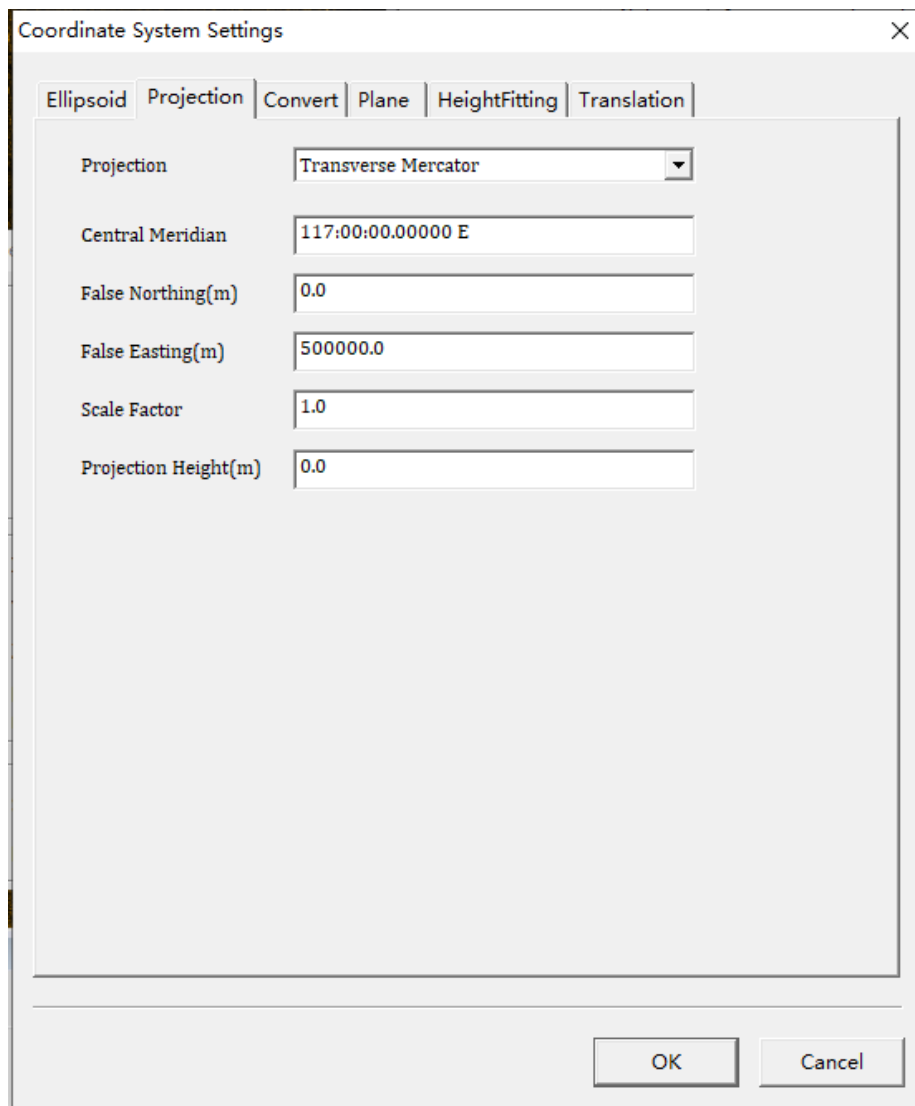


Figure 6.12 Projection Setting

### (3) Ellipsoid Conversion settings

In Ellipsoid Conversion window, user can set up the conversion parameter

between ellipsoids. It can support the conversion of No Conversion, Three Parameters and Seven Parameters. Among them, Three Parameters only need to enter the first three digits of Seven Parameters. It is as shown in Figure 6.13:

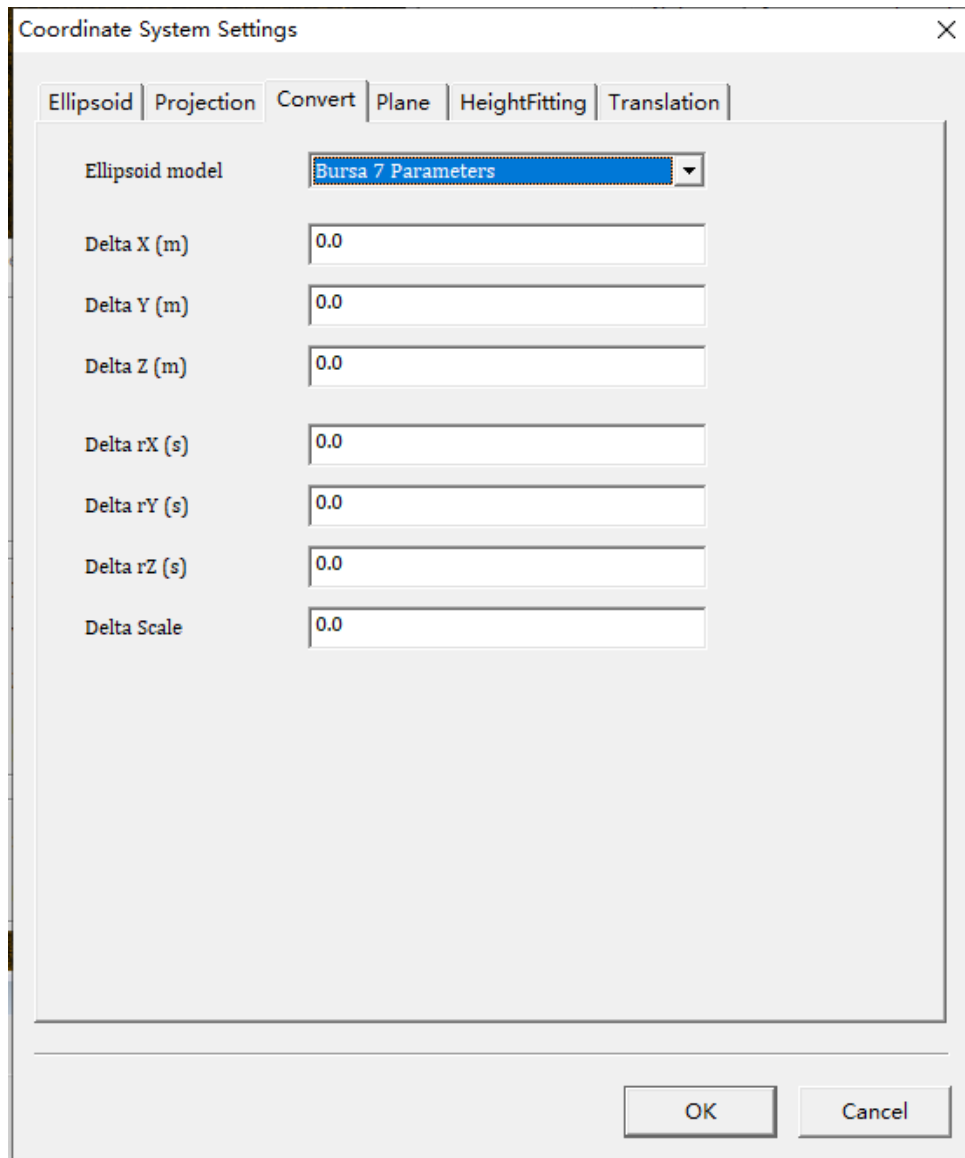


Figure 6.13 Ellipsoid Conversion Setting

#### (4) Plane Translation Setting

In the “Plane Translation Setting” window, two types of plane translation of No Plane Translation and Four Parameters Translation are supported. It is as shown in Figure 6.14.

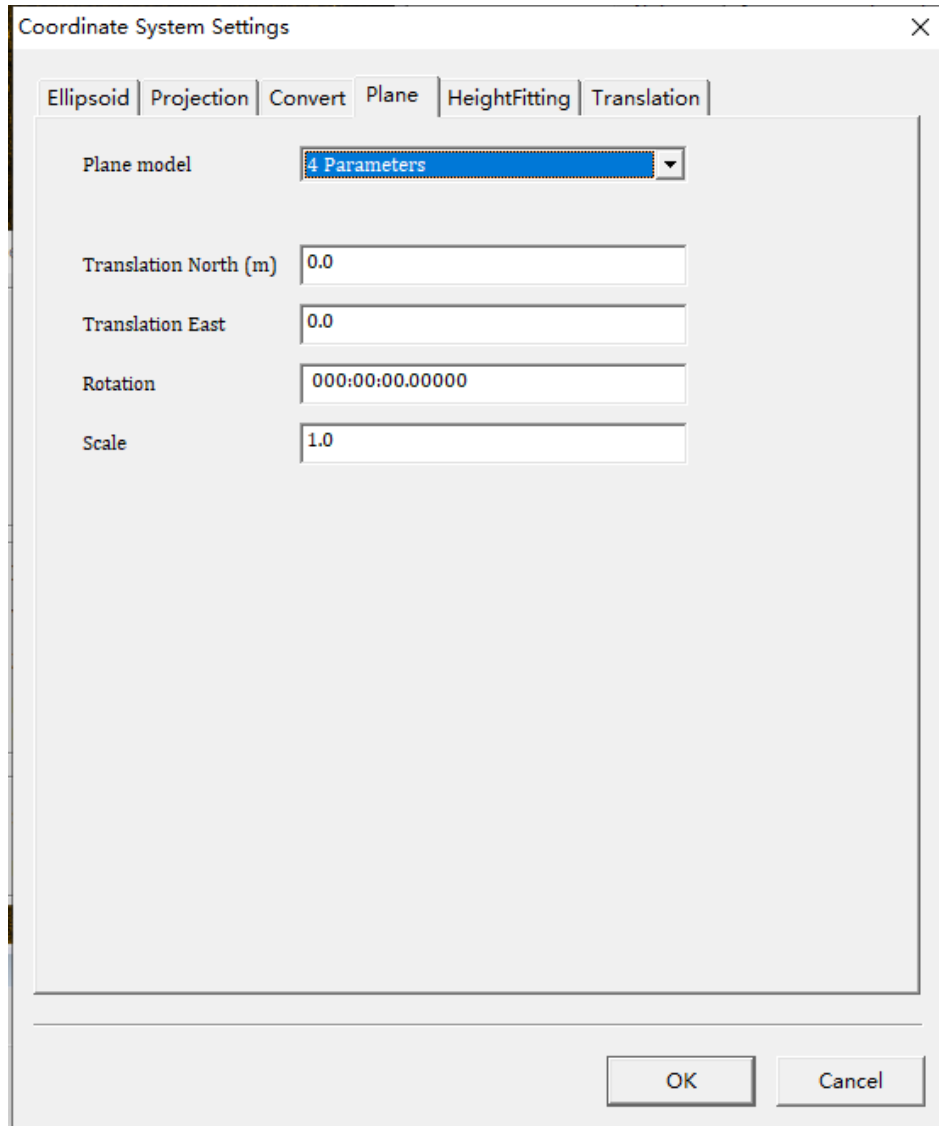


Figure 6.14 Plane Translation Setting

#### (5) Height Fitting Setting

The "Height Fitting" currently supports two elevation fitting methods of No Elevation Fitting and Fixed Difference Correction as shown in Figure 6.15.

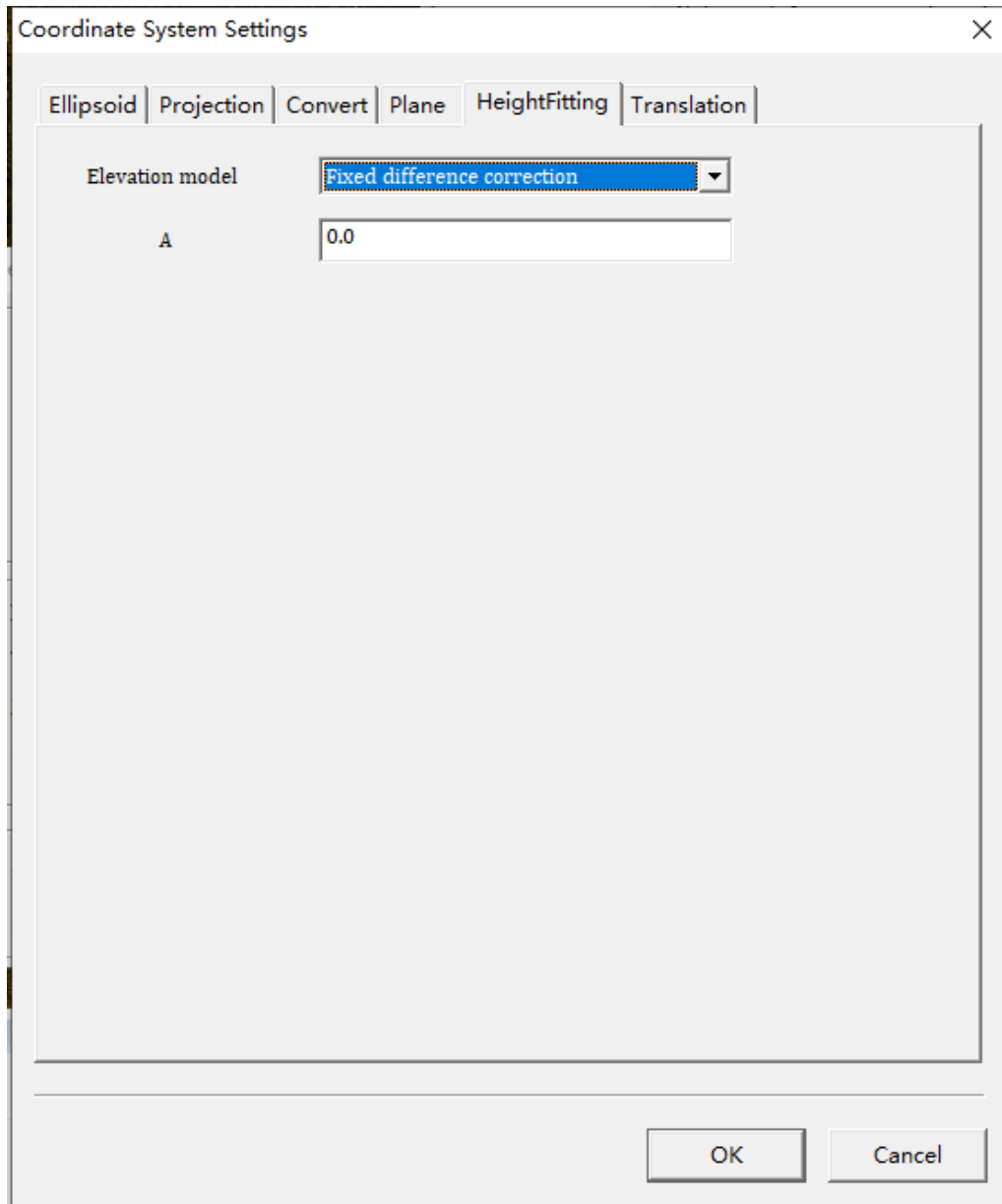


Figure 6.15 Height Fitting Setting

#### (6) Coordinate Translation Setting

The "Coordinate Translation" is mainly used to set up the Fixed Difference Correction during RTK operation. It is the same as the concepts of DX, Dy and DZ in the RTK software setting, such as Point Calibration & Point Translation as shown in Figure 6.16. The user can enter the corresponding fixed difference.



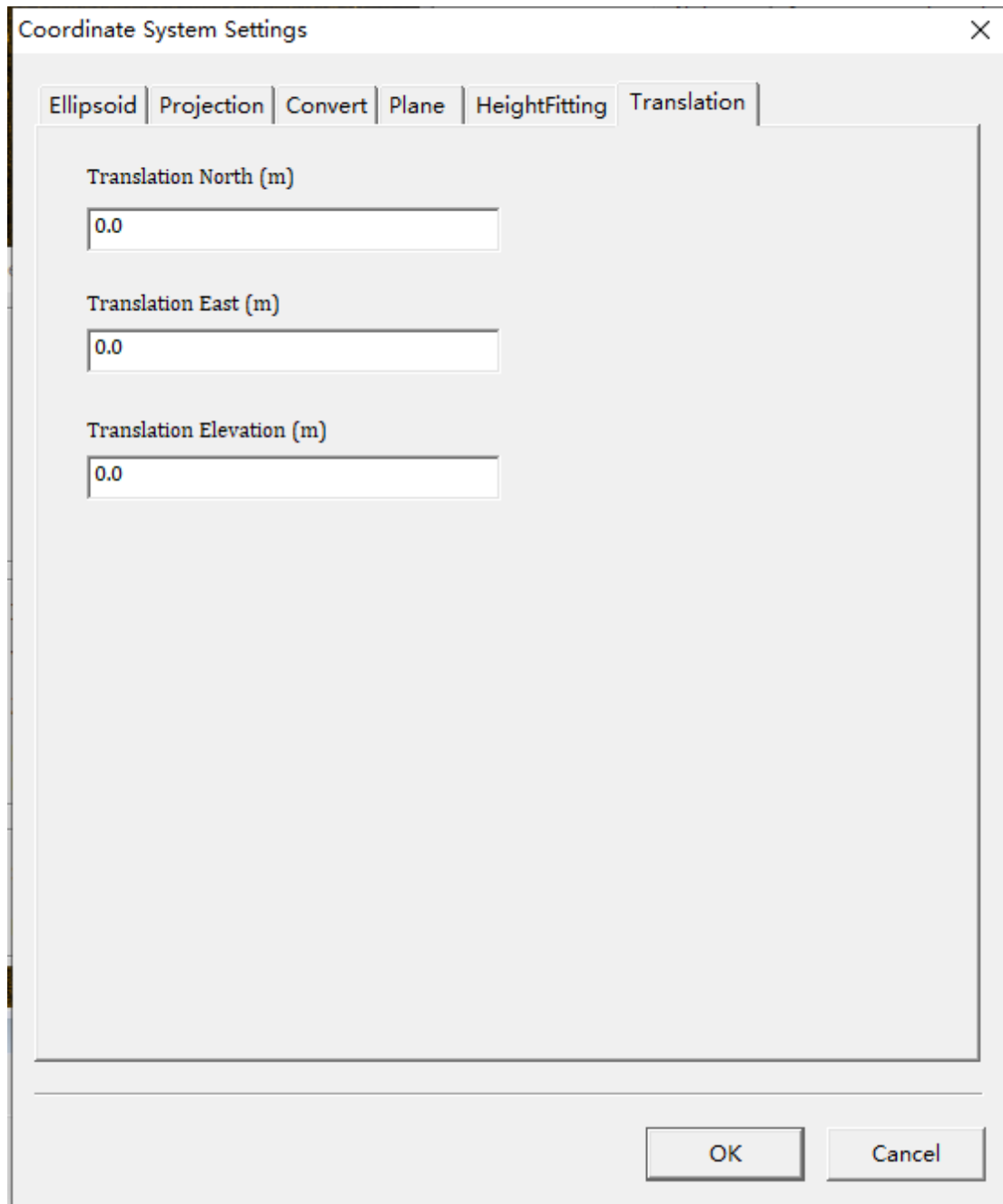


Figure 6.16 Coordinate Translation Setting

After setting these parameters, just click "OK" button to finish it.

### 1.3.2. Data Display

The Data Display window mainly includes high or low frequency echo sounding signal diagram of side scan sonar system, slant range scale, high or low frequency analysis diagram and some other contents. Below is the Figure 6.17 showing the Data Display window.

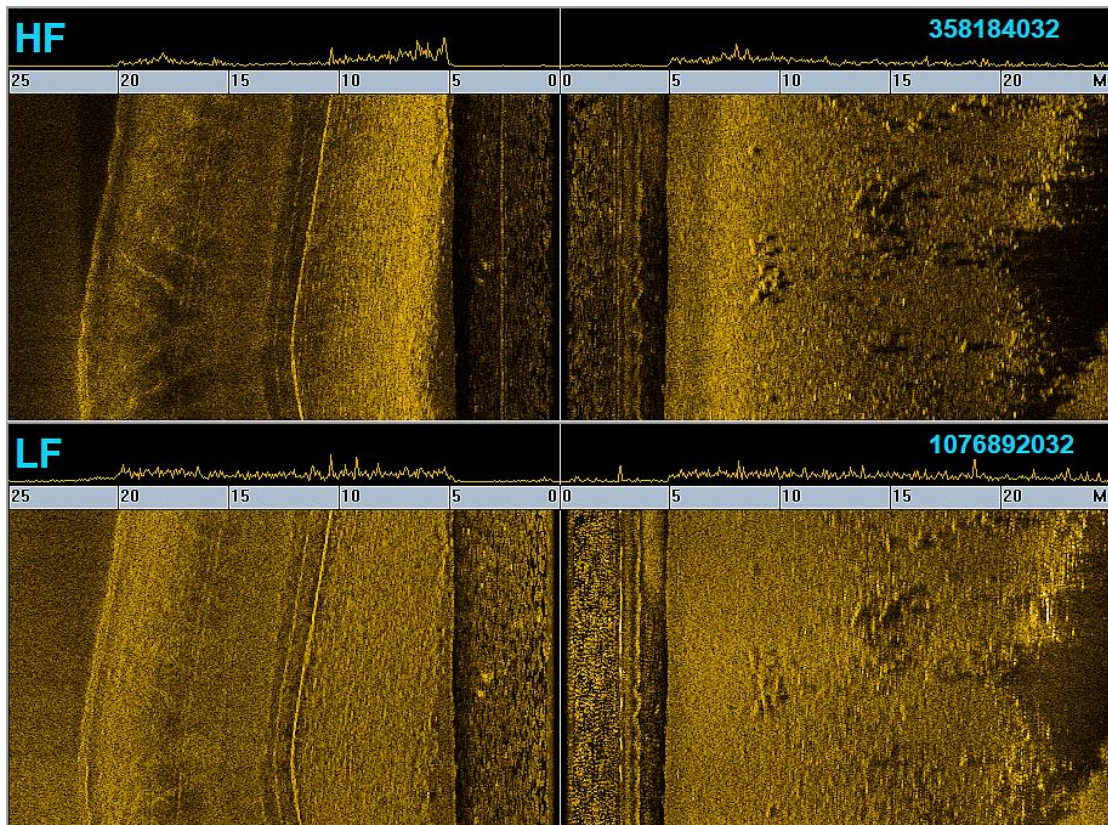


Figure 6.17 Data Display Window

**Notice:** As for single frequency side scan sonar products, this window will display only the waveform and analytical diagram of single frequency.

In the Data Display window, we can make the following operations through mouse operation:

- (1) Box selection: Enlarge the data image;
- (2) Double click on left key of mouse: Restore the enlarged image;
- (3) Double click on right key of mouse: Capture the target, then it will pop up the Target Window automatically;

### 1.3.3. Navigation Window

The Navigation window is mainly used to provide navigation and positioning information for users according to GNSS data and the coordinate system settings during the normal operation. In this window, users can perform common navigation function such as distance measurement, line editing, line switching, window rotation and zooming etc. Figure 6.18 is the main interface of Navigation window:

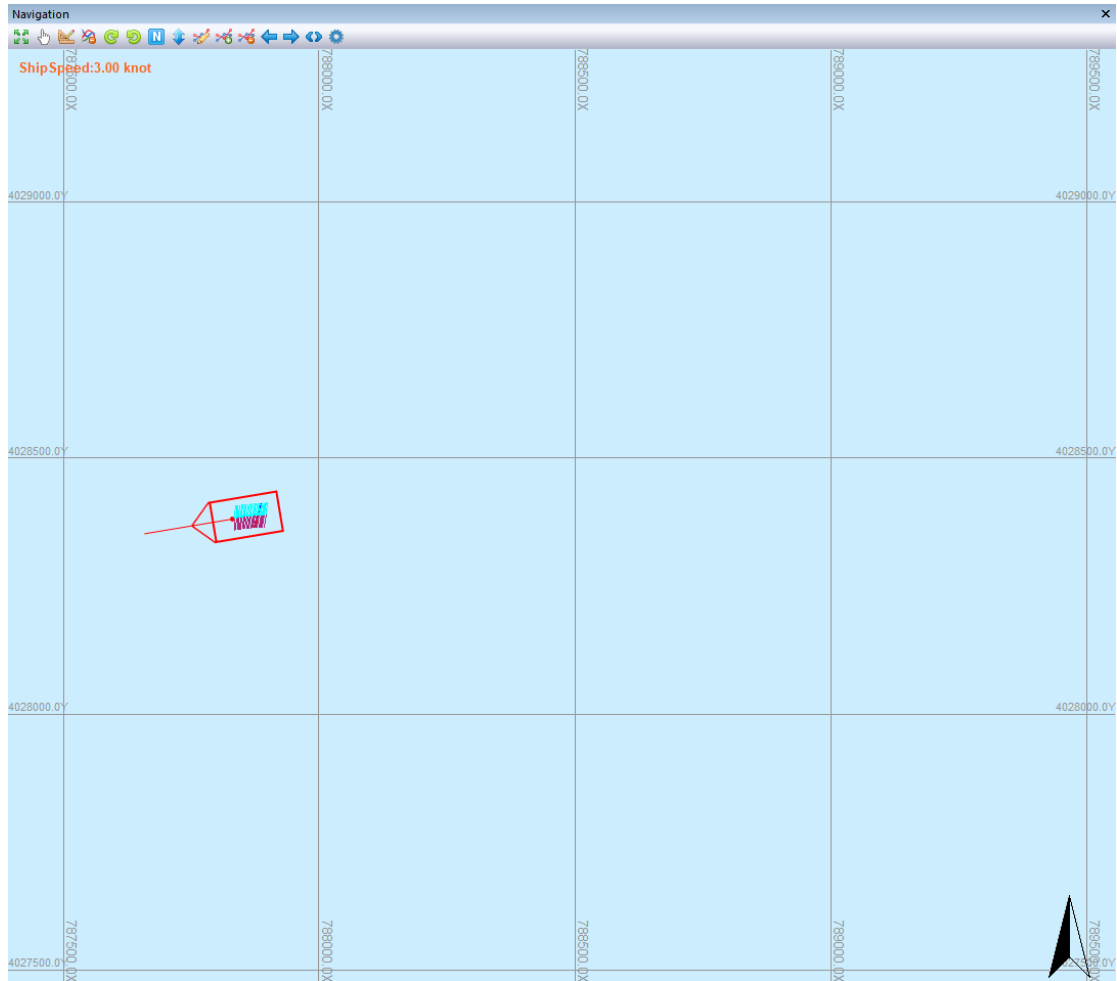











Figure 6.18 Navigation Window


- (1)  is the "Fit window" button. After clicking it, the Navigation window will display full view of the data & survey lines loaded in the current window;
- (2)  is the "Drag" button. After clicking it, user can drag the map view of the navigation window with the mouse;
- (3)  is the "Measure" button. After clicking it, press left mouse key and move the mouse to display the distance between the current position of the mouse to the first clicked position in real time;
- (4)  is the "Clear Track" button. After clicking it, all track lines, coverage lines and other information drawn in the navigation window will be cleared;
- (5)  is the "Rotate to Right" button. After clicking it, the Navigation window will rotate 10 degrees clockwise to right;


(6)  is the "Rotate to Left" button. After clicking it, the Navigation window will rotate 10 degrees anti-clockwise to left;


(7)  is the "True North" button. After clicking it, the Navigation window will be adjusted view angle as true north upward;


(8)  is "Reverse" button. After clicking it, the Navigation window will rotate 180 degrees based on current view angle;


(9)  is the "Edit Survey Line" button. After clicking it, the Navigation window will pop up the survey line editing dialog box, through which you can edit the survey line;


(10)  is the "Open Survey Line" button. After clicking it, the survey line importing dialog box will pop up. You can select the existing survey line file and click OK to load it into Navigation window;

(11)  is the "Close Survey Line" button. After clicking it, the survey line data loaded in navigation window will be closed. And the survey line data will no longer be displayed in Navigation window;

(12)  is the "Previous line" button. When there are multiple lines and user clicks this button, the previous survey line will be selected and its direction will be displayed in Navigation window;

(13)  is the "Next line" button. When there are multiple lines and user clicks this button, the next line will be selected and its direction will be displayed in Navigation window;

(14)  is the "Line Direction" button. After clicking it, the direction of the currently selected line in the navigation window will be adjusted to reverse direction;

(15)  is the "Display setting" button. After clicking it, a display setting dialog box will pop up. Through it, you can adjust the colors of survey lines, backgrounds and ships etc. In addition, you can also set whether display high or low frequency colors, display target or not, whether to display navigation information in some views, and the format of ship speed displayed;

### 1.3.3.1. Line Editor

Hydrosonar software provides flexible method to generate survey line. They mainly include the following methods.

(1) Coordinate Point Input Method: Enter the coordinates of each point on the survey line in editor, and the adjacent points are connected by straight lines;

(2) Cursor Method: use mouse draw straight line or broken line in main view window to generate survey lines;

(3) Translation Method: It can automatically generate a survey line by translation on a premised two-point survey line.

The exact operation steps is listed as below.

In the main interface, click “Line Editor” in the Edit Menu to open the following dialog box.

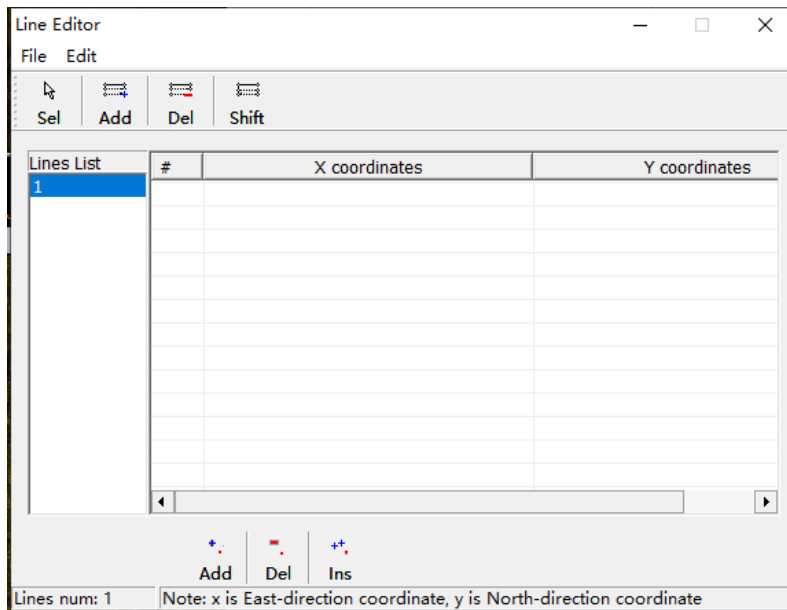


Figure 6.19 Line Editor

A) Coordinate Point Input Method: In the Edit Line dialog box, there is a default survey line in the line list. Its default line name and number will be sequenced. User can double-click to change it. Or click the "Add Point" button, the default coordinate point <0.00, 0.00> will be added as shown in Figure 6.20.

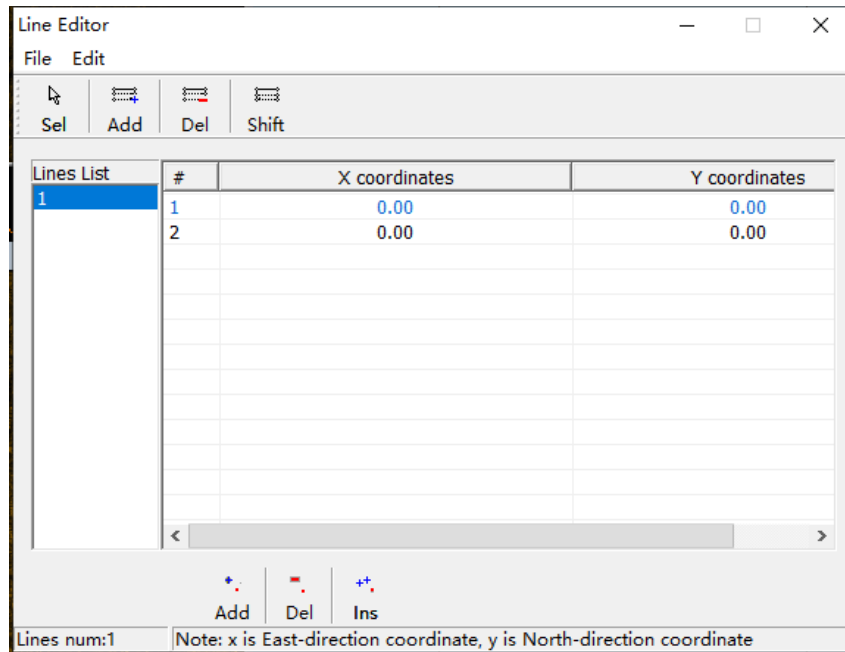


Figure 6.20 Coordinate Point Input Method

Generally, survey line is a straight line. So user only need add two points to create a survey line. One is starting point and the other is ending point. The software automatically connects these two points in a straight line.

If needed, each line can continuously add points. Double click 0.00 to enter coordinate value modification mode.

There two input modes for user to choose. The default mode is the plane rectangular coordinate mode. In the edit survey line dialog box, select the input mode in the "Edit" menu bar. <X, Y> is the plane rectangular coordinate mode. <L, B> is longitude and latitude mode.

After a line is edited, select "Add Line" to add another survey line. Click the line name and "Add Point" to edit until all lines are edited.

In drawing survey line dialog box, select "File" menu bar and click "Save". In the pop-up saving dialog box, save the file to the planned survey line folder under the project folder. Edit file name and click "Save".

B) Cursor Method: Use mouse to draw a straight or broken line directly in the main view. First click "Select Point" in the editor, then click the left key of mouse in the main view to select the starting point. Move mouse to next inflection point of the boundary line, click the left button... and so on, until the last inflection point, then right click to finish drawing this survey line. Similarly, draw the next line.

After drawing, select "File" menu bar in the drawing survey line dialog box and click "Save". In the pop-up saving dialog box, save the file to the planned survey line folder under the project folder. Edit the file name and click "Save".

C) Deviation method: It is a lines generation method that takes one line as benchmark and forms multiple parallel lines through translation. Select a survey line as the basic survey line, click "Parallel Offset", and the Survey Line Translation dialog box is shown in Figure 6.21.

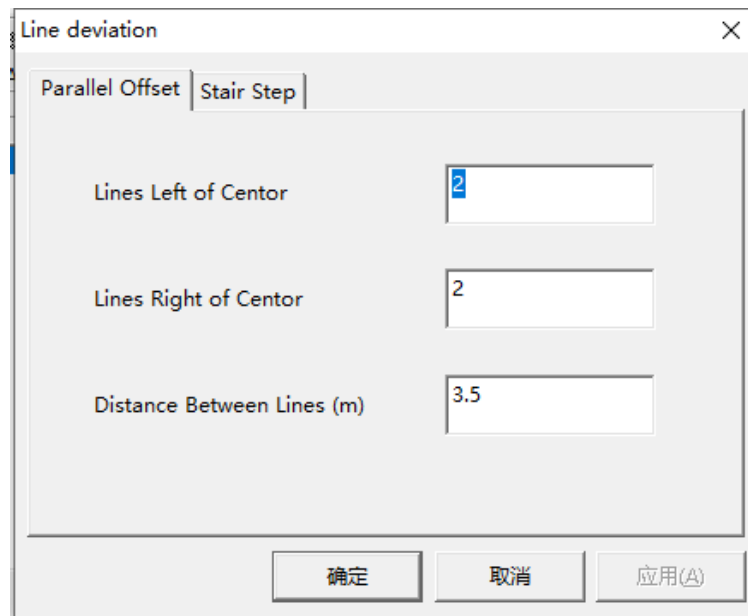


Figure 6.21 Line Deviation

The survey line deviation dialog box provides two translation methods, one is parallel line and the other is stair step offset.

C1) The parallel line type is shown as Figure 6.21 above. Take the benchmark survey line selected by the user as the center line to determine the line spacing (Unit: m) and the number of translated survey lines. The left or right side of the centerline is defined by the baseline direction, which is from the starting coordinate point to the ending coordinate point. After setting, click OK to generate the result diagram as shown in Figure 6.22.



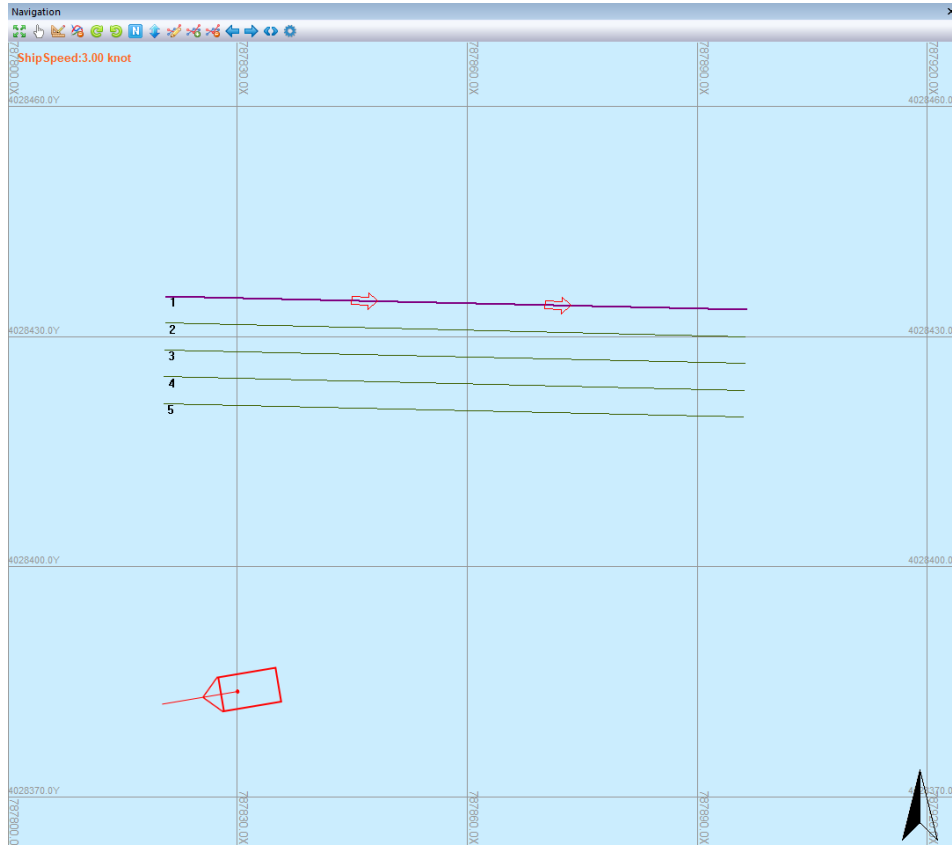
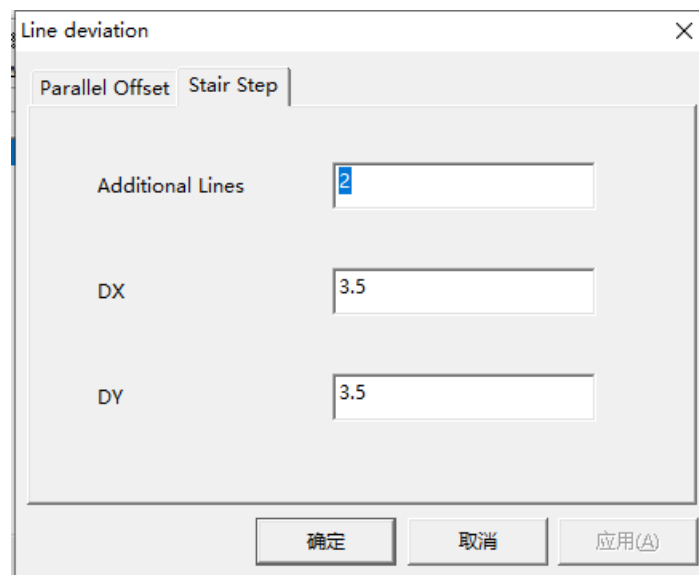


Figure 6.22 Parallel Line

C2) The stair step method is shown in Figure 6.23. Taking the starting point of the benchmark line as the origin, DX and Dy are the offset distances in X direction and Y direction respectively. Unit is meter. The user can set the number of lines and the offset distances of DX and Dy respectively as required. After the setting is completed, click OK. Generate a step offset line diagram as shown in Figure 6.24.



Line deviation

Parallel Offset | **Stair Step**

Additional Lines:

DX:

DY:

确定    取消    应用(A)



Figure 6.23 Stair Step Line Setting

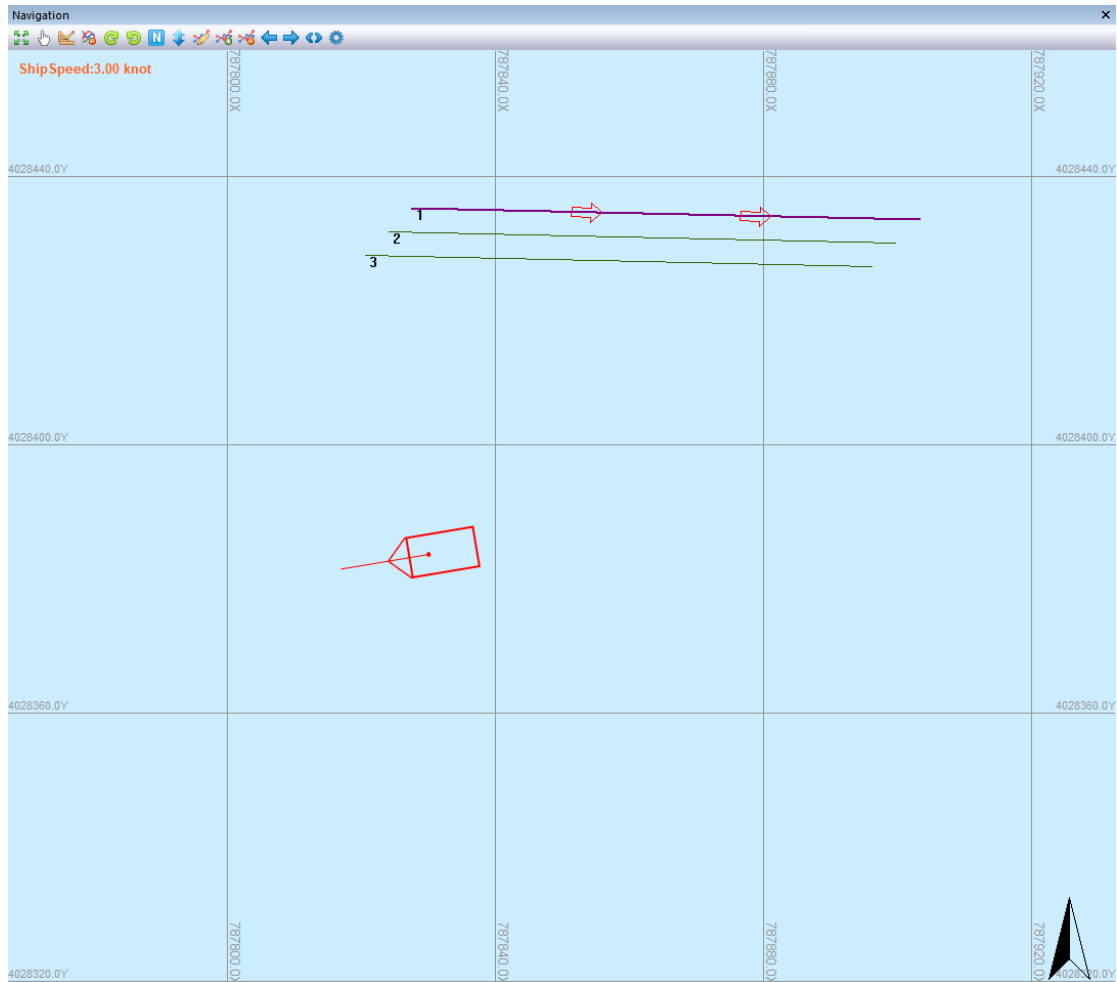


Figure 6.24 Stair Step Line

No matter what method you use to draw the planned survey line, you can modify "Delete Point", "Delete Line" and so on. After drawing, select "File" menu bar and "Save" in the drawing survey line dialog box. In the pop-up saving dialog box, save the file to planned survey line folder under the project folder, edit file name and click "Save".

If user already has a planned survey line file, select "File" in the edit menu bar, and select the planned survey line file (.lnw file) to open. If there is no more to modify, click "Save as" from "File". In the pop-up save dialog box, save the file to the planned survey line folder under the project folder, edit the file name and click "Save".

After the planned survey line is edited and saved, check display in the project management window. The survey line will be displayed in the main view, and the name of the survey line will be displayed at the first point of each survey line.

### 1.3.3.2. Display Setting

Through Display setting, user can adjust color of some information displayed in Navigation window and whether a series of information is displayed.

In the toolbar of Navigation window, click "Display Setting" button to open the display setting dialog box as shown in Figure 6.25:

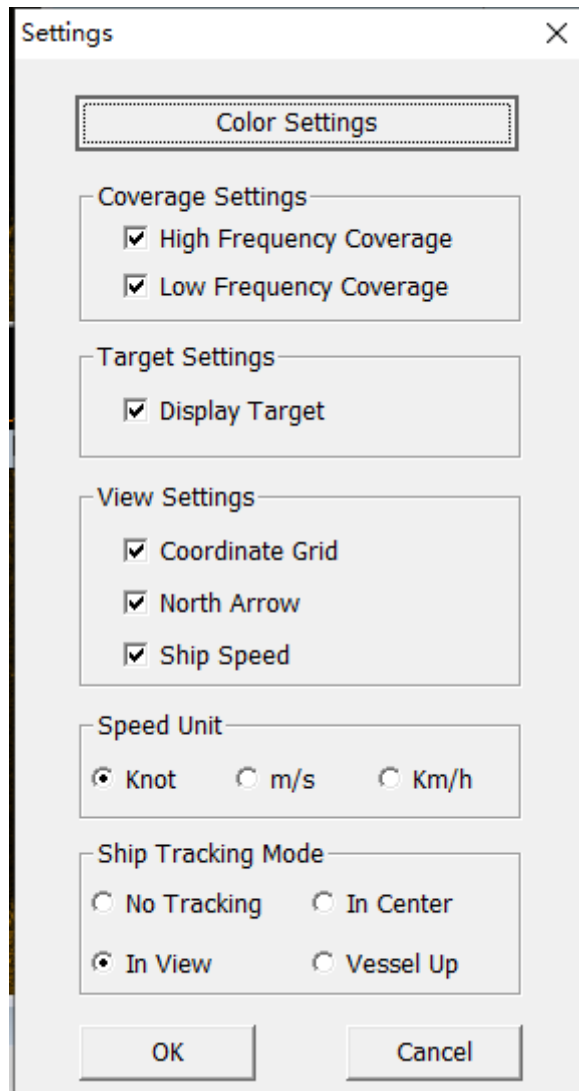


Figure 6.25 Display Setting

With the "Color Setting" button, we can set the colors of some columns of Navigation window information, such as survey line, selected survey line, ship, high and low frequency coverage line, text and background as shown in Figure 6.26:



Figure 6.26 Color Setting

At the same time, user can select whether to display by checking to show coverage line, target, navigation information and other information, as well as the format of ship speed display as shown in Figure 6.25.

### 1.3.4. Target window

The main function of Target window is to quickly lock and save the concerned target for user. In Data Display window, user can double-click the right mouse button to capture target image at the double-click position. Through the Target window, user can understand the length, width, height, and

position of the concerned target as shown in Figure 6.27.

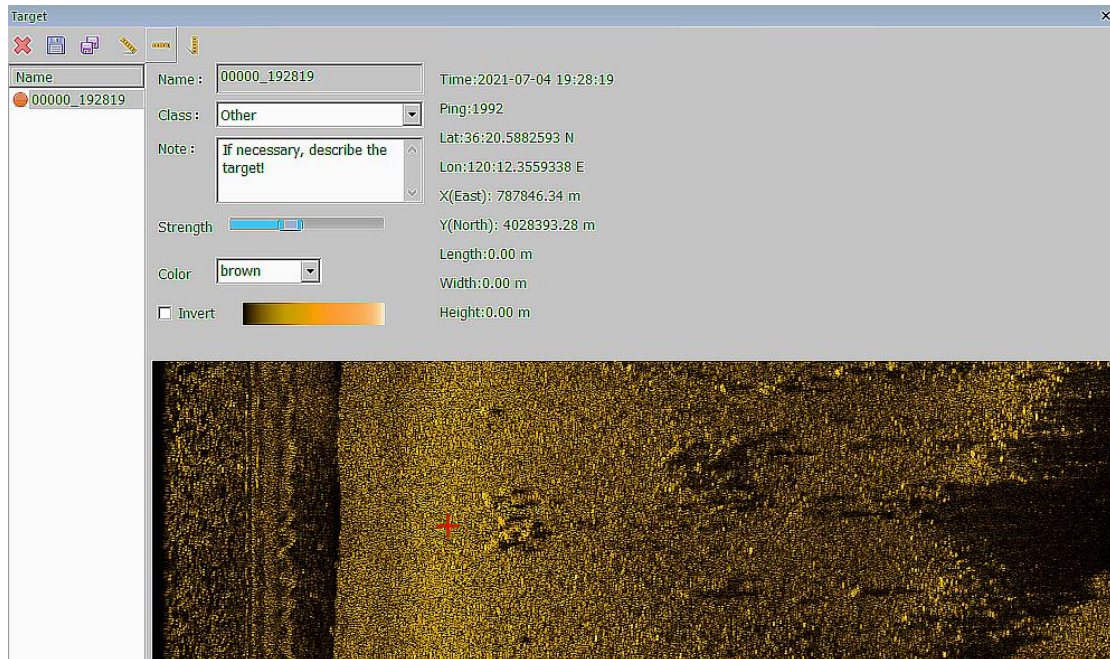


Figure 6.27 Target Window

In the Target window, we can delete, save, measure length, width and height of captured targets. User can mark category and other notes too.

Notice: The method to measure target height is to click "Height" button, then move mouse to parallel position of target figure. First click the bottom of image data, then click the top of target figure (High volume area), and finally click the drag end of target figure. At this time, the height of target will be displayed in the data information.

### 1.3.5. Control Panel

The control panel is mainly used to set up the side scan sonar operating parameters, image intensity adjustment of high and low frequency, color type setting, storage and playback setting, bottom tracking setting and data status information of various devices in the data display window as shown in Figure 6.28:



Figure 6.28 Control Panel

From Figure 6.28, we can also see that control panel is mainly divided into

five columns of Sonar Parameters, Display Setting, Storage and Playback, and Status information.

### 1.3.5.1. Sonar parameters

In sonar parameter bar, we can set up switches and a series of parameters to control sonar operation. They mainly include Range, Pulse Length, Gain, Expansion Loss and Absorption Loss. Figure 6.29 shows the sonar parameters interface:



Figure 6.29 Sonar Parameters

### 1.3.5.2. Display Setting

The display setting is mainly used to set up the high and low frequency image intensity, image color type, and whether the color is reversed. Figure 6.30 shows the display setting bar interface:

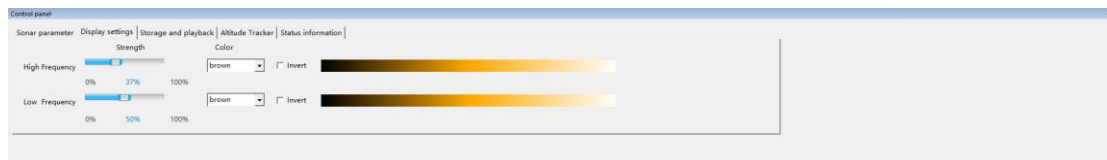


Figure 6.30 Display Setting

### 1.3.5.3. Storage and Playback

The storage and Playback bar is mainly used to control the data storage switch and playback. In the data acquisition stage, the storage and playback bar only displays the data storage part as shown in Figure 6.31. In the playback stage, the storage and playback bar displays the data storage and playback control information as shown in figure 6.32:

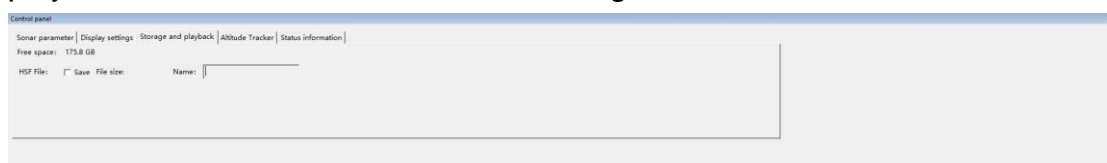


Figure 6.31 Data Storage and Playback

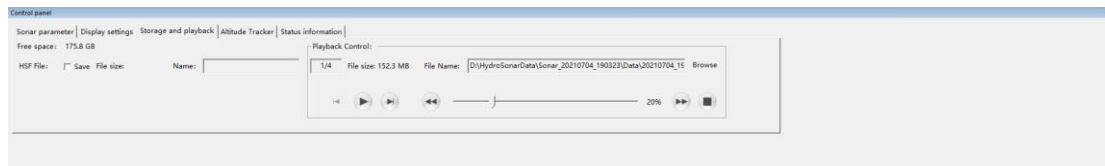


Figure 6.32 Playback of the Storage Data

(1) Storage: We only need to check the storage box behind HSF file to realize data storage. And this control switch is automatically associated with and synchronized with the storage switch on the menu toolbar;

(2) Playback: In the menu toolbar, select open file, then the playback control bar will appear. Through this bar, we can start, pause, stop, speed up, slow down and file switching of playback data;

#### 1.3.5.4. Status Information

The status information bar mainly displays information such as time, position, ship speed, towing depth, pressure, attitude, high & low frequency, and a series of sonar operating parameters. Figure 6.34 shows the status information bar interface:

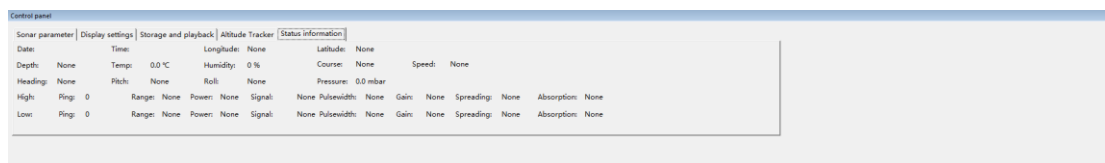


Figure 6.34 Status Information

#### 1.3.6. Status Bar

The status information bar mainly displays the equipment model, ID, and the slant distance of the cursor when it stays in the data display window, as well as GNSS, network connection, altitude alarm and other information on the right side of the status bar as shown in Figure 6.35.



Figure 6.35 Status Bar

## **2. Side Scan Sonar Operation**

### **2.1. Preparation Before Survey**

#### **2.1.1. Equipment Inspection**

Prepare and check the equipment before survey, and conduct safety inspection on the side scan sonar system.

#### **2.1.2. System Installation**

After arriving the project position, install the system. Prepare winch if needed, towing device and other tools for measurement;

### **2.2. HydroSonar Operation**

#### **2.2.1. Computer IP Setting**

Modify the local IP address of computer to ensure that the IP address of computer is 192.168.1.\*\* (From 21 to 255) section.

#### **2.2.2. Run HydroSonar**

Click shortcut of HydroSonar, then its main menu will show as Figure 7.1.

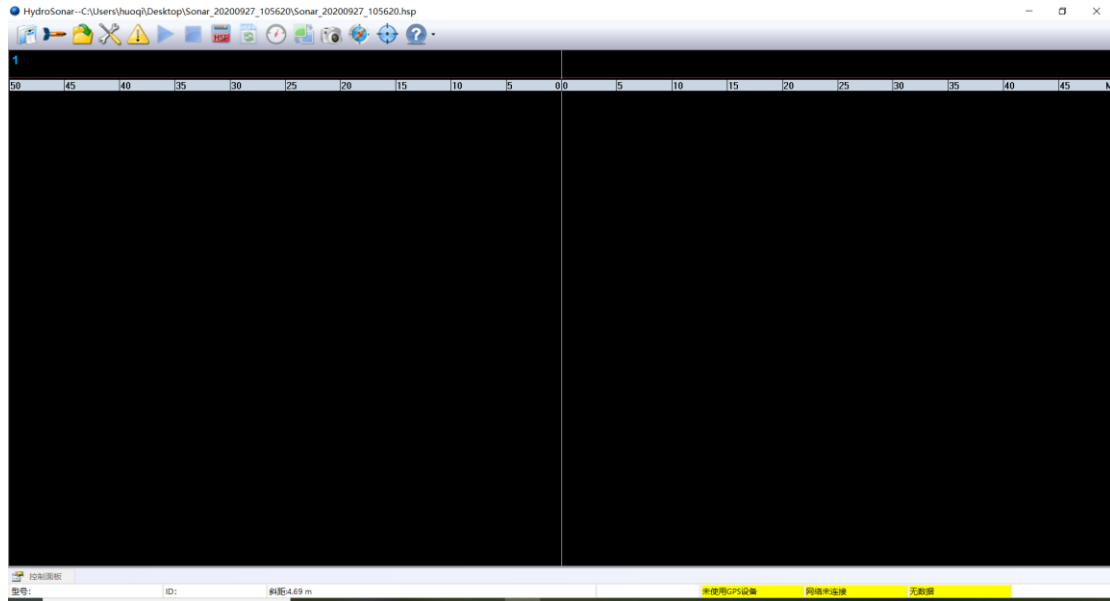



Figure 7.1 HydroSonar Main Menu

After run the software, judge whether the system runs normally through the connection status information in the working parameter window.

## 2.3. New Project

When we do side scan sonar measurement of a project for the first time, we first need create a new project. We can click the button of  (In the Toolbar - Project) to pop up the Project dialog box as shown in Figure 7.2:

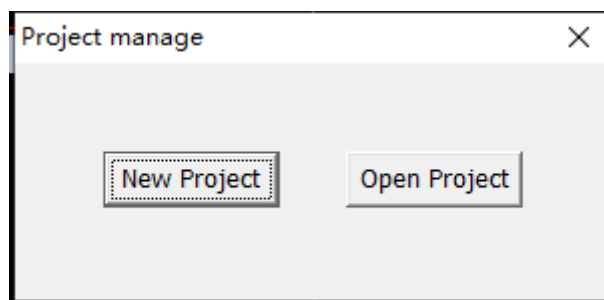


Figure 7.2 Project Toolbar

Click "New Project" in the Project dialog box. Then in the pop-up New Project dialog box, set up the project name and saving path. Click "OK" as shown in Figure 7.3.



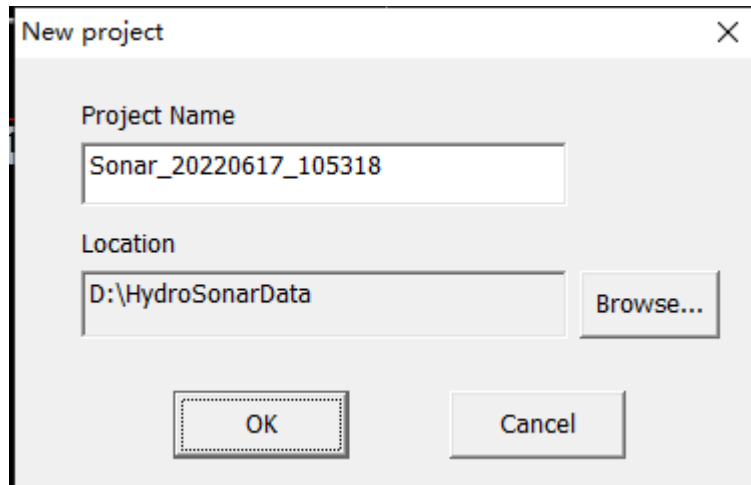


Figure 7.3 New Project

## 2.4. Connect Device


After a new project is created, click the button of  (In Menu Toolbar - Connect Device). HydroSonar the software will automatically connect the devices. When the side scan sonar is successfully connected, the software will automatically pop up the dialog box of Successful Connection. And the status bar will display that the network is connected as shown in Figure 7.4.



Figure 7.4 Sonar Successful Connection

If the device connection fails, the software will pop up the dialog box of device connection failure as shown in Figure 7.5. At the same time, check whether the power cable and Ethernet cable is connected correctly, whether the IP setting is correct.

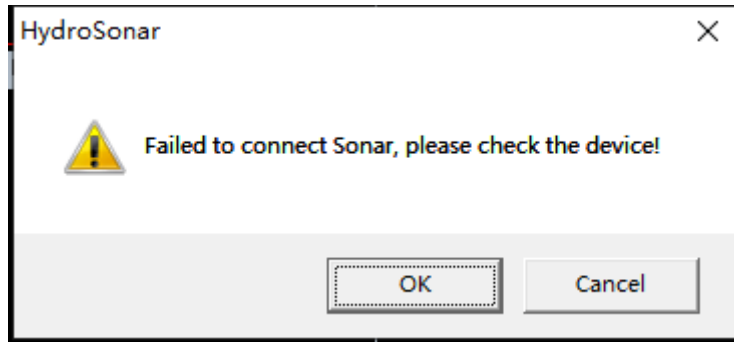



Figure 7.5 Device Connection Failure

## 2.5. GNSS Connection Setting



Click the button of  (In Menu Toolbar - Device Parameter Setting), there will pop up setting dialog box. User can set up the serial port number, baud rate and other information of GNSS input, and then click to open serial port. At the same time, the open serial port button changes to the close button. The GNSS setting column turns gray and its status can not be modified any more. Below Figure 7.6 shows the GNSS setting.

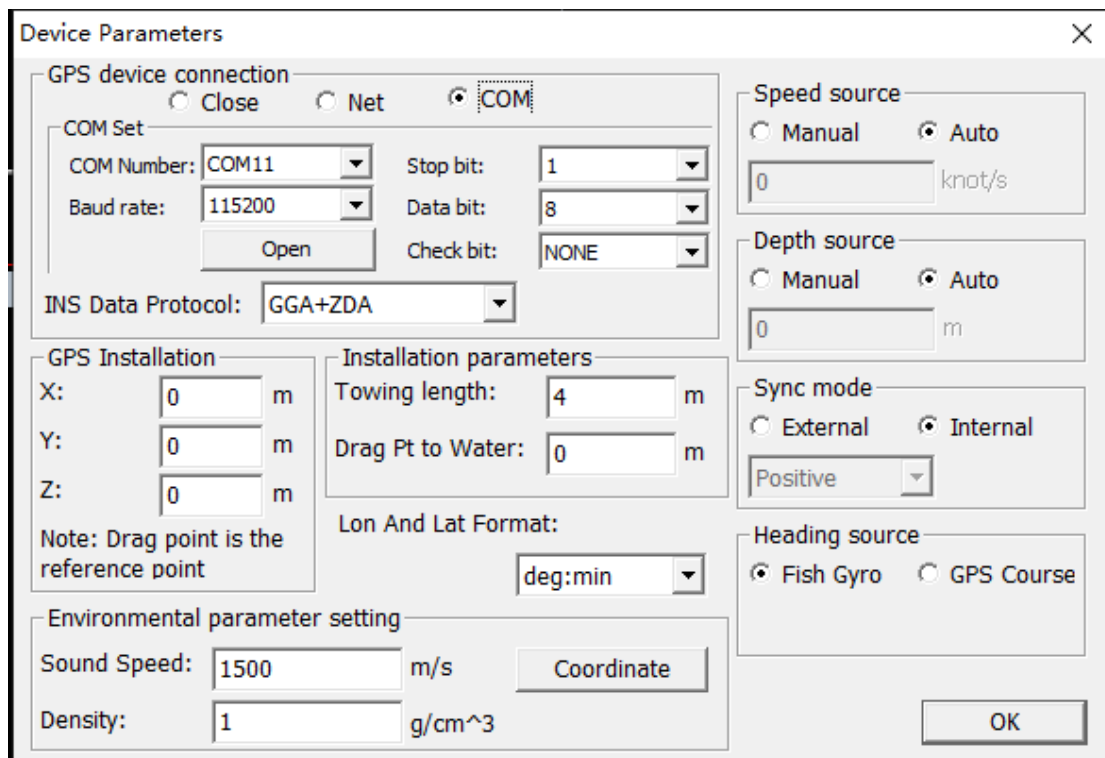
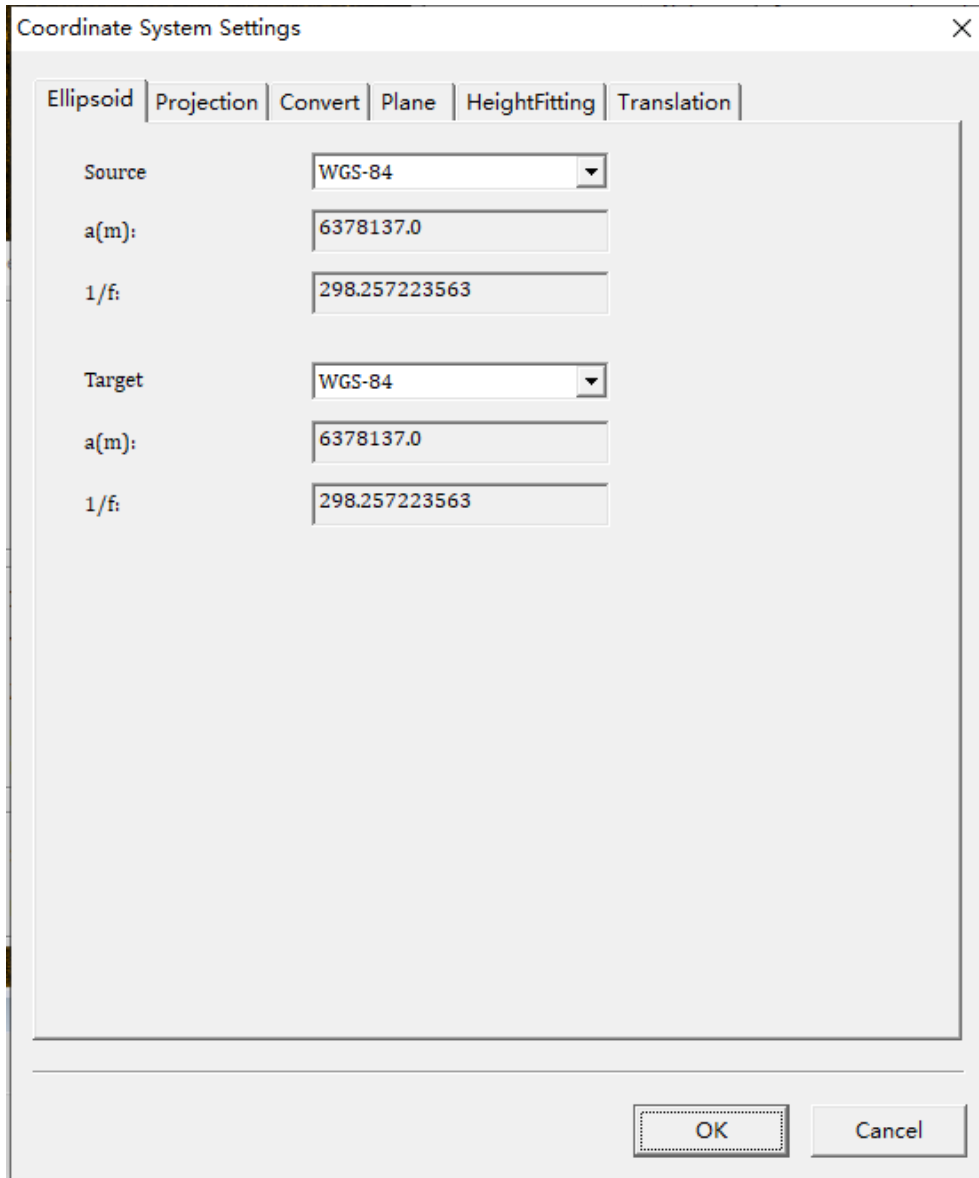


Figure 7.6 Device Parameters Setting

## 2.6. Coordinate System Setting

In the device parameter setting dialog box (Figure 7.6) that pops up after setting GNSS connection (Figure 7.5), we can set up the coordinate system, including ellipsoid parameters, conversion parameters, projection mode, central meridian and other information as shown in Figure 7.7:




The image shows a dialog box titled "Coordinate System Settings" with a close button (X) in the top right corner. The dialog has six tabs: "Ellipsoid", "Projection", "Convert", "Plane", "HeightFitting", and "Translation". The "Ellipsoid" tab is selected. The dialog contains two sets of input fields for source and target ellipsoids. Both sets have a dropdown menu set to "WGS-84", a text box for "a(m)" containing "6378137.0", and a text box for "1/f" containing "298.257223563". At the bottom right, there are "OK" and "Cancel" buttons.

Field	Value
Source	WGS-84
a(m)	6378137.0
1/f	298.257223563
Target	WGS-84
a(m)	6378137.0
1/f	298.257223563

Figure 7.7 Coordinate System Setting

## 2.7. Alarm setting



Click  from "Menu Toolbar - Alarm Setting" to set up the project and GNSS positioning status alarm as shown in Figure 7.8.

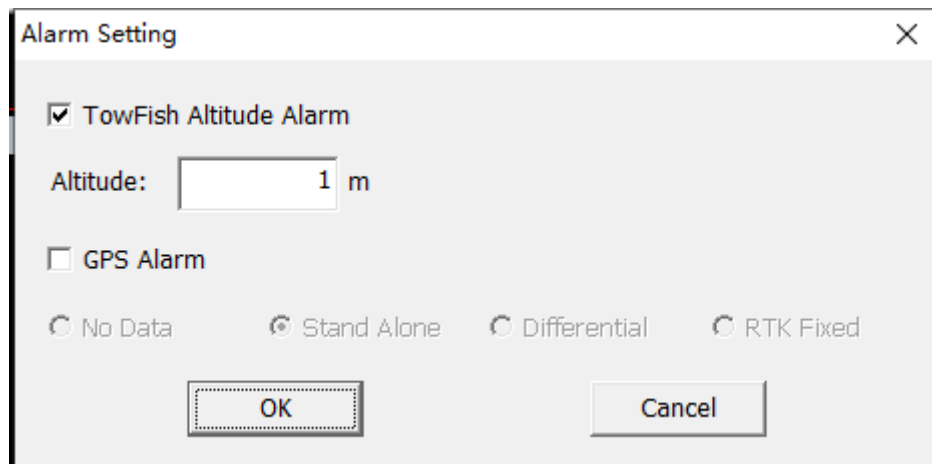



Figure 7.8 Alarm Setting

## 2.8. Start Operation

After the towfish is launched and sonar start to work, click the button of  (In Menu Toolbar - Start Working) button, the equipment starts to work normally, and sonar image data will be displayed on the data display window. According to sonar image data and status information, adjust the towline length and ship speed, so that the towfish or fixed sonar is at the desired depth or operation mode required by the project.

## 2.9. Sonar Parameters Setting

When the towfish reaches ideal depth or height, open control panel to adjust the range, pulse length, gain and other information of high & low frequencies, so as to make the sonar image in an ideal state. The setting interface is as shown in Figure 7.10.



Figure 7.10 Sonar Parameter Setting


## 2.10. Survey Line Setting

In the Navigation window, click the edit survey line button to edit the survey lines required by the project through the survey line editing dialog box.

## 2.11. Start measurement

After the ship enters the project area and arrives the planned survey line, click HSF file button in Menu Toolbar, the software will start recording sonar data. At the same time, this button icon will turn green. When it is necessary to stop data collection, we can click the button again to stop it.

## 2.12. Stop working

When the project is completed, click the button of  (In the Menu Toolbar - Stop Working), the hydrosonar software will stop working. At the same time, the towfish can be collected back to the boat.

After the measurement, return to the berthing port. Clean the equipment with fresh water, dry it then disassemble and pack it.