Foreword

Application of Manual

Welcome to use the Manual of HI-TARGET HD-MAX series products. This Manual describes how to set up and use HD-MAX series products.

Introduction of the Manual

The Manual specifies related instructions on hardware and software of HD-MAX series products. Please follow the contents of the Manual during operation.

Experience Requirements

In order to better use HD-MAX series products, HI-TARGET suggests that the operator shall have certain knowledge on measurement and shall read the Manual carefully. For more information about the system, please visit the official website of HI-TARGET: www.hi-target.com.cn/en

Security technology prompts

Attention: Special operation needs special attention. Please read the contents carefully.

Warning: Very important prompts. Operations not following the warning contents will cause instrument damage, data loss, system collapse, and even will endanger personal safety.

Disclaimer

We have checked the contents of the current Rev. of Manual as well as the consistency between the hardware and software, which doesn't means that the possibility of deviation has been ruled out. Therefore, we do not guarantee that the contents described in this Manual, the hardware and software are

completely consistent. All the data indicated in the Manual have been inspected. Necessary correction values are included in the following Rev.

Technology and services

For any questions encountered during the operation process, please contact our technical personnel. We will promptly answer your questions.

Your suggestions

If you have any suggestions and opinions regarding this Manual, please provide feedback to us. Your feedback can significantly improve the quality of the Manual.

CONTENTS

CHAPTER

1

Overview

Introduction to this Chapter

- Navigation Overview
- Principle of Echo Sounder
- Product Features
- Technical Parameters

Navigation Overview

Global Positioning System (GPS) has developed for many years. It has been upgraded from stand-alone GPS accurate to 100m which can only be applied for rough navigation and positioning to real-time differential GPS (DGPS) accurate to several centimeters which can be applied in various measurement fields. GPS technology has become increasingly mature, varieties of products have been produced, and there are more and more users applying DGPS technology.

As the world's most popular positioning method, DGPS has been widely applied in marine sounding, waterway survey, engineering exploration orientation, cadastral survey, terrain cadastral survey, boundary demarcation, harbor piloting, navigation of geophysical prospecting and hydrocarbon exploration and staking of seismic shot and other measurement fields. Thus, a measuring software which can realize multiple functions is needed.

The software is compatible to a variety of import and domestic GPS receivers. It is a measuring tool software integrating measurement, editing and other multiple functions with task-based operating mode and fool operation interface. Adhering to the purpose of high and new technology popularization as well as plebification. The software will appreciate the users relying on more economical price as well as intelligent operation.

Principle of Echo sounder

Echo sounding principle

It is assumed that the sound speed under water is V. In case of a pulse acoustic signal being loaded on a transducer, acoustic wave is transmitted from the transducer to the seabed and then back. The time of acoustic signal round trip is t, then:

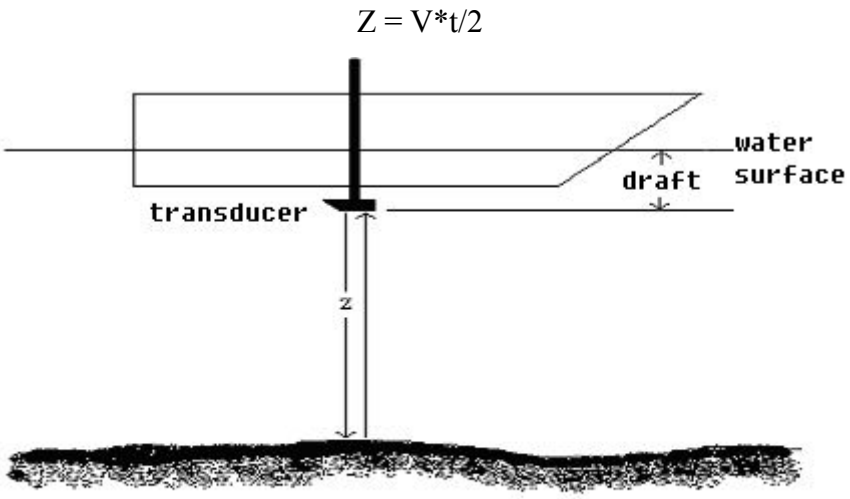


Figure 1-1

Z is the depth from the transducer to the seabed, plus transducer draft.

Underwater signal recognition

Although the principle of depth sounding is simple, the situation in the water is very complicated with parasitic echo, haunted by fish or clutter echo and different reflection conditions at water bottom. In shoal waters, second trip echo, triple transit echo may turn up. Relevant technology has to be adopted on how to track the real underwater echo signal from numerous clutters.

Water bottom gate tracking technology (time gate tracking technology)

Since variations at water bottom are relatively flat, the sounding changes between two times of depth sounding (about 0.1s) are not too big. Assuming that the variation of secondary depth is ±10%, a time gate will be set between 10%*Z before the last correct echo to the next 10%*Z. Only those echoes within the time gate are correct ones, the ±10% range is referred to as time door width. Once there is no echo within the time gate, it will gradually expand the time door until entire echo searching until capturing the correct echo.

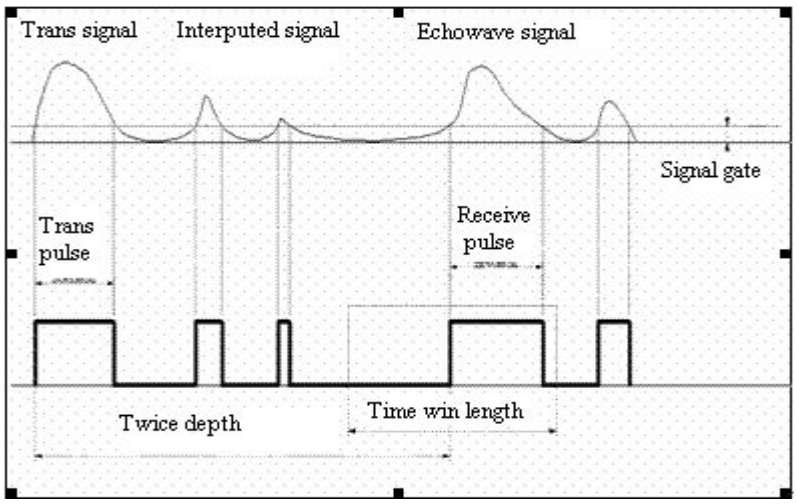


Figure 1-2

Pulse width selection

In most instances, the echo pulse width at water bottom surface is the Max.. The pulse width of interfering signal and second trip echo are relatively smaller. Pulse width option is to identify the pulse with the Max. pulse width as correct echo signal together with time gate.

Signal threshold

If there are more interferences within your measurement area or environment, signal threshold settings are to be increased thus to filter out interfering signals. However, signal threshold cannot be too high. Otherwise, it will also filter out weak echo signal. Different thresholds can affect sounding accuracy to a certain extent. Thus selection of appropriate signal threshold is in favor of interference inhibition and stable tracking.

Gain control

Gain control technology is to control amplifying circuit and reduce the gain in case of too high echo signal to prevent too much interfering signals by measuring the signal intensity of echo-pulse. When the echo signal is too small, it will control and receive amplifying circuit automatically and increase the gain thus to receive echo. The size of gain range is a key factor to measure receiver performance. The receiving gain control range of HD-MAX Echo Sounder is 90Db by adopting manual gain control (MGC).

Time varying gain (TVG)

When the acoustic wave propagates in water, sound intensity will attenuate according to exponential laws. To maintain stable signal amplitude, TVG will control the receiving amplifier to increase magnification according to contrary law, which is the so called TVG.

Product features

- **Industrial-grade integrated design with multiple functions.**
- **Full edition Windows XP system is adopted with 17" TFT display screen as well as ultra high hardware configuration.**
- **High strength engineering plastic and reinforced structure design are adopted to replace traditional metal shell.**
- **Chart display control and various information query functions are available to realize intuitive display as well as convenient operation.**
- **High equipment integration, information integration and functional integration.**

Technical parameters

Table 5.1 Technical parameters of HD-MAX series products

CPU speed: 1.6G*2
RAM: 2GB
Memory space: 16GB SSD
Display screen size: 17"
Display resolution: 1280*1024
Starting time: < 40s
High frequency emitted from the probe: 200KHZ
Point-positioning precision: <2.5M (built-in GPS function)
Input voltage: 10～30V
Average power consumption: <40W
Operating temperature: 0 ～50˚C

CHAPTER

2

Hardware Introduction of HD-MAX

Introduction to this Chapter

- Front Face of the Host
- Back Face of the Host
- Side Faces of the Host
- Other Accessories
- Installation size chart

Front Face of the Host

The front face of the host is as shown in the Figure below. It is composed of display screen, measuring functional keys area: digital keys area, sounding functional keys area and USB interfaces area.

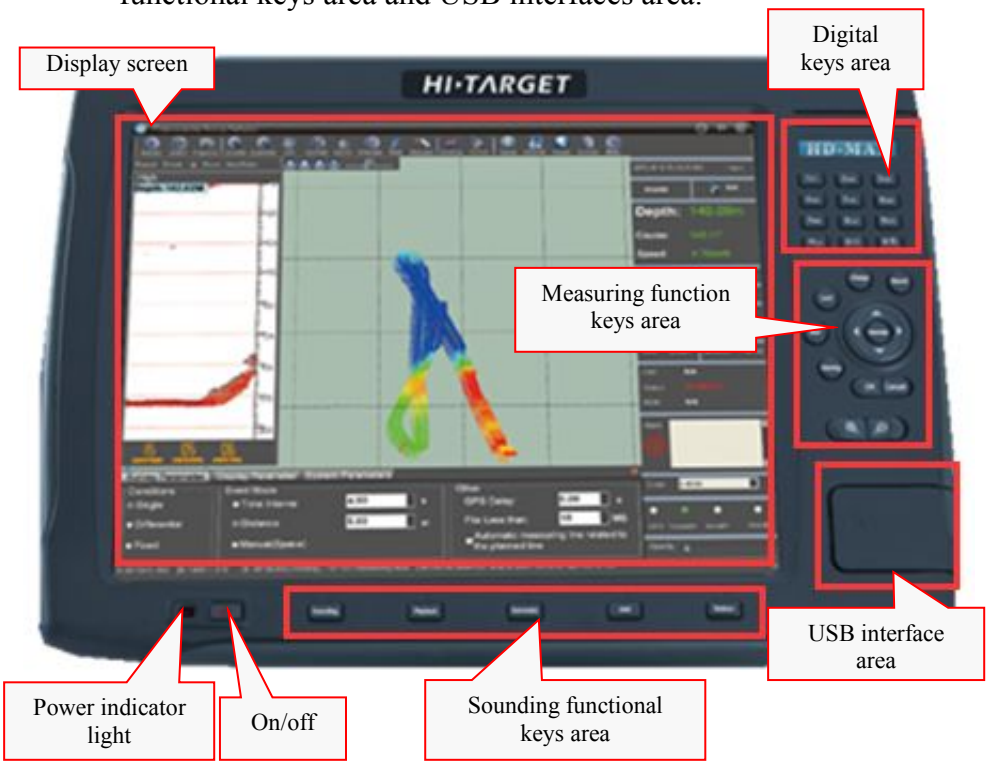


Figure 2-1

Display screen

17" TFT display screen to realize clear display as well as convenient operation.

Measuring functional keys area

Include locking, line changeover, recording, marking and other commonly used functional keys for measuring.

Sounding functional keys area

Include depth sounding, playback, automatically and other commonly used functional keys for measuring.

USB interfaces area

Open the cover, you can see three USB interfaces available.

Back Face of the Host

Figure 2-2

The back interfaces of HD-MAX series products include DC10-30V power interface, high frequency transducer interface, serial data transport interface (SDTI), VGA display output interface and GPS antenna interface.

Side Faces of the Host

Figure 2-3

As shown in Figure 2-3, after fixed, the bracket can support the host. The angle of the bracket can be adjusted randomly by loosening bracket screws.

Other Accessories

Keyboard

The product is equipped with portable and convenient p-p USB interface keypad which is characterized by good stability, exquisite appearance, flexible use, as well as excellent hand feeling. It is easy for operation on the ship.

Mouse

The product is equipped with p-p USB interface mouse with good stability. It is easy for operation on the ship.

AC power adapter

Figure 2-4

The instrument has a wide input voltage range. It can be applied for 10~30V DC (nominal input voltage: DC24V) power supply. The standard output is 20V.

High frequency transducer

Figure 2-5

The high frequency transducer is to connect 7 core socket in back interface board of HD-MAX product.

Receiving antenna 1

Figure 2-7

The antenna is to connect to ANT POS at rear interface board of HD-MAX products to receive GPS signal. (GPS measuring version of HD-MAX series products)

VGA patch cord

Figure 2-10

VGA patch cord is used to connect external computer monitor for sub-screen display.

Second full serial port serial port line

Figure 2-11

Second full serial port serial port line is used to external connected to two RS-232 serial ports

DC power supply cable

Figure 2-12

Host installation size chart

Equipment shell size is as shown in Figure 2-7:

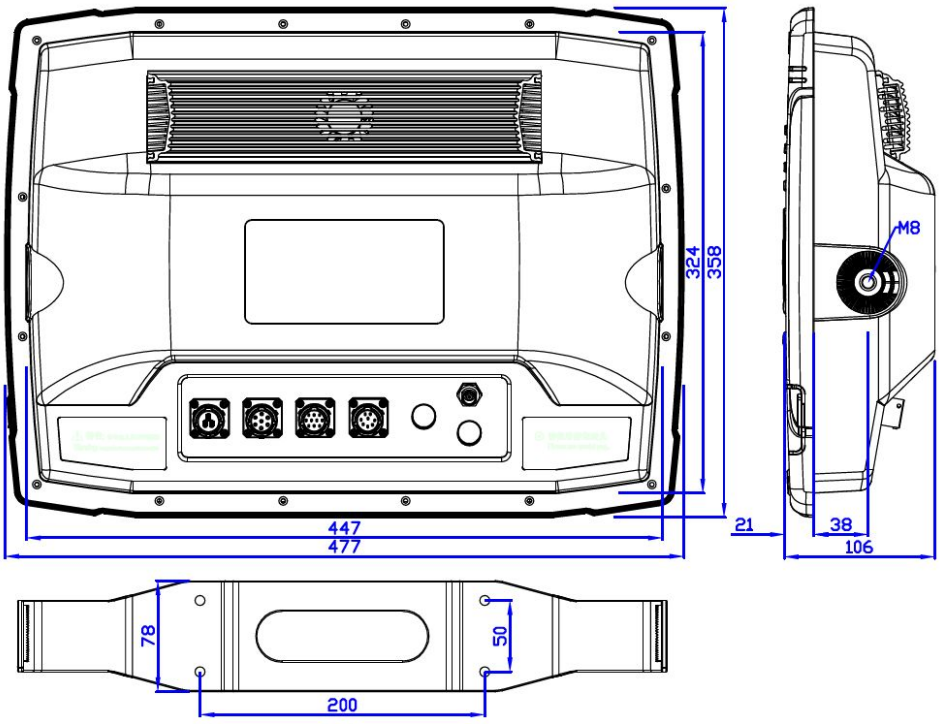


Figure 2-13

Installation Cautions

a) Avoid direct sunlight and high temperature. Avoid strong vibration.

b) Do not plug nor unplug the power when powered on. It is more possible to facility a DC stabilized power supply of 10-30V.

c) Confirm that there is enough space behind the host in order to install the plug and cable.

d) Non-professional personnel shall not disassemble the equipment. For any question, please contact the retailer as soon as possible.

CHAPTER

3

Basic operations

Introduction to this Chapter

- Buttons
- Keyboard
- Startup & Shutdown
- USB Interface
- Rear panel Interface

Startup & Shutdown

Startup

Press power button (about 1s). After the power indicator light is on, loosen to perform hardware detection and loading system. The whole process of starting up takes about 1 minute. The system interface after starting up is as shown in the Figure below:

Figure 3-1

Shutdown

a)Shutdown: Click "Start"->"Shutdown". The software system shall shutdown.

b)Long press the power button for 5s. After the power supply indicator light is off, loosen the button and the system will shutdown mandatorily.

Buttons

Measuring function keys

Figure 3-2

Commonly used functional keys for measuring are as shown in the Figure, include locking, line changeover, recording, as well as marking.

Sounding functional keys

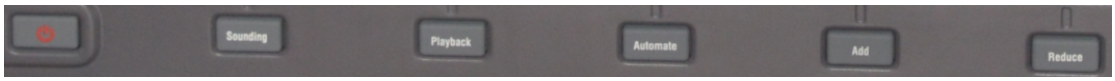


Figure 3-3

Commonly used functional keys for depth sounding are as shown in the Figure, include depth sounding, playback, automatically, shift up and shift down.

Confirm/Cancel keys

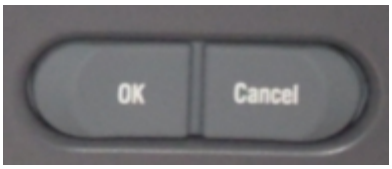


Figure 3-4

[OK] key is equal to [Enter] key of the computer. [Cancel] key is equal to "ESC" key of the computer.

Interface at the backside

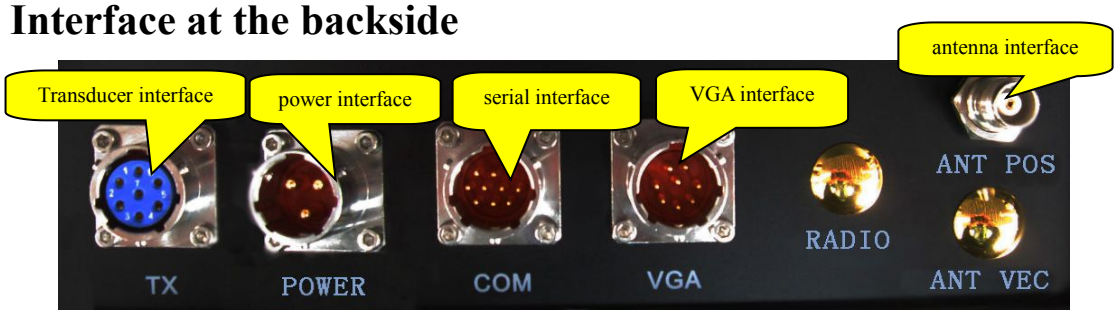


Figure 3-5

Transducer interface TX

Transducer interface is used to connect depth measuring high frequency transducer. It is applied for transmitting and receiving ultrasonic signals with a transmitting frequency of 200KHZ; after starting up, open the software and click the "depth". The probe can enter the working position.

Pin definition

Pin	1	2	6	3	5
Wiring definition	Ground	High and low frequency		High frequency	Low frequency
Cable characteristics	Shielded wire	White line		Red line	Blue line

Power interface DC

The power supply system is an important part of the system. The stable operation of the instrument is owed to the excellent power supply system. The rated voltage of the product is 10V～30V DC power supply. Be sure to keep the voltage within the permissible range to avoid damage to the device.

Pin definition

Pin	1	2
Wiring definition	Positive	Negative

Antenna interface (ANT POS and ANT VEC)

ANT POS and ANT VEC antenna interface are used for antenna connection. Among them, ANT POS can receive GPS signal and beacon signal simultaneously; GPS signal is the GPS positioning signal transmitted by satellites in the sky. Beacon signal is the differential signal transmitted from the beach beacon station; after the system is powered on, the antenna can search the satellite signal and the beacon signal.

VGA interface

VGA video output interface can connect video display, such as projector, monitor etc..

After the system is defaulted as startup, VGA port has output available. You only needs to connect to the device directly. No other setting is required.

Pin definition

Pin	1	2	3	4	5	6	7
Wiring definition	BLUE	PCGND	SCL	NC	NC	RED	GREEN
Pin	8						
Wiring definition	SDA						

Serial interface

Since HD-MAX series products have many peripheral serial data communication equipments, more serial ports are required. The expanded serial interface can satisfy the requirements. HD-MAX series products have two external RS-232 serial ports (COM1 and COM2) available. Among the

two ports, the one is connected according to standard 9-pin serial port definition, and the other one is only connected to communication pin as RX, TX and GND. The other control pin is not connected. You just need to plug in your RS-232 serial port.

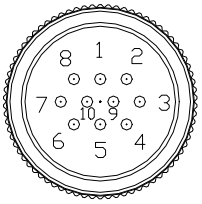


Figure 3-6

Table 3.1 Interface description

Pin	Pin definition
1	TXD2
2	RXD2
3	RTS1
4	RXD1
5	DSR1
6	DCD1
7	DTR1
8	PCGND
9	TXD1
10	CTS1

Initial setting of GPS mainboard

Detailed information is as shown in the software section

CHAPTER

4

Software Introduction

Introduction to this Chapter

- Software Overview
- Technical Parameters
- Installation of Software

Software Overview

The software is Hi-MAX. It is mainly applied on HI-TARGET HD-MAX series Echo sounders for depth sounding. It can be connected to GPS and other accessory equipment (such as attitude indicator, electric gyrocompass, swell instrument). The functions of the software mainly include: project management, coordinate transformation parameters setting, instruments and equipment connection, ship design, plan line design, CAD base map import, chart import, marine surveying, sounding sampling, data correction, tide level correction, results preview and export, serial port commissioning, coordinate transformation parameters calculation, coordinate transformation, software registration and software upgrade.

From the perspective of customers, the software pursuits more precise measurement, more humanized operation as well as more abundant functions to realize a variety of measurements. The software has the following characteristics:

(1) Parameters setting

◇ Support to import the conversion parameters of Hi-RTK handheld software to realize seamless converting of sea survey parameters and land measurement.

◇ Support access to attitude indicator, gyrocompass and other sensors. Attitude algorithm module is available for high precision sounding measurement.

◇ Support calculating antenna height smoothly and accurately through inputting water level elevation.

◇ Support serial port tests to resolve results displayed so that the users can determine that whether the serial port settings are correct or not conveniently and intuitively.

◇ Support boat design template matching. *.DXF and *.shp boat form templates can be imported.

(2) Plan line

◇ Support multiple layout methods for plan lines: channel layout, parallel layout, vertical layout, area layout and circular sector layout;

◇ Support plan line endpoint capturing with strong plan line editing functions. Support retracement and restoration functions.

◇ Support plan line preparation with mouse and coordinate input. Furthermore, parallel operation is permitted; support points library drawing.

◇ Support importing DXF format plan line; support to export plan line to DXF format.

(3) Marine surveying

◇ Support synchronous acquisition of geographical coordinates and sounding, namely the coordinate point collection is consistent with the output of Echo sounder.

◇ Support patterns of middle ship position and ship heading.

◇ Support to display electronic chart, DXF engineering map and support electronic chart feature query.

◇ Support point, line, curve fitting, surface marks, as well as inland waterway common schema tags which can be exported to DXF format.

◇ Soundings display supports multiple color modes such as monochrome, two-color, ribbon, depth color customization; soundings display modes support square, round cakes, depth value and so on.

◇ Shallow-water alarm, speed alarm, data acquisition anomaly alarm and other common alarm functions are available. Support text and voice prompts.

◇ With survey line management functions. Can export line data user-defined format, and can show/hide the survey line.

◇ Support track data acquisition in case of not connecting to Echo sounder.

(4) Marine sounding

◇ Support manual and automatic adjustment of gain, threshold, and power.

◇ Support color schemes manual configuration of echo, sounding line, waterline and other elements.

◇ Support manual and automatic gear

◇ Automatic capture undersounding

◇ Support echo, geographical position synchronous recording

◇ Support echo, geographical position synchronous playback

(4) Data post-processing

◇ Support manual acquisition of soundings as well as manual soundings editing.

◇ Support median method, weighted average, statistics and other automatic filter method.

◇ Support coordinate transformation parameters correction, delay correction, water surface elevation correction as well as draft correction.

◇ Support mono-station correction, regional multiple correction, fixed difference correction and a variety of tidal correction methods.

◇ Support depth contour and in-depth pseudo color rendering generated by achievement database.

◇ Support achievement data export. Support to export XYZ, DAT and other common data formats. Support export of user-defined formats.

◇ Support to edit sounding points according to echo.

◇ Support high and low frequency switching functions

(5) Other aspects

◇ With HI-TARGET GPS instrument (RTK/beaconreceiver/positioning & heading receiver), parameter setting, mainboard command transmitting and other relevant functions

◇ With coordinate transformation parameters calculation, distance and orientation calculation and other functions.

◇ Support software online updating and software offline upgrading.

Technical parameters

Operating environment: X86 system platform, CPU: Not smaller than 1GHZ. The internal storage shall not be less than 1GB.

Operating system: WindowXP or Windows7

Language environment: Support Chinese and English

Installation of Software

Double-click software installation package. A language selection dialog box will popup.

Figure 4-1 Installation language selection

Click [Confirm] to enter the next step:

Figure 4-2 Install the initial interface

Click [The next step]

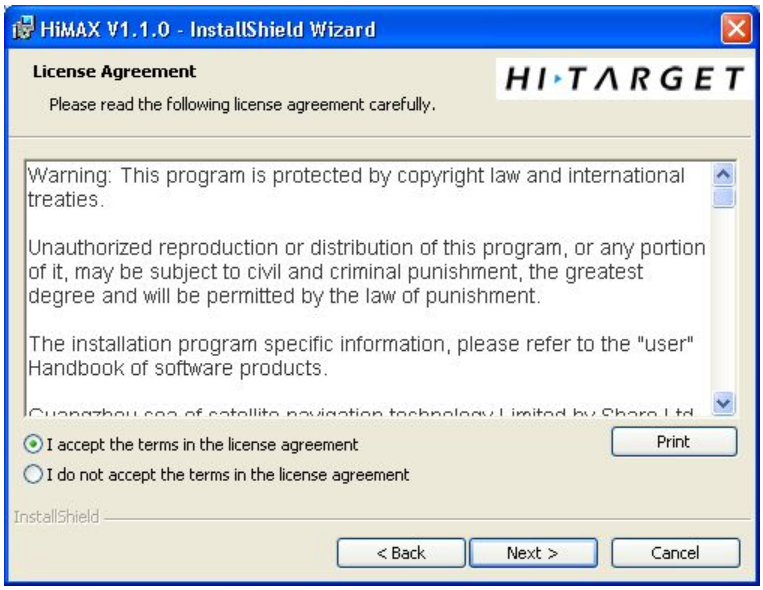


Figure 4-3 License agreement

Select [I accept the …]. Click [Next]

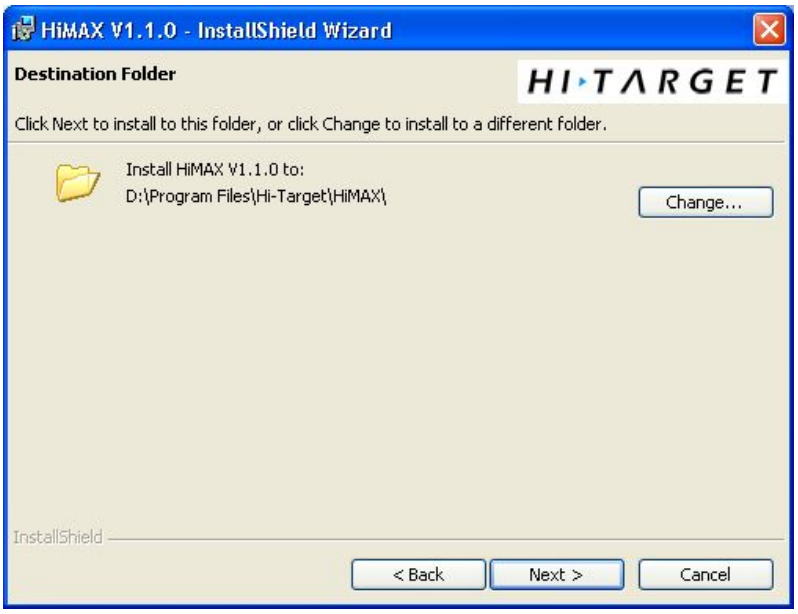


Figure 4-4 Installation directory

Click [Change] to change software installation directory:

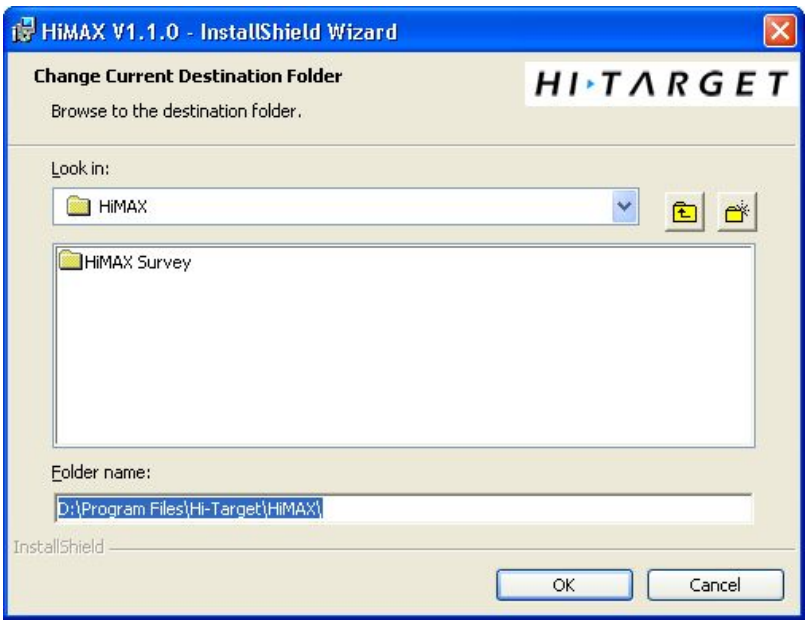


Figure 4-5 Installation directory setting

Modification completed. Click [OK] and click [Next]:

Figure 4-6 Start installation

Click [Install] to start installation:

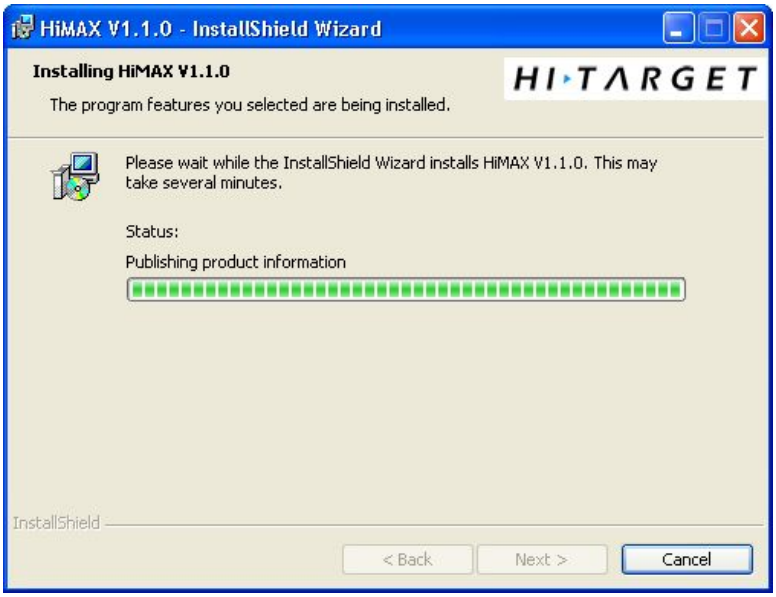


Figure 4-7 Start installation

After complete the installation, click [Finish] and exit the interface:

Figure 4-8 Installation completion

After successful installation, start menu will display installation directory. And shortcut icons of starting the software and uninstall the software are available.

Software uninstall

There are two methods to uninstall the software:

(1) Run the built-in uninstall program

Under the secondary menu, Hi-MAX, of Start Menu, the shortcut icon Uninstall Hi-MAX of uninstall program is available.

Figure 4-9 Start uninstall

Click [Yes] to continue and [No] to exist current operation.

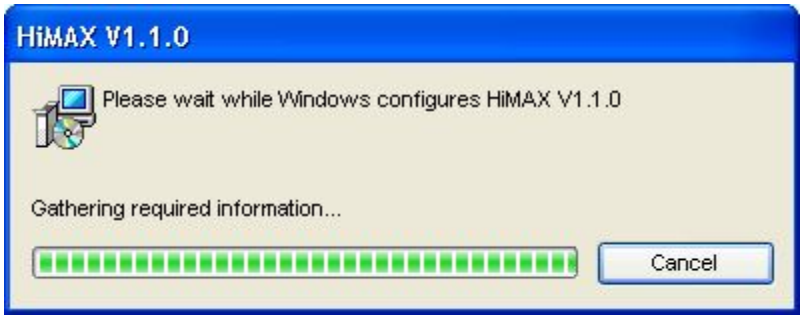


Figure 4-10 Start uninstall program

(2) Program uninstall of the system

Find out the Hi-MAX software in "Add or remove programs":

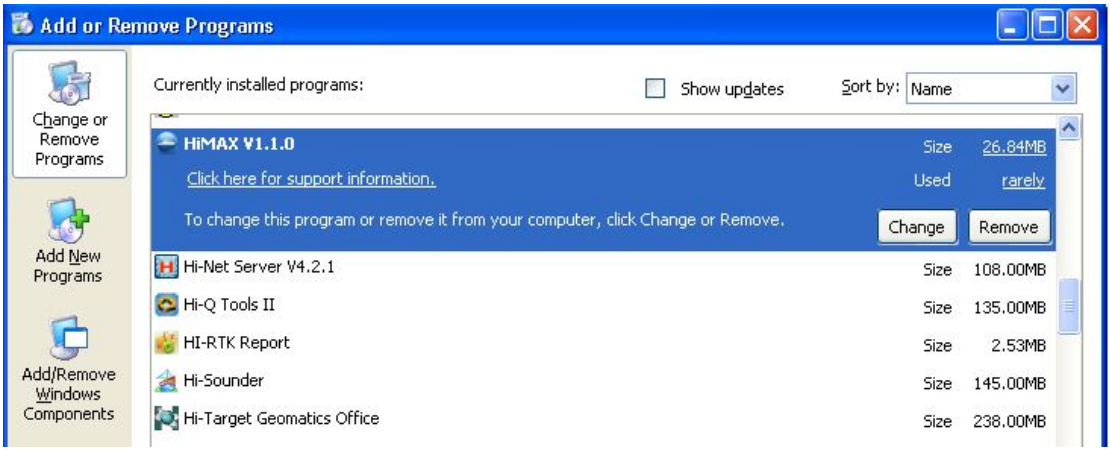


Figure 4-11 Add or remove programs

Click [Remove] to uninstall the software directly. Select [Change] to enter uninstall interface:

Figure 4-12 Modify the program

Click [Next] to continue:

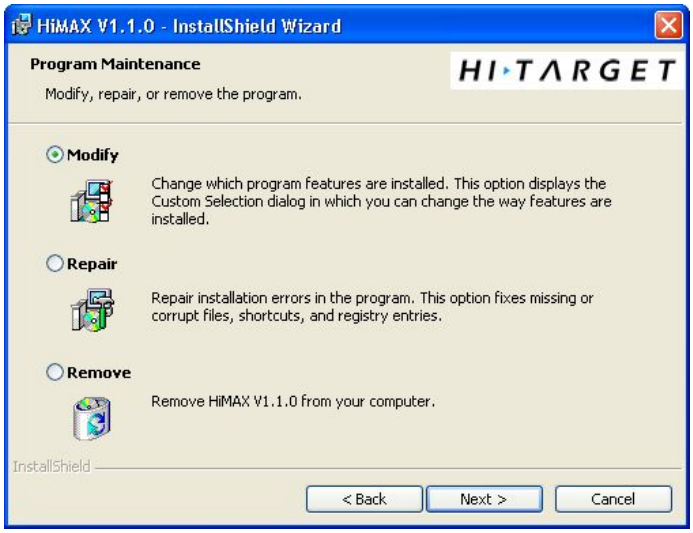


Figure 4-13 Software maintenance

Select Modify, Repair, or Remove to perform relevant operations.

CHAPTER

5

Simple Operation Process

Introduction to this Chapter

- Main Interface
- Simple Operation Process
- Conclusion of This Chapter

Main Interface

Run the software to enter the main interface. The main interface includes project name, module button, automatic measurement selection, English and Chinese selection, and version number. Select relevant modules for operation.

Figure 5-1 Software main interface

◇ "Current item" is the current default item name.

◇ Check "Software startup for automatic measurement" and the measurement interface can be entered automatically after next startup.

◇ Select "Chinese" or "English" Environment. Software is to switch between languages.

◇ At the lower right corner is the current software version.

◇ Module buttons are available on the main interface. Click it to enter corresponding module interface.

Simple Operation Process

1.Click [Project] to create new project. Open, import, apply and delete current projects. (Declaration: After starting up the software, automatically open the last project. If the project is opened, this step can be omitted).

2.Click [Geodetic]. Set up central coordinate system. According to seven parameters, four parameters, elevation fitting parameters, points transformation parameters and transformation parameters. (Description: The [UtilityTools] module of the software can provide coordinate parameter calculation. The results calculated by the functional parameters can be applied in [Geodetic]; [Geodetic] module supports parameter files importing functions can import parameter files of *.dam format and support item parameters of importing V60 controller. If the user do not perform any modification to current coordinate parameters, the step can be omitted.)

3.Click [Equipment] to connect any types of GPS, Echo sounders, compass, attitude indicator and swell instrument. (Description: This software supports most types of GPS, Echo sounders, compass, attitude indicators and other equipment. Sounder data format can self-define. For the few and unknown instrument, it can be connected to the software based on international NMEA0183 standard format).

4.Click [BoatShape] and select hull lines model. Set length, width, position transducer, GPS antenna and other parameters. (Description: In this step, only the deviation parameter of GPS antenna position and transducer position will affect measuring results. The parameters need accurate measurement and then input to the software. The other parameters can be input roughly.)

5.Click [PlanLines]. Draw plan line with a mouse, coordinates and coordinates library. The DXF format plan files can be imported/exported. (Description: This software provides parallel layout, vertical layout, regional layout, fan layout, channel layout and other layout model to facilitate rapid layout).

6.Click [Charts]. Encrypted S63 electronic chart can be imported. Unencrypted S57 electronic chart can be imported. (Description: If the electronic chart is unnecessary, this step can be ignored).

7.Click [BaseMap] to import engineering basemap in DXF format. Sounding data basemap in DAT format or user-defined format can be imported. (Description: If the engineering basemap is unnecessary, this

step can be ignored.)

8.Click [Survey] to enter measuring interface. Click [Record] button to perform data acquisition and recording automatically. During the measuring process, chart query, plan line preparation, marking, distance, angle measuring and other functions can be applied. (Description: Among all measuring modules, mode switch can be performed between [North up] and [Head up]. It can switch between [Unlock] and [Locked] to control whether the ship position is displayed in the middle).

9.Click [Sampling] to amend error sounding data, data resampling and other data processing. (Description: The software can provide median filtering, weighted average, statistics and other mathematical models. The software can perform automatic correction to the wrong sounding data quickly and efficiently.)

10.Click [Correct]. It can perform coordinate transformation parameters correction, delayed correction, surface elevation correction and draft correction. (Description: At data acquisition, if the coordinate transformation parameters input wrongly, coordinate transformation parameter correction can be adopted to correct them.)

11.Click [Tide] to input water level information of tide station. And then perform tide level correction for result data of [Sounding sampling]. (Description: For RTK operation, this step can be ignored.)

12.Click [Results] to preview the depth contour and pseudo color rendering images according to result data of [Sampling] or [Tide]. If you are satisfied about the result, you can export the achievement data to complete the whole process. If not, you can repeat the process after go back to [Sampling] or [Tide].

The above contents are brief operation process of sounding and the followings are software assistant functions.

1.Click [SerialDebug] to view satellites information. The base station information or Rover instrument parameters can be set up. Or serial port command can be transmitted to mainboard of the instrument.

2.Click [UtilityTools]. You can calculate seven-parameter,

four-parameter, elevation fitting parameters. It has coordinate transformation calculation, distance azimuth calculation, unit conversion and other functions.

3.Click [Register] and input the registration code to register the Software Dongle.

4.Click [Upgrade] to perform software online or offline upgrade packages upgrading.

5.In the case of [After the software launch, the survey starts automatically] being selected, the software will automatically enter [Survey] functional module at software starting.

Conclusion of This Chapter

The software interface is simple, efficient, and easy to understand. The complete modularization design has greatly facilitated operation. Users can complete basic operations of marine surveying following the sort order specified on software interface. Besides, the software provided abundant utilities for easy and rapid operation.

CHAPTER

6

Project management

Introduction to this Chapter

- Project Settings
- Conclusion of This Chapter

Project Settings

At the main menu interface, click [Project], a dialog box as shown in Figure 6-1 will popup. You can view the existing project tasks, open a project, establish a project, template application, import a project, delete a project etc.

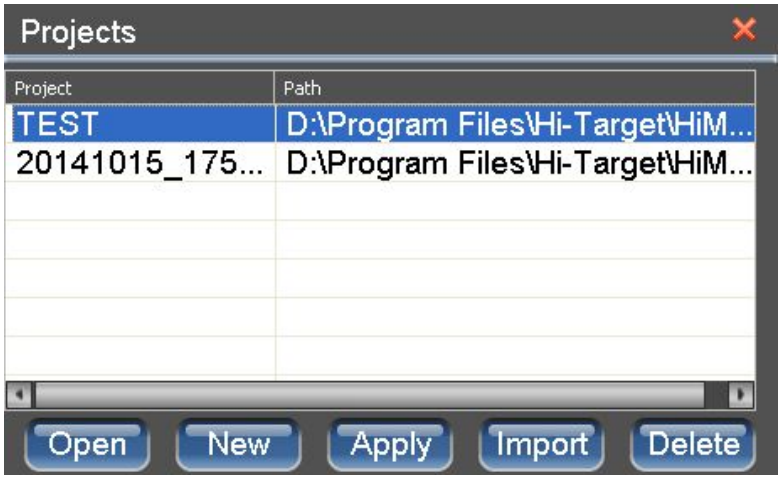


Figure 6-1 Project task

Open a project: Select a project in the list. Click [Open] to open the current project; if it is opened successfully, it prompts that the project has been opened successfully. And then exit the interface; if it prompts any failure, please choose whether delete it or not.

Establish a project: Click [New], and the interface to input a new project name will show up (as shown in Figure 6-2]. Input the name of a new project. Click [OK] to establish a new project. Click [Cancel] to exist new project operation.

Figure 6-2 Establish a project

Template application: First of all, select the project in the list. Click [Apply], and the interface to input a new project name will show up (as shown in Figure 6-2]. Input the name of a new project. Click [OK] to establish a new project. The new project will use the template application automatically for item parameters selected. Click [Cancel] to exist template application

operations.

Import the project: Click [Import]. A dialog box (*.pgm) that reminders open the project file will pop up. Select the project engineering files that have to be imported and open them. The items imported successfully will be displayed in the project list to facilitate other operations in the future.

Delete the project: First of all, select the projects in the list. And then, select [Delete] to delete the project selected from the project list. In order to avoid data loss caused by misoperation, [Delete] function will only delete the project from the project list, but not delete the project specific data.

Conclusion of This Chapter

After the software starting up, it will open the project that opened at last time automatically. Only when you need to open the other projects, [Open] functional key will be used; for the first time of running the software, the software will automatically create a default project. The project will be named after a date for project construction. The difference between [Apply] and [New]: [Template application] is to copy the parameters of the selected project to create a new project. [New] is create a new project with all parameters as default values. [Import] only imports the projects at other memory locations to project list but will not remove data storage location. [Delete] only deletes the project from the project list, but will not delete specific data.

CHAPTER

7

Coordinate parameters

Introduction to this Chapter

- Coordinate Transformation Parameters Settings
- Conclusion of This Chapter

Coordinate Transformation Parameters Settings

At the main menu interface, click [Geodetic] to enter coordinate transformation interface. It is possible to import existing coordinate conversion parameters to import existing coordinate transformation parameters in other projects rapidly; the coordinate conversion parameters used previously can be used as the conversion parameters of current project; can set/modify coordinate transformation parameters of current project, including ellipsoid parameters, projection parameters, ellipsoid transformation parameters, plane transformation parameters, elevation fitting parameters, points transformation parameters and plane grid parameters.

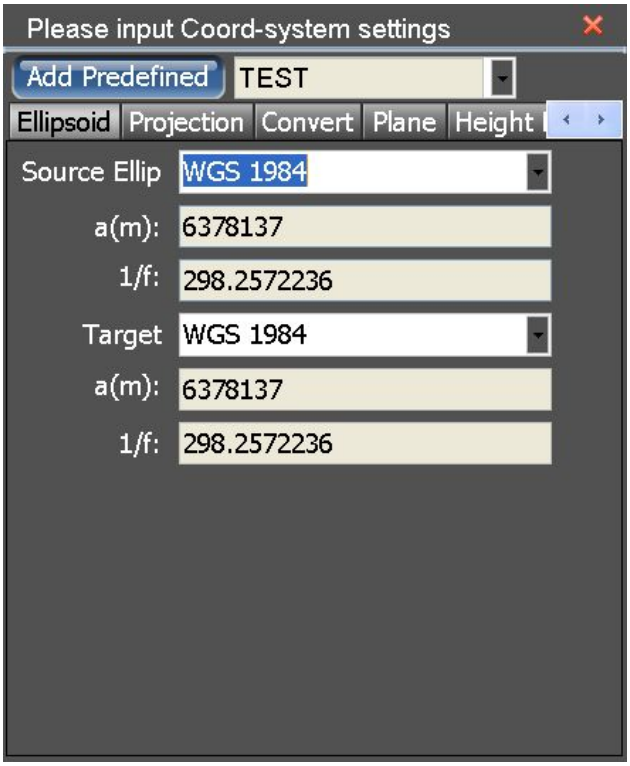


Figure 7-1 Coordinate parameters

Import coordinate transformation parameters: Click [Add Predefined]. The dialog box of opening the file will pop up. The file type can be selected as (*.dam) or (*.Prj). And then open the parameter files. The function supports to open existing Hi-RTK project files (*.Prj). Besides, it can open the coordinate conversion parameter files of other projects (*.dam) as well.

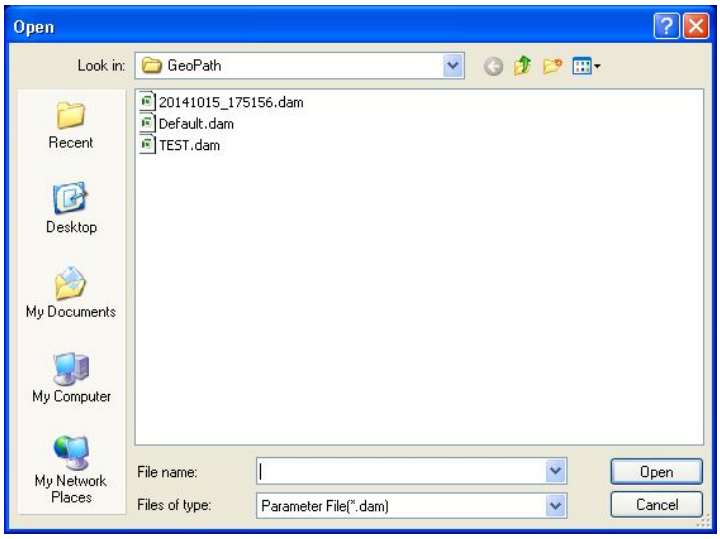


Figure 7-2 Parameters importing

Choose existing coordinate transformation parameters: The coordinate transformation parameters used recently are shown in the parameter pull-down list at the right side of [Import] button. Select a project to set the coordinate transformation parameters of the project as coordinate parameters of the current project.

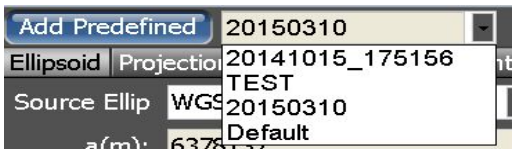


Figure 7-3 Parameters selection

Set/modify coordinate transformation parameters: Coordinate transformation parameters include ellipsoid parameters, projection parameters, ellipsoid transformation parameters, plane transformation parameters, elevation fitting parameters, points transformation parameters and plane grid parameters. The setting of these parameters shall follow strict sequence. The parameters that have to be set up frequently include projection parameters, plane transformation parameters, elevation fitting parameters and points transformation parameters.

Saving coordinate transformation parameters: Import coordinate transformation parameters or select existing ones, or set/modify coordinate transformation parameters. After completing such operations, click the icon  at top right corner. The software will save current setting of coordinate transformation parameters automatically.

Ellipsoid setup

Ellipsoid parameters include source ellipsoid and local ellipsoid. Generally,

WGS84 is adopted as source ellipsoid and Beijing 54 as local ellipsoid in China.

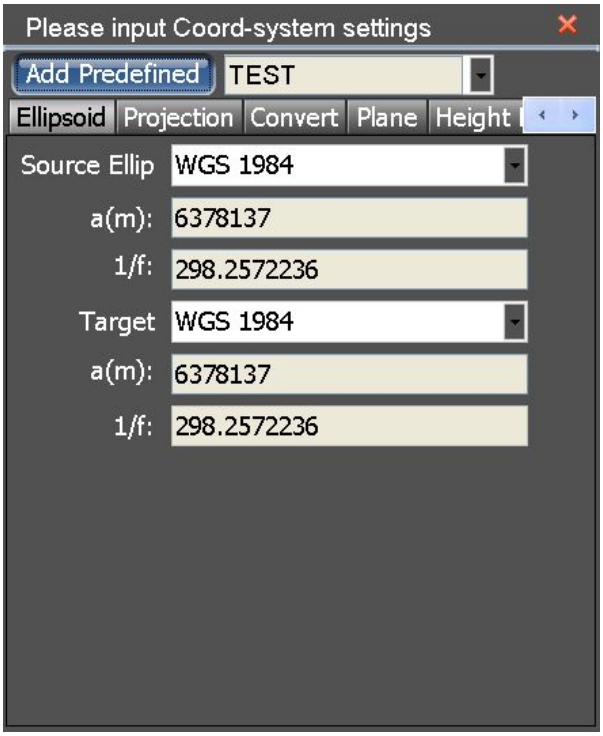


Figure 7-4 Ellipsoidal parameter

Projector setting

The role of projection parameters is to achieve the transformation from space rectangular coordinate system to plane rectangular coordinate system. Choosing different projection methods will obtain different plane coordinates correspondingly. The most frequently-used projective modes include "Mercator", "Transverse Mercator", "Gauss -define" and so on.

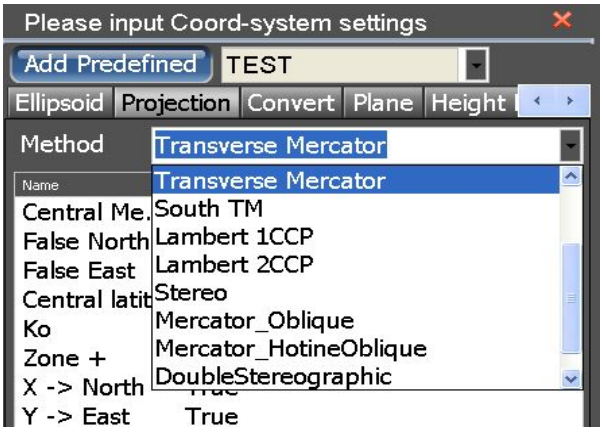


Figure 7-5 Projective modes

Major parameters of projective modes setting include central meridian, north with constants, east with constants, scale etc.. Generally, north with constants, east with constants, scale are fixed constants. Users only need to set the

central meridian corresponding to the projection mode.

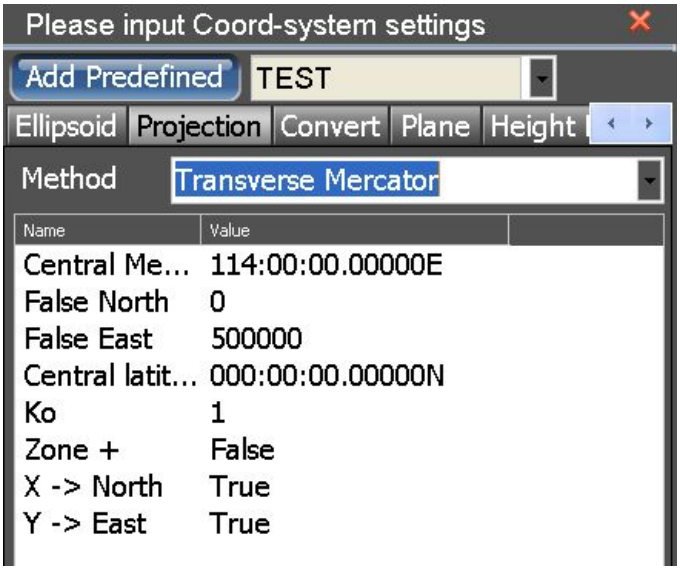


Figure 7-6 Projection parameters

Ellipsoid transformation

Ellipsoid transformation parameters are to complete the transformation from source ellipsoid space rectangular coordinate system to local ellipsoid space rectangular coordinate system. The most frequently-used transformation methods include: Bursa-Wolf, Molodensky, One-touch etc.

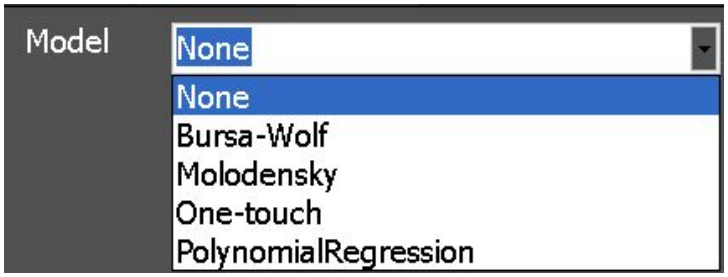


Figure 7-7 Transformation model

Set up parameters based on the selected ellipsoid transformation model or acquire the parameters through Utilities, such as seven-parameter:

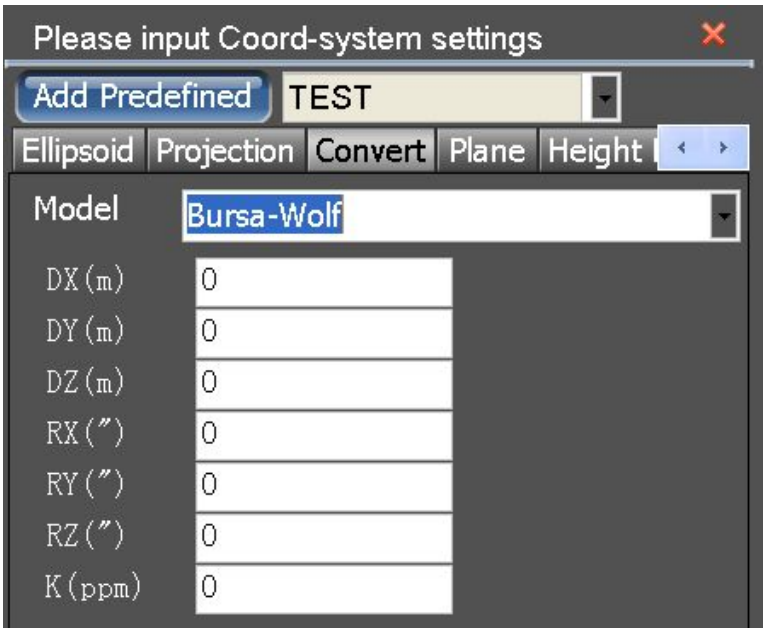


Figure 7-8 Seven-parameter

Description of several commonly used Ellipsoid transformation parameters

(1) Bursa-Wolf

Transformation, rotation and scale parameters at spatial vector between two ellipsoids with extremely small rotation angle is a rigorous transformation model. At least, three points are required for calculating. It is applicable to transformation from WGS-84 to national coordinate system.

(2) Molodensky

It is a simplifying form of Bursa-Wolf method, only with transformation parameters at spatial vector. It is a transformation method with lower precision. It can calculate from a given point. It is applicable to transformation from WGS-84 to national coordinate system.

(3) One-touch

Combination of transformation, rotation, scale parameters as well as plane transformation parameters at spatial vector between two ellipsoids. The rotation angle can be as an arbitrary value. At least, three points are required for calculating. It is applicable to transformation from WGS-84 to any coordinate system.

Attention: Users shall pay attention to coherent units of seven-parameter. Especially when the "K" value dimensional unit is ppm (percent per million), users shall pay more attention at inputting!

Plane transformation

Plane transformation parameters refer to transformation from plane-coordinate system to local ellipsoid plane coordinate system after completing source ellipsoid projection. The frequently-used conversion methods include: 2D Helmert, TGO, Grid etc.

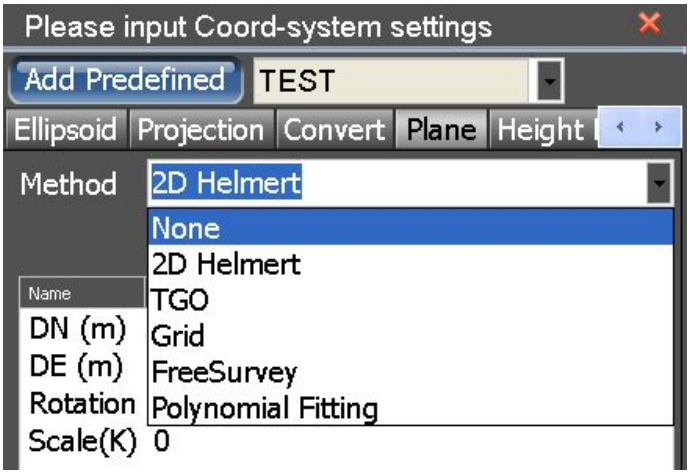


Figure 7-9 Plane transformation model

Set up parameters based on the selected model, or acquire the parameters through Utilities, such as 2D Helmert:

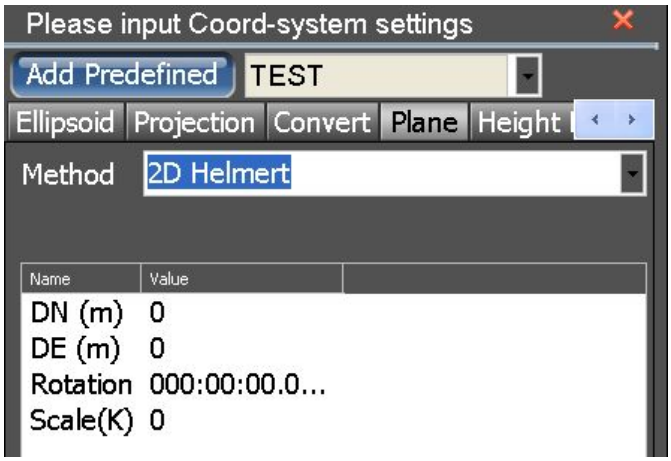


Figure 7-10 2D Helmert

Description of several commonly used plane transformation parameters

(1) 2D Helmert

Transformation, rotation and scaling parameters between two plane-coordinate systems. It is applicable to most common engineering users. Parametric solution can be performed from the known coordinates of two arbitrary coordinate systems.

(2) TGO

A plane transformation method of TGO software. Comparing to 2D Helmert, origin of coordinate north and origin of coordinate east are increased.

(3) Grid

Call-in the edited grid file format to WGS-84 coordinate transformation to grid coordinate.

(4) FreeSurvey

It is a plane transformation method self-defined by THALES. Comparing to four-parameter, origin of coordinate north and origin of coordinate east are increased.

Height Fitting

Height fitting is parameter correction to elevation fitting. Generally, it is jointly used together with plane transformation parameters. The frequently-used Polynomial fitting parameters include: Geometric Surface, TGO, Grid, FreeSurvey Height fitting, and elevation fitting pattern description etc.

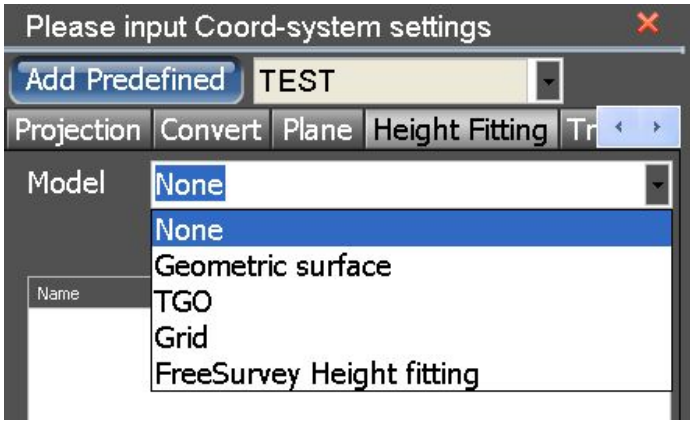


Figure 7-11 Elevation fitting model

According to the fitting method selected, generally select "Constant" of " Geometric Surface". Equations are obtained through inputting parameters or elevation fitting algorithm of [UtilityTools], such as parameter fitting and plane fitting:

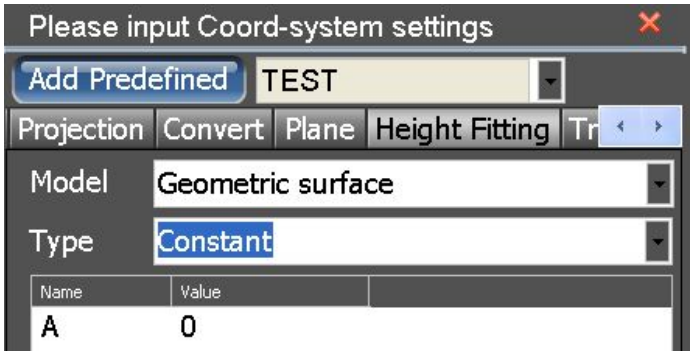


Figure 7-12 Fixed difference correction

Description of several commonly used elevation fitting parameters:

(1) Geometric Surface

Constant correction: Take GPS measured elevation and the fixed constant as operational elevation. Only a starting point is required.

Plane fitting: An optimal fitting plane will be generated corresponding to height anomaly at multiple benchmarks based on three starting points. When the plan is parallel to horizontal plane, the plane fitting is equal to fixed difference correction.

Quadratic Surface fitting: An optimal fitting paraboloid will be generated corresponding to height anomaly at multiple benchmarks based on five starting points. Quadratic Surface fitting is subjected to stricter start counting. If the fitting degree is too poor, it may cause elevation correction value divergence in the working area.

(2) TGO

Elevation transformation model of Trimble TGO software include five parameters: constant balancing, northern slope, eastern slope, the origin of north and the origin of east.

(3) Grid fitting

Grid fitting requires to select grid file fitting to support Trimble (ggf), HI-TARGET (zgf), Geoid99 (bin) which can be compatible with egm-9 model. Generally, grid fitting files are great in size. Thus it may require more time for reading. The grid fitting is rarely used in China at present. If "grid fitting" and the other four elevation fitting methods are applied simultaneously, perform "grid fitting" prior to other fitting methods.

(4) Free Survey Height fitting

Elevation transformation model of Trimble includes five parameters: constant HO, northern slope, eastern slope, origin latitude and original longitude.

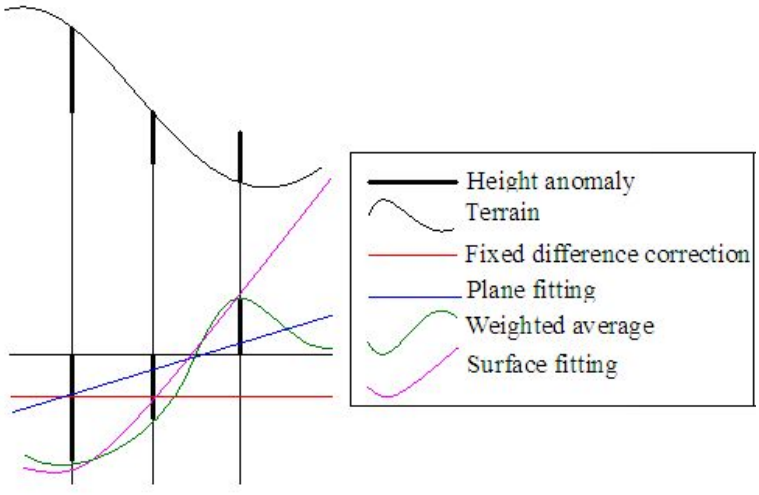


Figure 7-13 Simulating comparison chart of elevation fitting plane

Points translation

Generally speaking, points translation (TruckPoint) only has one known point in the working area. The GPS differential mode adopted by users is code differential (beacon or SBAS). Besides, in case of no other translation parameters, coordinate correction is to be performed to ensure measurement accuracy. It is similar to fixed difference correction of the previous ocean sounding software. The only difference is that the plus-minus signs of input value are opposite.

dx, dy and dh can be entered as translation parameter directly. Or you can obtain accurate translation parameter through point translation parameter calculation tools in [UtilityTools].

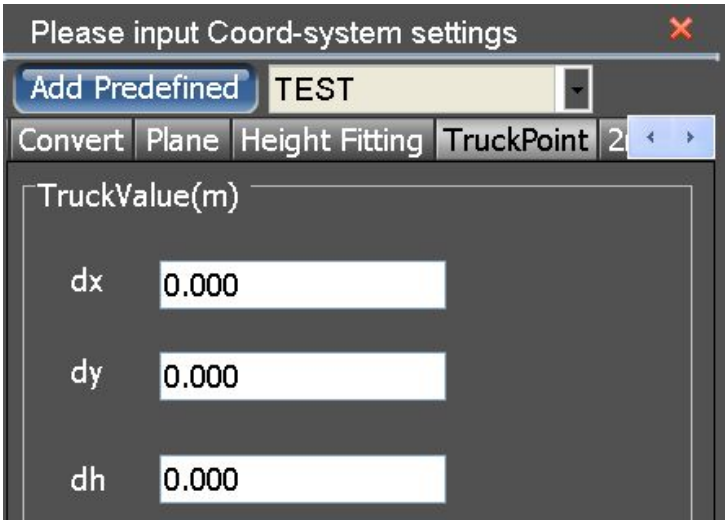


Figure 7-14 Points translation

Attention: The points translation parameters of the software are consistent with that of Hi-RTK hand book software. However the fixed correction parameters of previous software are different and the plus-minus signs of parameters are opposite. For example, the fixed difference of previous software can be input as dx, dy, dh. And for the software, the translation parameters should be input as -dx, -dy and -dh.

Config

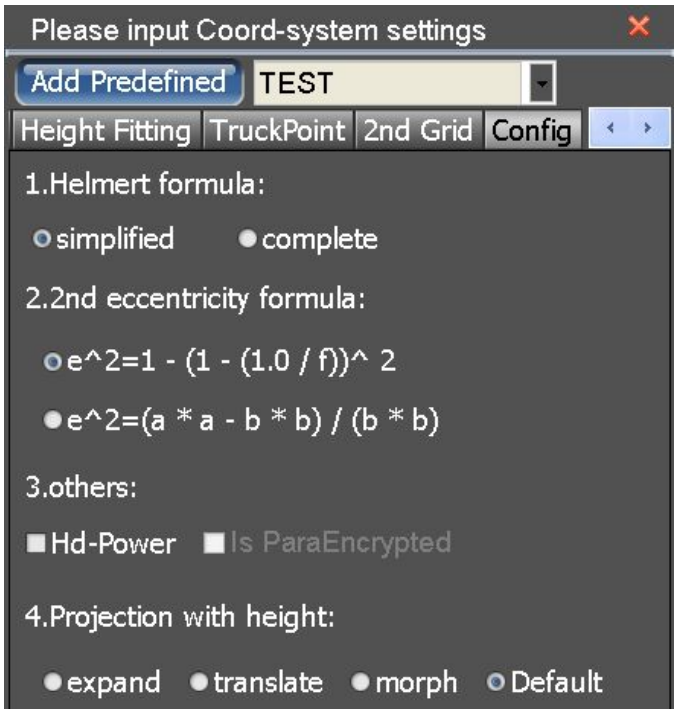


Figure 7-15 Options

(1) Helmert formula. Simplified or complete version are optional. If the rotation angle is great at ellipsoid transformation, it is suggested to take the complete formula.

(2) "Hd-Power" is to be clicked if the solved parameters from Hd-Power software is to be applied. Choose the simplified formula for seven-parameter. Choose the first one for secondary eccentricity formula.

Conclusion of This Chapter

Coordinate parameter setting is an essential link for measurement setup which determines local coordinate precision directly. Generally, there are two types of coordinate transformation methods, seven-parameter, and four-parameter plus elevation fitting. If transformation parameters of local coordinate system are provided, the user only needs to input corresponding parameter. If not, it is necessary to solve the transformation parameters. When the number of known points is more than three, generally, seven-parameter will be applied; when the number of known points is two, four-parameter plus elevation fitting will be applied.

CHAPTER

8

Device Connection

Introduction to this Chapter

- GPS setting
- Auxiliary equipment settings
- Conclusion of This Chapter

At the main menu interface, click [Equipment] to enter equipment connection interface. The communication parameters of GPS device, Echo sounder and subsidiary sensors can be set up. Communication tests can be performed as well for communication parameters.

GPS Settings

Serial port setup

Select the serial port and baud rate for GPS connection. You can click  to detect baud rate automatically:

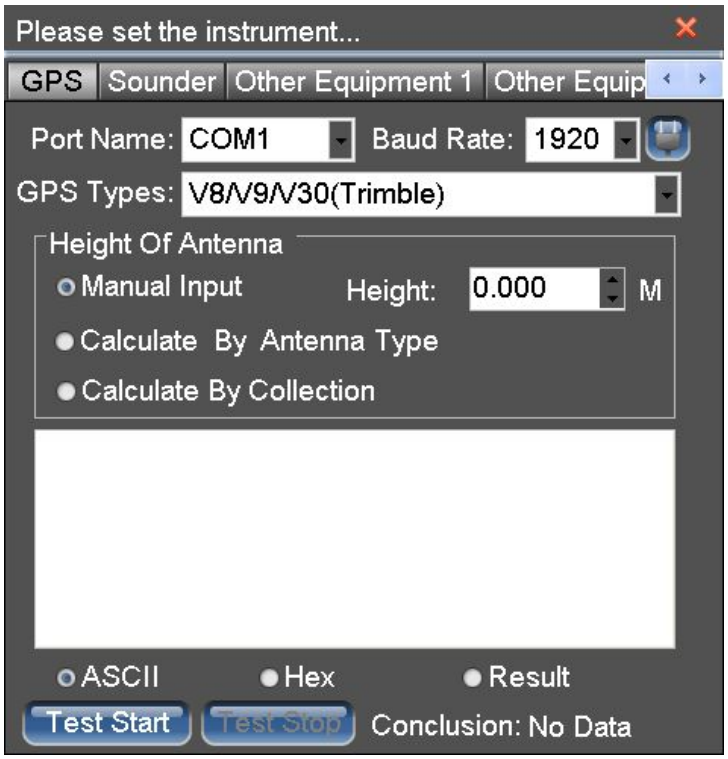


Figure 8-1 GPS serial port setup

Instrument type setup

Select GPS instrument type of current connection

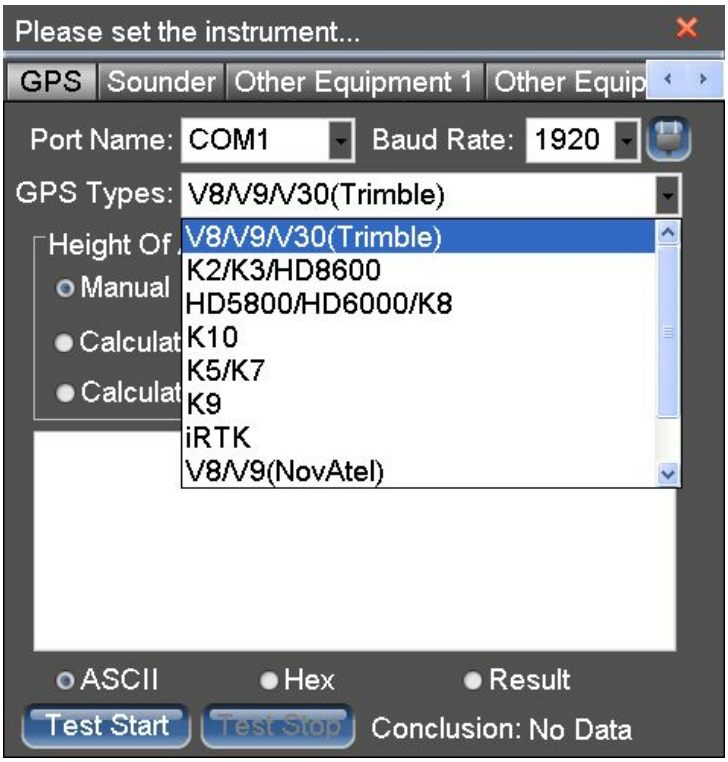


Figure 8-2 GPS instrument type

If the current GPS instrument type can not be detected in the instrument type drop-down list, please select "other models of GPS (NMEA-0183). Connect to the GPS device following general international NMEA-0183 standard protocol.

Antenna height setup

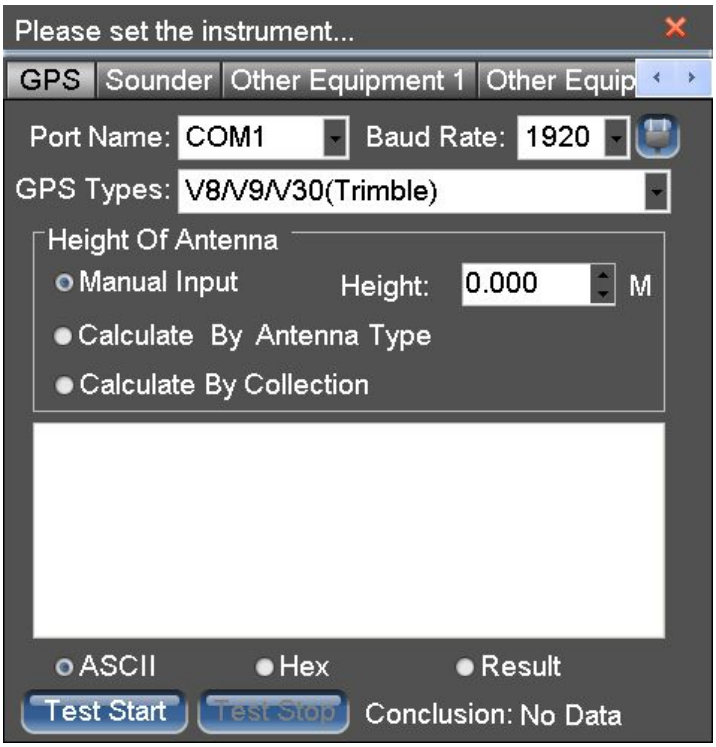


Figure 1-1

Figure 8-3 Antenna height

(1) Input antenna height: Input antenna height directly at antenna height input box.

(2) Calculate antenna height: Select [Calculate By Antenna Type] to enter calculation interface:

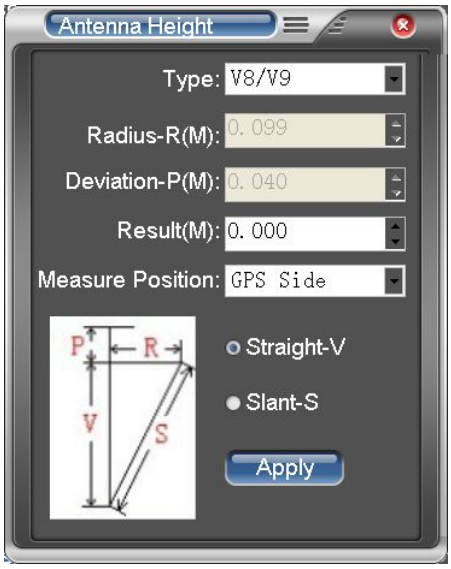


Figure 8-4 Antenna height calculation

Select antenna type and input antenna height value. Choose type, high antenna measuring position and radius of the antenna and the phase shift according to different instrument model has a fixed value, if it is a custom, users need to input. After the setup is completed, click [Application].

(3) Calculate antenna height automatic: Select [Calculate By Calculation] to enter calculation interface:

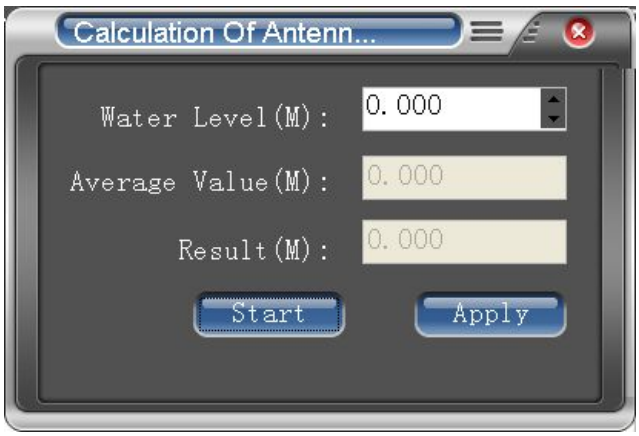


Figure 8-5 Antenna height calculation

Input current water level elevation. Click [Start]. The antenna height will be calculated automatically through smooth acquisition of ten times of effective GPS antenna height. Click [Apply] and apply the currently calculated antenna height to software. (It is a frequently-used method to obtain antenna height on oceanographic instrumentation. First of all, measure the water level elevation when the water surface is calm; secondly, try to keep the surface elevation and GPS acquisition time in synchronization without great time interval.)

Communication test

Click [Test Start] and the serial port will be opened to receive and parse data. The text box will display the received data and show the comprehensive assessment of test results at lower right. There are three statuses of [Conclusion]:

（1）No data: Serial port has not received any data.

（2）Normal data: Correct serial port setting. Moreover, the selected instrument type matches the connected GPS devices.

（3）Abnormal data: Data received at the serial port. However, it can not perform data acquisition. The possible reason is that: ① The baud rate is not correct. ② The selected instrument type is not matching with the connected GPS devices. ③ Date information not output

◇Select [ASCII]. Serial data will be displayed as in character. It can check statement information from current GPS output, such as GGA and ZDA information:

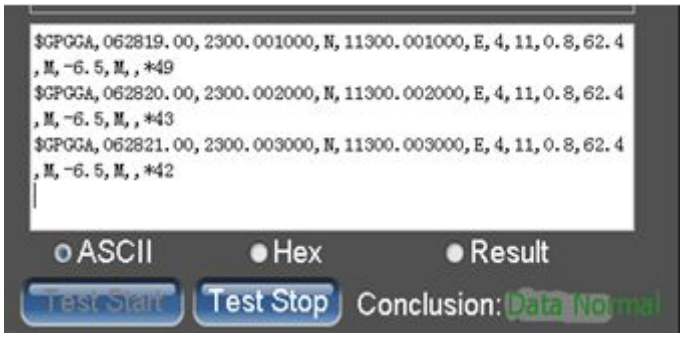


Figure 8-6 ASCII code display

◇Select [Hex]. Serial data will display in the form of hexadecimal digits, you can view the GPS output binary information:

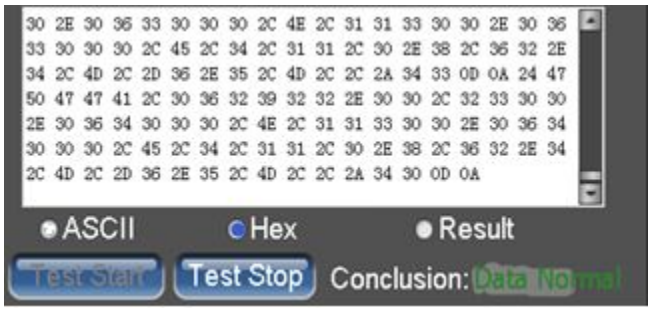


Figure 8-7 Hexadecimal digit display

◇Select [Result]. Perform data analysis for serial data and display resolved results, including date time, longitude and latitude, elevation, computational state, satellite data:

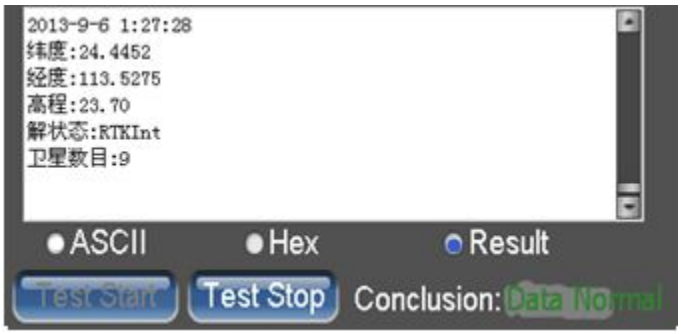


Figure 8-8 Results form displayed

Auxiliary Equipment Settings

It accesses to two auxiliary equipment the setup methods of which are the same. Click [Other Equipment] tab control. Auxiliary equipment can be connected to gyrocompass, attitude indicator, orientation GPS and other auxiliary measuring sensors. After setting serial port and Baud rate, select access sensor types.

Serial port setup

Select auxiliary measurement sensors connected to serial port and baud rate:

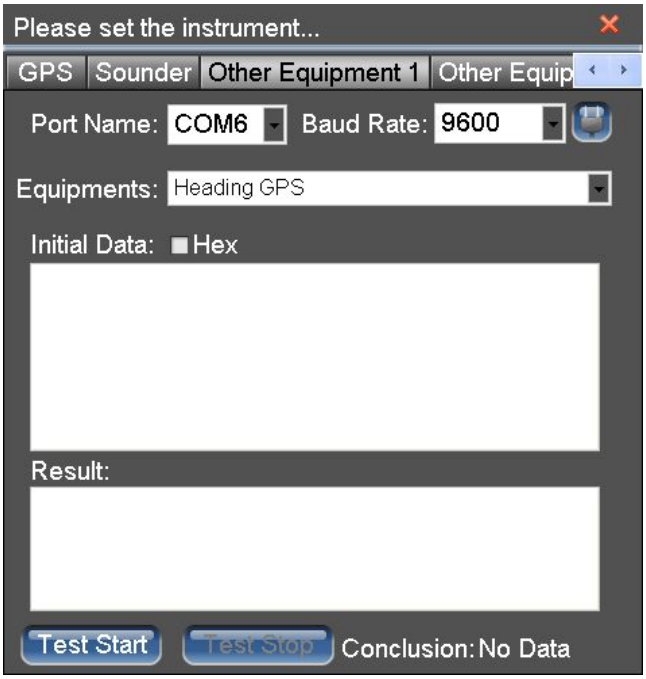


Figure 8-9 Serial port settings of auxiliary sensors

Instrument types setup

Select instrument types according to the actual access sensors or connect sensors in TSS1/TSS3 standard communication format. Directional GPS can get access to auxiliary sensors.

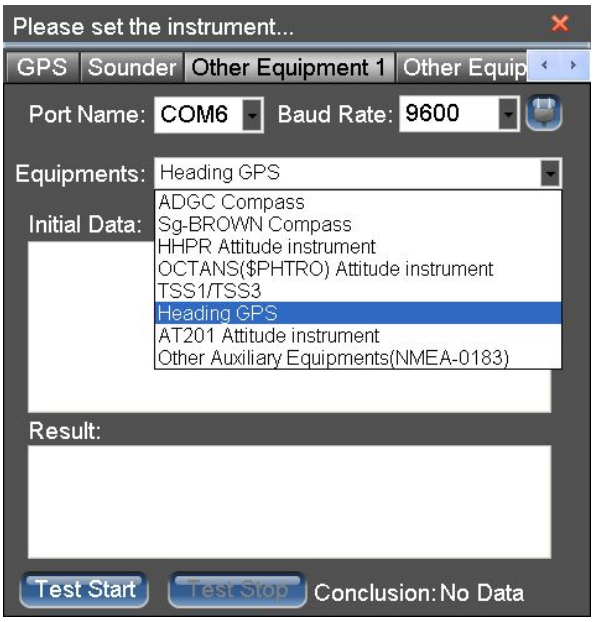


Figure 8-10 Instrument types of auxiliary sensors

Attention: After connecting to directional GPS, the data type of directional GPS output should be consistent with that output from directional GPS.

Communication test

Click [Test Start]. Open the serial port to receive and resolve data. The original data text box will display the serial port received data. Read the sounding information showed in the results box. Show the comprehensive assessment of test results at lower right. There are three status of [Conclusion]:

（4）No data: Serial port not received any data.

（5）Normal data: Correct serial port setting. Moreover, the selected instrument type is matching with the connected Echo sounder device.

（6）Abnormal data: Data received at the serial port. However, the data is not correct. The possible reasons are: ① The baud rate is not correct. ② The selected instrument type is not matching with the connected depth sounding devices.

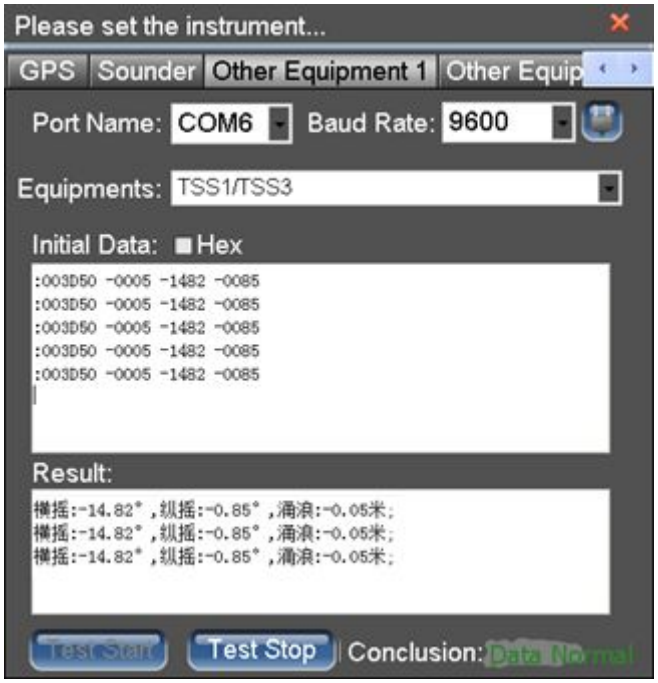


Figure 8-11 Auxiliary sensor communication test

Conclusion of This Chapter

Instrument connection parameters mainly include serial port, Baud rate and instrument type. Based on serial port raw data and resolved results displayed, the incorrect parameter setting or existing problems of serial port can be determined properly. The auxiliary sensors are to avoid influence on measuring results caused by hull pitch and swing thus to improve the accuracy of data acquisition. The auxiliary sensors include gyrocompass, attitude indicator, directional GPS et. al..

CHAPTER

9

Ship Design

Introduction to this Chapter

- Ship Design
- Conclusion of This Chapter

Ship Design

At the software main menu interface, click [BoatShape] to enter the design interface. The outer contour of the ship can be designed. The instrument installation parameters can be setup.

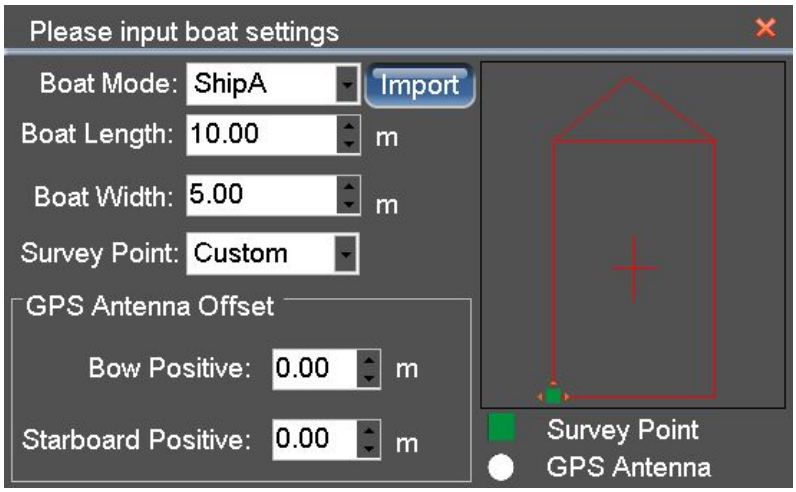


Figure 9-1 Ship Design

Design outer contour of the ship: Select existing ship model or import hull outline data in DXF format. Set up the length and width of the ship. The software will perform self-adapting calculation according to hull model and width to generate outer contour of the ship. The outside contour line of the hull will affect visual effects of ship but without any effects on acquisition data.

Instrument installation parameters setup: Select installation position of transducer. [Left Side], [Right Side] or [Custom] are optional. The self-defined settings will select green squares to move forward as shown in the schematic diagram. Set the deviation between GPS antenna position to transducer. Instrument installation parameters will affect the measured result data thus they should be measured accurately.

Attention: At positions near to bow, there are more waves and bubbles which will generate great interference on sounding of Echo sounder. While at positions near to the stern, the waves and bubbles generated by propeller will generate great interference on sounding of Echo sounder as well. Therefore, the optimal installation position of transducer is at the middle section of the ship. Generally, the transducer is subordinate to stroke-side or starboard. If the actual installation location is at the other position, select [Left Side] or [Right Side] if it is installed at a position close to stroke-side or starboard correspondingly.

Conclusion of This Chapter

For ship design, ship model as well as the width of the hull will not affect the measuring result data. Users only need to input approximate values of hull length and width. (Only the deviation parameter of GPS antenna position and transducer position will affect measuring results. The parameters need accurate measurement.)

CHAPTER

10

Plan line design

Introduction to this Chapter

- Plan line preparation
- Plan line edit
- Plan line routing
- Plan line import
- Auxiliary functions
- Conclusion of This Chapter

At software main menu interface, click [PlanLines] to enter plan line design interface. Draw the plan line with the mouse or coordinate. It supports plan line edit as well. Rapid routing can be realized by channel routing, regional routing, parallel routing, vertical routing and fan routing. Plan line data in DXF format can be imported.

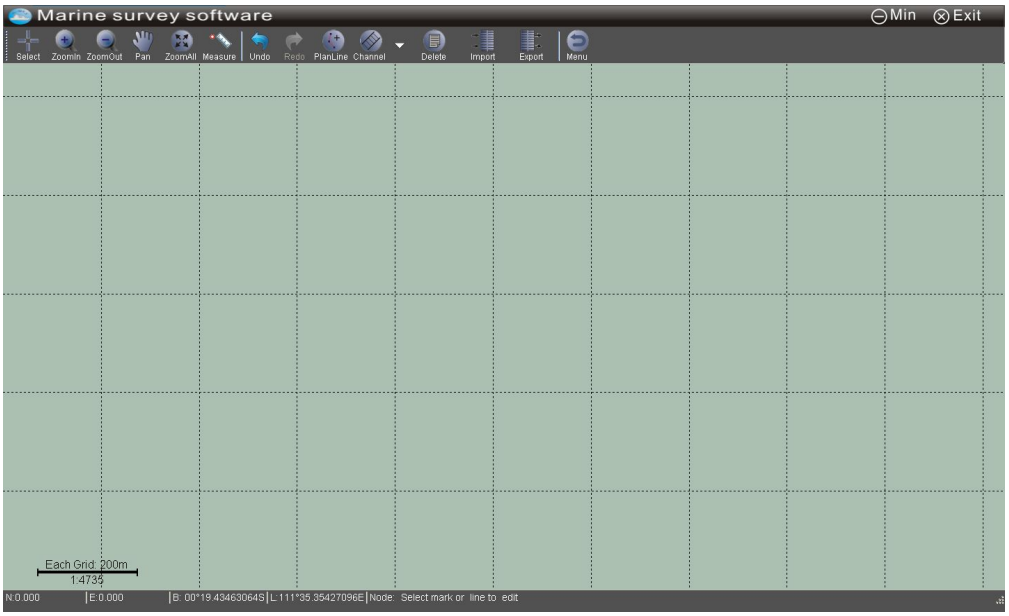


Figure 10-1 Main interface of plan line design

Plan line preparation

Click [PlanLine] 

to enter plan line drawing mode. Click the screen with a mouse directly to draw point by point. And also you can draw the plan line by increasing coordinates into the coordinates list. Mouse drawing and coordinates drawing can be performed simultaneously. Click [Save] to save the current plan line and start to draw the next plan line. During the processing of drawing, it can perform coordinates increasing, inserting, editing, deletion, empty and other operations.

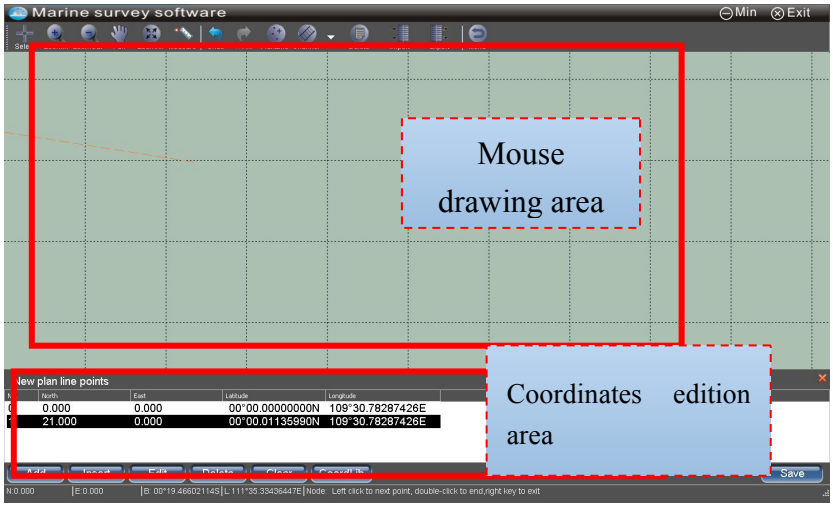


Figure 10-2 Plan line drawing

Mouse drawing

Under the mode of plan line drawing, the mouse icon will turn red cross. You can click left key of mouse to determine the vertex position of plan line. The coordinates of the position clicked by the mouse will be automatically added to the coordinates list. Double click the left mouse button to complete the current plan line and start to draw the next plan line. Click the right mouse button to complete the current plan line and exist the mode of plan line drawing.

Coordinates drawing

Plan line vertices can be increased by pressing [Add] and [Insert] in the coordinates list of coordinates drawing area. The coordinate value of a certain coordinate point can be modified by pressing [Edit]. The plan line vertices can be deleted by pressing [Delete] and [Clear] key.

[Add]: To add a coordinate point in coordinates list.

[Insert] To insert a coordinate point before the selected line in coordinates list.

[Edit] To modify the selected coordinate point in coordinates list.

[Delete] To delete the selected coordinate point in coordinates list.

[Clear] To remove all coordinate points in coordinates list.

[CoordLib]: Direct reference points in coordinates library.

Coordinates input box

Before coordinates input or coordinates editing, please refer to Chapter IV. Input correct coordinate transformation parameters. There are two types of coordinate input methods optional:

(1) Plane coordinates input

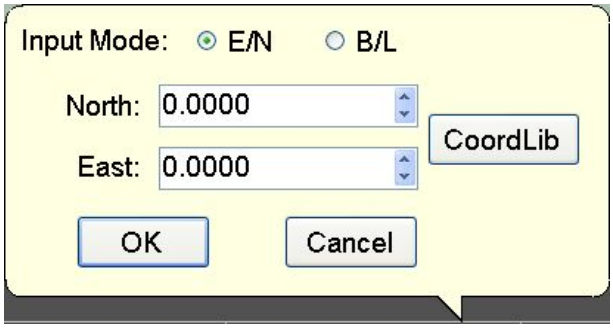


Figure 10-3 Plane coordinates input box

The coordinate system of plane coordinates is the local coordinate system. After click [OK], the system will convert plane coordinates to WGS84 latitude and longitude and store according to the parameters setting of [Geodetic]. Or you can cite directly from the coordinate library.

(2) Latitude and longitude input mode

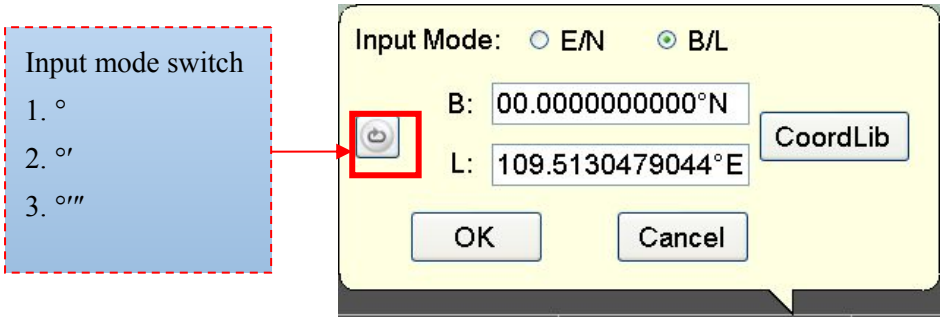


Figure 10-4 Latitude and longitude input box

The input latitude and longitude is as in the form of WGS84. The input mode can be switched among degree, degree of minutes and degree of seconds. "N" refers to northern latitude, "S" as southern latitude, "E" as east longitude and "W" as west longitude.

Plan line edit

Plan line edit mainly includes removing, deleting and modifying vertex coordinates as well as deleting plan line. First of all, click [Select] 

, and then select a plan line to enter the plan line edit mode. You can edit the toolbar for plan line edit. After that, click [Exit] or right mouse button to exit

edit mode.

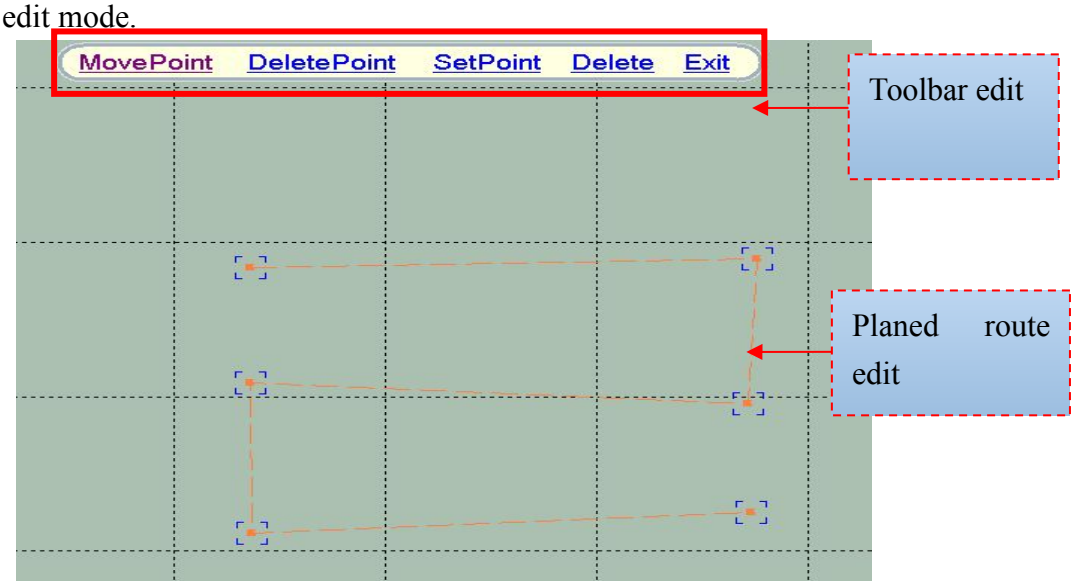


Figure 10-5 Plan line edit

Edit plan line vertex

After selecting a plan line with selection tool, you can perform the following operations as below:

Dragging the vertices with the mouse: Click [MovePoint] and then perform vertex dragging with a mouse.

Mouse click and delete vertices: Click [DeletePoint] and click the vertex to be deleted with the left button of the mouse.

Modify vertex coordinates: Click [SetPoint] and then click the vertex to be modified with the left button of the mouse. A coordinate input box will pop up. Input the new coordinate value in the input box. Click [OK] to complete modification to the coordinate.

Plan line deletion

There are three methods can be selected from: Single selection deletion, box selection deletion and scope deletion.

(1)Single selection deletion

To select a plan line with the selection tool and select [delete] in the edit toolbar.

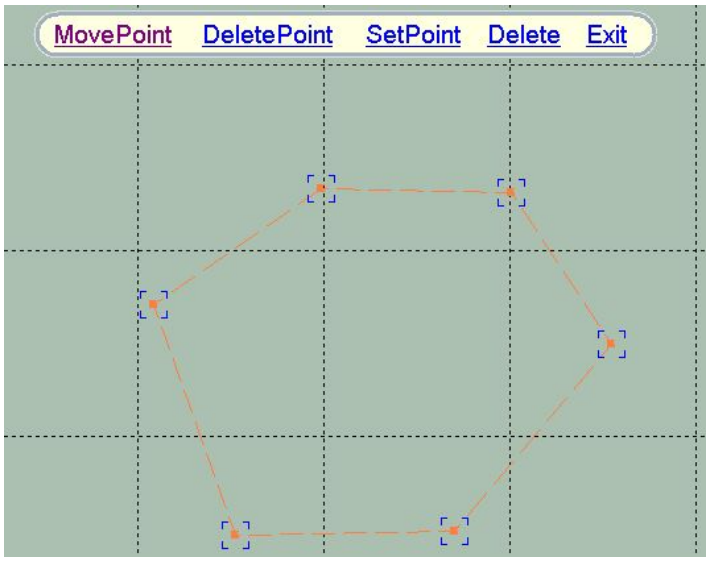


Figure 10-6 Single selection deletion

(2)Box selection deletion

Select multiple plan lines from selection tool boxes. A bubble box of plan lines will pop up. Click [Delete] to delete the selected plan line (orange display).

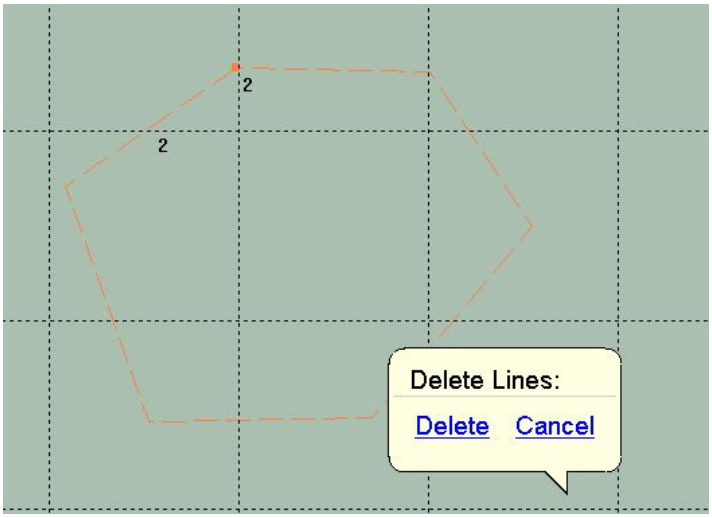


Figure 10-7 Box selection deletion

(3)Scope deletion

Click [Delete] 

in the menu bar. The bubble box of [DeletionLine] can delete the plan line in a wide range.

Figure 10-8 Range deletion

To delete all lines in the screen: Delete all plan lines in the current scope, including certain plan lines displayed in the screen range.

To delete all lines: Delete all plan lines.

Plan line routing

Plan line routing can generate a large number of plan lines conveniently and rapidly. The frequently-used routing models include: "channel routing", "area routing", "vertical routing", "parallel routing" and "Sector routing". Users can select appropriate routing models to perform rapid routing according to the requirements of actual measured area.

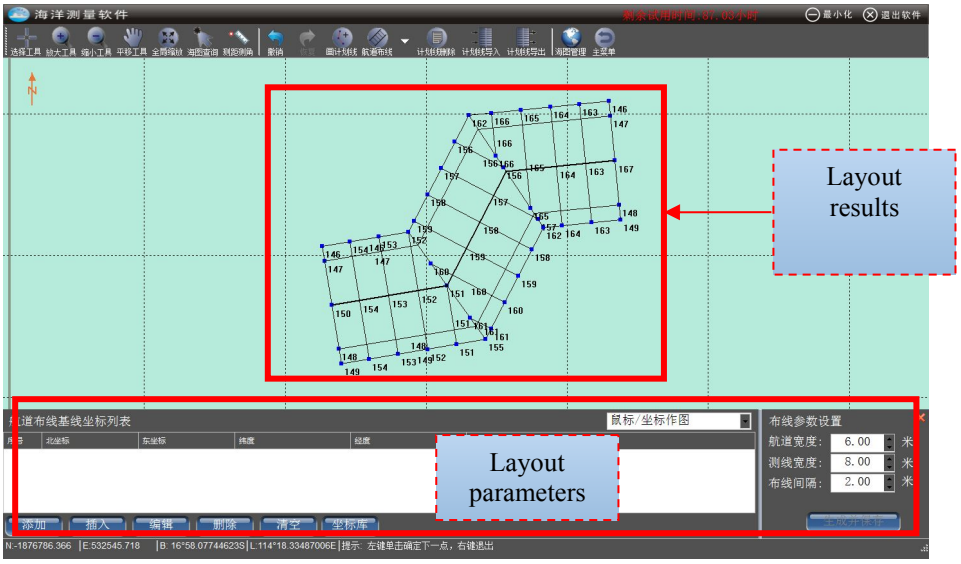


Figure 10-9 Plan line routing

Mouse/coordinate drawing: Draw a baseline with the mouse or coordinate (The method of mapping method and line drawing method are the same).

Choose an existing line with the mouse: Choose an existing plan line and add all vertex coordinates to baseline coordinates list. Editing the coordinate points in the list will not change the selected plan line.

Generation and storage: The system will generate plan line according to the baseline and routing parameters, save the generated plan line and start the new plan line routing.

Channel routing

Click [Channel] 

in the toolbar. Draw a base line with the mouse or coordinate or select an existing plan line as axle wire of the channel. Set routing parameters and click [Create and save]. The system will generate channel plan line and start a new channel routing.

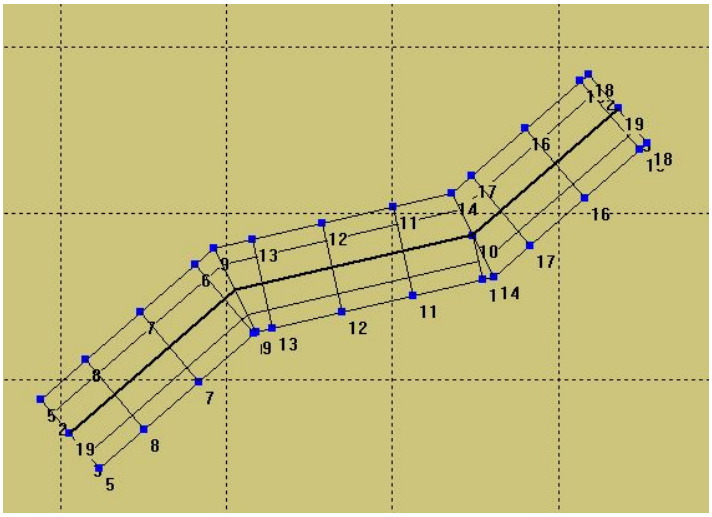


Figure 10-10 Channel routing

Channel width: The passable width, channel width ratio is wider than the survey line width.

Survey line width: In waterway survey, perform routing vertical to the channel axis as well as the width of the plan line.

Routing interval: In waterway survey, perform routing vertical to the channel axis as well as the space between the plan lines.

Area routing

Click [Area] 

in the toolbar. Draw a base line with the mouse or coordinate or select an existing plan line as the border of the area. Set routing parameters and click [Create and save]. The system will generate channel plan line and start a new area routing.

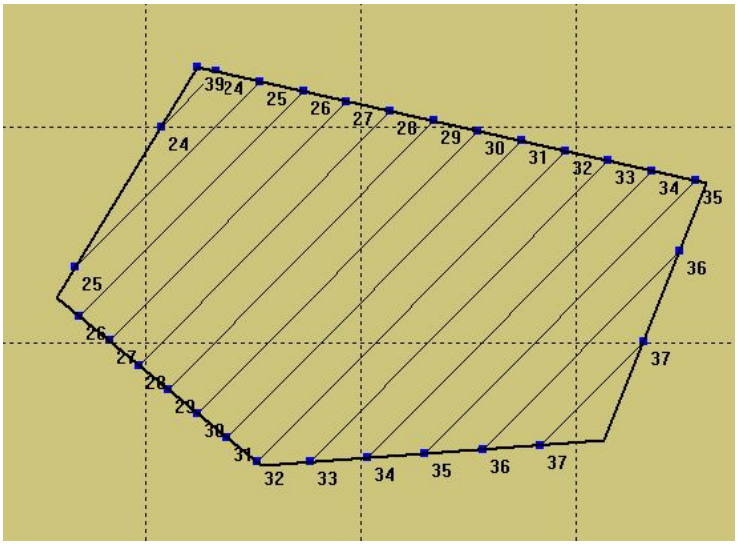


Figure 10-11 Area routing

Routing direction: The included angle between plan line direction and the true north direction.

Layout interval: Distance between the plan lines generated.

Parallel routing

Click [Parallel] 

in the toolbar. Draw a base line with the mouse or coordinate or select an existing plan line as start line. Set routing parameters and click [Create and save]. The system will generate channel plan line and start parallel routing.

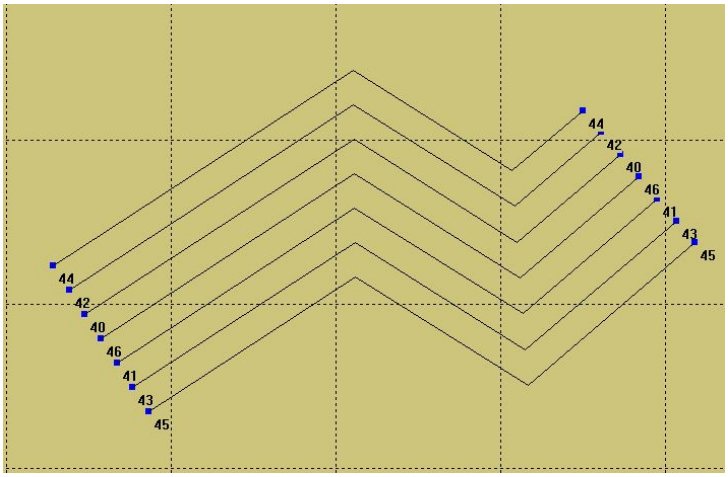


Figure 10-12 Parallel routing

Layout interval: Distance between the plan line generated.

Line number at the left side: The number of plan lines at the left side of start line (namely baseline).

Line number at the right side: The number of plan lines at the right side of start line (namely baseline).

Vertical routing

Click [Vertical] 

in the toolbar. Draw a base line with the mouse or coordinate or select an existing plan line as start line. Set routing parameters and click [Create and save]. The system will generate channel plan line and start vertical routing.

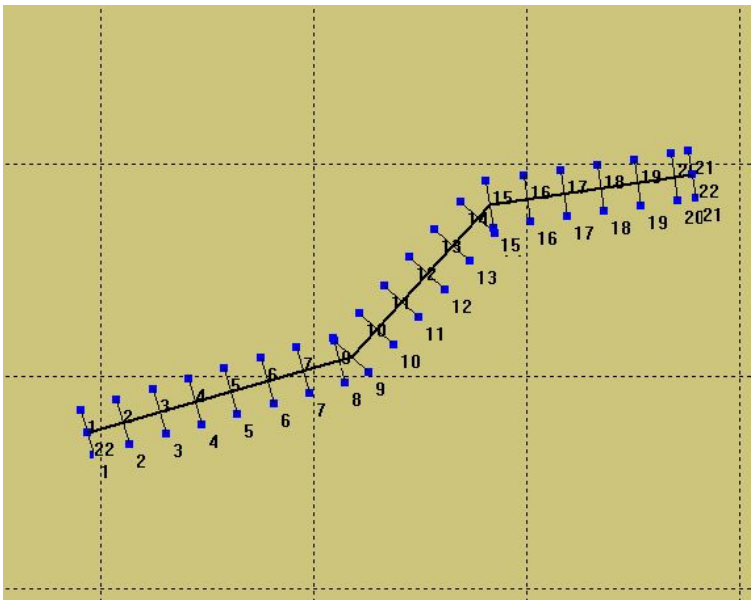


Figure 10-13 Vertical routing

Layout interval: Distance between the plan line generated.

Line length at the left side: The length of plan line at left side of baseline.

Line length at the right side: The length of plan line at right side of baseline.

Circular sector routing

Click [Sector] 

in the toolbar. Select a point with the mouse or input a coordinate point as the central point of circular sector. Set routing parameters and click [Create and save]. The system will generate channel plan line according to the baseline as well as the setup parameters. And then start a new circular sector routing.

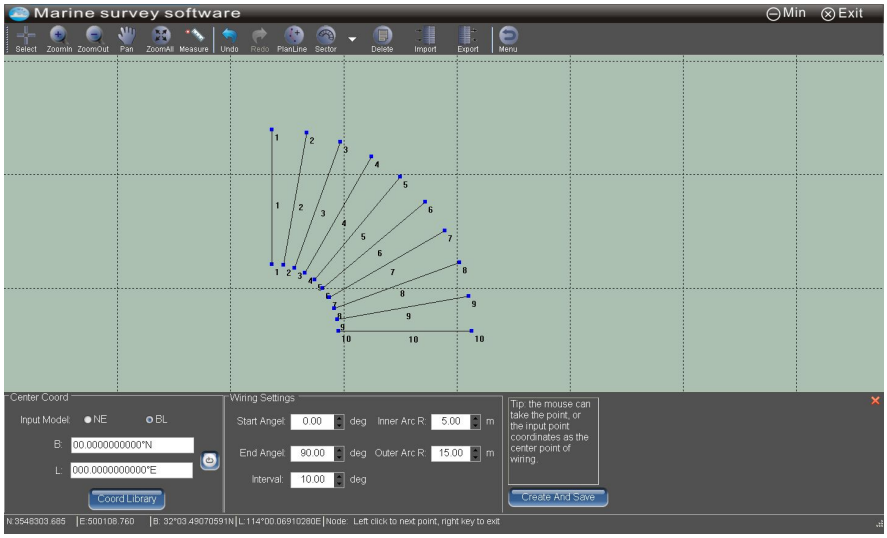


Figure 10-14 Circular sector routing

Center Coord: The coordinate of the central point of circular sector. It can be selected with a mouse or input plane coordinates or WGS84 longitude and latitude.

Start angle: The included angle between the first plan line and the true north direction.

End angle: The included angle between the first plan line and the true north direction.

Interval angle: The angle-interval between planned routes.

Inner arc radius: Radius of inner arc

Outer arc radius: Outer arc radius

Plan line import-export

Click the [Import] 

and a dialog box will pop up. Select the imported DXF file and click [Open]. After the planned routes are imported to the system, they can be edited.

Click the [Export] 

and a dialog box will pop up. Select the route and export DXF file and click current planned routes.

Shortcut key

(1) Upper, lower, left and right buttons

When draw graphics with a mouse, press upper, lower, left and right buttons to move the background image all around.

(2) Middle mouse button

Slide the middle mouse button pulley. Set mouse position as the center and graph zooming. Press the mouse middle button to perform Pan View。

(3) Right mouse button

While performing zoom in, zoom out, pan view, planned routes drawing, editing and layout, press right mouse button to exit those operations immediately.

Other functions

(1) Can perform chart query and chart management. There is no separate introduction available since it is the same with measuring interface.

(2) Distance measuring angle. There is no separate introduction available since it is the same with measuring interface.

(3) Undo and Recovery function

Click Undo or Recovery 

to undo the last operation. And click Recovery to resume the cancelled operation as shown in the Figure.

Conclusion of This Chapter

Planned route design is an important preparation of bathymetric survey. Through reasonable planned route layout, the measured data can be more even, reducing the occurrence of repeated measurements and missing thus to effectively improve the measurement efficiency. The software supports electronic chart display. Users can import the electronic chart of the measuring area into the system. Take the electronic chart as a reference. It is more easy and convenient to perform planned routes arrangement.

CHAPTER

11

Electronic Chart

Introduction to this Chapter

- Sea Chart Import
- Sea Chart Display
- Sea Chart Inquire
- Conclusion of This Chapter

Sea chart is a geographical map presenting marine and ocean space. It is an indispensable reference basis for sailing. Main contents include: shore, islands, reefs, sounding, beacons and radio navigation etc.. At the software main menu interface, click [Charts] to enter electronic chart management interface. The CWB electronic chart, S63 encrypted electronic chart, S57 unencrypted electronic chart can be imported. Can perform display, hidden, deletion and other operations on the imported electronic chart.

Sea Chart Import

The system has passed IHO certification. The chart data from the data providers of other countries can be imported. In addition, the on line electronic chart data provided by Changjiang Waterway Survey Center can be online imported. The successfully imported electronic chart will be displayed in the electronic chart list. And display in background graphics under the module of [Planned routes design] and [Marine surveying].

CWB electronic chart

CWB electronic charts are those issued on the website of Changjiang Waterway Bureau. They need to be connected to the Internet. CWB electronic charts almost cover the whole Yangtze River Basin. Select "Electronic Chart Services of Changjiang Waterway Survey Center". Click [Online upgrading] to obtain the issued information of electronic chart. The system will display the electronic charts requiring to be updated. Click the electronic charts requiring to be updated and click [Updated the selected charts]. The system will automatic download the clicked electronic chart data and import to the system.

Figure 11-1 CWB electronic charts

Encrypted chart

Encrypted charts refer to purchasing electronic charts from formal channels to the electronic chart data provider. The data format is S63. After selecting activated code files and S63 data directory, click [Start importing]. The system will automatically import electronic charts.

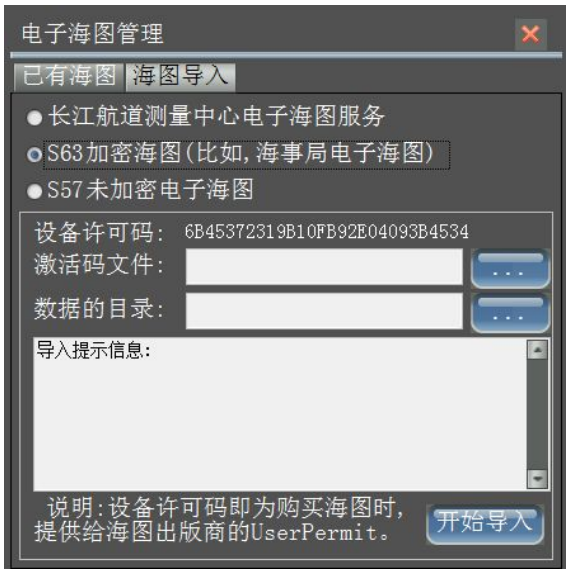


Figure 11-2 Encrypted electronic charts

Equipment license code: When users buy chart, they need to provide the unique identification document of the equipment to electronic chart data provider.

Activated code files: After the users purchasing electronic charts, the electronic chart data provider will provide chart authorization documents, which include decryption key information of the electronic chart.

Data directory: Chart version information and encrypted electronic chart are saved under the folder path of S63 chart data.

Unencrypted chart

Unencrypted chart refers to unencrypted electronic chart obtained from grey channels with the data format of S57.

Select data storage directory of S57. The software will identify S57 files and display them in tree form in the left list. Click to import the data and the software will automatically import the data to the system and will export the imported message in the text box at the right side.

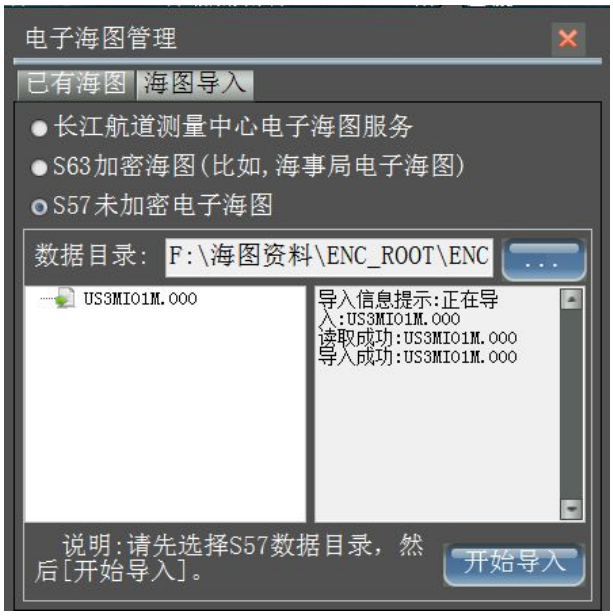


Figure 11-3 Unencrypted electronic chart

Existing electronic chart

Figure 11.1.4 Existing electronic chart

The basic information of imported electronic chart at "Existing electronic chart", including electronic chart No., block geographical names, scale,

published edition, updated edition, date of publication, upgraded date and publisher name etc.. Users can edit block geographical names and mark the electronic charts. It can show, hide and delete operations on electronic charts. If the electronic chart is set as hidden, the electronic chart will not be displayed as basemap at [Planned route design] and [Marine surveying] interface.

Sea Chart Display

At [Planned route design] and [Marine surveying] interface, click [Chart management] 

in toolbar to display or hidden electronic charts, or skip views to position of electronic charts. You can also set display parameters of chart.

(1) Chart list

Figure 11-5 Chart list

Set electronic chart as visible: Click the electronic charts that need to be displayed. Click [Display]. The icon will become , presenting visible.

Set electronic chart as hidden: Click the electronic charts that need to be hidden. Click [Hidden]. The icon will become , presenting invisible.

Delete existing electronic charts: Click the electronic charts required to be deleted and then click [Delete]. The system will remove the clicked electronic chart data from the magnetic disk.

Skip to certain electronic chart: Click the electronic chart to be viewed with a mouse. The items will be highlighted. And then click [Locate the selected chart]. The background view will automatically skip to the position of the chart.

(2) Chart display parameters

Figure 11-6 Chart display parameters

Sounding setup: The sounding standard displayed by the chart. For example, the area with a sounding less than 2m belongs to shoal waters, presenting in dark color. The areas deeper than 30m belong to navigation safety area, presenting in light color. And the areas with a sounding greater than 30m belong to deep water area.

Cartographic symbols: There are two sets of graphic symbol libraries displayed by electronic chart. The first type is traditional paper-based electronic chart and the other type is simplified symbol figure.

Contextual model: While sailing on the sea, the electronic chart shall be displayed in bright color at day time. During nights with dark light, however, electronic charts shall be displayed in darker color in order not to affect sailing at night. Five color patterns are generated respectively, namely: sunny day pattern, day pattern, cloudy day pattern, evening pattern and night pattern.

Display elements: Electronic charts include abundant information on icons, symbols, text information, etc., and classify the information displayed. Some of them are essential and are classified as basic elements. Some of them are as standard information since they have to be displayed. Standard element contains the basic elements. All-element display refers to show all information.

Map color: Namely the display colors of sounding areas. Most parts of the electronic chart are sounding areas. In order to distinguish different sounding, the chart is to be displayed in four colors or two colors.

Display control: Electronic chart contains a lot of information. Those information not requiring to be displayed can be hidden according to the needs of the display.

Sea Chart Inquire

At [Planned route design] or [Marine surveying] interface, click [Sea chart inquire] 

and then click the ground objects to be reviewed. Pop up the bubble box of inquired results. List the ground objects of the position clicked by the mouse in the bubble box. Select the ground objects in the bubble box. And the ground objects at the view displayed by the electronic chart will be highlighted.

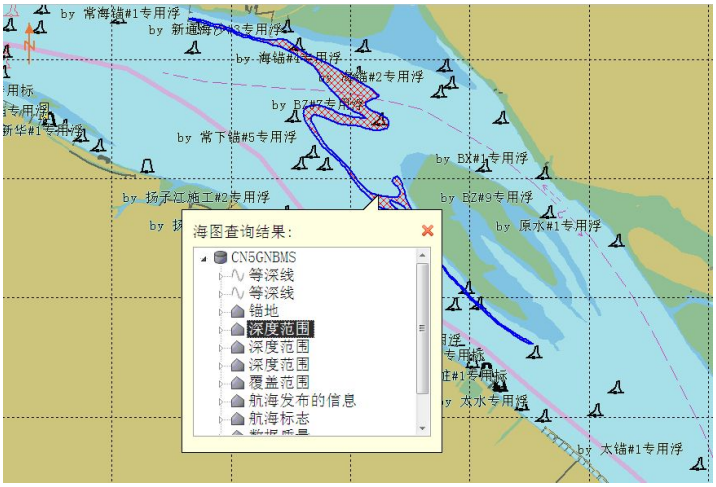


Figure 11-7 Sea Chart Inquire

Conclusion of This Chapter

There are two methods to obtain electronic charts: ①Chart data service provider (such as bureau of maritime affairs) ② The others If purchasing electronic chart data from a chart data service provider, the user shall provide equipment license code to ensure that the electronic chart can only be displayed on the equipment with the license code. The equipment license code of this system is only corresponding with Software Dongle. Consequently, any device (such as computer) inserted with a Software Dongle can display corresponding encrypted electronic chart. Electronic charts are very helpful for marine surveying. Especially in unknown regions,

electronic charts can be set as background reference to facilitate planned route design and marine navigation. Furthermore, electronic charts also show existing sounding points as reference base of sounding survey.

CHAPTER

12

Engineering Base Map

Introduction to this Chapter

- Engineering Base Map Management
- Engineering Base Map Display
- Conclusion of This Chapter

Engineering basemap Management

On the software main menu interface, click [BaseMap] to enter basemap setup interface. The engineering basemap in DXF as well as soundings in DAT formats can be imported and display can be controlled.

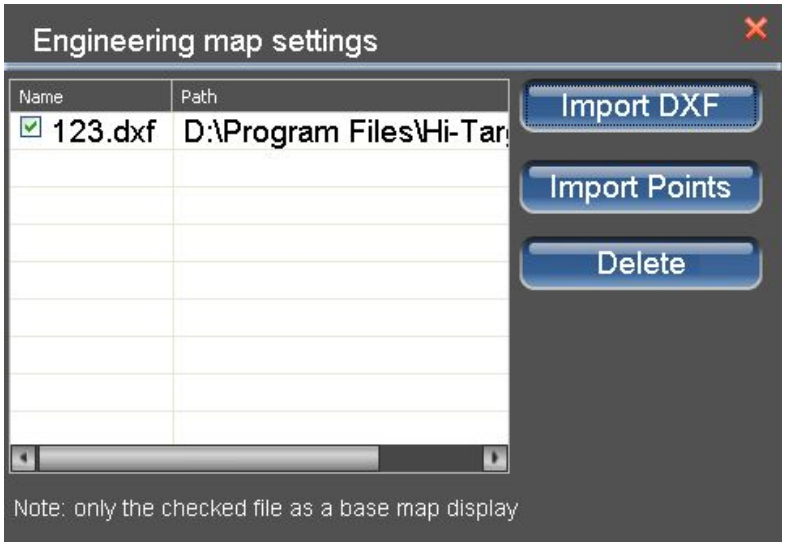


Figure 12-1 Engineering basemap

Import the engineering base map: Click [Import DXF] button and the document dialog box will pop up. Select the file type and select the basemap to be imported. Click [Open]. If the base map is opened successfully, the document will be displayed in the documents list on the left.

Import the sounding point: Click to import the sounding point. CASS (.dat), Hypack (.XYZ) or other files in user-defined formats can be imported. Select the document formats to import the document. Select data and separators according to user-defined format.

Figure 12-2 Soundings import

Delete engineering base map: In the file lists, select the items to be deleted with the mouse and the items will be highlighted. Click [Delete].

Engineering Base map Display

At the engineering base map interface, click the engineering base map to be displayed and exit the interface.

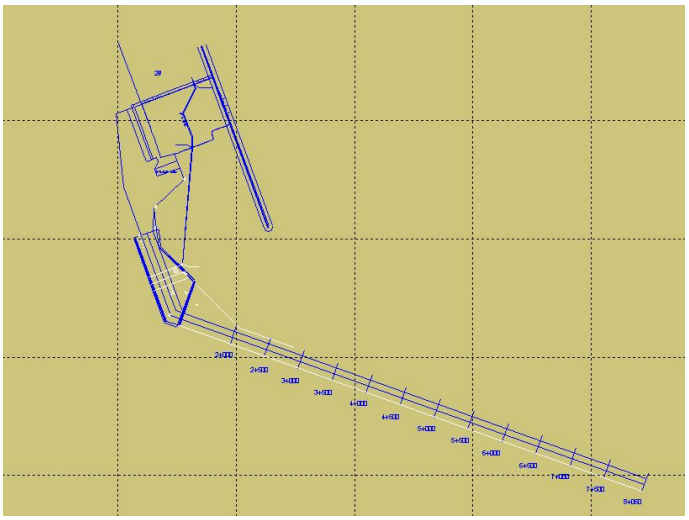


Figure 12-3 Engineering Base map Display

Conclusion of This Chapter

Engineering base map will show graphic elements of DXF such as circular arc, straight line, line, broken line, polyline, text and fitted curve etc.. It can display sounding points of DAT format as well. Engineering base map, presenting as base map in marine surveying and planned route interface, assists on planned route layout as well as marine surveying.

CHAPTER

13

Depth Measurement

Introduction to this Chapter

- Common Functions Introduction
- Parameters Setting
- Data Acquisition
- Conclusion of This Chapter

At the main interface of the software, click [Survey] to enter ocean depth measuring interface as shown in Figure 13-1. Click the shortcut key of instrument sounding, corresponding changes will show up at sounding, playback, automatic, shift up, shift down interfaces;

Depth sounding: To control depth sounding of the instrument (start or suspend sounding);

Playback: To look back sounding status of record data;

Shift up: To increase the sounding range;

Shift down: To decrease the sounding range;

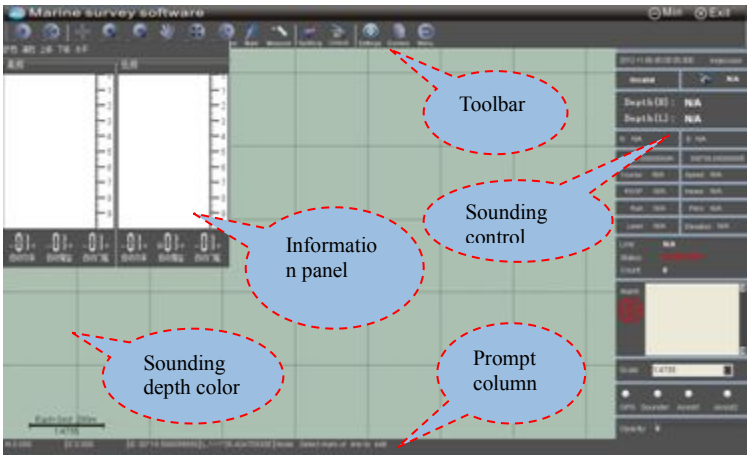


Figure 13-1 Marine surveying interface

After entering the interface, the system will automatically enter the following operation:

（1）Automatically connect serial port and read serial port data.

（2）Automatically load the designed ship form data.

（3）Automatically load the planned route data layout.

（4）Automatically load the electronic chart data and engineering base map.

Common Functions Introduction

Graph zooming and Pan view

(1) Zoom

Zoom can be achieved by three ways:
①Zoom in and zoom out tool

Click [ZoomIn] 

or depth sounding functional key  , then the view will be enlarged. If local amplification is required, you can drag a box in the view or click left mouse button to zoom in with the position pointed by the mouse as the center.

Click [ZoomOut] 

or depth sounding functional key  , then the view will be zoomed out. If local shrinking is required, you can drag a box in the view or click left mouse button to zoom out with the position pointed by the mouse as the center.

②Overall graph zooming

Click [ZoomAll] 

. The view will display planned route, engineering basemap, measurement data points, marking and other elements according to the maximum range.

③Mouse pulley

When push the pulley forward in the view, the image will be zoomed in, and when push the pulley backward, the image will be zoomed out with the position pointed by the mouse as the center.

(2) Pan view

Pan view can be achieved by three ways:

①PanTool

Click [Pan] 

, press the left mouse button and drag the mouse to move the image.

②Middle mouse button

Press the middle mouse button and drag the mouse to move the image. The shortcut operation will not affect the other operations, such as planned route drawing. To move the bottom image, press the middle mouse button. After the mouse changing to hand shape, drag the mouse to perform Pan View. After loosening the middle mouse button, it can continue to draw planned route.

③Shortcut key

By pressing the Up, Down, Left and Right key of the keyboard, the view points will be moved to up, down, left and right. For example, when move the view point to right side, the view background will move to the left side.

Ship position locking and heading

(1) Ship position locking

In the process of measurement, keep the ship position at the middle section of the screen by real time moving view background which is equivalent to locking the ship at the middle section of the screen. It is known as ship position locking for short.

Ship position locking: Click [Unlock] 

to shift to ship position locking mode. The icon will change to 

.

Ship position unlocking: Click [Locked] 

to shift to ship position unlocking mode. The icon will change to 

.

Attention: Since under the ship position locking mode, the system will automatically perform Pan View to keep the ship at middle section of the ship. It is suggested to shift to unlocking mode when carrying out view browse, planned route preparation, mark drawing and other operations to shift to ship position unlocking mode.

(2) Ship heading

Ship heading function refers to rotate background base map to make the direction of the bow pointing to upward direction of the screen. When performing sounding survey according to the planned route, ship heading can provide intuitive visual experience and is very helpful for ship navigation.

Heading up: Click [NorthUp] 

to shift to Heading up mode. The icon will change to 

. If the ship position is locked, the view will automatically rotate to keep ship bow direction pointing to upward direction of the screen.

North up: Click [Heading up] 

to shift to North up mode. The icon will change to 

. The view will automatically rotate to keep North up pointing to upward direction of the screen.

Planned route drawing

Click [PlanLine] 

to enter planned route drawing mode. Specific operations shall refer to Section I of Chapter VII "Planned route drawing"

Graphic symbol

During marine surveying process, some marks are required to be done, such as marking the measured areas or marking water-based facilities at the measurement area. The frequently-used graphic symbols include dot, line and surface. The system supports point mark, line mark and surface mark. Click [Mark], and a mark dialog box will show up at the bottom of the view. Marks can be added with a mouse or coordinate. The marks can be edited, deleted and exported as DXF files.

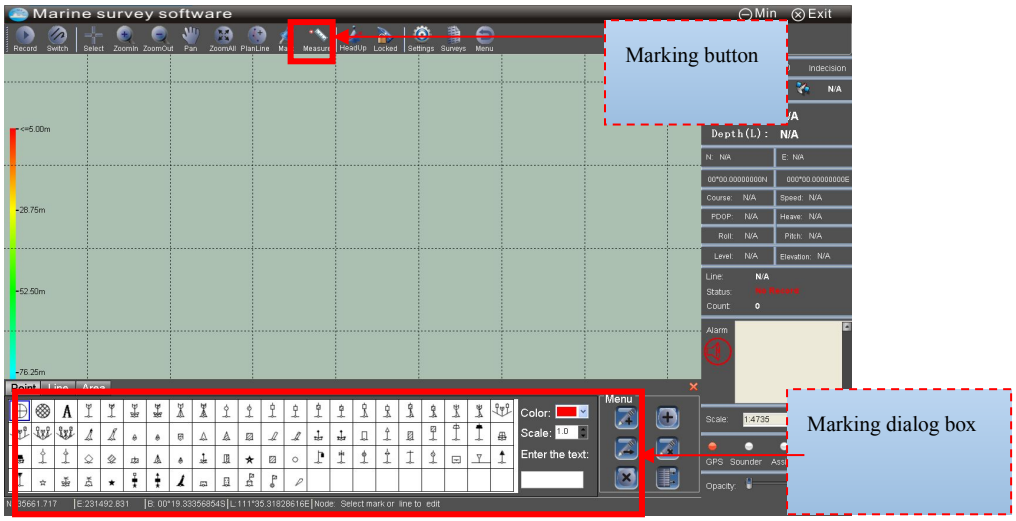


Figure 13-2 Marking

(1) Point mark

Attribute parameters of point mark include: Mark shape, color, and display scale size. The generally required operations include: dot mark drawing with a mouse, adding marks with coordinate, dot marks edit and dot marks deletion.

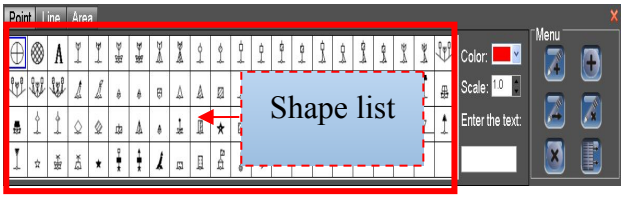


Figure 13-3 Point mark

Dot mark drawing with a mouse: Select the shape, display, display size proportion of the mark and click mouse drawing button  . A dot mark will be completed at the position pointed by the left mouse button in the view.

Adding marks with coordinate: Select the shape, display, display size proportion of the mark and click mouse coordinate adding button  . A dialog box of coordinate input will pop up. Input the correct coordinate in the dialog box. Click [Confirm].

Dot marks edit: Click Edit  . The mouse will select the dot mark to be

edited and enter to edit mode. The dot mark edit toolbar will show up (as shown in Figure 10-30. [Move]: Drag the selected dot mark with a mouse. [Input]: Modify the selected marking coordinates. [Delete]: Delete the selected dot mark. In addition, under edit status, the selected dot mark shape can be modified by choosing a shape icon in dot mark shapes list; the color also can be changed by choosing a color; the display proportion of the dot mark also can be setup. Click [Exit] or the right mouse button to complete dot mark edit.

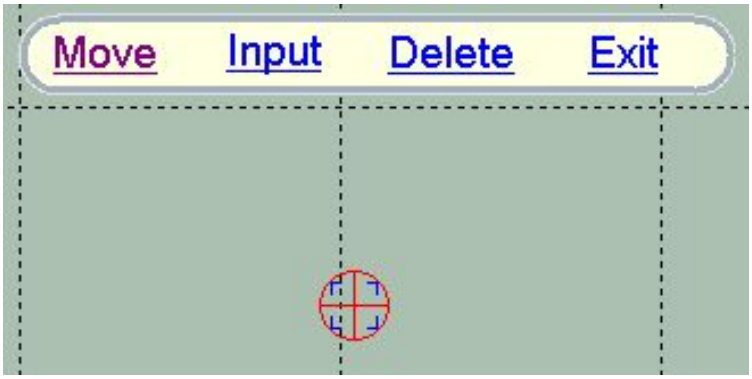


Figure 13-4 Dot marks edit

Dot marks deletion: Click deletion button  . Select the dot mark to be deleted with a mouse and delete it.

Dot marks export: Click Export button  and a dialog box will pop up. Select the export path.

(2) Line mark

Attribute parameters of line mark include: drawing type, line type, color and line width. The generally required operations include: line mark drawing with a mouse, adding line marks with coordinate, line mark edit and line mark deletion.

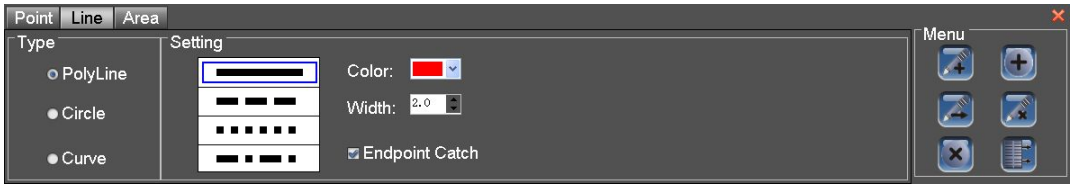


Figure 13-5 Line mark

Line mark drawing: Select the type, line type, color and line width and then click mouse drawing button  . Draw with a mouse directly or click coordinate adding  to input correct point coordinates in the pop-up dialog. The two method can be performed alternatively as well.

Line mark edit: Click Edit  . The mouse will select the line mark to be edited and enter to edit mode. The line mark edit toolbar will show up (as shown in Figure 10-6). [Move]: Drag the vertex position of selected line mark with a mouse. [DeletePoints]: Delete the vertex position of the selected line mark. [Point coordinates setup]: Modify the vertex coordinates of the selected line mark. [Delete]: Delete the selected line mark. In addition, under edit status, select the line type and modify the line type of the selected line mark; select the color and modify the color of the selected line mark; set up the line width and modify the line width of the selected line mark; Click [Exit] or the right mouse button to complete line mark edit.

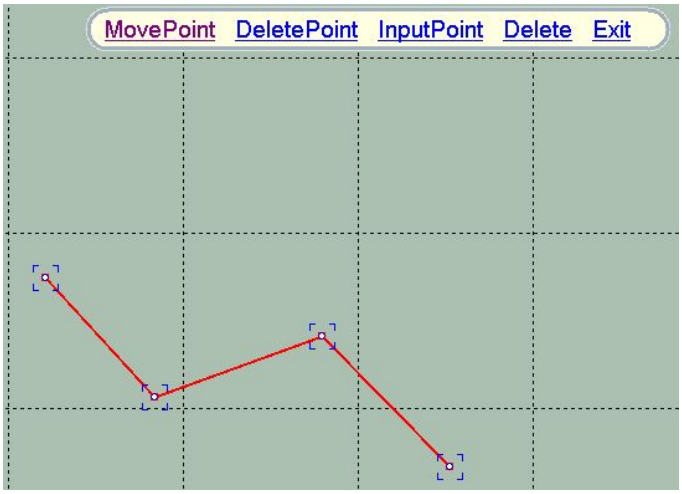


Figure 13-6 Line marks edit

Line marks deletion: Click deletion button  . Select the line mark to be deleted with a mouse and delete it.

Line marks export: The same as above.

(3) Surface mark

Attribute parameters of surface mark include: type, line type, color and filling. The generally required operations include: surface mark drawing with a mouse, adding line marks with coordinate, surface mark edit and surface mark deletion.

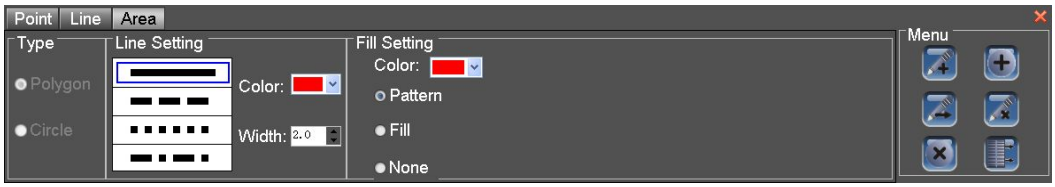


Figure 13-7 Surface mark

Surface mark drawing: Select the type, line type, color and line width and then click mouse drawing button  . Draw the border line of surface mark with a mouse directly or click coordinate adding  to input correct point coordinates in the pop-up dialog. The two method can be performed alternatively as well.

Surface mark edit: Click Edit  . The mouse will select the surface mark to be edited and enter to edit mode. The line mark edit toolbar will show up (as shown in Figure 10-8). [Move]: Drag the vertex position on border line of selected line mark with a mouse. [DeletePoints]: Delete the vertex position on border line of the selected line mark. [InputPoint]: Modify the vertex coordinates of the selected surface mark. [Delete]: Delete the selected surface mark. In addition, under edit status, select the line type and modify the line type of the selected surface mark; select the color of border line of the selected surface mark and modify the color of the selected line mark; set up the line width and modify the line width of the selected line mark; set filling

parameters. The filling mode and color of selected surface mark can be modified. Click [Exit] or the right mouse button to complete edit surface markers.

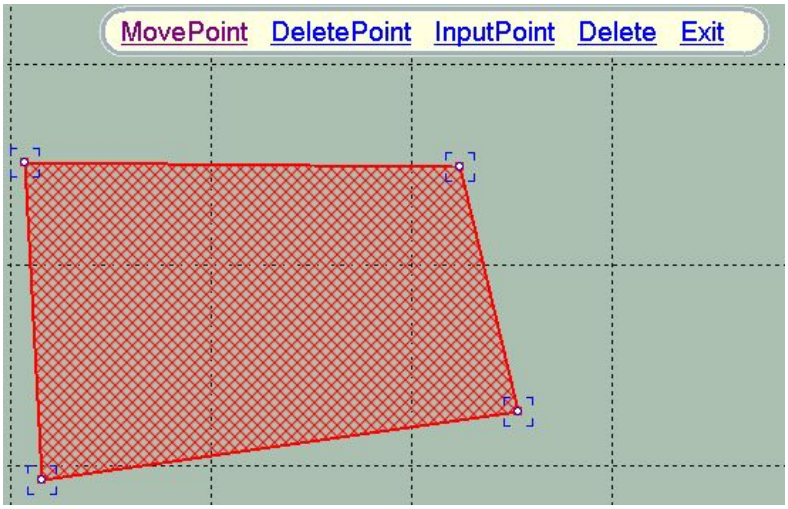


Figure 13-8 Line marks edit

Surface marks deletion: Click deletion button  . Select the surface mark to be deleted with a mouse and delete it.

Surface marks export: The same as above.

Graphic edit

The graphics that can be edited include planned route and marking. Use [Select] 

to select planned route or marking thus to enter planned route or marking edit mode immediately. The system will show corresponding edit toolbar depending on the selected objects such as if a planned route selected, it will show planned route editor toolbar. And if a dot mark selected, it will show dot mark editor toolbar. Specific operations of planned route edit shall refer to section II of Chapter VII Planned route design. And specific operations of marking edit shall refer to "graphic marker" of the Chapter.

[Select] with box selection deletion function: Press the left mouse button of drop-down box to select multiple planned routes and marks. The deletion dialog box will pop up. [Delete Marks] Delete the selected dot mark, line mark and surface mark. [Delete plan Lines] Delete the selected planned route. [Delete All] Delete all selected planned routes and marks.

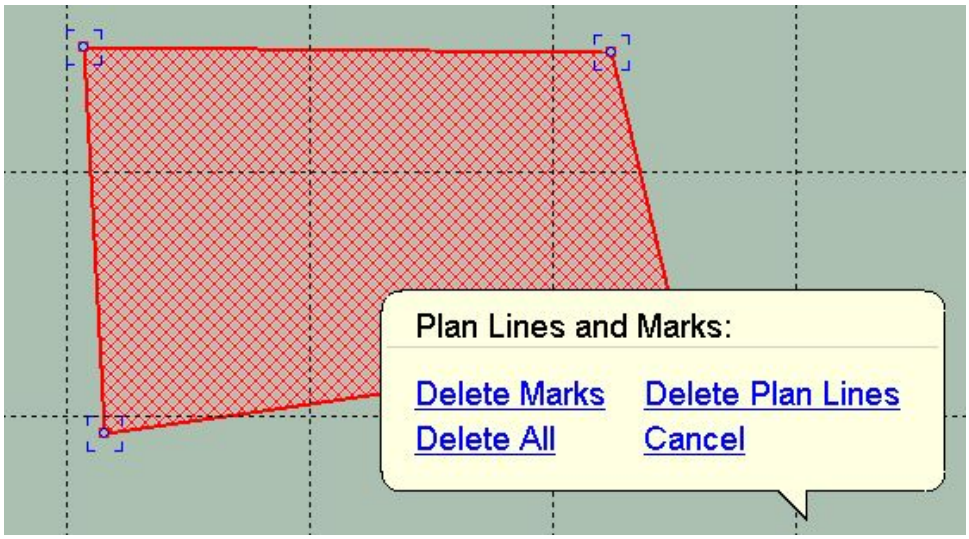


Figure 13-9 Box selection deletion

Distance and angle measurement

Click [Measure] 

to click the screen with a mouse. Perform angle and distance measurement consecutively. Double-click the mouse after measurement, it will show the sum of multiple broken lines (as shown in Figure 10-9). Click the right mouse button to exit the function.

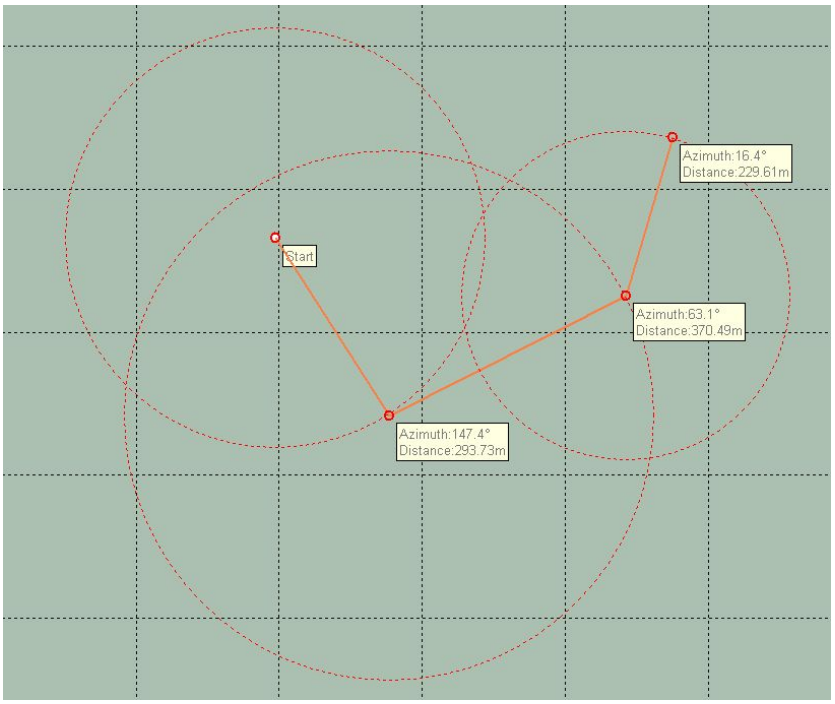


Figure 13-10 Distance measurement and angle measurement

Survey line management

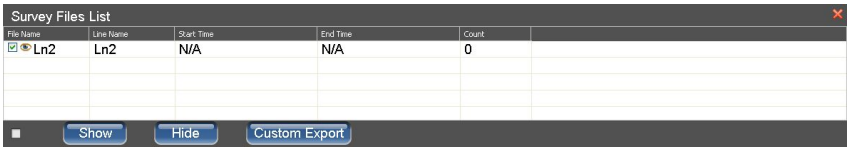


Figure 13-11 Survey line management

Display/hidden: Check the survey line. Click display/hide to set the selected survey line as display or hidden.

Self-defined export: Click the survey line and export the user-defined format.

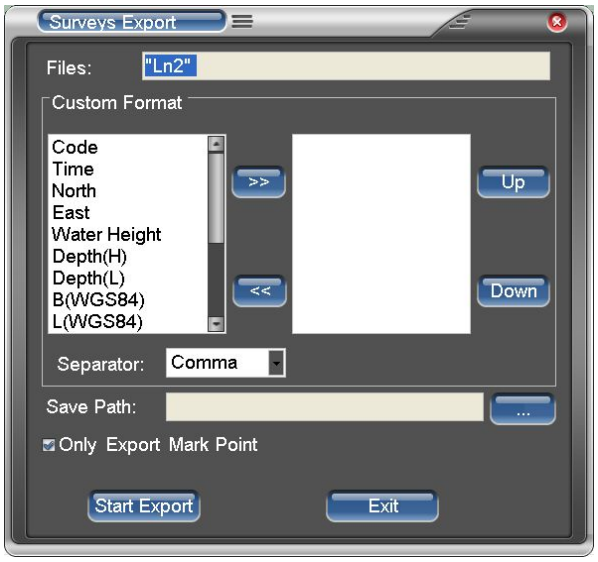


Figure 13-12 Survey line management

Select the exported data. Sort up through moving up and down. Select the separator, set up the export route and click start export.

Parameters Setting

Parameter settings are divided into measurement parameters, display parameters and system parameters. In the daily measurement process, the most important type is measurement parameter which will affect measuring results to certain extent. Display parameters are mainly to set style and color of sounding, including display control of coordinate grid and path line. System parameters mainly include display units of velocity and distance, latitude and longitude display format, alarm, time zone and so on. Click [Settings] 

and then a parameters setting dialog box will show up at bottom of the screen. The following will introduce measurement parameters, display parameters and system parameters respectively.

Measurement parameters

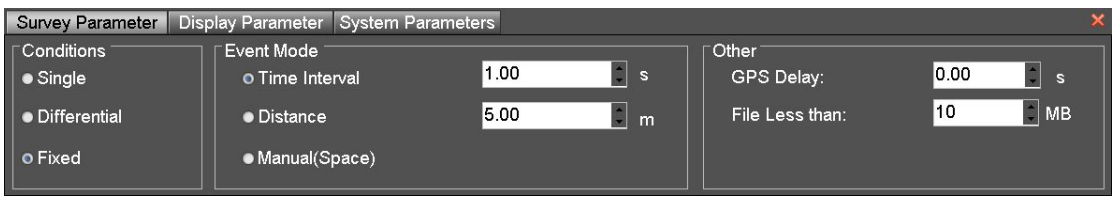


Figure 13-13 Measurement parameters

(1) Record condition

Data acquisition recording conditions can be set as single point solution, finite difference solution and fixed solution according to high to low calculation precision of GPS. At data acquisition, if the output precision of GPS is lower than the record condition, it will not be recorded. For example, if the current record condition is fixed solution, when GPS not reaching to the fixed solution, the system will not perform record acquisition nor recording before reaching to the value. Generally, the record conditions of K9, k20 and other RTK devices are set as fixed solution. And that of beacon equipment such as K5, K3 are set as finite difference solution. It is suggested that do not set the record conditions as single point solution since it can hardly satisfy the measurement accuracy requirement.

(2) Marking mode

If measuring software is required to be applied on a sounder to control marking process, marking mode has to be set up. The methods for controlling and transmitting marking commands include following time interval, actual traveled distance and manual (press space key). On aspect of marking measurement point display, a circle one times bigger than common sounding points will be applied for marking.

According to time interval: Send a marking instruction to connected Echo sounder serial port at certain time interval. Generally, the interval is set as 1~3s.

According to actual traveled distance: Send a marking instruction to connected Echo sounder serial port when the actual traveled distance of the ship exceeding the set distance. Generally, the distance interval will be set as 5~10m.

Manual: Send a marking instruction to connected Echo sounder serial port at every time when the user press the space key.

(3) Other settings

GPS data delay: The time from GPS antenna receiving satellite signal to the software receiving the location data. The main reasons causing GPS data delay include two aspects: GPS mainboard decoding delay and cable

transmission delay. During daily operations, the methods to effectively reduce cable transmission delay include:

Method I: Only positioning data and time information will be output from GPS through sending mainboard command. It will effectively reduce the amount of data transferred from serial port thus to reduce the delay.

Method 2: Try to get the GPS antenna installation position closer to measurement position as far as possible to reduce the length of GPS antenna cable thus to reduce the delay.

Method 3: Choose the coarser transmission cables since the resistance of coarser transmission is smaller with shorter transmission delay.

Since during actual measurement, the users take different GPS motherboards and cablesis different, therefore, GPS delay time are different as well. At present, the best solution is to introduce hard synchronized PPS during the measuring process thus to effectively eliminate GPS data delay.

Survey line size: To set the size of each survey line document, If the document size of current survey line exceeds the value, the software will automatically create a new line file to continue recording.

Display parameters

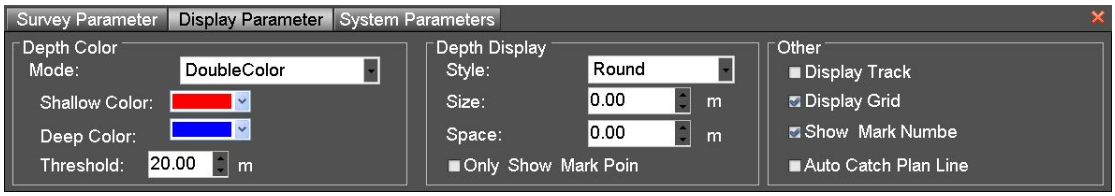


Figure 13-14 Display parameters

(1) Color of sounding points

There are three color modes optional:

①Monochromatic mode: Adopt the same kind of color display for all sounding points.

②Double color mode: The sounding value less than separating sounding value presents as light color. And those greater than the boundary depth value present as dark color.

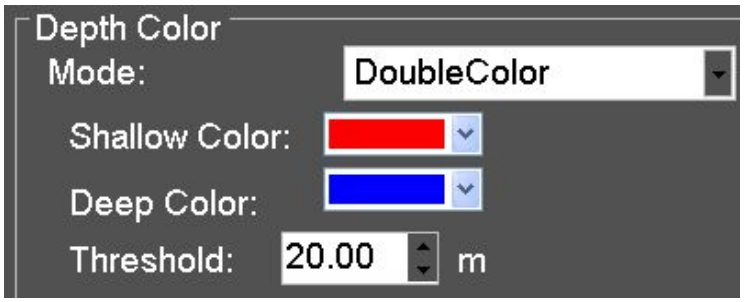


Figure 13-15 Double color mode

④Gradient colors mode: The sounding points will display in gradient color from shallow to deep.

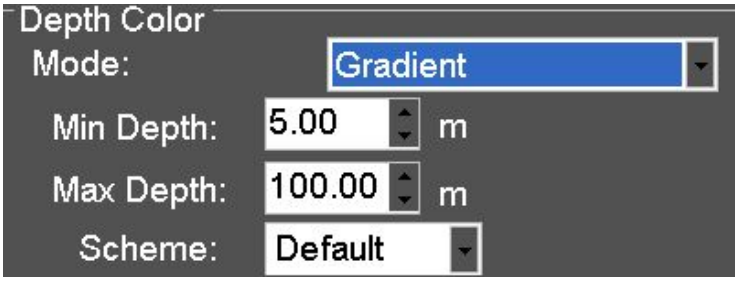


Figure 13-16 Gradient colors mode

Figure 13-17 Effects of gradient display

(2) Display method of sounding points

There are three display methods of sounding points: round cakes, diamonds and sounding values. The size can be set up. If the display size is set as 0, it will be displayed as the Min. size.

(3) Other settings

You can set up if to show path line, coordinate grid, scaling number and if start up automatically capturing planned routes.

System parameters

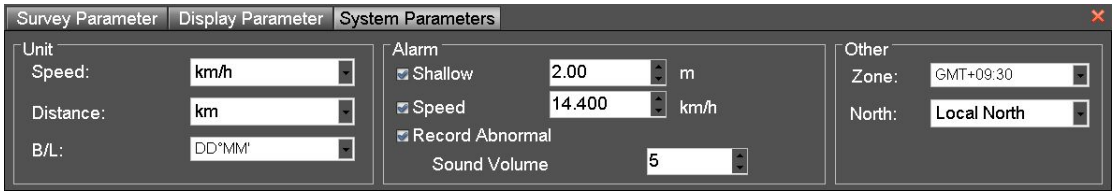


Figure 13-18 System parameters

(1) Units

Display the data unit on the interface. And display speed units, distance units, latitude and longitude formats. Speed units optional: m/s, km/h; distance units optional: m, km and sea mile; latitude and longitude formats optional: degree, degree of minutes and degree of seconds.

(2) Alarming

Shallow water alarm: Click to start up shallow water alarm function. When the measured sounding is lower than the set sounding, the software will send out alarm.

Ship speed alarm: Click to start up ship speed alarm function. When the speed of the ship is greater than the set value, the software will send out alarm.

Data acquisition anomaly alarm: Click to start up the function. It will send out alarm in case of any data acquisition anomaly such as insufficient positioning data accuracy, no data available at Echo sounder serial port or other circumstances leading to data acquisition anomaly.

Alarm sound volume: Set the volume size. If a loudspeaker is available on the hardware equipment, it will affect the volume of the loudspeaker.

(3) Others

Time zone settings: default time zone: GMT+08：00GPS adopts UTC time. The time displayed in the system is local time taking time zone into consideration.

North direction setting: Set north direction. Local north coordinate axis or WGS84 north axis can be selected.

Real-time Information Display

At right side of software measurement interface, GPS information, Echo sounder information of echo sounder, attitude information, data acquisition information, alarm information, serial port communication information etc. will be displayed at real-time.

Item No.	Information bar description	Figure

1	Current GPS time, orientation methods (trajectory directional, Compass orientation, GPS compass orientation), among which GPS compass orientation include positioning and orientation device, double-GPS orientation.	
2	Location modes (single point solution, finite difference solution, float solution and fixed solution). The number of satellites used.	
3	HF sounding, LF sounding	
4	North coordinate and east coordinate (local plane coordinates at measuring point)	
5	Latitude and longitude (WGS84 latitude and longitude at measuring point)	
6	Heading (azimuth angle of ship bow) and navigational speed	
7	PDOP, surge	
8	Rolling and pitching	
9	Water level (water surface elevation), bottom elevation	
10	Survey line name (name of current recording survey line), acquisition status, record spots (total number of current measuring records)	
11	Alarm (including shallow water alarm, ship speed alarm, data acquisition anomaly alarm, alarm according to parameter settings. Sound will be available if there is any audio device in place.)	
12	Measuring scale (Set the measuring scale of current view)	
13	Indicator light (Gray refers to serial port not opened, red flashing as communication data anomalies, and green flashing as normal communications data)	
14	Transparency (Set the status bar background as transparent. If you want to expand vision scope of the measurement, set the status window as semitransparent)	

Table 1 Information bar

Data acquisition

Click [Record] 

and then the system will start data acquisition

automatically. If you want to pause data acquisition, click [Pause] 

. In such circumstances, it will stop data record temporarily. Click [Record] again, and the data collected will be recorded to existing survey line documents. For Echo sounder software, sounding data and measurement data will be saved synchronously.

(1) Survey line documents

Naming format of survey line documents: LnAA_BB_YYYYMMDD_hhmmss

Field	Format	Description
Marking	Ln	Survey line marking
No.	AA	The number of corresponding planned route. If there is no corresponding planned route available, the filed will be as null character.
Times	BB	Repeat count of measurement. For example for planned route AA measurement, BB will be as 0 at the first time and BB will be as 1 at the second time, ...
Date	YYYYMMDD	Specific date
Time	hhmmss	Specific time

Table 2 Survey line name

Example:

Ln10_1_20130830_164040

Refers to Aug. 30, 2014, 16:40:40. Performed a second measurement for the planned route numbered 10.

(2) Planned route capturing

The system will automatically capture the nearest planned route close to the ship and display it in highlight. In case of building a new survey line document, the current survey line will be named after the captured planned route.

(3) Quick change over

Click [Switch] 

. If it is under acquisition status, a new survey line document will be established; if it is under acquisition suspend status, a new survey line document will be established at the next data acquisition. [Switch] can solve the following two issues:

1. How to measure a survey line repeatedly?

When the ship gets close to the planned route A which is to be measured, the

system will capture the planned route automatically. Click [Record] to record the data to the corresponding survey line document LnA_0_YYYYMMDD_hhmmss of planned route A. After completion of the measurement, if any problems detected on the survey data, re-measuring is required. If the planned route A is still under capturing status, click [Switch] and then the system will create a new record file of the survey line LnA_1_ YYYYMMDD_hhmmss to record the re-measuring data. Perform multiple repeated measurements for survey line A following the same method as mentioned above.

2. How to start a new survey line measurement?

When the ship gets close to the planned route A which is to be measured, the system will capture the planned route automatically. And then the ship will travel according to planned route A. Click [Record] to record the data to the corresponding survey line document A_0_YYYYMMDD_hhmmss of planned route A. After completion of the measurement, when the ship gets close to the planned route B, the system will capture the planned route B automatically. Click [Switch] and then the system will create a new record file of the survey line LnB_0_ YYYYMMDD_hhmmss to record the re-measuring data. Perform multiple repeated measurements for new survey lines following the same method as mentioned above.

Data Playback

Click [Playback] 

and then a file selection box will pop up. After select a file according to the correct file format, the software will enter data playback mode. If the playback data is correct, the depth sounding data and measuring data will be in synchronization.

Attention: In case of performing data playback at data recording, the data recording will be suspended.

Depth Sounding Setting

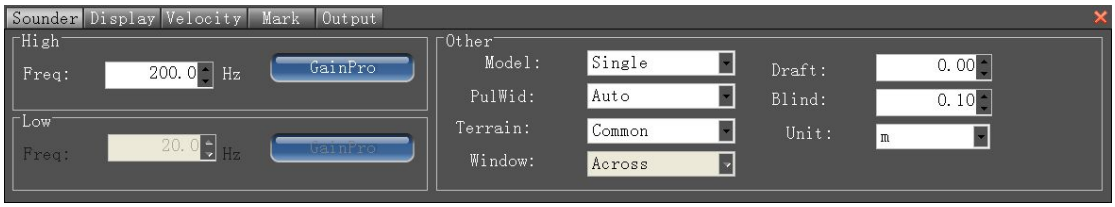
Click [Sounder] 

in menu bar to enter depth sounding interface. You can set up Echo sounder parameters.

Echo sounder setting includes setting of depth sounding, display, marking, sound velocity as well as scale.

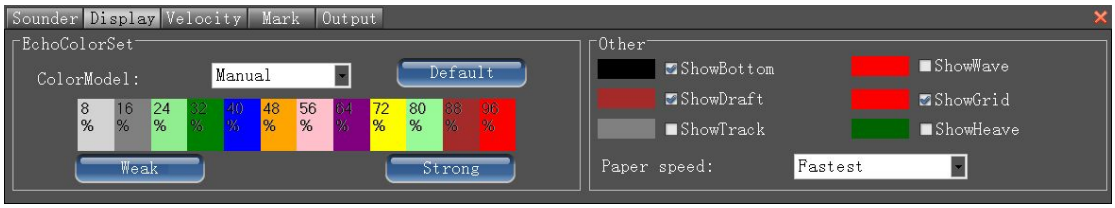
Depth sounding parameters

Depth sounding parameters include high and low frequency setting, high and low frequency setting, gain scheme, underwater topography and pulse width setting. As shown in the Figure below.



Attention: Generally, depth sounding parameters remain as default value. While in special water area (such as various and complicated underwater topography, poor echo status), parameters are to be adjusted according to actual circumstances.

Display parameters



Parameters displayed can set up the color of echo as well as information required by the user.

Marking parameters

The user can select the contents to be marked.

Sound velocity setting

Sound velocity setting is classified into two types. The first one is manual calculation of sound velocity. The other one is to realize real time sound velocity capturing by access to the sound velocity instrument.

Manual calculation of sound velocity: Perform sound velocity by inputting temperature, salinity and other parameters.

Access to sound velocimeter: The software can obtain real time sound velocity by setting serial port parameters as well as adjusting the sound velocimeter.

Scale setting

For scale setting, the users can select automatic scale or manual scale, as well as adjust scale range and initial scale of the scaleplate.

Effective area: Setting up the effective areas can help the software to better capture the correct depth. For example, if the known sounding range of the measuring area is within 1-100m, the effective area can be set as 1-100.

Attention: The scope of effective area shall not be too small. Too narrow range may lead to echo capturing failure. Draft parameters should be set up every time at new project or reconnection of transducer.

Conclusion of This Chapter

At marine surveying, graph zooming and transformation will assist you to browse the view; planned route drawing may build some temporary planned routes; tags can be marked; distance and angle measurement can help you to check the distance and orientation of two points; measuring parameter can set up acquisition and marking conditions; display parameters can set sounding points and methods; system parameter can set display units, system alarm and time zone. At the information bar, GPS information, Echo sounder information of echo sounder, attitude information, data acquisition information, alarm information, serial port communication information etc. will be displayed at real-time.

CHAPTER

14

Sounding Sampling

Introduction to this Chapter

- Basic Functions Introduction
- Sounding Correction
- Sounding Sampling
- Conclusion of This Chapter

At the main interface of the software, click [Sampling] to enter the sounding sampling interface as shown in Figure 14-1. It is possible to correct the originally wrong sounding and perform sounding sampling according to practical requirements.

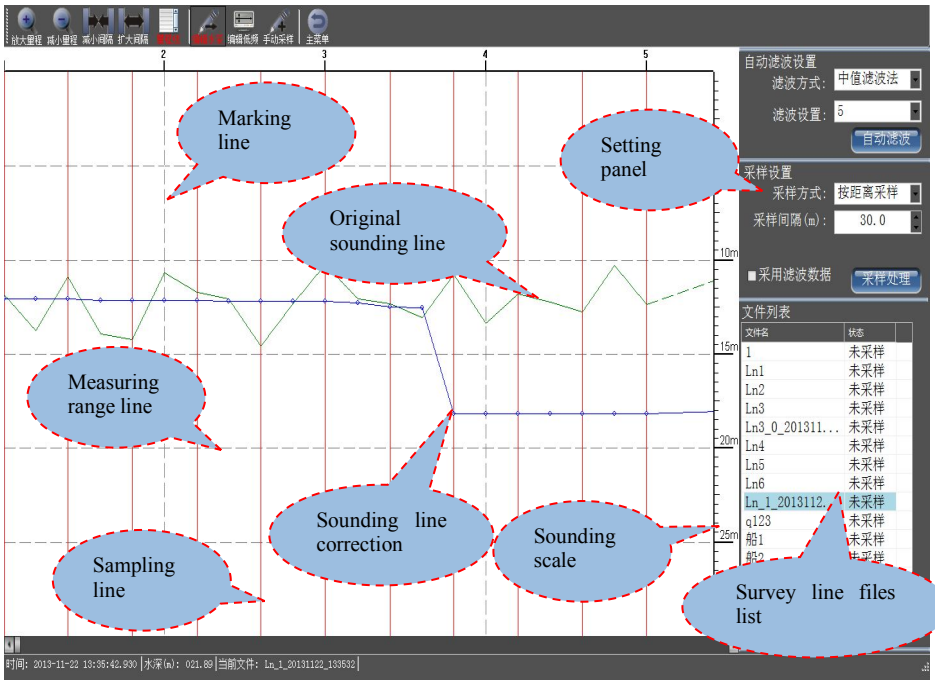


Figure 14-1 Main interface of sounding sampling

Describe the meaning of various lines in the drawing area:

◇Marking: Mark the depth points as marking points. Each marking lines are numbered.

◇Original fathom curve: The connection wire between original high frequency depth points as the reference line of correction data.

◇Fathom curve correction: Manual or automatic correction data line according to original soundings. The fathom curve that manually corrected present as blue and that automatically filtered as red.

◇Sampling line: Mark the sounding as sampling point.

◇Measuring range line: Auxiliary line of sounding measuring range which facilitate sounding checking.

Basic Functions Introduction

(1) Sounding measuring range zoom in/zoom out

Click [Zoom Out] 

to expand the displayed sounding measuring range.

Click [Zoom In] 

to sounding measuring range zoom out.

(2) Expand/reduce display interval of sounding points

Click [Span+] 

to increase horizontal interval of sounding points. While clicking [Span-] 

will decrease horizontal interval of sounding points.

Sounding points interval reflects the density of sounding points at horizontal direction. Reducing interval will facilitate to check the sounding variation curve while expanding interval can be convenient for manual sounding correction.

(3) Display/hide measuring range line

Click [Scope] 

and then the texts will change to red which means to display measuring range line. Click it again and the texts will change to white which means to hide measuring range line. Measuring range line is the auxiliary line of sounding scale. Users can now the general depth range of corresponding current sounding point according to measuring range line.

(4) Display/hide echo

Click [Display echo] 

in the Echo sounder software, software will draw the echo data stored in the data. The user can edit sounding data based on the echo data, which is more intuitive and accurate.

(5) Edit HF/LF

Press the button 

can switch between HF/LF data.

Sounding Correction

In the process of measurement, the sounding data at certain measuring points belong to false depth due to external environment. Therefore, it is necessary to correct the sounding points at sounding sampling. Methods to perform sounding correction: To check if there is any discontinuity exist on the sounding variable curve. If yes, correct the point based on sounding variation tendency nearby.

Select the survey line documents to perform sounding sampling in the "document list". Click [Open], and the system will automatically load the sounding points data of the survey line, as well as display the fathom curve in the view area for sounding correction. Two sounding correction methods, namely manual correction as well as automatic filter wave correction will be introduced as below.

Manual correction

Click [EditLine]  and the text will change to red. At this moment, the mouse is under sounding edit status. Drag to correct the fathom curve (blue line with circle) to perform sounding correction. Click [EditLine] once more to exist sounding edit status and the texts will recover to white.

If the survey line is double-frequency data, it is default as editing HF sounding. Click  once more, the button will become to red, it can edit LF sounding which is the same to the operation mentioned above.

Automatic filtering correction

Set filter mode and filter setting parameters. Click [Process] to perform automatic filtering correction for current sounding points of survey documents. The fathom curve is shown as red line with circle. If it is necessary to display or edit the fathom curve after automatic filtering correction, please make sure that [Use Auto Data] being clicked.

Manual editing can be further performed for fathom curve after automatic filtering correction. The manual editing belongs to manual amendment after automatic filtering correction. Specific editing methods are similar to those manual sounding correction. Click [Sampling] and the text will change to red. At this moment, the mouse is under sounding edit status. Drag to correct the fathom curve (red line with circle) to perform sounding correction.

The commonly used filtering methods of automatic filtering include median filtering method, weighted average method and statistics method.

Median filtering method: Take the average value of the previous and posterior N sounding points of a certain sounding point as the sounding value of the point.

Weighted average method: Calculate the sounding of the previous and posterior two sounding points of a certain sounding point as the sounding value of the point according to certain proportion.

Statistics method: Calculate the sounding value after correction according to principle of statistic as well as depth value varying pattern.

Attention: The manually corrected fathom curve and those automatically filter corrected are mutual independent. When determining to adopt automatic filtering data, please click [Use Auto Data]. At this moment, the current fathom curve is as automatically filter corrected one (red line with circle). Otherwise, do not click [Use Auto Data The current corrected fathom curve will be as manual corrected fathom curve (blue line with circle).

Sounding Sampling

Since the original data recorded by the system are more than actual achievements data, it is necessary to perform sampling according to distance or marking points. According to normal operation processes, generally, perform sounding correction at first and then sounding sampling. The sounding value are corrected one. The following will introduce two sounding sampling methods, namely automatic sampling and manual sampling.

Automatic sampling

Set sampling method and sampling interval. Click [Sampling]. The sounding points sampled will be marked with a sample line. Sampling methods include sampling according to interval and taking marking points:

Sampling according to interval: At every sampling interval distance, a depth point sampling will be sampled. For example, a sampling interval of 5m refers to a sounding point will be taken at every 5m.

Taking marking points: At marine surveying, marking commands will be sent according to time interval or distance interval. The collected measuring points are marking points at the same time. If select marking points, only take those marked sounding points.

Manual sampling

Sometimes, automatic sampling can not satisfy sampling requirements completely and manual sampling is required as supplement. For example at areas with fierce sounding variations, sampling points have to be increased manually to reflect the sounding variation at the region.

Click [Sampling] 

and the texts will become red. The mouse is under manual sampling mode at this moment. Click the sounding point requiring sampling then the sounding point will be marked with a sample line. If you want to cancel a sampling sounding point, click it and the sampling line of the point will disappear. Click [Sampling] once more to exist manual sampling mode and the color of the button will recover to white.

Attention: The results of automatic sampling will cover that of manual sampling. Consequently, it is suggested to take automatic sampling before manual one. For sampling of automatically filter corrected fathom curve, please make sure that [Use Auto Data] is selected. Otherwise, do not select it.

Save sampling data

After completion of sounding sampling, save the sampling data. The survey lines under treatment will be highlighted in the document list. Click [Save] to save current sounding sampling results and the current survey line documents will be marked as sampled. Under such circumstance, after performing

sounding correction or sounding re-sampling, click [Save] and a dialog box prompting whether to cover the previous record will pop up. If select "Yes", the previous sampling results will be covered.

Conclusion of This Chapter

During sounding sampling process, generally, perform sounding correction at first and then automatic sounding sampling, followed by manual sounding sampling. Save the sampling data. There are two sounding correction methods, namely manual correction as well as automatic filter wave correction.

CHAPTER

15

Data Correction

Introduction to the Chapter

- Transformation Parameters Correction
- Delayed Correction
- Water Elevation Correction
- Draft Correction
- Conclusion of This Chapter

Measured data error may occur due to some factors in preliminary measurement. They can be corrected latterly. Click [Data correct] to enter data correction interface to switch among parameter correction, delay correction, surface elevation correction and draft correction.

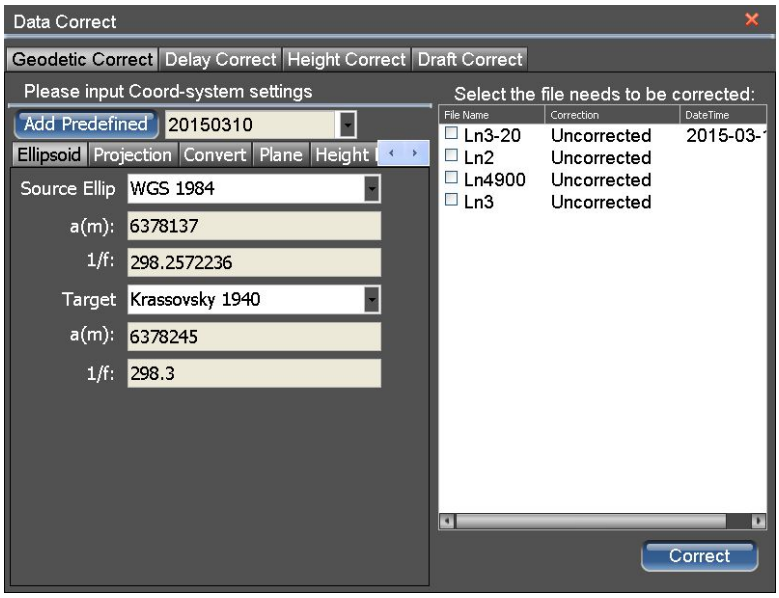


Figure 15-1 Data Correction

Among them:

Transformation parameters correction: Correct the influence caused by preliminary translation parameters setting.

Delay correction: Correct the errors caused by GPS locating data and sounding data matching delay.

Water surface elevation correction: Change the points with great elevation variation.

Draft correction: Correct draft changes influence caused by faster speed.

Transformation Parameters Correction

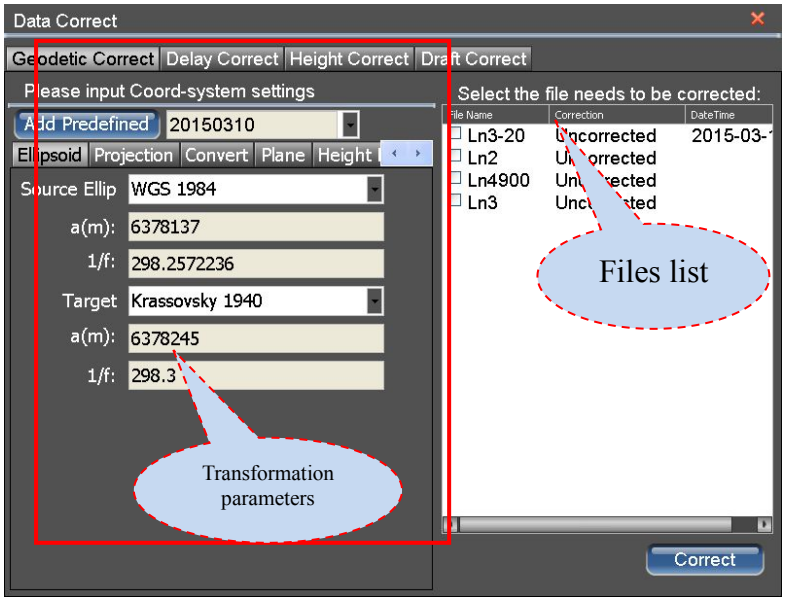


Figure 15-2 Transformation Parameters Correction

Translation parameters setting method is the same with that of coordinate transformation parameters setting in the main interface. No unnecessary details will be described in the manual. Click the survey documents requiring correct in the documents list. Click Correct.

Delayed Correction

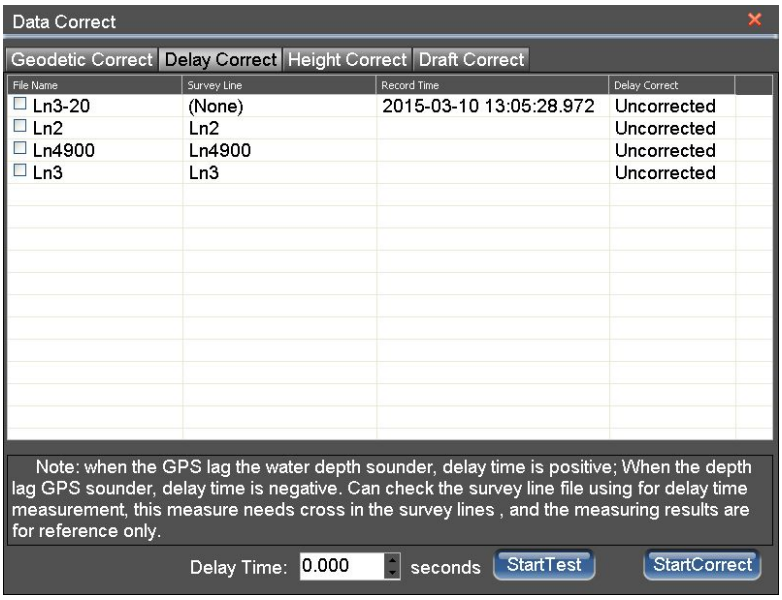


Figure 15-3 Delayed Correction

Click [StartTest] and [StartCorrect] to perform delayed correction.

Water Elevation Correction

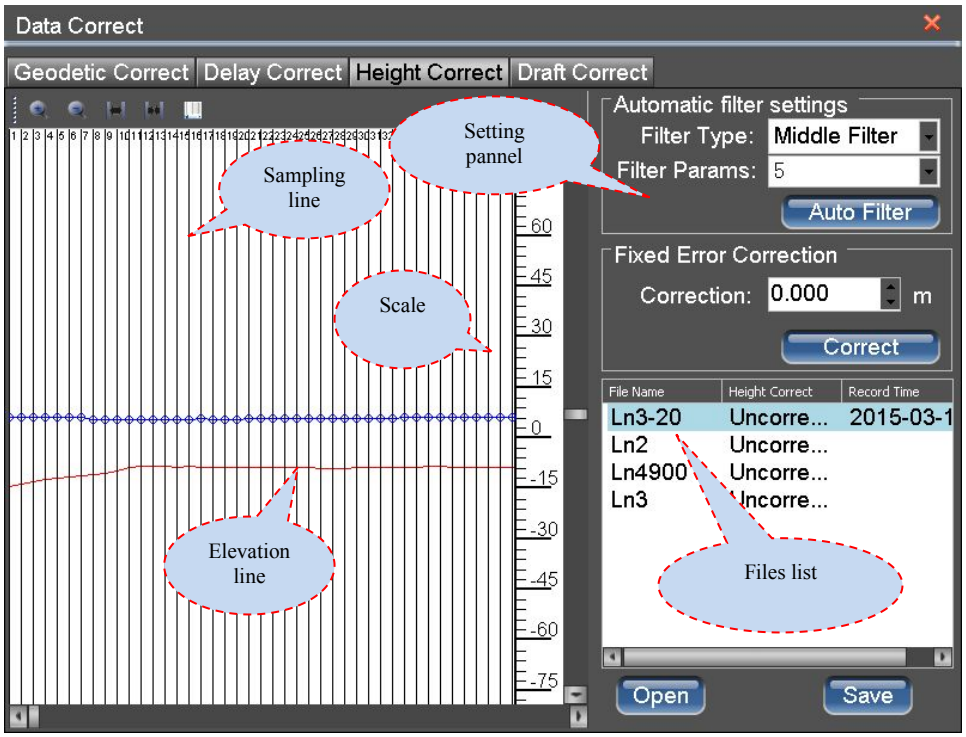


Figure 15-4 Water Elevation Correction

Select the file and click [Open] to perform correction. Select automatic filtering for automatic filtering or input a fixed difference correction value. Click [Correct] and click save to save the corrected data.

Description of toolbar:

Zoom in/zoom out:  Can perform measuring range zoom in/zoom out.

Broadening/narrowing:  The interval between points can be broadened or narrowed.

Display/hide sample line:  Set whether to display sampling line or not.

Draft Correction

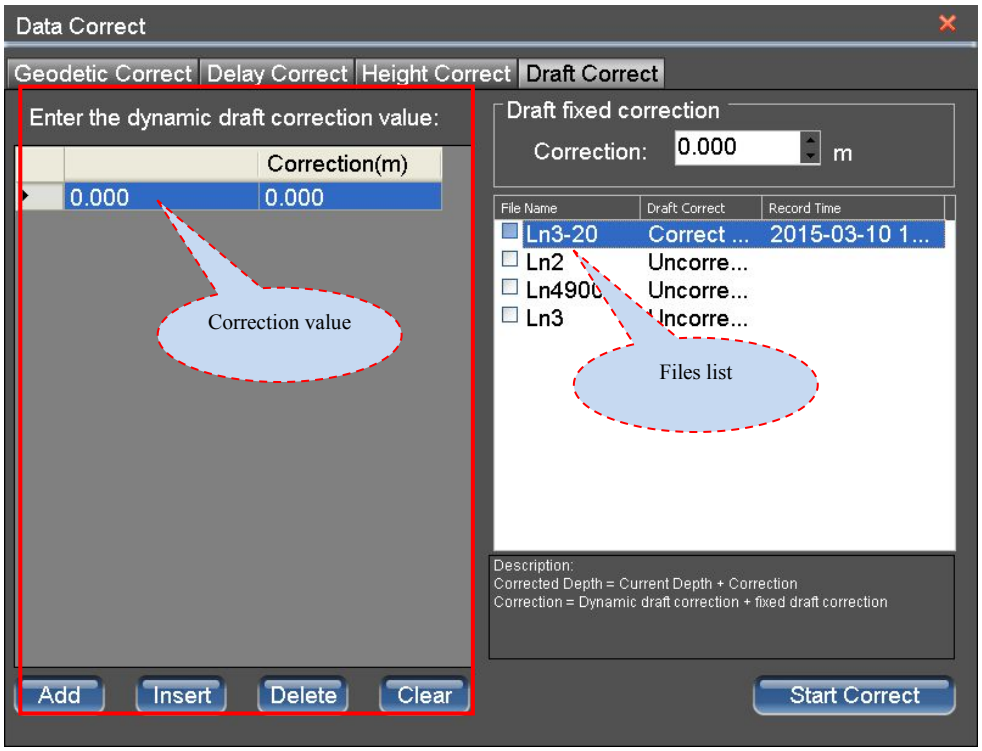


Figure 15-4 Water Elevation Correction

(1) Set correction value. Click [Add] to increase a line. Input the speed and corresponding correction value. Click [Insert] to insert a line of data. Click [Delete] to delete a line of data. Click [Clear] to remove all data.

(2) If a fixed difference correction is selected, perform direct data correction value.

(3) Click the file and click [Start Correct] to correct the file.

Conclusion of This Chapter

All corrections are for post-processing files of the module. The results are for reference only. Please pay attention to careful operation in practical operation. If any problems detected after correction, perform post-processing sampling for original survey line data.

CHAPTER

16

Tide Level Correction

Introduction to this Chapter

- Tide Station Data
- Regional Correction Settings
- Data Correction
- Conclusion of This Chapter

Since the height location accuracy of beacon difference or SBAS difference is low, they can not satisfy the requirements of actual measurement. Thus it is necessary to obtain water bottom elevation through tide level correction. Click [Tide Correct] at main interface of the software to enter tide level correction interface as shown in Figure 16-1.

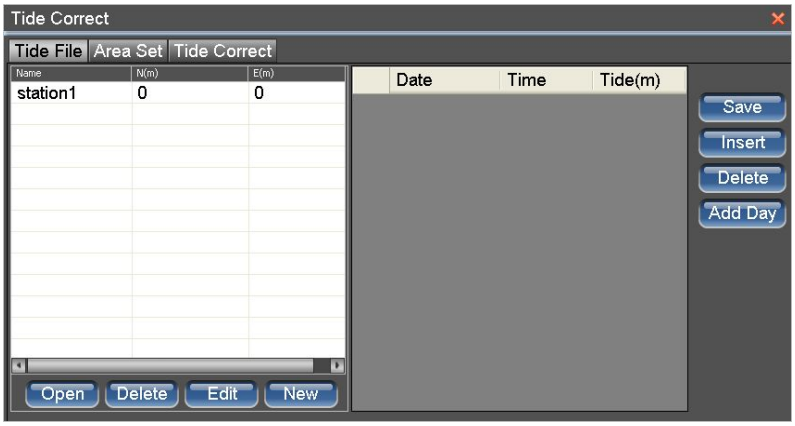


Figure 16-1 Tide level correction

Mainly there are three methods for tide level correction:

(1) Single station correction: Input the geographical coordinates and water level information of tide station at first and then select the survey line documents for correction.

(2) Regional correction: Input the geographical coordinates and water level information of multiple tide stations at first and then create correction area as well as set tide station of the area. Eventually, select the survey line documents for correction.

(3) Fixed water level: Set the fixed water level and choose the survey line files needing to be corrected for correction.

Tide Station Data

(1) Input tide station data

Step I: Build a new tide station data Click [New], and a window will pop up as shown in Figure 12-2. Input the station name and local coordinates of the

tide station. Click [OK]. Then the tide station will be shown in the tide station list at the left side.

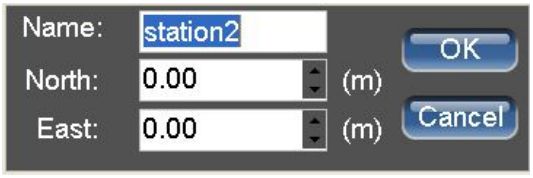


Figure 16-2 Establish a new tide station

Step II: Input water level data of the tide station Click [Add Day], and a window will pop up as shown in Figure 16-3. Input start time, end time and time interval in the window and click [OK]. Multiple lines will be increased in the water level data list. Input the water level information of each time successively. Click [Save] to save the water level information of current tide station.

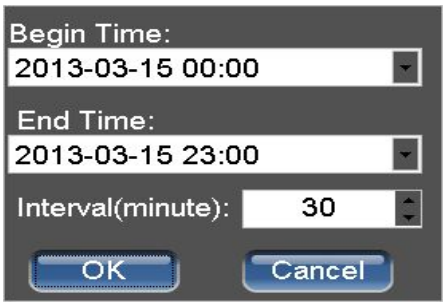


Figure 16-3 Increasing multiple lines of water level time

(2) Edit current tide station information

Step I: Edit current tide station information Select the tide station to be edited in the tide station list. Click [Edit] and a window modifying the local coordinates of the tide station will pop up. Set the new coordinates of the tide station and click [OK] to complete modification to tide station coordinates. If only water level information of the tide station has to be modified and the local coordinates of the tide station not requiring to be modified, after selecting the tide station to be edited, click [Open].

Step II: Modify water level data of the tide station In the water level information list, the date, time and water level of a certain line can be modified. If it is necessary to insert a new line before a certain line, click the number of the line to select the line. Click [Insert] and a blank line will

appear. Input the date, time and water level in the line. If you need to delete one or more lines, click the line number, or drag the mouse, or press Shift key simultaneously, or press Ctrl key simultaneously thus to select the lines to be deleted. Click the [Delete]. After modifying the water level information, click [Save] to save water level information of current tide station.

(3) Delete tide station data

Select the tide station to be deleted in the tide station list. Click [Delete].

Attention: The water level information section of tide station shall completely cover sounding measuring time section thus to ensure water level information at each measuring points.

Regional Correction Settings

Regional correction refers to precise correction for one or more specific areas. Regional correction parameters are not required for single station correction and fixed difference correction.

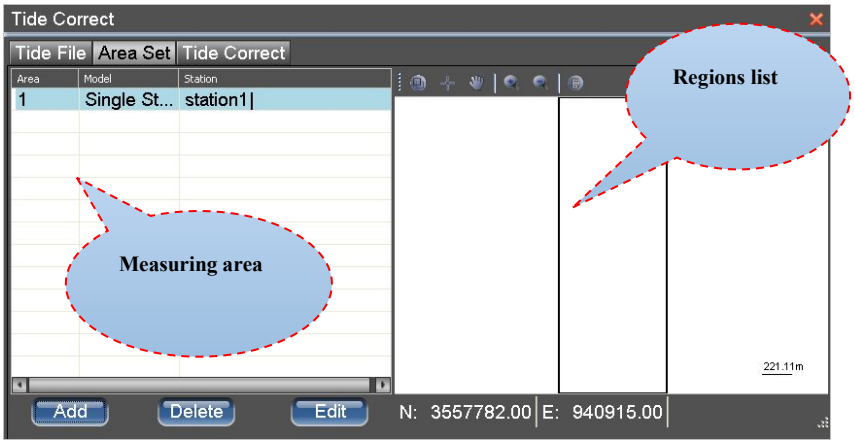


Figure 16-4 Regional Correction Settings

(1) Create correction areas

Step I: Build tide stations combination at the correction area Click [Add] and the window as shown in Figure 12-5 will pop up. Select correction method. If it is a single station correction, please select "Station I" tide station. If it is a double-station correction, please select "Station I" or "Station II"; if it is a three-station correction, please select "Station I", "Station II" or "Station III". After completing the setup, click [OK]. And then the region will be displayed

in the region list.

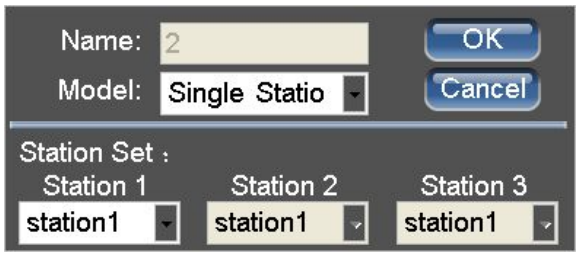


Figure 16-5 Regional tide station

Step II: Draw polygonal boundary of the corrected region Select the established region in the region list. There are two methods to draw regional boundary, namely with a mouse or coordinate: ① Click [Draw Area] to draw regional polygon model with a mouse. Draw a polygon boundary of the region in the measuring area by clicking with a mouse. Click the right mouse button to complete regional drawing; ② Click [Library] and input regional vertex coordinates in the coordinates list successively. In the measurement area view, the polygon at current regions are presented in red. And those not in current region are to be presented in blue. There is a section number at the top left corner of polygon as shown in Figure 12-6.

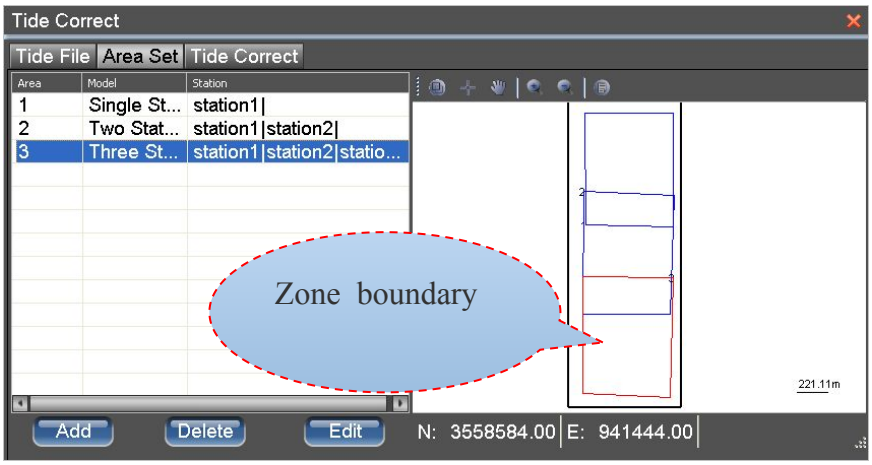


Figure 16-6 Polygon at zone boundary

(2) Edit correction area

Step I: Edit the tide station combination of correction region In the regions list, choose the area to be edited, and then click "Modify". You can re-select a correction method in the popup windows and set the tide station of each station. Click [OK] to complete correction method modification in the region.

Step II: Edit polygonal boundary of corrected region. If you don't need to modify the regional boundary, this step can be ignored. There are two methods for regional boundary edit, namely mouse edit and coordinate edit: ①If you need to remove the boundary line of current area, click [Draw Area]  . The boundary line will be removed then. Start to draw new regional boundary. After that, click the right mouse button to complete the regional drawing. If you need to move vertex position of the region, click [Move]  to enter the mode of moving vertex position with a mouse. Drag the border vertices at current region and click the right mouse button to exit the mode of moving vertex position with a mouse; ② If the boundary coordinates of current region have to be modified, click [Library]  and edit the vertex coordinate in the coordinates list windows as shown in Figure 13-7. If you need to insert a line after a certain line, click the number and select it. Click [Insert] to insert a blank line. Input the coordinate in the blank line. If you need to delete a line, click the number and select it. Click [Delete]. After editing, click [OK] to complete zone boundary editing.

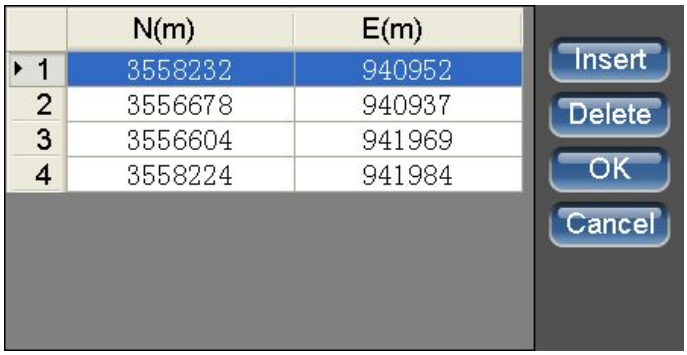


Figure 16-7 Polygon list at zone boundary

(3) Delete the correction area

Select the regions to be deleted in the regions list and click [Delete].

(4) View browser at drawing area

Click [zoom in]  to enlarge the view; click [zoom out]  to reduce the image; click [Move All]  to enter the mode of mouse dragging. Click the right mouse button to exist mouse dragging mode. The coordinates of the mouse will be displayed at the bottom of the drawing area.

Attention: Since the measuring points beyond the correction can not be regionally modified, the multiple regional correction area had better cover the whole measuring range completely thus to ensure that each measuring point can be corrected. If a measuring point is at multiple correction regions simultaneously, the system will take the Min. regional number for correction.

Data Correction

Tidal correction modes for sounding sampling include single station correction, regional correction and fixed water level. For single station correction, it is necessary to input tide station parameter in advance. For regional correction, it needs to input tide station data and regional correction parameters in advance.

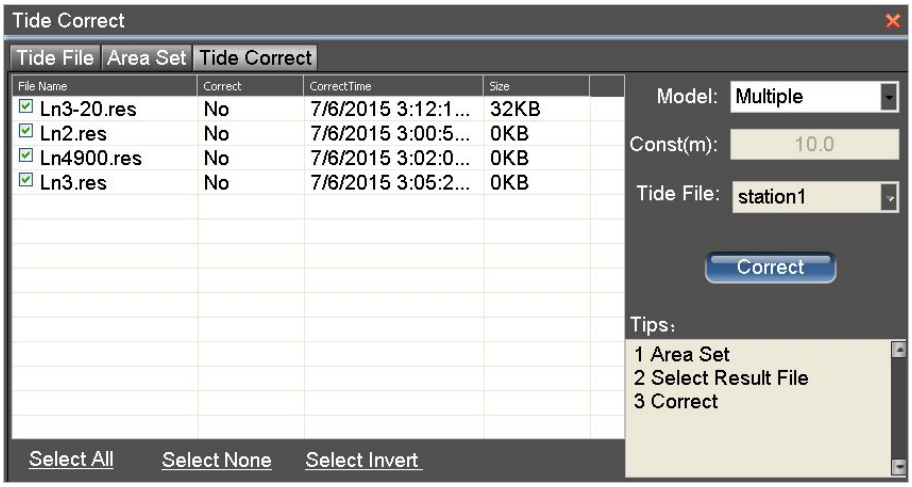


Figure 16-8 Data Correction

Step I: Select correction mode If select single station correction, it is necessary to select the tide station file. For regional area correction, it is necessary to set regional correction parameters. For fixed water level selection, input fixed water level.

Step II: Select the survey line files to be corrected Select the survey line files to be corrected in survey line files list. And then click [Correct]. The status will be displayed as "modified" after survey line files correction. Perform duplicate data correction for survey line files. The correction will cover the

previous one.

While performing single station correction, in case that the measuring point not within the water level information period of the tide station, the software will pop up a dialog box. If select "Yes", only measuring points within water level information period will be modified. If select "No", no modification will be performed. For regional correction, in case that the measuring point not within the correction area or water level information period of the tide station, the software will pop up a dialog box. If select "Yes", only measuring points within water level information period of tide stations will be modified. If select "No", no modification will be performed.

Attention: If no sounding sampling process performed for survey line files, it will not be displayed in survey line files list. During data correction process, if it is prompted that the measuring point not within the correction area or water level information period of the tide station, please check water level information input and regional correction setup before performing correction. Generally, it is not permitted to continue modification forcibly.

Conclusion of This Chapter

At beacon difference or SBAS difference process, since the height location accuracy of beacon difference or SBAS difference is low, they can not satisfy the requirements of actual measurement. Thus it is necessary row obtain water bottom elevation through tide level correction. At RTK surveying, since RTK elevation positioning accuracy is higher, bottom elevation could be obtained from surface elevation collected by RTK. Thus it is not necessary to perform tide level correction. Therefore, tide level correction is not a necessary item for RTK, but a step that can be ignore. For beacon difference or SBAS difference process, however, tide level correction is an obligatory step.

CHAPTER

17

Achievements Preview

Introduction to this Chapter

- Data Preview
- Data Output
- Conclusion of This Chapter

Achievements preview can facilitate users to preview mapping results of measurement points. After performing sounding sampling as well as tide level correction as required, depth contour and pseudo color depth rendering graphics generated by achievement data can be displayed relying on this function. If the display effects are not good, you can return to sounding sampling or tide level correction to redo the steps until obtaining satisfactory results. At main interface of the software, click [Results] to enter the achievements preview interface as shown in Figure 17-1.

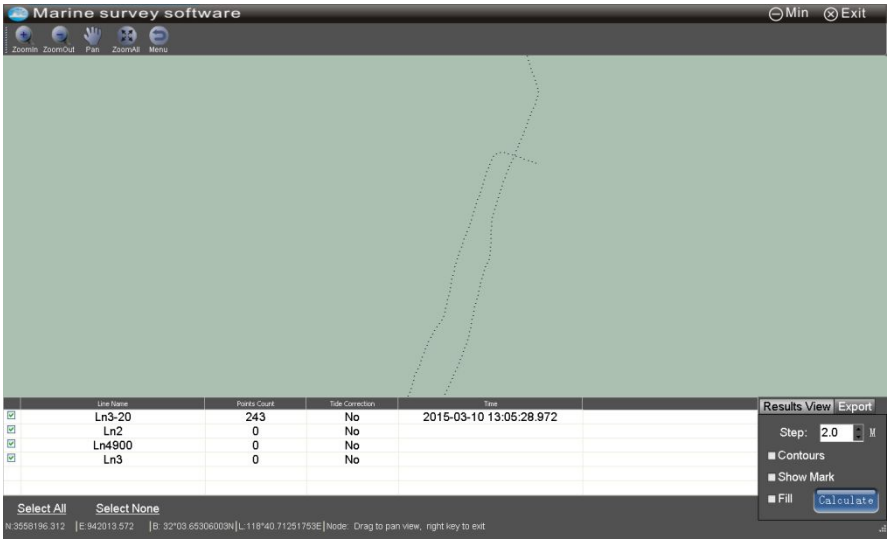


Figure 17-1 Achievements preview interface

Data Preview

Step I: Select the measuring files to be previewed. You can perform quick selection operation with "Select all" or "Unselect all".

Step II: Set contour interval and select the elements required thus to display contour line, pseudo color depth render filling graphics as well as sounding marks.

Step III: Click [Calculate] button to generate preview graphics as shown in

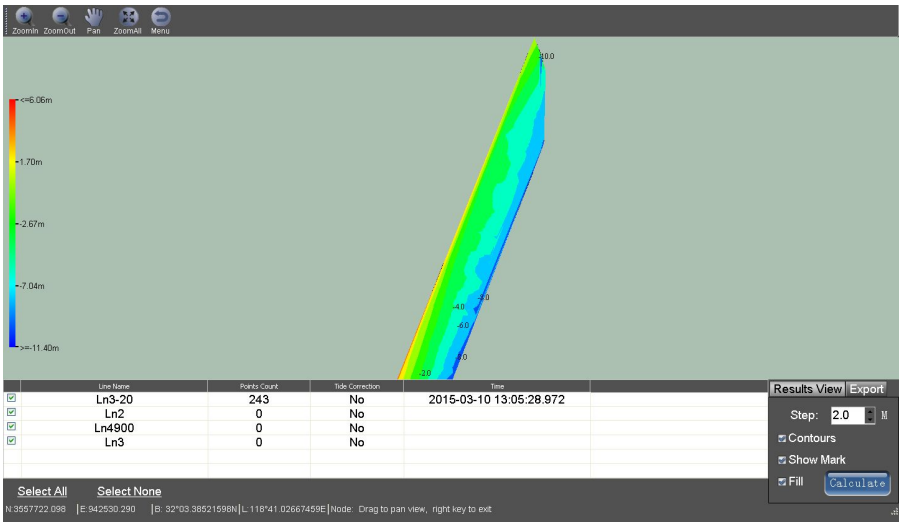


Figure 17-2.

Figure 17-2 Achievements preview effects

After clicking [Calculate] button, control the contents to be displayed by selecting "contour line display", "filling display" and "marks display".

Data Output

Step I: Select the measuring files to be exported. You can perform quick selection operation with "Select all" or "Unselect all".

Step II: Click [Export] label and [Export] button. Select save type in the pop-up dialog. Data format and separator are to be set up for user-defined format files. Input the file name and click [Start].

Attention: If no sounding sampling process performed for survey line files, it will not be displayed in survey line files list. In case of no tide level correction performed for survey line files, the system will calculate the bottom elevation based on water level elevation measured by GPS. In case of tide level correction performed for survey line files, the system will calculate the bottom elevation based on water level correction value at achievements export.

Conclusion of This Chapter

Achievements preview provides users with visual preview of achievements data. If the effects are not satisfied, you can perform post-processing until get

the satisfied results. Users can export the final outcome data which is convenient for being imported to mapping software.

CHAPTER

18

Serial Port Debugging

Introduction to this Chapter

- Satellites Information
- Data Debugging
- Base station setting
- Rover setting
- Conclusion of This Chapter

Serial port debugging mainly include checking satellites information, debugging of GPS exported data, base station setting as well as Rover setting. At main interface of the software, click [Serial Debug] to enter serial port debugging interface. Click [Connect] and the instrument connection windows will be pop up as shown in Figure 15-1. Set up serial port, Baud rate and instrument type. And click [Connect] to establish connection between the software and GPS instrument. After GPS connection, you can check GSP information, debug serial port data, set up base station and Rover.

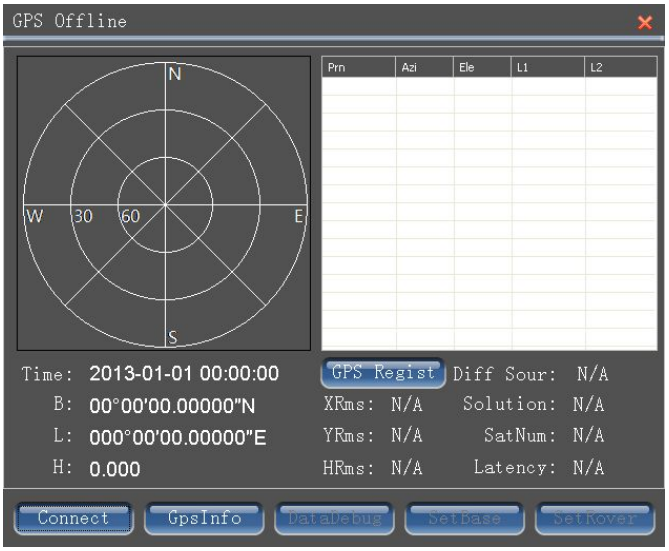


Figure 18-1 Instrument connection

Satellites Information

Satellite information will display the current latitude and longitude, satellite distribution map, satellite information list as well as difference ages as shown in Figure 15-2.

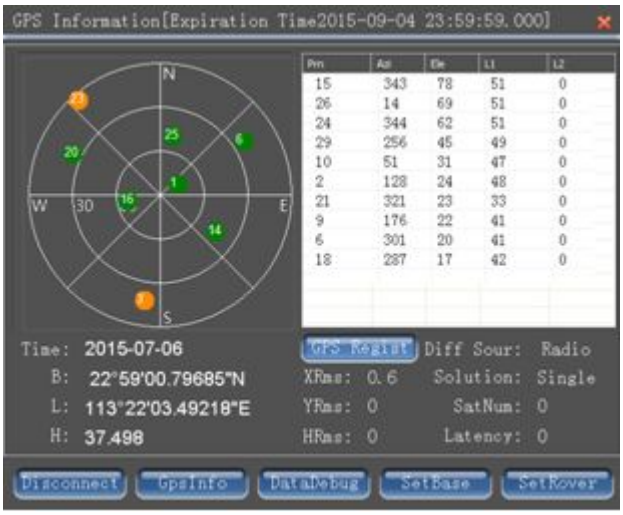


Figure 18-2 GPS information

In a satellite distribution map, the number in the pie chart is the satellite number. The green pie refers to satellites with better data quality (SNR>40); the yellow pie refers to satellites with poor data quality; and the red pie refer to satellites with signal failure. In satellites information list, satellite number, azimuth, altitude angle, L1 SNR, L2 SNR and other information of the satellite are displayed.

Difference ages reflect the delay after GPS receiving the difference information. Generally, the difference age of RTK fixed solution is 1~2, and that of beacon receiver or SBAS is less than 6.

Attention: GPS receiver shall output the satellites information data before checking satellite information. If there is no satellite distribution chart nor satellite information list available, please send out GSV mainboard command at [DataDebug] to make the GPS export satellites information data.

Data Debugging

Click [DataDebug] to switch to operation interface of serial port data debugging. Check the data information exported from the GPS and can send commands to GPS host through a serial port. The data received at the serial port can be shown as in texts or hexadecimal values. Select information

screening by selecting "Display texts". Only specific data information will be displayed.

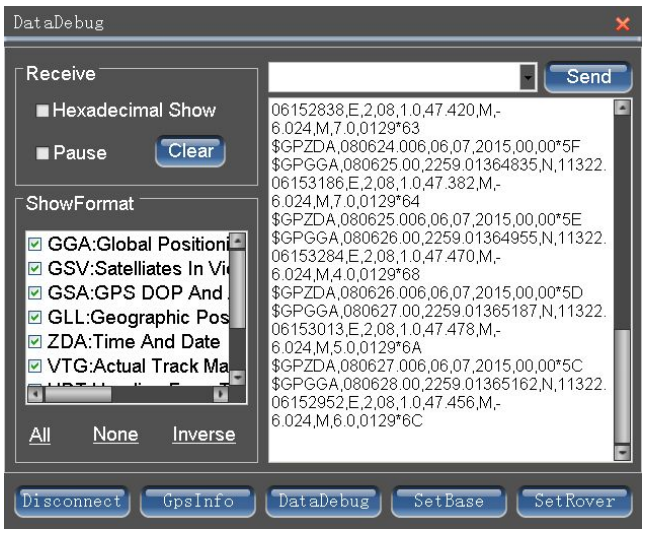


Figure 18-3 Data debugging

In data debugging, the mainboard commands will be different according to connected GPS models. Several frequently-used mainboard commands will be introduced as below.

(1) K5/K7 mainboard command

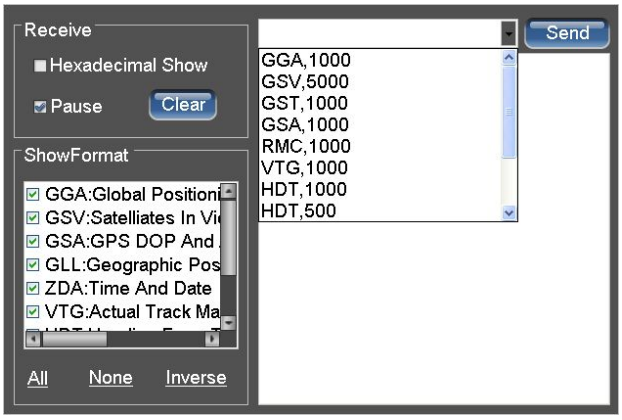


Figure 18-4 K5/K7 mainboard command

Item No.	Mainboard command	Description
1	$JOFF	Close all information output
2	$JASC,GPGGA,1	Locate information output command, 1time/s

3	$ JASC, GPGGA,0	Locate information output command, and close the positioning information output.
4	$ JASC, GPGSV,0.2	2Satellites information output commands are visible. 1time/5s
5	$ JASC,GPGSA,1	Active satellite information output commands. 1time/s
6	$ JASC,GPZDA,1	Time and date output commands. 1time/s
7	$ JASC,HDT,1	Set up heading direction information. 1time/s
8	$ JASC,HDT,2	Set up heading direction information. 1time/500ms
9	$ JASC,HDT,5	Set up heading direction information. 1time/200ms
10	$JMASK,15	Set up satellite altitude cutoff angle 11$JSAVE
11	$JSAVE	Save the settings

During marine surveying, generally K5/K7 only needs to output positioning information, date/time information and heading direction information to send command sequence:

①Close all information output: $JOFF

②Position information output: 1time/s: $JASC,GPGGA,1

③Time and date output: 1time/s $JASC,GPZDA,1

④Orientation information output: 5times/s: $JASC,HDT,5

⑤ Hold-over command

(2) V60/V30/K9/K10 mainboard commands

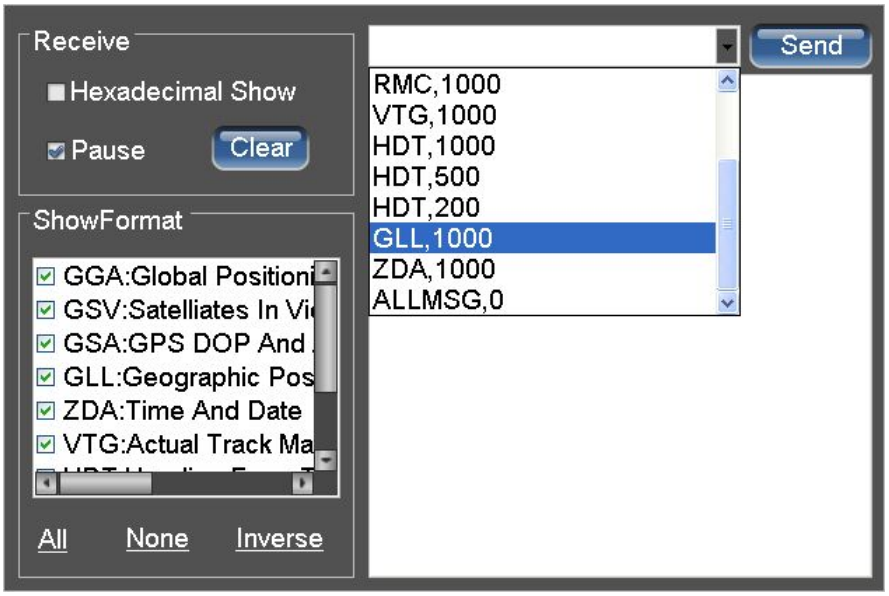


Figure 18-5 V60/V30/K9/K10 mainboard commands

Item No.	Mainboard command	Description
1	GGA,1000	Locate information output command, 1time/s
2	GSV,5000	Satellites information output commands are visible. 1time/5s
3	GST,1000	Pseudorange error statistics output commands, 1time/s
4	GSA,1000	Active satellite information output commands. 1time/s
5	RMC,1000	RMS locate information output command, 1time/s
6	VTG,1000	Navigational speed information output command, 1time/s
7	HDT, 1000	Navigational direction information output command, 1time/s
8	HDT, 500	Navigational direction information output command, 1time/500ms
9	HDT, 200	Navigational direction information output command, 1time/200ms

10	GLL,1000	Geographical location information output command, 1time/s
11	ZDA,1000	Time and date output commands. 1time/s
12	ALLMSG,0	Close all information output

Base Setting

When applying V60, V30, K10 and other types of instrument as base station, click [SetBase] to perform parameters setup for base stations. After the setup of base station is completed, click [OK].

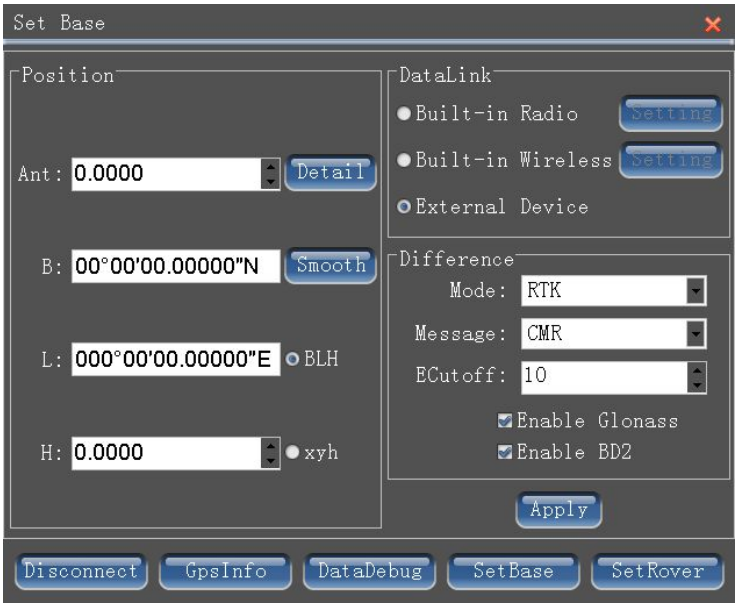


Figure 18-6 Base station setting

(1) Antenna height setting

Click [Detail] and the antenna height setting dialog box will pop up as shown in Figure 18-7. Select antenna type and input the measured antenna height. And then click [Apply].

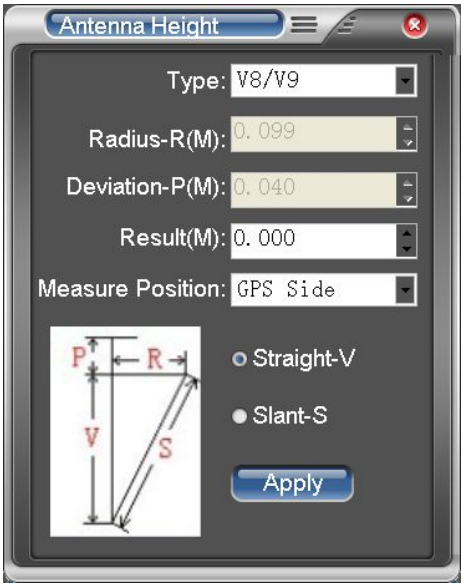


Figure 18-7 Antenna height setup

(2) Site coordinates of base station

If the base station is erected at a known point, input the coordinates of the point directly. There are two types of coordinate input methods, namely latitude and longitude as well as local plane coordinates; if the base station is erected at a unknown point, click [Smooth] and a smooth record dialog box will pop up as shown in Figure 18-8. Calculate correct WGS-84 coordinates as site coordinates in a smooth way.

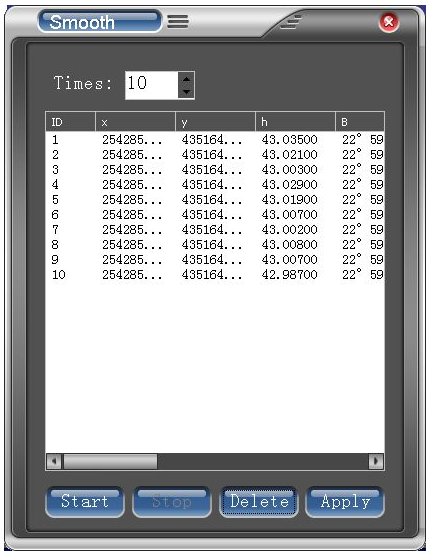


Figure 18-8 Smooth record

[Start]: Clear smooth sampling data and re-start smooth data sampling.

[Stop]: Stop smooth data sampling.

[Delete]: Remove those non-ideal coordinate data.

[Apply]: Perform smooth calculation according to the sampling data in the list to get relatively more accurate station coordinates and apply the results on base station coordinates.

[Times]: The Max. number of smooth sampling data is ten. If they have to be modified, please click [Stop] to stop data sampling.

(3) Setup data chain of base station

[External Device]: To apply the small five-core output differential data at GPS bottom.

[Built-in Wireless]: To apply GPS built-in GPRS module to transfer differential data to network server.

Figure 18-9 Wireless connection settings

Network types: Set based on the GPS network modules applied. GPRS, CDMA and GSM are optional.

APN: When apply GPRS, input "CMNET". And when apply CDMA, input "card, card".

Server IP and port: Can manually input server IP and port, as well as click [File] to display existing server lists as shown in Figure 18-10. Select the required server, and click on the button .

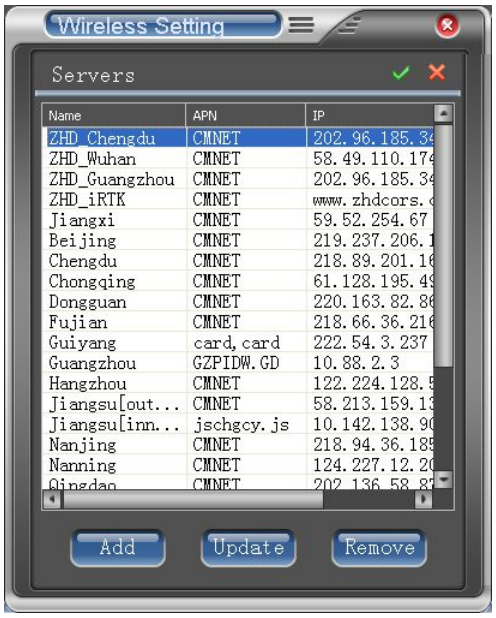


Figure 18-10 Server list

"Add": Add an existing server address information into the server list.

"Update": Modify the existing server address information.

"Remove": Delete the existing server address information.

Network: Include ZHD and CORS. If a HI-TARGET server is used, please select ZHD and input the grouping number as well as sub-grouping number.

Grouping number and sub-grouping number: They are in 7-digit and 3-digit respectively. The grouping number is required to be less than 255.

VPN setting: Click button. Input network user name and password.

[Built-in Radio]: To apply GPS built-in radio module to transfer differential data radio signals. When choose a built-in radio, the radio channels have to be set up.

(3) Other settings of the base station

Other setting parameters of base station include differential mode, difference cables, altitude cutoff angle etc..

Differential mode: Include RTK, RTD and RT20. RTK is the default setting. RTD refers to size difference and RT20 is single frequency RTK.

Message format: Include RTCA, RTCM(2.X), RTCM(3.0), CMR, NovAtel and sCMRx. If a Samsung system receiver is applied, the message format of

base station shall be set as sCMRx to support Beidou navigation differential positioning. If a Beidou system RTK receiver is applied, the message format of base station shall be set as RTCM(3.0) to transmit difference data.

Altitude cutoff angle: Refers to the cutoff angle to receive satellite signals. It can be adjusted in 5~20.

Start Glonass: Set whether to start up Glonass satellite system or not. When it is selected, it means that Glonass satellite will take part in the resolving.

Start BD2: Set whether to start up Beidou satellite system or not. When it is selected, it means that Beidou satellite will take part in the resolving.

Attention: Click [Apply]. If a dialog box is shown as successful setup has been made, please check whether the base station host will transmit differential signal or not. If the differential signal can not be transmitted normally, please repeat the [Apply] button. If a dialog box is shown as setup failure, please check whether all parameters are setup wrong.

Rover Setting

Commonly used mobile GPS instrument types mainly include beacon receiver (K3), RTK positioning and orientation instrument (K9), beacon positioning and orientation instrument (K5/K7) and RTK Rover (K10/V30/V60). For different types of GPS instrument, the settings of Rover will be different. The Rover set up interface of the system varies depending on instrument type. Click [SetRover] to enter the Rover setup interface of current connected instrument. After completing various parameters, click [Apply].

Beacon receiver

Select "K2/K3 /HD8600" as GPS instrument type. After GPS connection, click [Set Rover] to enter beacon receiver parameter settings interface as shown in Figure 15-11. After setting differential mode, output format and altitude cutoff angle, click [Apply].

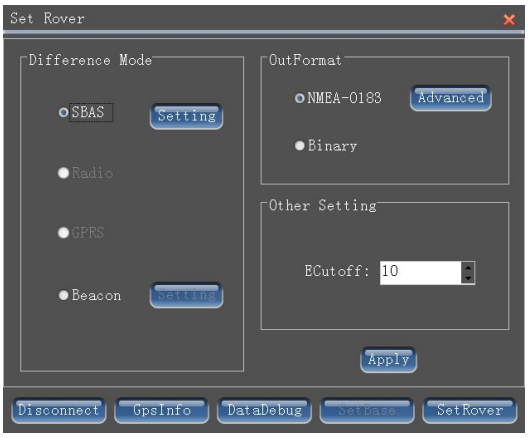


Figure 18-11 Beacon receiver setting

(1) Differential mode setting

Differential mode include SBAS differential mode and beacon station differential. In the near coastal areas, select beacon difference. When it is away from the shore where can hardly receive the beacon signal, select SBAS difference.

"SBAS Setting": Star standing difference model is classified of customization and automatic mode. Under customization mode, two satellites with poor star station can be selected. The number of default star standing differential satellites are 129 and 137.

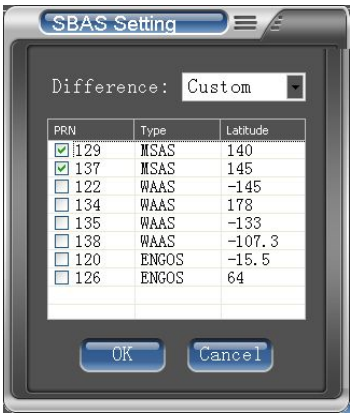


Figure 18-12 Star standing difference set

"Beacon difference": Automatic search, artificial settings and data options are optional beacon ways. If you are not clear about the most recent measurement areas, please select automatic searching and click [Apply]. Search beacon station with a beacon receiver automatically; If the beacon frequency and rate of the measurement area are known, please select manual mode. Click "Application"; if you are clear of the name of beacon station at the measuring area, please select station and click [Apply]. Manual mode of beacon station setting can reduce the time of automatic searching. If it is set as automatic beacon station searching, beacon will automatically choose the best beacon signal. After setting the beacon station, click [Close] to exit the dialog box.

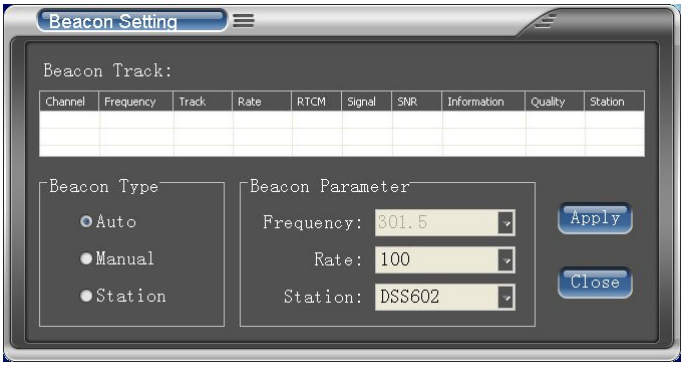


Figure 18-13 Beacon receiver setting

Attention: If the positioning data runout of beacon receiver is intensive and far exceeding the beacon precision, an intersection region with more than two beacon signals exists within the measuring region. When the beacon receiver is set as automatic mode, it will switch between several beacon stations ceaselessly which will lead to unstable location data. At this moment, try to set up the beacon station manually and to make the beacon receiver being locked at a specified beacon station.

(2) Set output data format

Beacon receiver output data format: NMEA-0183 and binary system. Generally, set the format as NMEA-0183. Click [Advanced] to customize data output format and time interval of NMEA-0183 data.

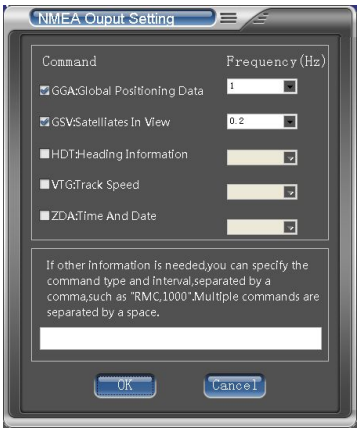


Figure 18-14 Uer-defined NMEA format

Select the command type of output data and set the time interval. Click [OK].

(3) Other settings of beacon receiver

Altitude cutoff angle: Refers to the cutoff angle to receive satellite signals. It can be adjusted in 5~20.

Beacon positioning and orientating instrument

Select " K5/K7" as GPS instrument type. After GPS connection, click [Set Rover] to enter beacon receiver parameter settings interface as shown in Figure 15-15. After setting differential mode, output format and altitude cutoff angle and orientating instrument parameters, click [Apply].

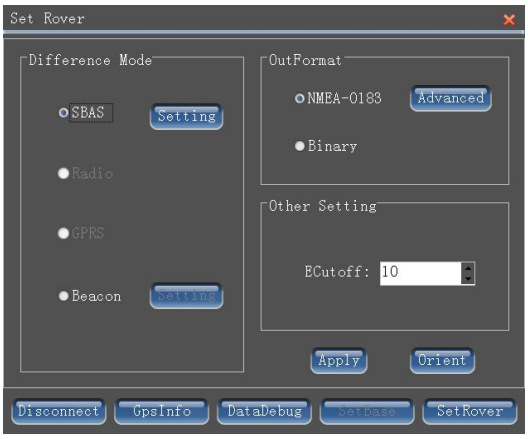


Figure 18-15 Beacon positioning and orientating instrument

The setup operation of differential mode, data output format and altitude cutoff angle of beacon positioning and orientating instrument are the same with that of the beacon receiver. Detailed information please refer to "14.4.1

Beacon receiver".

The distance between positioning antenna and directional antenna of beacon positioning and orientating instrument has to be set up. A measuring tape can be used.

Click [Orient] and input the measured baseline distance in the pop-up dialog.

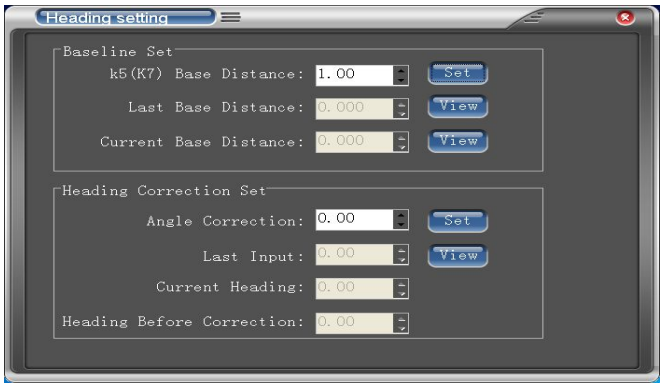


Figure 18-16 Orientation parameters setting

Attention: If an aluminum alloy rod with K5 standard configuration is utilized. The baseline distance between the two antennas is one meter. The fixed value of the baseline distance between the two antennas of K7 is 0.35m. In other circumstances, the baseline distance between the two antennas shall be measured accurately. After adjusting the baseline distance, check the previous baseline distance. If the current input baseline distance is the same with the previous one, it means that it has been set up successfully. About 5 minutes after setting the baseline distance, check the currently adopted baseline distance. If the difference between them is over 2cm, it indicates that the baseline distance precision doesn't conform to the requirements, and that it has to be measured and set.

Rover RTK

Select "K9/K10/V30/V60" as GPS instrument type. After GPS connection, click [Set Rover] to enter RTK Rover parameter settings interface as shown in Figure 15-17. After setting differential mode, output format and altitude cutoff angle and orientating instrument parameters, click [Apply].

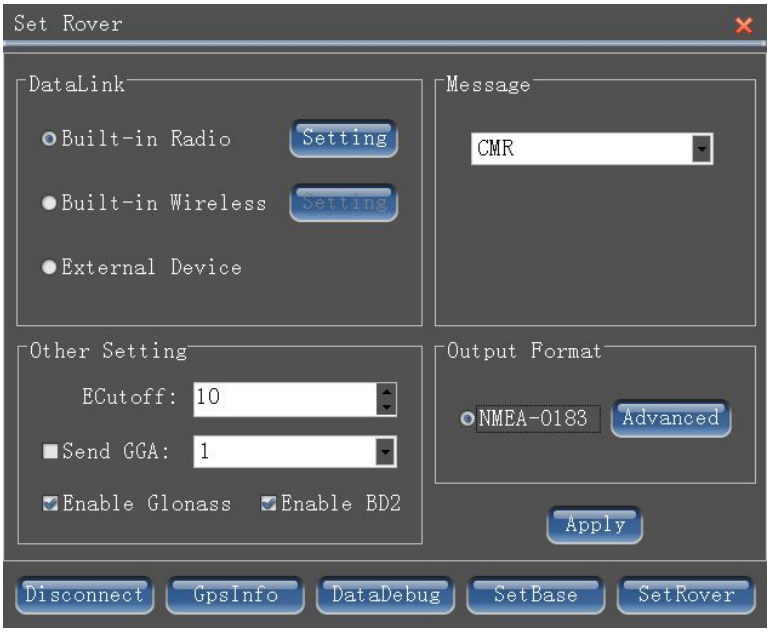


Figure 18-17 RTK Rover setting

(1) Setup data chain

[External Device]: To apply the small five-core receiving differential data at GPS bottom.

[Built-in Wireless]: To apply GPS built-in GPRS module to receive differential data from network server.

Figure 18-9 Wireless connection settings

Network types: Set based on the GPS network modules applied. GPRS, CDMA and GSM are optional.

APN: Input corresponding operator name.

Server IP and port: Can manually input server IP and port, as well as click [File] to display existing server lists as shown in Figure 15-10. Select the required server, and click on the button .

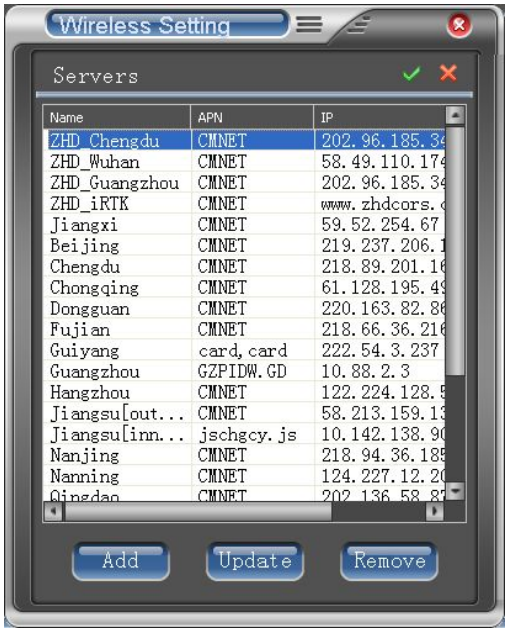


Figure 18-10 Server list

"Add": Add an existing server address information into the server list.

"Update": Modify the existing server address information.

"Remove": Delete the existing server address information.

Network: Include ZHD and CORS. If a HI-TARGET server is used, please select ZHD and input the grouping number as well as sub-grouping number. If CORS is selected, source node, user name and password have to be input.

Grouping number and sub-grouping number: They are in 7-digit and 3-digit respectively. The grouping number is required to be less than 255.

VPN setting: Click button . Input network user name and password.

[Built-in Radio]: To apply GPS built-in radio module to receive differential data signals. When choose a built-in radio, the radio channels have to be set up.

(2) Other settings

Other setting parameters of Rover include differential mode, data output format and altitude cutoff angle etc..

Message format: Include RTCA, RTCM(2.X), RTCM(3.0), CMR, NovAtel and sCMRx. If a Samsung system receiver is applied, the message format of base station shall be set as sCMRx to support Beidou navigation differential positioning. If a Beidou system RTK receiver is applied, the message format of base station shall be set as RTCM(3.0) to transmit difference data.

Data output format: You can set up output data type and time interval for GPS serial ports.

Altitude cutoff angle: Refers to the cutoff angle to receive satellite signals. It can be adjusted in 5~20.

GGA transmission: When CORS network is connected, it is necessary to report the Rover position to the computer host and obtain differential data based on interpolation. If such network is utilized, select "GGA transmission" as needed and choose transmission time interval. The default interval is "1s".

Start Glonass: Set whether to start up Glonass satellite system or not. When it is selected, it means that Glonass satellite will take part in the resolving.

Conclusion of This Chapter

Serial port debugging is a very convenient tool with which you can send commands to different types of HI-TARGET GPS and perform instrument parameters setting.

This system will show different data debugging commands and parameter settings interface automatically which match with corresponding different instrument models connected.

CHAPTER

19

Utilities

Introduction to this Chapter

- Coordinate Transformation Parameters Calculation
- Coordinate Transformation
- Distance Orientation Calculation
- Unit Conversion
- Conclusion of This Chapter

Utilities include coordinate transformation parameters calculation, coordinate transformation, distance and orientation calculation, unit Conversion and other functions. At main interface of the software, click [UtilityTools] to enter utilities interface as shown in Figure 19-1.

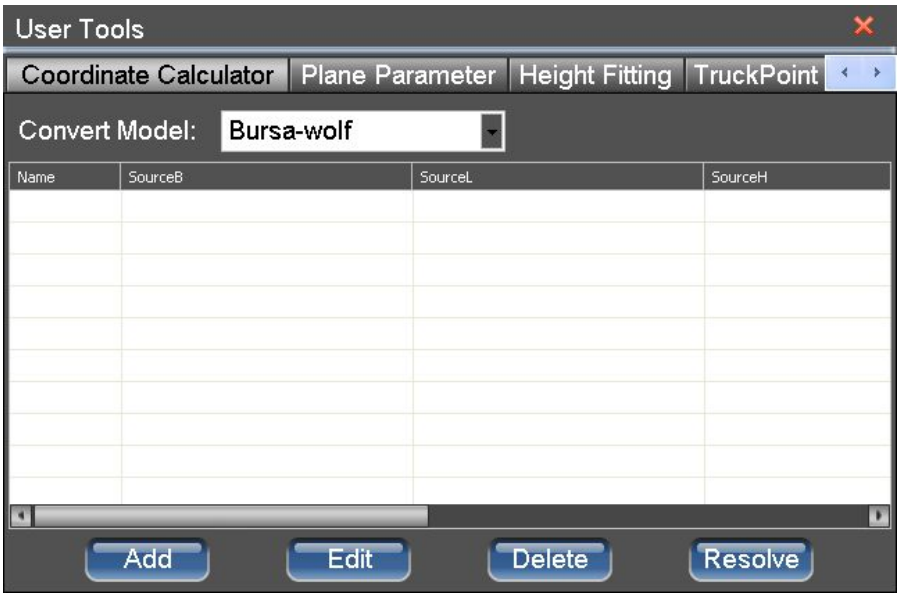


Figure 19-1 Utilities

Coordinate Transformation Parameters Calculation

Ellipsoid transformation parameters calculation

(1) Select calculation methods

Ellipsoid transformation parameters calculation methods include Seven Boolean Sally method, Morrow's three-parameter model, one-step method and four-parameter + elevation fitting.

(2) Calculation point coordinates

Add point coordinates: Click [Add] and a coordinate input windows as shown in Figure 16-2 will pop up. Add the coordinates of already known source points and target points. You can direct input coordinates or click current connected GPS measurement point coordinates (at [Equipment] module. Please make sure whether GPS instrument connected parameters are correctly set up. Click [OK].

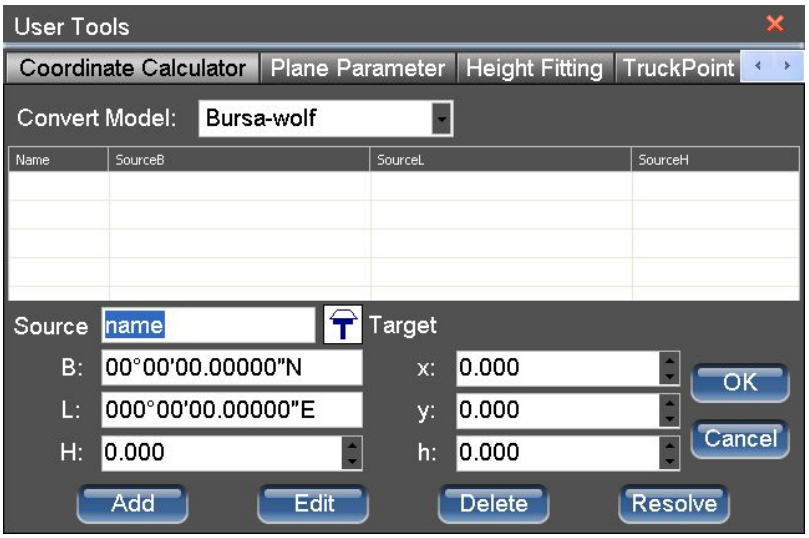


Figure 19-2 Add coordinate points

Edit point coordinates: Select a line in the coordinate list. Click [Edit] and input the coordinates of the point in the coordinate input window. Click [OK].

Delete point coordinates: Select a line in the coordinate list. Click [Delete]

(3) Calculating transformation parameters

Three groups of coordinates are needed for Seven Boolean Sally method; only one point is needed for Morrow's three-parameter model; at least three groups of coordinates are needed for one-step method; two groups of coordinates are needed for fixed difference correction of four-parameter + elevation fitting; three and six groups of coordinates are needed for plane fitting and surface fitting respectively.

Select the coordinate points involved in calculating. Click [Resulve] and perform calculation by adopting the selected coordinate points for conversion parameters calculating. Click [Apply] to apply the calculated parameters to coordinate transformation parameters setting of current project.

Figure 19-3 Seven-parameter calculation

Calculation of plane transformation parameters

In some items, if the known points involved in plane transformation parameters as well as elevation fitting parameters are different, it is necessary to perform plane transformation parameters calculation as well as elevation fitting parameters calculation.

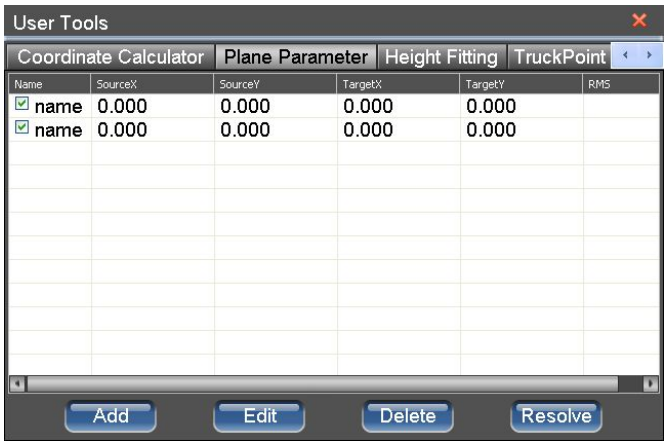


Figure 19-4 Plane transformation parameters

(1) Calculation point coordinates

Add point coordinates: Click [Add] and then a coordinate input windows will pop up as shown in Figure 16-5 to add already known source point and target point coordinates. Click [OK].

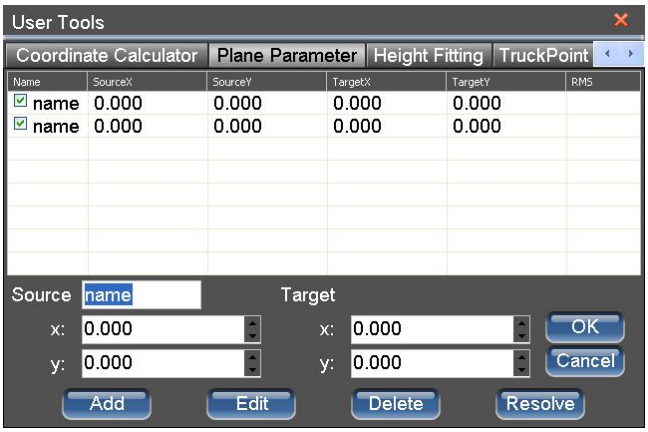


Figure 19-5 Add point coordinate

Edit point coordinates: Select a line in the coordinate list. Click [Edit] and input the coordinates of the point in the coordinate input window. Click [OK].

Delete point coordinates: Select a line in the coordinate list. Click [Delete]

(2) Calculating transformation parameters

Select the coordinate points involved in calculating (at least two groups of coordinates). Click [Resolve] and perform calculation by adopting the selected coordinate points for conversion parameters calculating. Click [Apply] to apply the calculated parameters to coordinate transformation parameters setting of current project.

Figure 19-6 Four-parameter calculation

Elevation fitting parameters calculation

In some items, if the known points involved in plane transformation parameters as well as elevation fitting parameters are different, it is necessary

to perform plane transformation parameters calculation as well as elevation fitting parameters calculation.

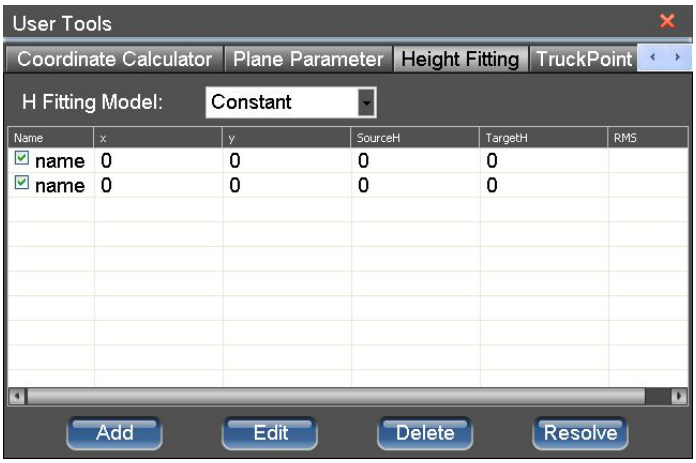


Figure 19-7 Elevation fitting model

(1) Select fitting model

Elevation fitting model include fixed difference correction, plane fitting and surface fitting.

(2) Calculation point coordinates

Add point coordinates: Click [Add] and then a coordinate input window will pop up as shown in Figure 19-8 to add already known source elevation and target point elevation. Click [OK].

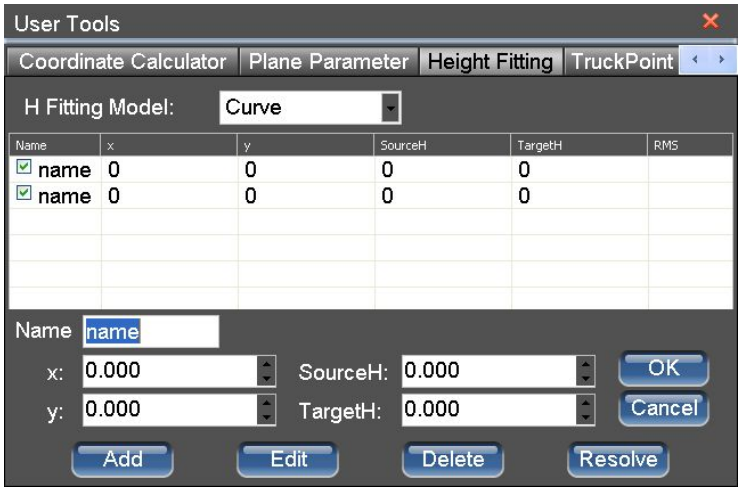


Figure 19-8 Add point coordinate

Edit point coordinates: Select a line in the coordinate list. Click [Edit] and input the coordinates of the point in the coordinate input window. Click [OK].

Delete point coordinates: Select a line in the coordinate list. Click [Delete]

(3) Calculating transformation parameters

At least one starting point is needed for fixed difference correction. At least three starting points and six starting points are needed for surface fitting. Select the coordinate points involved in calculating. Click [Resolve] and perform calculation by adopting the selected coordinate points for conversion parameters calculating. Check the residual error. Generally, the Max. residual error shall not be less than 3cm. Click [Apply] to apply the calculated parameters to coordinate transformation parameters setting of current project.

Figure 19-9 Elevation fitting parameters calculation

Point transformation parameters calculation

Point transformation is used for calculation of plan and elevation transformation parameters between two coordination system. It is mainly applied for certain engineering survey. Through a given point, perform plane coordinates transformation after the projection plane coordinates translation thus to converted to local engineering coordinate system. Before point transformation calculation, please make sure that GPS instrument connection parameters of [Equipment] are correctly connected.

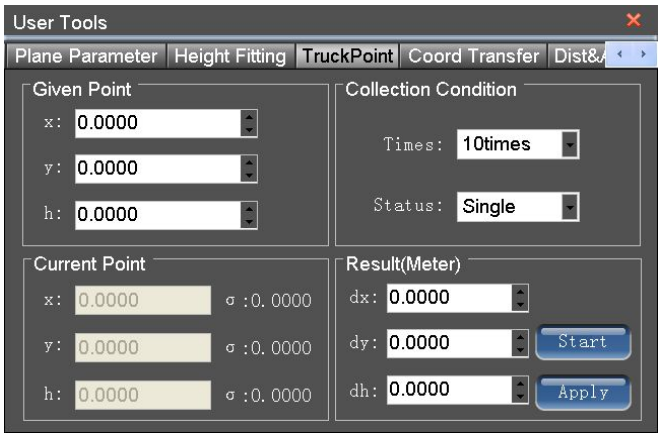


Figure 19-10 Transformation parameter of points

(1) Input known point coordinates

Input the known-point plane coordinates of current measurement points.

(2) Smooth conditions setting

Times: Select smooth times, including "10 times", "50 times", "100 times" and "manual shutting down".

Solution types: Select GPS data conditions, including "single point positioning", "finite difference solution" and "fixed solution". For example, if "finite difference solution" is selected, smoothing computation can only be performed only when the GPS calculation accuracy reaching to finite difference solution or above.

(3) Transformation parameters of calculation points

Click [Smooth] to collect GPS measuring coordinates. Perform smoothing computation. Click [Stop] to terminate smoothing acquisition. Click [Apply]. Apply the current calculation results on point transformation parameter.

Figure 19-11 Transformation parameter of calculation points

Coordinate Transformation

The conversion parameters of coordinate transformation is adopted for current project. Consequently, before performing coordinate transformation, make sure that input correct conversion parameters in [Geodetic].

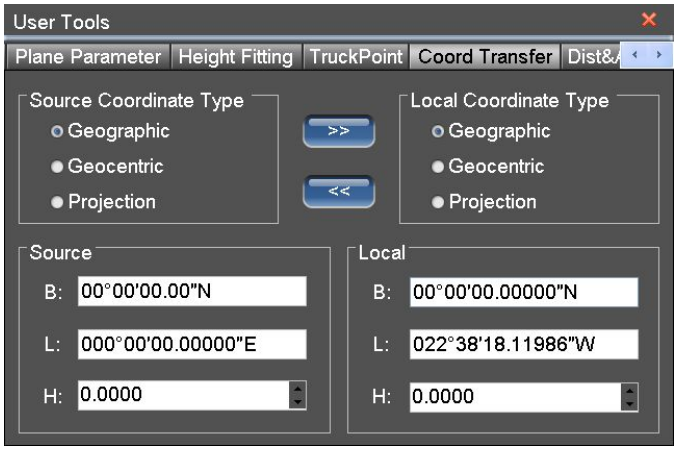


Figure 19-12 Coordinate Transformation

Select source coordinates type and local coordinates type. Input source coordinates or local coordinate values according to transformation requirements.

(1) Click  to transform from source coordinate to local coordinate.

(2) Click  to transform from local coordinate to source coordinate

Distance Orientation Calculation

The distance and azimuth angle can be calculated between two points. Calculate point coordinates based on distance orientation calculation.

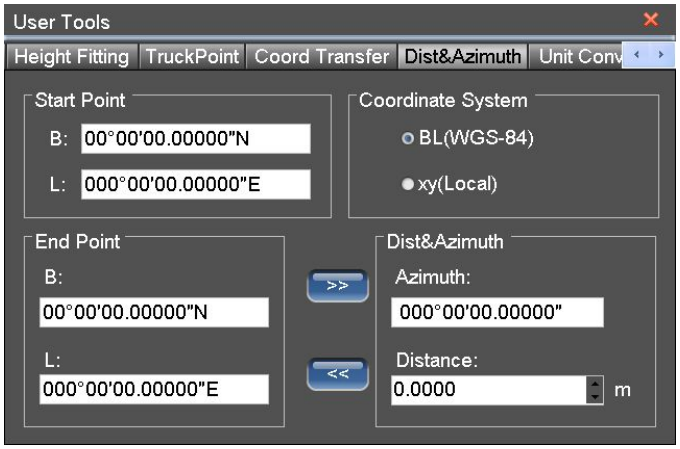


Figure 19-13 Distance orientation calculation

Coordinate system: Starting point coordinates and end coordinates calculated. They can be as WGS-84 or local plane coordinates as well.

Starting point: Calculate starting point of distance and position

End point: Calculate end point of distance and position

Orientation: The included angle between the direction from the starting point to end point as well as true north direction.

Distance: The slant distance from the starting point to end point.

(1) Click  to calculate distance and orientation from current starting point to ending point.

(2) Click  to calculate end point coordinates based on current starting point distance and distance azimuth.

Unit conversion

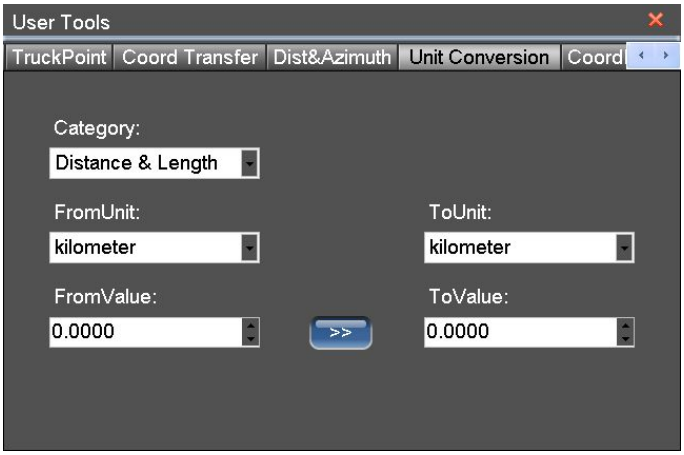


Figure 19-14

Select the unit type. Choose source unit and target unit. Input transformation value. Click  to calculate target values corresponding to the target unit.

Coordinates library

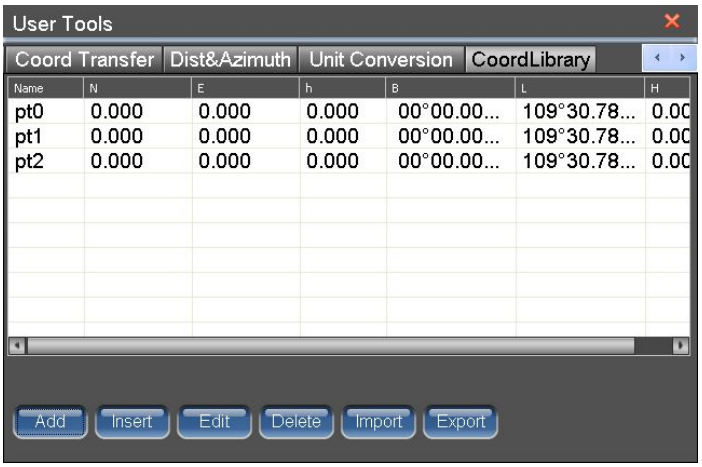


Figure 19-15 Coordinates library

Edit Coordinates library files. Perform editing by pressing [Add], [Insert], [Delete] and [Edit]. Csv files or DXF files can be imported or exported.

Conclusion of This Chapter

Utilities include coordinate transformation parameters calculation, coordinate transformation, distance and orientation calculation, unit conversion and other functions which have been greatly convenient for daily work of users.

CHAPTER

20

Software Registration

Introduction to this Chapter

- Software Registration
- Software Dongle
- Conclusion of This Chapter

Software Registration

After users purchase the software, HI-TARGET will provide corresponding 16-digit permanent registration code of Software Dongle. Users only need to enter registration key. Click [Register]. "Current validity" will display expiration date of Software Dongle registration. If the registration code utilized is a temporary one, please contact HI-TARGET to obtain a permanent registration code before the expiration date.

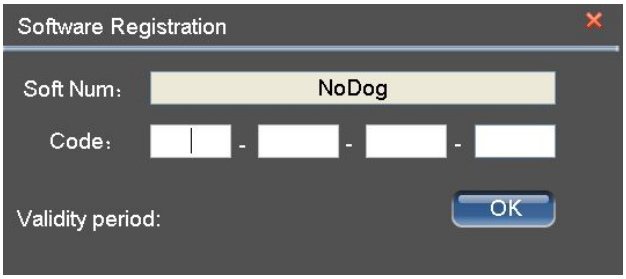


Figure 20-1 Software registration

If "No Software Dongle" is showed, it means that the software didn't detect any Hi-MAX Sounder Software Dongle. If the current validity is shown as "permanent code", it means that the current Software Dongle has been registered as permanent. And it is not subject to time limitation any longer.

Software Dongle

Hi-MAX Sounder Software Dongle is a dedicated Software Dongle for the software. The software can not identify other types of Software Dongle. If users need to buy Software Dongle, please contact local branches of HI-TARGET.

Conclusion of This Chapter

In case of using a temporary code, please pay attention to the expiration date to prevent affecting measurement operation caused by temporary code overdue. If users need to get registration code or replace the Software Dongle, please contact local branches of HI-TARGET.

CHAPTER

21

Software Upgrading

Introduction to this Chapter

- Local Upgrading
- Online Upgrading
- Conclusion of This Chapter

During the process of software upgrading, a firewall or other antivirus software may deter upgrading program start-up. Therefore, please close such software.

Local Upgrading

There are two methods for local upgrading:

（1）Download the latest program installation package.

Step I: Download the latest Hi-MAX Sounder software installation package from download center of the official website of HI-TARGET http://www.hi-target.com.cn/en/.

Step II: Uninstall the previous Hi-MAX sounder software

Step III: Run the new Hi-MAX Sounder software installation package for program installation.

（2）Download the latest update file

Step I: Download the latest Hi-MAX sounder software upgrade file from download center of the official website of HI-TARGET http://www.hi-target.com.cn/en/.

Step II: At main interface of the software, click [Upgrade] to start up software upgrade wizard system. Select "Local upgrading" from [Options].

Figure 21-1 Local Upgrading

Step III: Select the path of the upgrade file following upgrade wizard [Files] as shown in Figure 21-2. And then, click [Next] to complete upgrading.

Figure 21-2 Upgrading file

Attention: Upgrade through upgrade files. You can only upgrade the low version of the software to higher version. But reverse upgrade is not permitted.

Online Upgrading

If the current software operating environment can be connected to Internet, users can upgrade the software through online upgrading. At main interface of the software, click [Software upgrading] to start up software upgrade wizard system. Select "Network upgrading" from [Options].

Figure 21-3 Online Upgrading

Click [Next]. Upgrade the system automatically to get the latest version of the software as shown in Figure 17-4. And then, click [Next] to complete upgrading.

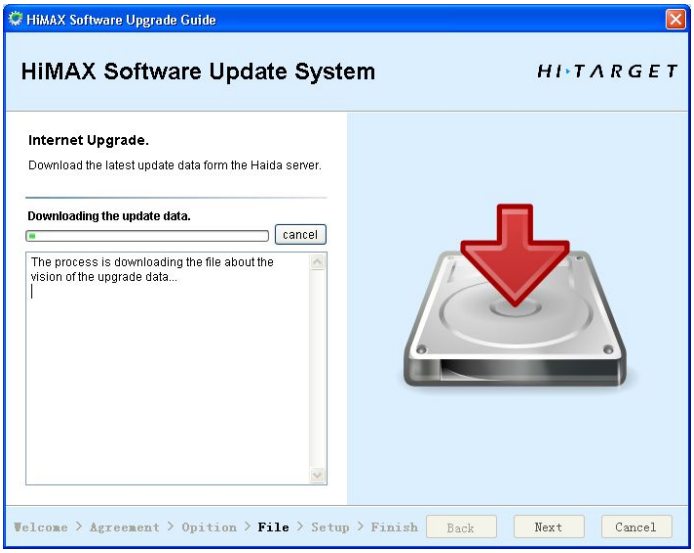


Figure 21-4 Obtain upgrading file

Attention: If the latest version of the software are issued, software upgrading can be performed through online upgrading.

Conclusion of This Chapter

Hi-MAX Sounder software support local and online upgrading. For local upgrading, please download the latest installation or upgrade software from the official website. You have to get access to Internet for online upgrading. During software installation, please close related antivirus software to avoid unnecessary troubles for software installation. For any questions, please consult local agencies of HI-TARGET. We will provide you with services wholeheartedly!