

## EasySail Software User Manual

MAKES YOUR WORK MORE EFFICIENT © 2024

## CHENAV REVISIONS TO THE MANUAL

### Document Number: CHCNAV-SMSC-EasySail-V1.4.0-20241011

Date Of Revision	Number Of Revisions	Revision Personnel	Illustrate
2023.09.01	1	Richard Lee	The initial version of V1.0 only includes a single-beam topographic survey module
2024.09.29	1	Richard Lee	V1.4.0 software release, including single-beam topographic surveys and ADCP hydrological surveys



## CHENAV PREFACE INSTRUCTION MANUAL USE

Welcome to use the *EasySail* software instruction manual of Shanghai CHCNAV Navigation Technology Co., Ltd. (hereinafter referred to as CHCNAV or CHCNAV Navigation), which is applicable to the APACHE series USVs produced by Shanghai CHCNAV Navigation Technology Co., Ltd(APACHE No. 3, APACHE No. 3 Pro, APACHE No. 4, APACHE No. 4 Lite, APACHE No. 6) and its D230/D270 single-beam sounder carry out a series of operations such as hull connection, single-beam data acquisition, single-beam data post-processing, and data result export through *EasySail* software. At the same time, it is also connected to the D270 single-beam sounder through *EasySail* software for route planning, data collection, data post-processing, data results export and other operations.

#### **INTRODUCTION TO THE MANUAL**

This manual is an introduction to the software operation process of the USV or single-beam sounder produced by Shanghai CHCNAV Navigation Technology Co., Ltd. for single-beam underwater topographic survey through *EasySail* software.

#### **EXPERIENCE REQUIRED**

In order for you to better use *EasySail* software, CHCNAV Navigation recommends that you read this manual carefully. If you don't know more about CHCNAV Navigation *EasySail*, please contact CHCNAV Navigation Company for more services according to the above contact information.

## HOW TO CONTACT CHCNAV

Service Hotline	400-620-6818
Company name	Shanghai Huace Navigation Technology Co., Ltd
Headquarters address	Huace Spatiotemporal Intelligent Industrial Park, Xianghuaqiao Street, Qingpu District, Shanghai
Base address	Huace Spatio-temporal Intelligent Science and Technology Innovation Park, Guandong Street, Jiangxia District, Wuhan City, Hubei Province
Front desk hotline	021-51508100

Website: https://www.huace.cn/

For all of your customer service needs, including our emergency round-the-clock technical support, please call 400-620-6818 (Line 5)

Use our online customer portal https://www.huace.cn/ and click on the support link to download manuals, firmware updates, software, or other CHCNAV-related documentation.

## **CONVENTIONS USED IN THIS MANUAL**

The conventions used in this document are designed to help you learn how to use the system quickly and easily.

Software menu items are printed in bold: File menu, collect data. Items or keys that require user typing will appear as F1. If a key combination is connected to a plus sign (ALT+F), you will hold down the first key while pressing the second key. Italics include program name (*EasySail*) and file name (*default.txt*).

The code or sample files are printed with a fixed font. Here's an example:

Equipmentmodel:RiverStar600kHz

Firmwareversion:1.0.6

Serialnumber:

#### **SAFETY TECH TIPS**

## **ONOTES:**

The content of the tips is generally a special place for operation, which needs your special attention, please read carefully

## **Warning:**

If you do not follow the warning, it will cause damage to the instrument, loss of data, and system crash, and even endanger personal safety

## Tips:

This symbol indicates other information that can help you avoid problems or should be taken into account while using the said feature

### **IMPRINT NOTICE**

This manual is copyrighted by Shanghai CHCNAV Navigation Technology Co., Ltd., and the company has the right to treat it as confidential information. The Company reserves the right to change this manual, and the specifications of the product, equipment, or software described in this manual without notice.

#### **EXCLUSION OF LIABILITY**

Please be sure to read the instruction manual carefully before using this software, which will help you better use this software. Shanghai CHCNAV Navigation Technology Co., Ltd. shall not be liable for the losses caused by your failure to operate the software in accordance with the requirements of the instruction manual, or the misoperation of the software product due to your failure to correctly understand the requirements of the instruction manual.

Shanghai CHCNAV Navigation Technology Co., Ltd. is committed to continuously improving the software functions and performance, improving the quality of service, and reserves the right to change the content of the instruction manual without prior notice.

We have checked the consistency of the content described in the printed materials with the hardware and software, but we do not rule out the possibility of deviations, the drawings in the instruction manual are for reference only, if there is any discrepancy with the software, please refer to the latest version of the software.

## **TECHNOLOGY & SERVICES**

If you have any technical questions, you can call Shanghai CHCNAV Navigation Technology Co., Ltd., and we will answer your questions in a timely manner.

#### **RELATED INFORMATION**

You can find the manual in the following ways:

- 1. Obtained by contacting Shanghai CHCNAV Navigation Technology Co., Ltd.
- Enter the official website of Shanghai CHCNAV Navigation Technology Co., Ltd., and download it by yourself through <u>Service and Support - Download Center - Marine Surveying and</u> <u>Mapping - Brochure / User Manual</u>

### YOUR SUGGESTION

If you have any suggestions and comments on CHCNAV Navigation *EasySail* software, please contact us. Your feedback will greatly improve the quality of our products.

## HISTORICAL SOFTWARE RELEASE DESCRIPTIONS

#### EasySail V1.4.0 update content:

- 1) CORS Login Add SWAS access point
- 2) Added A4-Lite, A6-V1.1 ship types
- 3) Coordinate System Automatically acquires the central meridian
- 4) Coordinate System Grid file import is supported
- 5) Measuring ruler supports two-point measurement and multi-point measurement
- 6) Support one-key linking (no need to open the remote control assistant)
- 7) Single-beam measurement supports the display of 300,000 trajectory points
- 8) Added a video view display and blank switch
- 9) Target points are marked in blue (Auto Sail mode)
- 10) Hydrographic Surveys Add Clock Mechanism
- 11) Polygon point saving is supported
- 12) Clear waypoints and polygon points
- 13) Added ship type setting function
- 14) Voyage control function, add a secondary confirmation box
- 15) Fix known issues



1.	SO	FTWA	<b>ARE OVERVIEW.</b>	•••••	••••••		
	1.	BRIEF	LY				
	1.1	SOF	TWARE OPERATING	ENVIR	RONMENT		14
	1.2	SOF	TWARE INSTALLATI	ON / U	NINSTALLATION /	DATA CLEA	RING15
	1.3	SOF	TWARE FILE DESCR	IPTION	1		
	1.4	ACC	OUNT LOGIN				
2.	DE	VICE	CONNECTION	•••••	•••••		21
	2.1	4G N	10DE TO CONNECT	USV			
	2.2	LAN	MODE TO CONNEC	T USV			
	2.3	D270	) SINGLE BEAM SOU	NDER	CONNECTION		25
3.	ТО	POGF	RAPHIC SURVEY	MOD	OULE		
	3.1	TOP	OGRAPHIC SURVEY	QUICK	K JOB GUIDE		27
	3.2	PRO	JECT MANAGEMEN	Г			
	3.3	CRE	ATE A NEW PROJEC	Г			
		3.3.1	INTRODUCTION	ТО	TOPOGRAPHIC	SURVEY	<b>ENGINEERING</b>
			PARAMETERS				
	3.4	DEV	ICE SELF-TEST				
	3.5	TOP	OGRAPHIC SURVEY,	ROUT	E PLANNING		
		3.5.1	HAND DRAWN RO	UTES			
		3.5.2	POLYGON ROUTE	DRAW	ING		
		3.5.3	TRACKS GENERAT	e pol	YGONS		
		3.5.4	IMPORT THE FILE.				
	3.6	ROU	TE EDITING				
	3.7	TOP	OGRAPHIC SURVEY	MAIN	INTERFACE		
	3.8	PAR	AMETER SETTINGS				
		3.8.1	RECORD CONTROL	L			
		3.8.2	SOUNDER SETTIN	GS			
		3.8.3	GENERIC - SHIP CO	ONTRO	DL SETUP		
		3.8.4	GENERAL - SYSTE	M SET	TINGS		

	3.8.5	GENERIC -CORS LOGIN	
	3.8.6	GENERIC - GNSS REGISTRATION	55
	3.8.7	GENERAL - MAP/BOOM SETTINGS	
	3.8.8	MAP/VIDEO SWITCHING	57
	3.9 EXT	TENDED FUNCTIONALITY	
	3.9.1	CUSTOM SERVERS	
	3.9.2	VIDEO TUTORIALS	
	3.9.3	SHARE PROJECTS/LOGS	59
	3.9.4	SHARE CODE TO OBTAIN/DOWNLOAD DATA	
	3.10 TEH	RRAIN DATA OUTPUT AND PROCESSING	64
	3.10.1	DETAILED EXPLANATION OF POST-PROCESSING FUNCTIONS	
4.	HYDRO	GRAPHIC SURVEY MODULE	75
	4.1 A Q	UICK WORK GUIDE FOR HYDROGRAPHIC SURVEYS	76
	4.2 PRO	DJECT MANAGEMENT	77
	4.3 CRI	EATE A NEW PROJECT	78
	4.4 DE	VICE SELF-TEST	80
	4.5 RO	UTE PLANNING	82
	4.6 RO	UTE EDITING	
	4.7 HY	DROGRAPHIC SURVEY MAIN INTERFACE	85
	4.8 HY	DROGRAPHIC SURVEY PARAMETER SETTINGS	87
	4.8.1	WORKING PARAMETER SETTINGS	
	4.8.2	SITE INFORMATION SETTINGS	
	4.8.3	GENERAL SETTINGS	
	4.9 HY	DROLOGICAL DATA OUTPUT AND PROCESSING	
	4.9.1	FLOW RATE FILE	
	4.9.2	FLOW AGGREGATION	
	4.9.3	DATA EXPORT AND SHARING	
	4.9.4	REAL-TIME OUTPUT	
	4.9.5	HISTORICAL DATA BACKTRACKING	
5.	SOFTW	ARE SETTINGS	95

5.4	IMPRINT	 	 

# CHCNAV EASYSAIL

## **1. SOFTWARE OVERVIEW**

This section describes the features of *EasySail* software and the minimum installation

requirements



## 1. BRIEFLY

*EasySail* is an USV industry application measurement and control software independently developed by CHCNAV, which is designed to be used by all USVs in APACHE series. Support topographic and hydrographic surveys. Topographic surveys support surveying mode, hydrological mode, semiautomatic, and fully automatic survey modes. Hydrographic surveys support mapping and hydrographic models. Enables USVs to automate measurement operations to adapt to the complex needs of various scenarios. At the same time, it supports 4G and data transmission connection, Acoustic Doppler Flow Profiler (ADCP) current measurement, single beam sounder, Hikvision camera video transmission, route planning, virtual hoverstick, CORS login, GNSS registration, SI unit switching and other functions.

## **I** Tips:

This guide covers EasySail 1.4.0 version



Click here to connect

Figure 1.1: The main page of the EasySail software

## **1.1 SOFTWARE OPERATING ENVIRONMENT**

The software only supports Android system, supports EC10 remote control and some tablets and mobile phones, Android 9 or above system, resolution 1920x1080.

Support products: APACHE series USV, CHCNAV D270 sounder.

Support locale: Chinese simplified, Chinese traditional, English, Russian, the software will automatically switch languages according to the current system locale, switch the system locale during the software operation, you need to restart the app;

## A Notes:

At present, many functions of the software require a mobile network, and the use of USVs also requires a network to provide network RTK services, so please ensure that you are in an environment where the network is available when using this product.



## **1.2 SOFTWARE INSTALLATION / UNINSTALLATION /** DATA CLEARING

#### 1. Download and install

To download the software installation package, please visit the official website of CHCNAV: www.huace.cn. After downloading the APK file, you can directly double-click to install it;

#### 2. Software Permissions

In order to ensure normal use, the current software requires customers to open some permissions, including location and storage permissions, and floating window permissions are also required to open the map interface.

#### **3.** Uninstall instructions

Uninstalling the software will simultaneously delete all data (engineering data, record control parameters, sounder parameters, etc.) including satellite map tile data, device connection information, custom server, route engineering, etc.

#### 4. Clear Data Description

Using Android to clear the history data will clear all cached application data of the software, including account login information, software engineering, CORS and SWAS information, permission acquisition, logs, etc., the software will be restored to the initial installation state, and you need to log in again, and SWAS and CORS also need to be actively connected.

## A Notes:

In order to ensure the normal access to the location of the remote control, be sure to turn on the positioning permission and function;

In order to ensure normal data saving and recording and shooting functions, you need to turn on the file storage permission.

## **1.3 SOFTWARE FILE DESCRIPTION**

After the current software installation and use, the storage address for project files is:

#### 1) EC10 remote control

The EasySail folder in the root directory, including jobs and logs

#### 2) Other Android devices

Android/data/com.huace.easysail

	/	= /\4	常業 ■ 5:15
<b>闪见</b>	・・ 内部存储 > And	'대회 droid 〉 data 〉 com.huace.easysail	Q
~ IQ#XIT	( <del>+</del> )	按时间排序▼	00
	6.5 files 音频 刷刷 - 8	Iģ	> 6
位置	cache 2022/12	/09 - 5 项	>
<b>内部存储</b> 46.5 GB 可用/1	28 GB >		
4 我的云盘	>		
■ 网络邻居	>		
<b>面</b> 最近删除	22 项 >		
来源		) 浏览	③ 我的

Figure 1.2: Internal storage of the EC10 remote control

#### 1) Cache

It mainly stores cached map tile data, including plane data and map label data;

#### 2) files

Other data generated during the operation of the software.

#### 证州与世史勇鼓

$\leftarrow$	我的平板	Q
我的平	板 〉Android 〉 data > com.huace 〉 files	
(Ŧ	按类型排序 ▼	00
	<b>boat_param</b> 2023/10/30 - 6 顶	>
	coordinate_system 2023/10/30 - 6 项	>
	<b>default_format</b> 2023/10/30 - 1 项	>
	<b>easysail_res</b> 2023/10/30 - 3 顶	>
	jobs 昨天 - 4 项	>
	jobs_adcp 昨天 - 39 项	>
	<b>logs</b> 上午 9:27 - 35 项	>
	<b>temp</b> 上午 11:36 - 1 项	>



#### 1) easysail\_res

software prototypes and map profiles;

2) jobs

Topographic survey project directory, each route project is a folder, and the folder name is the route name;

#### 3) jobs\_adcp

Catalogue of hydrographic survey projects, each test project is a folder;

4) logs

The software operation log, which records the abnormalities during the voyage will be recorded in the log;

5) fpv

Folder for photo, video and video storage. in the corresponding project directory under jobs;

6) boat\_param

Store ship control parameter files (.param);

7) coordinate\_system

Storing coordinate system files;

8) default\_format

Deposit user-defined files;

#### 9) temp

Temporarily stored file data, which can be ignored;

## Notes:

After the project is saved, the result file of shooting and video recording is stored in the following path:

#### **1.** EC10 remote control

*EasySail/jobs/The name of the project file/fpv* 

#### 2. Other Android devices

Android/data/com.huace.easysail/jobs/The name of the project file/fpv

## A Notes:

The default path of the data post-processing file export and the file downloaded by the share code is

as follows:

- 1. File export path: [1A CHCNAV Export Folder] in the root directory;
- 2. Sharing code download path: [1A CHCNAV sharing code folder] in the root directory.

## **1.4 ACCOUNT LOGIN**

At present, the software can be used for CHCNAV cloud account registration and login, and under the premise that the network is available, you can directly use the mobile phone number verification code to register and log in. Click the **[Settings]** button on the upper right of the main interface to enter the login interface.

## Tips:

You will need to log in again after 30 days of login.

<	Login	
	ACCOUNT PHONE NUMBER	
	Please enter your email/mobile phone number	
	Please input the password 💋	
	LOGIN	
	Register Account Reset Password	
	Click the login button means you already agree User Agreement And Privacy Policy	

Figure 1.4: CHCNAV account mobile phone verification code login

<	Login	
	ACCOUNT PHONE	
	+86 • please input the p	hone number
	Please input the verification code	Send
	LOGIN	
	Register Account	
Click the lo	ogin button means you already agree <u>User</u>	Agreement And E

Figure 1.5: CHCNAV account account password login

# CHCNAV EASYSAIL

## **2. DEVICE CONNECTION**

This chapter introduces the EasySail software for the connection of APACHE series

USVs, single-beam sounders, RiverStar series ADCP and other equipment



## **2.1 4G MODE TO CONNECT USV**

- The remote control is connected to a 4G network, such as a mobile phone hotspot or inserted a SIM card, to ensure that the Internet can be accessed normally;
- Select the corresponding server, enter the SN number (that is, the serial number on the GD100), password (Admin1234) and other information, and click Connect.
- 3. To view the camera image, you need to check the video access to CHC cloud and enter the camera serial number (that is, the serial number on the Hikvision label in the cabin)

USV Ma	pping D270	Echo Sounder	
	22,0		
Connect Methods	4G 🗸	Lan	
Remote Server	International Server	-	
Username	3352802	•	
Password		ø	
Video Access	e 💿 CHC Cloud (	) None	
	CONNECT		

Figure 2.1: Unmanned ship 4G mode connection page

After entering the basic information, click to connect, if the connection fails, the software will pop up a dialog box "**Connection failed, please check the 4G antenna, ESIM card dial-up and data plan, etc.**", you can follow the dialog box prompt text, check in turn.

## **L** Tips:

#### http://service.huace.cn/rechange?sn=

Enter the SN number of GD100 after [=], and you can query the remaining traffic of the current ESIM card, the expiration of the package, and support direct online recharge through this link.

<	Device Connection
	USV Mapping D270 Echo Sounder
	Device Connection
	Failed to connect, please check the 4G antenna and SIM card
	CONNECT

Figure 2.2: The USV 4G mode connection failure pop-up window



## **2.2 LAN MODE TO CONNECT USV**

- If the current device is an EC10 remote controller for Android, select the EC10 remote control type, otherwise select M12 (need to connect to the WiFi of the USV, WiFi name: APACHE 2.4G-XXXXXXX);
- 2. The remote control turns on the Ethernet switch, and the network segment must be 144;
- 3. Unmanned ships must be equipped with 2 RC antennas;
- 4. The 2 antennas on the remote control are recommended to be placed vertically upwards to help the signal reception;
- 5. In the straight direction of the USV and the remote control, there can be no obstruction;
- If you want to view the camera image, select Video Access, and the image is transmitted to the EC10 remote control through the 144 network segment, which has a lower latency and is smoother.

C Device Connection
USV Mapping D270 Echo Sounder
Connect 4G Lan
Remote Control O EC O M
Video Access () Access () None
CONNECT

Figure 2.3: USV LAN mode connection page

## **2.3 D270 SINGLE BEAM SOUNDER CONNECTION**

- 1. Android devices are connected to D270 WiFi
- 2. Just click the Connect button

<		Device C	onnection		
	USV Map	oping	D270 Echo Sounder		
	IP	192.168.	53.27		
	Port	10002			
		CON	NECT		
Figure 2.4	D270 Sin	igle Bea	am Sounder cont	nection page	

# CHCNAV EASYSAIL

## **3. TOPOGRAPHIC SURVEY MODULE**

This section describes the specific features in the topographic survey module of the

EasySail software



## **3.1 TOPOGRAPHIC SURVEY QUICK JOB GUIDE**

#### The topographic survey quick operation steps are as follows:

- 1. The USV is turned on, the remote control is turned on, and after waiting for 1-2 minutes, operate the remote control handle to check whether the motor is rotating;
- 2. Open the *EasySail* software, connect the USV, after the connection is successful, the USV is launched, and the USV is manually controlled at full speed for 5 seconds to complete the initialization of the USV;
- 3. Then click [Topographic Survey] to enter the project list interface;
- 4. Create a new project or open an old project to enter the main interface of the satellite map;
- 5. View self-test information, connection status, etc.;
- 6. Plan the route and upload it;
- Start Operation: Switch to automatic sailing mode and click [Start Recording Button] to officially start the measurement operation.



## **3.2 PROJECT MANAGEMENT**

The project management interface can display all the saved projects, click **[Project Route]** to enter the project management interface, the interface displays the list of all tasks that have been created, each route task label contains the name, route type, creation time, update time and operation location, click the label to open the route task, open the project to enter the map interface, and enter the management mode through the **[Manage]** button to multi-select, delete, copy, or share the project file. When you need to search for a specific task, you can enter the **name of the search task in the [Search Box]** to support fuzzy queries.



Figure 3.1: Topographic Survey Project Management List

## **3.3 CREATE A NEW PROJECT**

The steps of a new topographic survey project are as follows:

Click New Project, set the coordinate system, you can select the commonly used coordinate system, and the common coordinate system interface can select the saved common coordinate file, or you can delete the file;

#### 1. Scan the QR code

Scan the generated QR code to read the coordinate system parameters of other devices;

2. Customize

Enter the coordinate system parameter interface; Set the coordinate system parameters according to the requirements;

#### 3. Predefine

Enter the predefined coordinate system interface, and you can select the required coordinate system according to the continent and region;

#### 4. Import from a file

Import .*crd or .dc* file to import the coordinate system.

<		New Project		
	Name	Area_20241015101830		
	Apply Project			
	Арріу Рюјест			
	Coordinate	WGS84	>	
		CONFIRM		

Figure 3.2: The start page of a new project



< Com	non Coordinate ••	•
China CGCS 2000	Scan QR	
China Vian 90	Load from file	
Asia/China	Custom	
China Beijing 54 Asia/China	Predefine	
WGS84 Asia/China		0
DELETE	NEXT	

Figure 3.3: Select a coordinate system for a new project

<		Predefine Coordinate	
Groups	User		~
Region	Admin		~
List			
China CGCS 2000			<b>e</b>
自定义坐标系			0
China Xian 80			0
WGS84			0
DELETE		DETAILS	CONFIRM

Figure 3.4: Predefined coordinate systems

#### 

<			•••	
	Name		WGS84	Create QR
	Ellipsoi	d Projection	Datum trans Horz. adjustment Vert. adjustment Ad	Scan QR
		Туре	WGS84	From comment CRS
		а	6378137.0000000	Save to comment CRS
	1/f Positive direction		298.2572235630	Load from file
			North-East	Share crs
				_
			CONFIRM	

Figure 3.5: More operations on coordinate system parameters

The coordinate system parameter interface can be customized for the coordinate system, and the setting items are: ellipsoid, projection, datum conversion, plane correction, elevation fitting, and correction parameter setting, which can customize the coordinate system according to user needs;

1) Create QR

Generate a QR code for the currently set coordinate system;

2) Scan QR

Scan the generated QR code to read the coordinate system parameters;

**3)** From comment CRS

Enter the common coordinate system module, and you can directly select the commonly used coordinate system;

4) Save to comment CRS

Save the current coordinate system parameters to a common coordinate system;

5) Load from file

Import coordinate files from local directories to read directly; Support file search;

6) Share CRS

You need to log in to your CHCNAV cloud account before you can share the coordinate system; Generate a 4-digit sharing code, which can be read by using the CHCNAV sharing code tool on the PC side to read the shared coordinate system parameter file, and the sharing code is valid for 30 minutes;

<	New Project
Name	Area_20241015102038
Apply P	roject
Coordin	ate Hand-drawn Import File
	CONFIRM
	Save Successfully

Figure 3.6: Generate route mode

#### 1. Create a new project

The new project supports two scenarios for route planning, i.e., hand-drawn routes and imported files.

#### 2. Import the file

Currently, the software import file supports waypoint files (*.waypoints*), polygon files (*.poly*, *.kml*, *.kmz*, *.dwg*, *.dxf*). ) to create a route mission or polygon shape.

## A Notes:

The import file does not support too many waypoints (up to 500 points), the area is too large, and any 2 points are larger than 10km, which cannot be generated.

#### 3.3.1 INTRODUCTION TO TOPOGRAPHIC SURVEY

#### **ENGINEERING PARAMETERS**

#### 1) Source ellipsoid

Default WGS84. The ellipsoid here is the target ellipsoid, and you can select the appropriate ellipsoid name from the drop-down list according to your project requirements.

#### 证价4世更勇敲



<				Coordinat	te Param		
	Name			China CGCS 2000			
	Ellipsoi	Ellipsoid Projection		Datum trans	Horz. adjustment	Vert. adjustment	Adjust parameters
		Туре		China CGCS2000			~
		a 1/f		6378137.0000000			
				298.2572221010			
		Positive direction		North-East			~
				N	хт		

Figure 3.7: Coordinate System Parameter - Ellipsoid

#### 2) **Projection**

Select the projection method from the drop-down list as needed, and change the central meridian, dimension origin, average latitude, length ratio, east plus constant, north plus constant, and projection surface height.

		Coordinat	e Param		
	Name	China CGCS 2000			
Ellipsoid	d Projection	Datum trans	Horz. adjustment	Vert. adjustment	Adjust parameters
	Туре	Customized Gaussian			$\checkmark$
				Obtain the central meridi	an
	Central meridian	117:00:00.000000E			
	Origin latitude	000:00:00.000000N			
	Scale factor	1.0			
	False easting[m]	500000.0			
	False northing[m]	0.0			
	Average latitude	000:00:00.0000000N			
		NE	хт		

Figure 3.8: Coordinate System Parameters - Projection

## Tips:

After EasySail is updated to version 1.4.0, the function of [Get Central Meridian] is added to the

**position of the input central meridian**, which can obtain the local central meridian of the device in the case of star search.

3) Datum trans

In the conversion model, you can select Bursa seven-parameter/three-parameter/strict sevenparameter/grid, and you can also set the coordinate transition mode to XYZ constant/BLH constant

<			Coordina	te Param			
	Name		China CGCS 2000				
	Ellipsoid	Projection	Datum trans	Horz. adjustment	Vert. adjustment	Adjust parameters	
	Туре		No transformation			~	
	Coordin mode	ate transition	From ECEF XYZ			$\sim$	
			N	EXT			

Figure 3.9: Coordinate System Parameter-Datum Conversion

#### 4) Horizon adjustment

The conversion model of the horizontal adjustment can be selected from the ordinary fourparameter and TGO horizontal adjustment. It also supports selecting or externally importing horizontal grids north/east



<		Coordinate	e Param		
	Name				
Ellipso	id Projection	Datum trans	Horz. adjustment	Vert. adjustment	Adjust parameters
	Туре	No adjustment			~
	Method	Bi-linear			$\sim$
	North grid file	None			IPORT
	East grid file	None			IPORT
		NE	хт		

Figure 3.10: Coordinate System Parameters - Horizon adjustment

#### 5) Vertical adjustment

The fitting model can choose from fixed deviation, plane fitting, surface fitting, and TGO vertical adjustment. The geoid model can be selected as none EGM96.ggf, ARM\_GEOID\_GEO.ggf, sa2010.grd. The interpolation methods can be bilinear interpolation, spline interpolation, or quadratic interpolation.

<		Coordinat	e Param		
	Name	China CGCS 2000			
Ellipsoid Projection		Datum trans	Horz. adjustment	Vert. adjustment	Adjust parameters
	Fitting method	No adjustment			~
	Geoid file	None		✓ ⑦ M	PORT
	Method	Bi-linear			~
		NE	ХТ		

Figure 3.11: Coordinate System Parameter-Vertical adjustment

#### 6) Adjust parameters

You can set offsets such as north/east/elevation. CHCNAV EasySail V1.4.0 User Manual | 2024-10 | V1.0

## 证作出更高级

### 

< Coordinate Param						
Name		Ch	ina CGCS 2000			
Ellipso	id Pro	jection	Datum trans	Horz. adjustment	Vert. adjustment	Adjust parameters
-	dN	0.0	)			
	dE	0.0	)			
	dH	0.0	)			
NEXT						

Figure 3.12: Coordinate System Parameters – Adjust parameters


# **3.4 DEVICE SELF-TEST**

Cł	Connect	ed Manual	4						
		Check List	×	20	1000	Pro Name	Area 202	241016093902	1
L	ISV Signal	≜.all	1/1	-					
0	NSS Status	Single / 29	社法	40		Work Mode	Survey		
0	NSS Registration	2099/12/31 Normal		TE		Generate Po	olygons By Trac	ks START	
S	ounder	Normal						REVERSE	WPS
N	lotor	Initialization	ITE			✓ Waypoints	List	IMPORT F	FILE
C	bstacle Module	Normal				i indypointe			
			28.630 137 m	m	Elevation 33.628 m	寺			
			ome D	ISI	1065 16 km				

Figure 3.13: Topographic Survey Equipment Self-Test Page

#### 1) Ship control 4G network signal

Real-time display of USV ship control network quality,  $\geq 95\%$ , full grid (5 grids) display;  $\geq$  95%, full grid (5 grids) display;  $\geq$ 85%, 4 grids;  $\geq$ 70%, 3 grids;  $\geq$ 60%, 2 grids;  $\geq$  50%, 1 grid display; Other, 0 grids are displayed.

#### 2) **GNSS solution mode**

Locate the solution state, including single point (red), floating (floating) and fixed (green) modes.

#### 3) GNSS registration

If the expiration time is greater than 48 hours, [Expiration Date + Normal] is displayed, which is indicated in green. If the expiration time is less than or equal to 48 hours, [Expiration in 2 days + expiration date] is displayed, which is indicated in yellow. If the expiration time is less than or equal to 24, [Expiration in 1 day + expiration date] is displayed, which is indicated in yellow. If it expires, it displays Expired, indicated in red.

#### 4) Sounder

The connection is successful, and it is shown in green.

5) Motor

The connection is successful, and it is displayed in green; The first connection will show an abnormality, push the longitudinal rod to check the wind direction and power of the motor, and

it will turn green.

#### 6) **Obstacle avoidance module**

The connection is successful, and it is shown in green.

# **3.5 TOPOGRAPHIC SURVEY, ROUTE PLANNING**

# 3.5.1 HAND DRAWN ROUTES

At present, the operation steps of the new route are as follows: click the map once to generate a task point, click the map multiple times to generate the task point one after another, and confirm the navigation position and direction according to the order of clicking to generate; You can increase the quest points by dragging the [+] point on the route. You can also switch the task point properties [mission point (green), sampling point (purple), home point (red), hover point-unlimited (yellow), hover point-time (yellow), hover time can be set according to your needs] in the drop-down box of the route list point properties.



Figure 3.14: Point properties

# A Notes:

Click the [ «] button on the right side of the software page to expand the waypoint list for editing.

# 3.5.2 POLYGON ROUTE DRAWING

The current logic of generating a route after creating a polygon is to click on the map once to generate a polygon boundary point, click three times in a row to generate a triangle, and click the map again to continue to add polygon boundary points. When the edit polygon button on the left is selected, you

can move it by dragging and dropping, or you can delete the selected point (click to select the polygon point to delete the point, and click the single-point delete button);



Figure 3.15: Polygon programming

After confirming the polygon range, you can click the generate button on the right side to generate the default route. You can also modify the route by setting the route direction angle, route spacing, start point, and polygon expansion.

# 3.5.3 TRACKS GENERATE POLYGONS

In the route editing mode, click the [Start] button on the right side of the trajectory generation polygon, and then manually control the USV to run a lap along the boundary of the survey area to automatically generate a closed polygon area.



Figure 3.16: Trajectory Generation Polygon - Start

CHCNAV	Connected	Manual	<b>≜.⊪ ∢</b> 3	3 💮 Single	91% 0% 36.4v 0.0v	@ 4.82km	🛇 30ms	•••
00	⊗ 🗊		(Hereit)		» Route name	Area_202 5	240129234	130
•					Work mode	Surv	ey	•
÷-		i i	3-	T	Generate po tracks	lygons by	FINIS	Н
	EB	HELL P	HE.	E			REVERSE	WPS
	山民办幼儿		1				IMPORT	FILE
青山社区	志治		10		Polygonal ro	ute planning	GENER	ATE
2.0		Northing	3456195.773	3m Water	s Route directi	ion angle(°)		
3.0 4.0 5.0 Gain : 9	Pitch -3.49°	Roll Depth 0.28° 0.35m	Target 0m	dist Targe 0	0	360	- 177	+
		•	(					

Figure 3.17: Trajectory Generation Polygon-End

Click the **[End]** button, and then click the **[Generate]** button by setting the route direction angle and route spacing to generate a preset route within the polygon area.



Figure 3.18: Adjusting the Direction Angle/Distance Between Routes

# 3.5.4 IMPORT THE FILE

When creating a new project for the first time, select Import File, which supports waypoint files (*.waypoints*) and polygon files (*.poly*, *.kml*, *.kmz*, *.dwg*, and *.dxf*). ) and so on to create route tasks or polygon graphics;

# A Notes:

The import file does not support too many waypoints, and the maximum number of waypoints is 500.



Figure 3.19: Freehand Route/Import File

In addition, in edit mode, in the waypoint list on the right, click the [Import File] button to import the file.



Figure 3.20: Importing files in edit mode

# CHENAV 3.6 ROUTE EDITING



Figure 3.21: Topographic Route Edit Page Function Buttons

#### 1) Mark the Home point

After entering the editing mode, click the button to switch to the selected state, and click the map again to generate the Home point.

#### 2) Mark the point at the current position of the ship

If the USV is connected and the software is in edit mode, click the button to generate a task point at the current USV location.

#### 3) Delete a point

After selecting a waypoint on the map or selecting a polygon boundary point in polygon drawing mode, the selected point is surrounded by a circle of white, and click the button to delete the point.

#### 4) Clear all points

Click this button and a pop-up window will appear, select the type of point (task point/polygon point) that needs to be cleared.

#### 5) Save the route

Click this button to save the route. After the route is saved, the measurement operation can be started normally.

#### 6) Upload routes

Click this button to upload the drawn mission route to GD100. CHCNAV EasySail V1.4.0 User Manual | 2024-10 | V1.0

#### 7) Download routes

Click this button to re-download the mission route in GD100 to the EasySail software.

#### 8) Draw polygons

Click this button to draw polygon range lines in the software.

#### 9) Add hop points

The hop point setting is located in the route list, and you can set its on/off state, and modify the starting point number and the number of cycles.

∧ Waypoints List
Add jump point
Jump to target point 1
Loop Times 5
Figure 3.22: Hop point information

# **3.7 TOPOGRAPHIC SURVEY MAIN INTERFACE**

Press and hold the icon to display the function information of the current icon.



Figure 3.23: Topographic Survey Start Survey Page Function Button

#### 1) Sail to the Home point

After clicking, the USV switches to the return state, and automatically sails to the set home point;

2) Sail here

After clicking the button, switch to the selected state, click the map, and the G point will be generated, and the USV will switch to the guidance mode and drive towards the G point, and click the map again to change the location of the target point. Click **the [Sail Here]** button again and switch to unselected to turn off the navigation guidance setting, but the USV will complete the last guidance task.

#### 3) Set the target point

Clicking this button will display the current task point list in a drop-down manner, select the corresponding mission point number, and the USV will sail to the number position (note: you need to switch to automatic mode).

4) Next target point

Click this button to sail the USV to the next target point.

5) Re-task

By clicking this button, the USV returns to point 1 and starts the mission again, sailing from point

1 to the last mission point.

#### 6) Start/end recording

Click this button to start/end the recording data, and the record number information below will display the number of the recording point in real time.

#### 7) Edit the route

When creating a new project, you will enter the map interface, and at this time, it will be in the edit route mode, and the user can operate the route (draw waypoints, delete waypoints, upload, download, etc.).

#### 8) Map settings

Click the Change button to set map tracking and map rotation

#### 9) Layer

Click this button to display the layer options, including route routes and record points, which can be manually checked and unchecked. If you cancel, you can hide the corresponding layer information on the map.

#### 10) Ruler

Click the button to select it. At this time, you can click any 2 points on the map to see the record and direction angle between the 2 points in real time. Click the button again to cancel the display.

#### 11) Bell

The real-time message will automatically pop up and be displayed. There are 2 types of real-time messages: one is long-standing, such as [system initialization, full speed navigation 5s], this message must be processed to automatically disappear within 5s, if you ignore it all the time, the message will always exist. The other is a temporary prompt, which will automatically disappear within 5s after popping up, such as [Shoal alarm, please drive away from the area]. Disappearing messages will appear in the bell message list. The list of messages can pop up by clicking the bell button, and if you want to close the list, you can click the bell button again.

#### 12) Automatic/manual switching

Toggle between automatic and manual sailing modes.

#### **13)** Hover/unhover toggle

Toggle hover and unhover mode.

#### 14) Real-time messaging

Real-time messages pop up automatically. See No. 11.

15) Hoverrocker

Control the throttle and direction of the USV. In the general settings bar, you can set the display and shade. This stick can only be displayed after the route has been saved.

#### 16) Sounder waveform view

Real-time display of the sounder waveform.

#### 17) Millimeter-wave radar view

Real-time display of the angle and distance of obstacles ahead. Below is the sailing attitude of the USV: pitch and roll.

#### 18) Common sensor information bar

Longitude and latitude, earth height, speed, water depth, target point distance, target point, record number.

#### 19) Camera

Real-time preview of camera image transmission.

#### **20)** Connection status

Real-time display of the connection status of the current device.

#### 21) Sail mode

Real-time display of the current USV's navigation mode information.

#### 22) Unmanned ship 4G signal

Real-time display of the 4G network signal quality of the current USV.

#### 23) Search for stars

Real-time display of GPS star search number.

#### **24) GPS solution status**

Single-point, inertial navigation, floating, fixed.

25) Battery level

Remaining power and battery voltage.

26) Cruising range

The remaining battery power and the number of miles it can support.

27) Delay

The quality of the network traffic that the current device is connected to. Unit-millisecond. If the network is within 300 ms, the network is good. 300-600ms, indicating network fluctuations, communication quality is average. If the network quality is higher than 600 ms, the network quality is poor.

#### **28)** Device setup module

Click this button to pop up the device settings interface, including record control, sounder settings, boat control settings, system settings, CORS login, GNSS registration, and general settings.

# **3.8 PARAMETER SETTINGS**

# 3.8.1 RECORD CONTROL

Set the recording control parameters, and record the data in real time, which is recorded according to the current settings.

For example, if you record 1m according to the distance, you will record. The data in the *.dep* file is recorded at 1m intervals.

#### **Solution Status:**

- 1. Select Fixed only record the fixed solution and inertial navigation solution data;
- 2. Select Float only record fixed, floating and inertial navigation solution data;
- 3. Select Single Point Record all data (fixed, floating, differential, inertial navigation, single point)

#### **RMS Limitations:**

HRMS stands for *Horizontal Root Mean Square and* is a measure of positional accuracy in the horizontal direction. It represents the average deviation between the measurement and the true position under ideal conditions;

VRMS stands for *Vertical Root Mean Square and* is used to measure the accuracy of position in the vertical direction. It represents the average deviation between the measurement and the true height under ideal conditions.

# Tips:

In the actual topographic survey, it is recommended that the solution status be set to a single point solution in the process of data collection, and the RMS is not limited, and the accuracy is limited according to the requirements during the data post-processing.



Figure 3.24: Parameter Setup - Record Control

# 3.8.2 SOUNDER SETTINGS

Set the sounder parameters, and manually set the range, gain, sound velocity, and depth filtering. The setting takes effect in real time, and after setting, you can view the corresponding waveform changes in the lower left corner of the map.

1. Draft

If it is connected to an USV, the draft is bound to the ship type and cannot be manually modified. If the D270 is connected, the draft can be manually modified.

2. Velocity

It can be manually entered, and the temperature and salinity are supported to calculate the sound velocity value at the same time (only the D270 single beam sounder or the APACHE series USV equipped with the D270 single beam sounder is supported).

3. Salinity

Manual entry is possible. Units - thousandths

4. Temperature

It can be entered manually or in real time with the D270 sounder temperature sensor data.

5. Range

It supports manual and automatic, and the current water depth range can be set.

6. Gain

Manual and automatic, the sonic intensity of the current sounder transducer can be set. CHCNAV EasySail V1.4.0 User Manual | 2024-10 | V1.0 Page

#### 7. Water depth filtration

Clutter and noise point data outside of the filtering range.

	Disconnected		Sounder Settings	×
00		<u>/</u> _	Work Mode	High Freq
		m	Rate(Hz)	Max
(±)		<b>A</b>	Draft(m)	0.000
		~	Sound Velocity(m/s)	1500.000
		푝	Calculates The Sound Velocity	
	温州市政府 驻京联络处	۲	Water Temp.(°C) $\bigcirc$ Real Time Acquisition	0.00
1.		0	Salinity(‰)	0
0.0	1社区卫生	Ť	Range(m) 0 5 10 25	50 100 250
	服务站	٥	Automatic Acquisition Of Range	
	Source So	under not	connected	
			Gain	• • +

Figure 3.25: Parameter Settings - Sounder Settings

# 3.8.3 GENERIC - SHIP CONTROL SETUP

#### 1. Write parameters

The drop-down list displays the name of the ship type parameter file (*.param*), select the corresponding ship type name, and click [Write].

#### 2. Save the parameters

Click the Save button to save the current ship control parameters in a custom file (.param).

#### 3. Ship control parameter settings

Click [+] or [-] to set the ship control parameters in real time, and support manual input. Takes effect immediately.



Figure 3.26: Parameter Settings - Boat Control Settings

# 3.8.4 GENERAL - SYSTEM SETTINGS

#### 1. The shoals retreated

Function switch, turn on this function, and the USV will automatically go backwards and sail away after entering the shallows.

#### 2. Automatic obstacle avoidance

Function switch, turn on this function, the USV will automatically detour or stop when it finds an obstacle ahead.

#### 3. Lost contact and returned home

Function switch, turn on this function, once the remote control is disconnected (the distance between the remote control and the USV is far), after a period of time (lost contact time), it can automatically return home.

#### 4. Return home with low battery

Function switch, turn on this function, if the battery is low, the USV will automatically return to home.

#### 5. Remote control pairing

After the remote control is turned on, if it is not paired with the boat. This button can be used to match the remote control.



Figure 3.27: Parameter Settings - System Settings

# 3.8.5 GENERIC -CORS LOGIN

On this page, you can view the current CORS login status. You can also manually enter parameter information to log in to CORS.

CHCNAV Disc	onnected		C	ORS Login X
		/ NA (	Protocol	NTRIP
		<b>m</b>	IP	21.144.118.5
±	REE E	A	Port	2102
			Mount Points	T RTCM3.2 -
		≣ ≓	User Name	zc
	温州市政府 驻京联络处		Password	ZC
- 12075		A A		
	社区卫生		DISCONNECT	CONNECT
.0	服务站	\$	DISCONNECT	CONNECT
		A.		

Figure 3.28: Parameter Settings - CORS Login

In the connection protocol section, you can drop down to select the SWAS built-in account, and click Connect directly.



Figure 3.29: Parameter Settings - SWAS Login

# 3.8.6 GENERIC - GNSS REGISTRATION

It can display the SN number, GNSS registration period, registration code and other information of the current USV.

If GNSS expires, you can contact the technical application for a registration code, and then enter a new registration code at the registration code position in the figure below, and click the registration button to complete the registration.



Figure 3.30: Parameter Settings - GNSS Registration

# 3.8.7 GENERAL - MAP/BOOM SETTINGS

#### 1) Map source

Support day map and ARCGIS and customization.

#### 2) Virtual joysticks

Set the display and hiding of the virtual joystick. It will only appear after the project is saved.

#### 3) Display

View switching for map and video perspectives. Whether each switch is full-screen or half-screen.



Figure 3.31: Parameter Settings - General Settings



Figure 3.32: Virtual joystick

# 3.8.8 MAP/VIDEO SWITCHING

- Click the view box in the lower right corner to switch between the map and video interfaces. Half-screen switching and full-screen switching are supported. Half-screen and full-screen settings can be set on the [General Settings] interface.
- 2. Video full-screen interface, with platform rotation, photo and video recording functions on the right side. The photo and video files are stored in the FPV folder of the current project.
- 3. In the video view interface, there are play and close buttons in the center of the gimbal in the upper right corner, which can turn the video stream on and off freely.



Figure 3.33: Camera/work page half-screen



Figure 3.34: Camera full-screen page

# **3.9 EXTENDED FUNCTIONALITY**

The software provides additional extended features, allowing users to learn how to use the software through video tutorials, share software logs, share code downloads, and customize services. The collection of these modules provides users with more options and flexibility to meet individual needs and enhance the experience of using the software. Click on the upper right corner of the main interface, and you can enter the above interface in the pop-up menu.

# **3.9.1 CUSTOM SERVERS**

- 1. Click **[Custom]** in the upper right corner to add a server, including the server name, IP address, domain name, and port number;
- The newly added server will be synchronously displayed in the server options of the [Device Connection] interface;
- 3. After customizing the server, the USV webpage should also be synchronized to add the same server (system settings-N2N settings).

		Remote	Server	
		Serve	r Info	
s	Server Name	Please inpu	t server name	
11	P / Domain	Please inpu	t ip or domain	
P	Port	Please inpu	t port	
	CANCEL	-	SAVE	

Figure 3.35: Custom server

# **3.9.2 VIDEO TUTORIALS**

After entering the USV video tutorial interface, users can learn how to connect equipment, set the coordinate system, plan the route, set the equipment, and post-process the data. Video resources provide detailed demonstrations and instructions to help users quickly learn how to use the software. You can view the tutorials of different functions by clicking on different titles, you can like and

favorite the video below, and click the button at the top right to refresh, clear the cache and generate

a QR code to share with others.

		р			
请输入关键字			2		
设备连接 坐标系统	航线规划	设备设置	数据后处理	Æ	
****** 无人船连接			>		
电台连接2			>		
电台连接1			>		
	没有更多数据明	拉			
	请 → 关键字       设备连接     坐标系统       ② ① ①     无人船连接       ③ ① ①     电台连接2       ③ ① ①     电台连接2	请输入关键字           设备连接         坐标系统         航线规划            无人船连接             电台连接2              电台连接1              267000000000000000000000000000000000000	请输入关键字         设备连接       坐标系统       航线规划       设备设置         ●       无人船连接           ●       电台连接2           ●       电台连接1           ②       砂石更多数据啦	请输入关键字       2.         设备连接       坐标系统       航线规划       设备设置       数据后处理       第         @       无人船连接             @       电台连接2             @       电台连接1              2	请输入关键字       2         设备连接       坐标系统       航线规划       设备设置       数据后处理       五         ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

Figure 3.36: Video tutorial

# **3.9.3 SHARE PROJECTS/LOGS**

On the project management interface, click the word [Manage] in the upper right corner to copy, share, and delete the project.

<		0 selected			Comp	lete
Q Sear	ch Project					
	Area_20241015104142 Creation Time: 2024/10/15 Upr 北京市东城区东华门街道智德前巷北	date Time: 2024/10/15 京市第二十七中学	Path	Processing	Coordinate	$\odot$
	<b>D270_20240909111440</b> Creation Time: 2024/09/09 Up 北京市东城区东华门街道东华门大街	date Time: 2024/09/09 i64号全福德烤鸭店(故宫东门店)	Path	Processing	Coordinate	$\odot$
	<b>测区_20240717115340</b> Creation Time: 2024/07/17 Upr 北京市东城区东华门街道故宫博物院	date Time: 2024/07/17	Path	Processing	Coordinate	$\bigcirc$
	<b>测区_20240717114212</b> Creation Time: 2024/07/17 Upr 湖北省武汉市汉阳区鹦鹉街道湖北水	date Time: 2024/07/17 总水利水电建设股份有限公司汉阳专用码头	Path	Processing	Coordinate	$\bigcirc$
	🗇 Сору	↔ Share		<u>间</u> Del	ete	

Figure 3.37: Project list management model



<			1 sele	ected				Comp	lete
Q Search Project									
Area_20 Creation 北京市方	<b>241015104142</b> Time: 2024/10/15  Uj wi成医东华门街道智德前 <sup>+++</sup>	odate Time: 202	24/10/15			Path	Processing	Coordinate	0
D270_20 Creation 北京市务	<b>0240909111440</b> Time: 2024/09/09 S城区东华门街道东华门	1	Share 9	code 0	2	Path	(B) Processing	Coordinate	
测区_20 Creation 北京市名	<b>240717115340</b> Time: 2024/07/17   F 碱区东华门街道故宫神	The share of the s	ode will becom	ne invalid after .zip	30 minutes	Path	Processing	Coordinate	
测区_20 Creation 湖北省武	240717114212 Time: 2024/07/17 式汉市汉阳区鹦鹉街道湖北北	水总水利水电建	CLC	DSE 司汉阳专用码	马头	Path	Processing	Coordinate	

Figure 3.38: The share code generation pop-up window

Click the three bars in the upper right corner of the initial interface, click Share Log, or click Share Code to download. Get engineering data.

Single Beam Measurement	Discharge Measurement	Settings
		Remote Server
		Video Help
		Share Logs
	Marrie A. A.	From Sharing Code
		and the second second
	and the second s	

Figure 3.39: More settings for the main page

Select the software log of the corresponding date and share it with the technician for analysis.



CHCNAV			User Login
Single Beam Measurement		Discharge Measure	ement
	Share	e Logs	
	Select Time 2024-10-15	<ul> <li>nearly 3 days</li> </ul>	The state of the state
	CANCEL	SHARE	-
Click here to connect			

Figure 3.40: The log sharing window

Single Beam Measurement			Dischar	ge Meası	
		Shar	e code		
ALL	8	1	7	8	
	The share File: Logs_202	code will beco	me invalid after 3 9.zip	30 minutes	
		CL	OSE		
		CL	OSE		

Figure 3.41: Share code pop-up

# A Notes:

When using the sharing function, you must first log in to your CHCNAV account, download the CHCNAV cloud sharing code tool on the official website, and use it together.

# 3.9.4 SHARE CODE TO OBTAIN/DOWNLOAD DATA

Open the official website of CHCNAV, download the code sharing tool, and install it on your



#### computer.

请选择	~	分享码工具
■ 教学视频	>	分享码工具
固件工具	>	□ EXE
』 软件工具	$\sim$	支持机型:
三维智能产品	>	日期: 2023年07月28日 大小: 63MB
测绘RTK	~	下载次数: 59次
测地通		点击下载
测放王		
CGO		
分享码工具		

Figure 3.42: The location of the download code sharing tool on the official website

When EasySail software shares the corresponding project/achievement/log, a pop-up window will generate a 4-digit sharing code. Turn on the computer, right-click on the desktop, select [CHCNAV Sharing Code - File Download], enter the corresponding sharing code, and enter the corresponding sharing code, and the file will be downloaded to the desktop in the form of a compressed package by default.

<ul> <li>新建文件夹(N)</li> <li>查看(V)</li> <li>排序方式(O)</li> <li>刷新(E)</li> </ul>	>	<ul> <li></li></ul>	×
<ul> <li>粘贴(P)</li> <li>粘贴快捷方式(S)</li> <li>          在终端中打开(T)      </li> <li>              华测分享码-文件下载      </li> <li>             打开华测云         </li> <li>             护眼卫士         </li> </ul>		请输入分享码	
<ul> <li>搜索 Everything 撤消 重命名(U)</li> <li>壁纸中心</li> </ul>	Ctrl+Z		
新建(W)	>		
<ul><li>□ 显示设置(D)</li><li>☑ 个性化(R)</li></ul>			

Figure 3.43: Obtaining the share code file on the PC side

After other users share files through the sharing function to generate a sharing code, they can enter the corresponding four-digit sharing code number on the sharing code download interface to complete

the fast download of the file.

CHCNAV	User Login
Single Beam Measurement	Discharge Measurement
From Sha	aring Code
CLOSE	DOWNLOAD
Click here to connect	

Figure 3.44: The remote control is downloaded via the sharing code



# 3.10 TERRAIN DATA OUTPUT AND PROCESSING

On the project management interface, click the post-processing button of the corresponding project.

<	Project Management			Managem	ent
Q Sear	ch Project				
	Area_20241015104142 Creation Time: 2024/10/15 Update Time: 2024/10/15 北京市东城区东华门街道智德前巷北京市第二十七中学	Path	Processing	Coordinate	>
	<b>D270_20240909111440</b> Creation Time: 2024/09/09 Update Time: 2024/09/09 北京市东城区东华门街道东华门大街64号全福德烤鸭店(故宫东门店)	Path	Processing	Coordinate	>
	<b>测区_20240717115340</b> Creation Time: 2024/07/17 Update Time: 2024/07/17 北京市东城区东华门街道故宫博物院	Path	Processing	Coordinate	>
	测区_20240717114212 Creation Time: 2024/07/17 则pdate Time: 2024/07/17 湖北省武汉市汉阳区鹦鹉街道湖北水总水利水电建设股份有限公司汉阳专用码头	Path	Processing	Coordinate	>
	+ New Project				

Figure 3.45: Topographic Survey Project Management List

Click the list on the left, the line measurement button, select the line to be processed, and click **[Next]/[Previous]** to switch the line processing.

<			Post Pr	ocessing_L	.0001_2024	4-01-20-10-3	0-00	• ①	More
/// Survey			A CE	The first survey li	survey line is ne, and so on	s opened by defa	ault, click [Next]	to open the	second
line Nort				6.0					
Previou				4.0					
s 🛱	-	L		1.0					•
Settings				2.0	andi ber di staat i	arrama ang king pagi		n anal Maini na a li pa	I I PARTINI I I
Eraser				3.0					
Revoke				4.0					
4	1.6	1	892.00	5.0L 10:30:00 1	0:30:01 10:30:02 1	Pag 0:30:03 10:30:04 10:30:0	e 1 of 22 5 10:30:06 10:30:07	10:30:08 10:30:09	10:30:10 10:30:11
$\sim$	LEFT	RIGHT	AUTO LEFT	AUTO RIGHT	🗹 ватсн	ATTITUDE CORRECTION	THREE CORRECTIONS	SAMPLING	SAVE DATA
				•	•				

Figure 3.46: Bathymetric Sampling Main Page

Click More in the upper right corner to check whether the Coordinate System and USV Information are normal.

CHCNAV EasySail V1.4.0 User Manual | 2024-10 | V1.0



Figure 3.47: More settings for bathymetric sampling



Figure 3.48: Ship type information

In the water depth interface, you can remove the noise by dragging the water depth point to the correct position or clicking **[Eraser]**.

Click directly below to move the bathymetric data laterally, such as Move Left/Move Right/Auto Move Left/Auto Move Right.

<			Post Pro	ocessing_	L0001_202	4-01-20-10-3	0-00	•	(!)	More
Survey line Next		5		The firs survey 8.0 6.0	st survey line i line, and so or	s opened by def n. 	ault, click [Next]	to open	the so	econd
Previou s Settings	4	L		4.0	•					
Eraser				3.0	annuna väitää	and the second secon	ladış internet yangışlar	1999 <b>( )</b> ( <b>)</b>	P A IKI DATI	Aldedaniaa
Revoke				4.0	10:32:01 10:32:02	Page 10:32:03 10:32:04 10:32:	9 13 of 22 10:32:06 10:32:07	, 10:32:08 10:	:32:09 11	ı ı 0:32:10 10:32:11
$\sim$	LEFT	RIGHT	AUTO LEFT	PAUSE	🔄 ватсн	ATTITUDE CORRECTION	THREE CORRECTIONS	SAMPL	ING	SAVE DATA
				•	٠					

Figure 3.49: Bathymetry editing

After deleting all the noise of the survey line in turn, click Batch, check the test line to be processed, and then click Attitude Correction or Three Corrections (Three Corrections include Attitude Correction, Sound Velocity Correction, and Delay Correction).

Click More in the upper right corner again, Sampling Settings, manually set the sampling interval, and click Isometric sampling in the lower right corner.



Figure 3.50: Sampling settings

### **3.10.1.1** Introduction to more settings for water depth sampling:

#### 1) Coordinate system

The coordinate system of project parameters can be checked, and any issues can be corrected in this window.

<	Coordinate Param								
		Name		WGS84					
	Ellipsoid	1	Projection	Datum trans	Horz. adjustment	Vert. adjustment	Adjust parameters		
		Туре		WGS84			<b>~</b>		
		а		6378137.0000000					
		1/f		298.2572235630					
		Positive di	irection	North-East			<b>v</b>		



Figure 3.51: Water depth sampling - coordinate system

#### 2) Ship type parameters

This window mainly checks whether the software correctly recognizes the ship type used in the current operation. The window contains parameters such as project name, ship type, project date, antenna X deviation, antenna Y deviation, antenna Z deviation, antenna phase center height, and ship draft.



CHCNAV EasySail V1.4.0 User Manual | 2024-10 | V1.0

#### Figure 3.52: Depth Sampling - Ship Parameters

#### **3**) Conditional filtering

This includes state resolution, RMS limitation, and depth range filtering, which have the same meaning as the record settings during the collection process.

	Post Processi		Conditional I	Filtering	$\times$
11	The first survey line is opened	Solution Status	Fix	Float	Single
Survey line		Fixed: only retain the solution status data	fixed solution an	d IMU data, and	filter out all other
>> Novt		Float: only retain the filter out all other sol	fixed solution, flo ution status data	ating solution ar	nd IMU data, and
INCAL		Single: keep all data			
Drawiew		RMS Limitation			
s		HRMS(cm) ≤	- 1.	00:	
Settings	1.	VRMS(cm) ≤	- 1.	00 +	
	20	RMS limit: after selection threshold will be filter	cting, all data poir red out.	nts that do not m	eet the RMS limit
Eraser		Depth Filter			
Revoke	30	Depth Filter(m)			
¢	40	Min Depth		0	.00 +
Restore		Max Depth		0	.00
~	LEFT RIGHT AUTO LEFT AUTO RIGHT 刘 BATCH	Depth filtering: after this range will be filte	selecting, all wate ered out.	er depth points th	at are not within

Figure 3.53: Water depth sampling - conditional filtration

#### 4) Sampling settings

This function is used to thinned out the data at equal intervals. For example, the sampling interval is 5m.

- 1) Distance: collect a data point every 5m (greater than or equal to 5m).
- 2) Deepest: within every 5m range, collect the deepest data point (greater than or equal to 5m).
- 3) Shallowest: within every 5m range, collect the shallowest data point(greater than or equal to 5m).
- 4) Average: collect a data point every 5m (greater than or equal to 5m), and the water depth at this point is the average water depth within 5m.



Figure 3.54: Depth Sampling - Sampling Settings

After the sampling is successful, a purple sampling line is generated on the water depth interface, and click to save the data again.



Figure 3.55: Isometric sampling

Select the data format and type to be exported, click Save, and the result file will be saved in the single-beam folder under the current project by default. Click Share to share the data.

<	Save	
Format	Name,North coordinates,East coordinates,Water surface elevation	
Parameters		
Save the header		
Merge save		
Suffix	.dat	~
Latitude and longitude format	0°00'00.00000"	~

SHARE			SAVE	
	•	•	•	

Figure 3.56: Saving data

# 3.10.2 DETAILED EXPLANATION OF POST-PROCESSING

<	Р	ost Proce	essing_L	0001_2024	-01-20-10-3	0-00	• ()	More
Survey			The first s survey lin	survey line is ie, and so on	opened by def	ault, click [Next]	to open the s	econd
line Next			8.0 6.0				×040+040+0+0+	-0-0-0
Previou s			4.0		•			
ettings			1.0 2.0		a tabua Mali ang Junio			
Traser			3.0		an an a suivide bei i	after hense stårt ofter for der	n denin annen i fera efis fed i	rthar ab in ai
tevoke			4.0		Pag	e 1 of 22		
			10:30:00 10	:30:01 10:30:02 10	:30:03 10:30:04 10:30:		10:30:08 10:30:09 1	0:30:10 10

Figure 3.57: Bathymetric sampling page

#### **3.10.2.1** Introduction to Views:

#### 1) Record the color of the points

The points of the fixed solution are shown in green, the points of the floating solution and the CHCNAV EasySail V1.4.0 User Manual | 2024-10 | V1.0 Page 70 / 100

inertial navigation solution are shown in yellow, and the other points are shown in red. Depth point green display: a point is selected, the color of the point changes, and the color of the selected point is orange. At the same time, the corresponding points on the map track view will also be marked synchronously (white circles are highlighted). Manual interpolation renders purple dots; Points erased by the eraser are grayed out and cannot be clicked again.

#### 2) Map interface

You can drag and drop to move, zoom in and out.

#### 3) Map record points are displayed

The color rendering is carried out according to the water depth, and the grade level is from light to dark: red, orange, yellow, green, blue, purple.

### **3.10.2.2** Brief introduction of the function buttons on the left:

#### 1. Turn on the tide test

Import a moisture test file (*.tid*). Requirements. The TID datetime contains the DEP datetime, and after importing, the water surface elevation is used the elevation data in the TID file is processed.

# Notes:

The .tid file should be edited as follows:

2024-10-11 14:10 15.00

2024-10-11 17:10 16:00

#### 1) Fixed interpolation

Select this button to correct the elevation data for the non-fixed solution.

2) Eraser

Select this button, and then select or box select multiple bathymetry points to delete them.

3) Manual interpolation

Select this button and click anywhere within the bathymetric view to insert a new record point at the corresponding time and depth location.

#### 4) Manual sampling

Manual sampling of feature point data - performed after equidistant sampling. For nonequidistant sampling points only. Select this button, select a non-equidistant sampling point with the mouse, and a red sampling line will be automatically generated.

#### 5) Quash

Go back to the previous step (drag a point/delete a point/add or delete feature point sample line).

6) Recover

Resume the previous operation (drag point/delete point/add and delete feature point sample line).

# 7) The pinch button on the left side of the map

You can turn on/off the map interface display;

#### 8) Survey line

Displays all line files recorded in the current project;

- 9) Set up
  - 1. The water depth, time interval, and time width multiples can be set, and the view interface can be modified;
  - 2. Selectable bathymetry editing mode: locked/single-point up and down/multi-point continuous;
  - 3. Fixed interpolation;
  - 4. Display data point information: After enabled, click to select the measurement point/elevation point to display the point information;

### **3.10.2.3** A brief introduction to the following function buttons:

1) Shift Left/Right

Flip left and right on the water depth interface;

2) Auto Shift Left/Right

One-click left and right page turning, manual pause;

3) Batch

Lines can be selected. Select a few and process a few. Click **the [Batch]** button to pop up a list of test lines, and there is a checkbox on the right side of each test line. By default, all survey lines are selected. Click the **[OK]** button, and all the selected line data will be read;

### **3.10.2.4** Introduction to gesture operation:

- 1. Drag up and down on a single-point longitudinal axis to adjust the water depth.
- For example, if you select a single point, you can move up and down to modify the depth value, but you can't move the current point left or right. However, when a point is selected, moving it left and right will modify all the points that its finger has passed.
- 3. Slide the upper left side of the point to the lower right side: perform a multi-point selection
operation, similar to the box selection action on the PC side.

## **3.10.2.5** Data processing operations:

#### 1) The depth of the water is high

bathymetric view of longitudinal bathymetric intervals;

#### 2) Time interval

the time interval between the view horizontally;

#### 3) Time width

The time width of the horizontal axis of the view is enlarged so that the points are not too dense to be selected;

#### 4) map

Double-click to open the position display of the DEP survey line;

#### 5) Conditional filtering

Select a selection in the box, and then select a DEP line in the line list to filter the view. Or select the DEP test line first, then select the filter conditions, and click the [OK] button to display it in real time;

#### 6) Sampling Method &; Sampling Interval X

- 1. Distance sampling: Take a point every distance X (>=X);
- 2. Deepest (within equal intervals): Within the equal interval X distance, the deepest water depth point data is taken as the sampling point;
- 3. Shallowest (equally spaced): Within the equally spaced X distance, the shallowest water depth point data is taken as the sampling point;
- 4. Average value (within equal spacing): Within the equal interval X distance, the average value of all water depth data is taken as the water depth point, and the sampling point is determined according to the distance sampling;

### 7) Three corrections

Sound velocity correction/delay correction/attitude correction;

8) **Posture correction** 

Attitude correction is carried out only based on the inertial navigation data recorded in the USV GD100;

#### 9) Isometric sampling

After the data are corrected and corrected, thinning sampling is carried out according to the sampling interval;

#### **10)** Save the data

- 1. You can choose the saving format, that is, save the header items;
- 2. Parameter settings: Save header: display header information characters;
- 3. Merge and save: Merge and save multiple lines to a summary file;
- 4. Suffix: Select the file suffix (*.txt/.csv/.dat*).
- 5. Latitude and longitude format: Set the display of latitude and longitude of the saved file;

## 11) Sound velocity correction/delay correction/attitude correction

- There are three correction modes: [Monosonic Velocity], [Depth + Sound Velocity] and [Depth + Correction Value]. After the parameter input is completed, click [Sound Velocity Correction] to complete the correction, or click [Skip] to enter [Delay Correction].
- Delay correction of the delay time of entering the water depth and position, the position lag is positive, the water depth lag is negative, click [Delay Correction] to complete the correction or click [Skip] to enter [Attitude Correction] .
- Attitude correction: input transducer opening angle, transducer installation error, select automatic filtering method (median filtering, weighted filtering, sliding filtering), click [Delay Correction] to complete the data correction, or click [Skip] not to correct.

Separator	Comma(,)		
Option		Selected	
Name			
Code			
Time			
North coordinates		<b>→</b>	
East coordinates		<b>—</b>	
Latitude			
Longitude			
Water surface elevati	on		
Water surface geode	tic height		
		CONFIRM	

Figure 3.58: Data saved in a custom format

# CHCNAV EASYSAIL

# 4. HYDROGRAPHIC SURVEY MODULE

This section describes the specific features in the hydrographic survey module of the

# EasySail software



# 4.1 A QUICK WORK GUIDE FOR HYDROGRAPHIC SURVEYS

## The steps for a rapid hydrological survey operation are as follows:

- 1. The USV is turned on, the remote control is turned on, and after waiting for 1-2 minutes, operate the remote control handle to check whether the motor is rotating;
- 2. Turn on *EasySail*, connect to the USV, after the connection is successful, the USV is launched, and manually control the USV at full speed in a straight line for 5 seconds to complete the initialization of the USV;
- 3. Then click [Hydrological Survey] to enter the project list interface;
- 4. Create a new project or open an old project to enter the main interface of the satellite map;
- 5. View self-test information, ADCP connection status, etc., and switch the flow velocity profile to full screen;
- Click [Start Transmission] to check the flow velocity isogram to show whether there is data output;
- 7. Plan the route and upload it;
- 8. When the USV travels to the target point, click the **[Data Record]** button to start recording the measurement data, and set the starting shore type and shore margin. When driving to the next task point, click the **[End Record]** button, and set the end type and shore margin to end the information collection of the current measurement;
- After recording the corresponding number of measurements according to the requirements, click the [Traffic Summary] icon to view the summary table and export the Excel file;

# **4.2 PROJECT MANAGEMENT**

The project management interface can display all the saved projects, click **[Project Route]** to enter the project management interface, the interface displays the list of all tasks that have been created, each route task label contains the name, route type, creation time, update time and operation location, click the label to open the route task, open the project to enter the map interface, through **[Manage].**button to enter the management mode, and perform multi-select/delete/copy/share operations on the project file. When you need to search for a specific task, you can enter the name of the search task in the [Search Box] to support fuzzy queries.

<	Project Management	Management
Q Sea	rch Project	
	<b>流量测验_20240802_111759</b> Creation Time: 2024/08/02 Update Time: 2024/08/02 云南省玉溪市澄江市龙街街道尖山派出所	Path >
	流量测验_20240724_114815 Creation Time: 2024/07/24  Update Time: 2024/07/24	Path >
	<b>流量测验_20240620_211712</b> Creation Time: 2024/06/20  Update Time: 2024/06/20 北京市东城区东华门街道东华门大街64号全福德烤鸭店(故宫东门店)	Path >
	+ New Project	

Figure 4.1: Flow Test Engineering Management

# **4.3 CREATE A NEW PROJECT**

- 1. In the background of the USV web page, the external device type is set to ADCP-RiverStar/RCP, with a baud rate of 115200;
- 2. After connecting to the USV, it will enter the hydrographic survey project management interface, and it will be automatically connected to ADCP.
- 3. Click the [New Project] button at the bottom. If the ADCP is not successfully connected, the ADCP device parameter configuration page will be entered. If you are connected, you will be directed to the site information screen.
- 4. Connect to ADCP by setting the ADCP type, ADCP baud rate, GPS baud rate, and GPS network port parameters on the device parameter page. If you select RiverStar as the ADCP model, click "Next" to enter the site information interface, and if you select other models, you will directly enter the topographic survey project.

<	Devi	ice Params		
ADCP Model	RiverStar	TRDI	RTI	SonTek M9
ADCP Baud Rate	115200			•
GPS Baud Rate	115200			
		NEXT		

Figure 4.2: Device parameters

5. To enter the site information interface, you need to fill in the site name, station number, river name, water system, measurement unit, measurement location, operator, survey ship number and remarks information, and after filling in the information, click [Next] to enter the working parameters interface.



<	Station Info	
Station Info		
Station Name	Station Number	
River Name	River System	
Measurement Number		
Field Party Data		
Field Party	Location	
Processed By	Boat	
Remarks		
	NEXT	

Figure 4.3: Site Information

6. Enter the working parameters interface to set the working parameters of the ADCP, including flow rate reference, transducer draft, external compass offset, and whether to use an external sounder. After the work parameter setting is completed, click **[OK]** to enter the map interface. In addition, it should be noted that if the USV is not connected, only the flow velocity reference can be modified, and other parameters cannot be modified. When the sounder is abnormal or not connected, the external sounder option cannot be modified.

<		Work Para	ms	
	Flow Velocity Refer	ВТ	GGA	VTG
	ADCP Draft(m)		-	0.00
	GPS Heading			
	External Sounder			
	Note: If the USV is not modified, and other par abnormal or not conne	connected, only the flo rameters cannot be m cted, unable to modify	w velocity refere odified, when the the external sou	ence can be e sounder is under option.
	_			_
		CONFIRM	1	

Figure 4.4: Operating parameters

# **CHCNAV 4.4 DEVICE SELF-TEST**

ĺ		ed Manual	Disconnected	الد.	29	🗘 Single	62% 42% 19.2v 18.3v	🛇 92 ms	•••
		Check List	×		»	Pro Name	Discharge	20241016_0	94021
	ADCP Connect Status	Disconnected							
		A .I				Task Name	Station_20	241016_094	021
	USV Signal	,≞ulli				Work Mode	Survey		•
	GNSS Status	Single / 29				Note: If you need the route again	i to switch wo	rk mode, pleas	e upload
	GNSS Registration	2099/12/31 Normal				∧ Waypoints L	.ist		
			4						
	Sounder	Normal							
	Motor	Initialization							
	Obstacle Module	Normal							
			Course 0.00° Ensemble 0	Flow Velo 0.00 m/s Total Q(B 0.000 m <sup>3</sup> /	city F) s		È	á	

Figure 4.5: Self-test of hydrological test equipment

## 1) Ship control 4G network signal

Real-time display of USV ship control network quality,  $\geq 95\%$ , full grid (5 grids) display;  $\geq$  95%, full grid (5 grids) display;  $\geq$ 85%, 4 grids;  $\geq$ 70%, 3 grids;  $\geq$ 60%, 2 grids;  $\geq$  50%, 1 grid display; Other, 0 grids are displayed.

## 2) GNSS solution mode

Locate the solution state, including single point (red), floating (floating) and fixed (green) modes.

## 3) GNSS registration

If the expiration time is greater than 48 hours, [Expiration Date + Normal] is displayed, which is indicated in green. If the expiration time is less than or equal to 48 hours, [Expiration in 2 days + expiration date] is displayed, which is indicated in yellow. If the expiration time is less than or equal to 24, [Expiration in 1 day + expiration date] is displayed, which is indicated in yellow. If it expires, it displays Expired, indicated in red.

## 4) Sounder

The connection is successful, and it is shown in green.

5) Motor

The connection is successful, and it is displayed in green; The first connection will show an abnormality, push the longitudinal rod to check the wind direction and power of the motor, and

it will turn green.

## 6) Obstacle Avoidance Module

The connection is successful, and it is shown in green.

## 7) ADCP connection status

If the connection is successful, it will show green [Connected], and if the connection fails, it will display red [Not connected].



# **4.5 ROUTE PLANNING**

The operation steps of the new hydrographic survey route are as follows: in the hydrographic survey mode, click the map once to generate a hovering point, click twice to generate two hovering points, that is, a measurement time, and confirm the navigation position and direction according to the order of clicking to generate; The position can be changed by dragging the hover point. The current operations on hover points include deleting one point and deleting all points, and you can also view the details of the points in the route list, and the waypoint properties can be configured according to your needs.



Figure 4.6: Hydrological Survey h route planning

# CHCNAV 4.6 ROUTE EDITING



Figure 4.7: Main page of hydrological survey work

## 1) Mark the home point

After entering the editing mode, click the button to switch to the selected state, and click the map again to generate the Home point.

## 2) Mark the point at the current position of the ship

If the USV is connected and the software is in edit mode, click the button to generate a task point at the current USV location.

## 3) Delete a point

After selecting a waypoint on the map or selecting a polygon boundary point in polygon drawing mode, the selected point is surrounded by a circle of white, and click the button to delete the point.

## 4) Clear all points

Click this button and a pop-up window will appear, select the type of point (task point/polygon point) that needs to be cleared.

## 5) Save the route

Click this button to save the route. After the route is saved, the measurement operation can be started normally.

#### 6) Upload routes

Click this button to upload the drawn mission route to GD100. CHCNAV EasySail V1.4.0 User Manual | 2024-10 | V1.0

## 7) Download routes

Click this button to re-download the mission route in GD100 to the EasySail software.

#### 8) Draw polygons

Click this button to draw polygon range lines in the software.

## 9) Add hop points

The hop point setting is located in the route list, and you can set its on/off state, and modify the starting point number and the number of cycles.

∧ Waypoints List
Add jump point
Jump to target point 1
Loop Times 5
Figure 4.8: Hop point information

# 4.7 HYDROGRAPHIC SURVEY MAIN INTERFACE

As you can see, some of the interface tools are the same as topographic surveys, and the different interface tool parts are marked out in the image below.



Figure 4.9: Hydrological test function buttons

## 1) Site traffic measurement information

Click this button to pop up the test task panel, you can view the test task and the test information under the currently selected task, and you can create a new test task.

# A Notes:

- 1. Don't reuse the same quiz task;
- 2. After you create a new task, you can open this panel to view the recorded measurements during the data recording process. Once you've reviewed it, you can click **[Continue]**.

## 2) Toggle the flow rate reference

Click this button to switch the flow rate reference between BT (Bottom Track), VTG, and GGA, and the icon will be displayed as the current flow rate reference.

## 3) Traffic summary table

Click this button to enter the traffic summary interface, where you can view the traffic summary table, traffic results table, and measurement test record table, and share and export. You can view and export the traffic summary information of historical test tasks.

# 4) ADCP Launch/Stop

Initiate or stop ADCP, start and end flow velocity measurements.

# 5) Data logging/stopping

Record and save quiz data.

# 6) Flow velocity amplitude plot

The depth information and flow velocity information of the river bottom during the navigation of the USV can be displayed.

# 7) Common sensor information bar

Speed, heading, flow velocity, flow direction, water depth, current rate, total flow, starting shore.

## 8) ADCP connection status

Displays the connection status of the current ADCP in real time.



# **4.8 HYDROGRAPHIC SURVEY PARAMETER SETTINGS 4.8.1 WORKING PARAMETER SETTINGS**

The working parameters of the ADCP can be set on the working parameter setting page to calculate the flow information. The working parameters can be manually set for flow rate reference, bottom tracking, GGA, VTG, transducer draft, whether to enable external compass, external compass offset, and whether to connect external sounder. The setting takes effect in real time, and after setting, you can view the corresponding flow velocity amplitude map change in the lower left corner of the map. In addition, during the data recording process, only the flow rate reference can be modified, and other parameters cannot be modified. When the sounder is abnormal or not connected, the external sounder option cannot be modified.

#### 1) Flow rate reference

After the ADCP is successfully connected, you can manually switch between *Bottom Track*, GGA, and VTG.

#### 2) Transducer draft

Can be entered manually in meters

#### 3) External compass

When the outer compass is enabled, manually enter the offset of the outer compass in -°

#### 4) External sounder

When the external sounder is activated, the bathymetric data measured by the sounder is obtained, and when it is turned off, the bathymetric data measured by the ADCP is obtained.

	Disconnected	Work Params	$\times$
		Flow Velocity BT 💋 GGA	VTG
		ADCP Draft(m)	+
	光谷恒为科技	GPS Heading	
Ū.		Heading Offset(*)	• +
		External Sounder	
围 当代·光	÷	<ol> <li>During the transmitting, only the flow velocity reference modified.</li> <li>When the echo sounder is abnormal or not connected, external sounder cannot be set.</li> </ol>	the
1.80 1	ADCP not of	connected	

Figure 4.10: System Settings - Operating Parameters

# 4.8.2 SITE INFORMATION SETTINGS

The Site Information Settings screen is used to set the details of a hydrological test item. You need to manually enter the relevant information of the site, including the station name, station number, river name, and measurement unit information, including the measurement unit, measurement location, operator, survey ship number, water system, and remarks information.

CHENAV Disconnected Station Info	×
Station Name	
M Station Number	
・ 発 ・ River Name	
Measurement Number	
Field Party Data	
Field Party	
Processed By	
Boat 华微4号 Lite	
River System	

Figure 4.11: System Setup - Site Information

# 4.8.3 GENERAL SETTINGS

The general settings in hydrographic survey mode are the same as those for topographic surveys and are not covered in detail in this section.

# 4.9 HYDROLOGICAL DATA OUTPUT AND PROCESSING

After performing the hydrological test task, the recorded data will be given in the form of The *PD0* format is saved, while the bottom of the main interface displays a real-time flow velocity amplitude plot along with some key parameters. By clicking the Map Tool Flow Summary Table button, you can view the measurement test loading table, flow result table, and flow summary table specified in the **[Acoustic Doppler Flow Test Specification]**, and you can also export the Excel table and share the test data.

# 4.9.1 FLOW RATE FILE

The flow velocity file records the ADCP flow velocity measurements and is saved as *PD0* format. It is stored in the file directory of the quiz task. Flow rate files are stored in binary mode, and the data includes flow rate data, flow data, basic information, and depth data.

# 4.9.2 FLOW AGGREGATION

The software supports real-time generation of traffic reports, and at the same time, the corresponding tables are generated in real time according to the selected measurements. Click the **[Traffic Results]** button of the map interface tool to pop up the traffic summary page. The traffic summary interface contains three tables, namely the traffic summary table, the traffic results table, and the measurement test loading table. The user views the recorded measurements according to the traffic summary table and selects the measurement data that meets the requirements. Open the measurement selection interface through the **[Select Measurement]** button in the upper right corner to select the required measurement data, regenerate the table data, switch the **[Report Type]** to select the export process result table or the measurement test loading table, and switch different **[Flow Rate Reference]** to generate the data under the corresponding flow rate reference. Finally, the data is exported and shared.

# 证州公共更高效

# 

CHC	NAV Disconnected	ł					🔍 🤌 🗽	•••
•			Dischar	ge Summary			×	
	Report Forms Type	Summary	Result	Test Record		s	ELECT TRANSECT	
M	Flow Velocity Refer	BT	GGA	VTG				
3	Transect Name	Start Bank	Ensemble Number	Start Time	Total Q(m³/s)	riangle Q	Top Q(m³/s)	
-								
8.20 <del>-</del>								
0.40 0.60 1.00 1.20 1.40 1.60 2.00								ed

Figure 4.12: Traffic Summary Table

		Disch	arge Summary	×
Report Forms Type	Summary	Result	Test Record	SELECT TRANSECT
Flow Velocity Refer	BT	GGA	VTG	
Station Number:			Measurement Number:	
Station Name:			Date:	2024/08/02 11:17:44
Field Party:			Boat:	华微4号 V1.1
Area Method:	Average	Direction	ADCP Draft:	0.15m
Position Method:	VTG		Cell Size:	Auto
Magnetic Method:	0.00°		Blank:	Auto
Depth Source:	Bottom T	rack	Shore Count:	10
Discharge Method:	None		Bottom Method:	Power
Correction Dercent:	0.00		Top Method:	Power

Figure 4.13: Flow results table

		Discharge	e Summary		X
Report Forms Type	Summary	Result	Test Record		SELECT TRANSECT
Flow Velocity Refer	вт	GGA	VTG		
	Sta	tion ADCP Measure	ment Test Record	Table	
Date:	2024-08-02	Weather:		Wind:	
Transect:		USV:	华微4号 V1.1	Device Name:	vivo
Start Time:		End Time:		Avg. Time:	
ADCP Type:	RiverStar	Firmware Ver.:		Software Ver.:	EasySail-v1.4.0
GPS Type:	Self GPS	Heading Type:	Self Compass	Sounder Type:	None
Data Path:	Android/data/com.l jobs_adcp/流量测验_202 _2024080	huace.easysail/files/ 40802_111759/data/站点 )2_111759	Config File:	Android/data/coi jobs_adcp/流量测验_2 _20240802_1	m.huace.easysail/files/ 0240802_111759/data/站点 11759/easysail.nav
- I	SHARE	1		EXPORT EXCE	L

Figure 4.14: Flow Test Record Table



Figure 4.15: Measurement selection

# 4.9.3 DATA EXPORT AND SHARING

The software provides tabular data export and sharing functions, after selecting the data that meets the requirements, the user selects the corresponding data table type and flow rate reference, and clicks the **[Export Excel]** button to pop up the corresponding data report to the Excel file, and there will be [Export Successful] after the export is completed. As a reminder, the path to the export file is displayed at the bottom. After the export is successful, click the **[Share]** button to share the interface, select the Excel file to be shared, click **the [OK]** button, and share the Excel file through the generated **CHCNAV EasySail V1.4.0 User Manual** [2024-10] **V1.0** 



four-digit sharing code.



Figure 4.16: Results sharing

Report Forms Type	Summary	Res	sult	Test Record			SELECT TRANSECT
Flow Velocity Refer	BT		Shar	e code			
بل ا	2024.00	6	8	1	5	Alizzat	
Transect:	2024-08	The share	code will beco	me invalid after 3	0 minutes	ce Name:	vivo
Start Time:	Fi	le: results_ů	占点_2024080	2_111759.zip		g. Time:	
ADCP Type:	RiverSt		CI	OSE		ware Ver.:	EasySail-v1.4.0
GPS Type:	Self GPS	Hea	ading type:	Seir Comp	ass	sounder Type:	None
Save path:1A_Chonav	_Export/EasyS		240802_11	1759/Test Re	cord/ADCP	Measurement T	est Record

Figure 4.17: Survey File Selection Sharing Page

•)					站声学的	8首勒流速	仪测量测验	記載表					
2	B	网	2023	/11/17 37:58	天	٣			风力	风向			
3	流量	测次	Station_2 02	0231117_1 822	31	6			191	略	BAH4	-W29	
	开始	时间	2023	-07-04	结束	时间	2023-	07-04 30.93	平均	时间	149.4	530s	
	机速度	文型号	ADC	P600k	(約(件)	版本			软件	截本	1.3.0.20	231117	
	GPS	토랑			罗经	보号			測深(	2型号			
	数据文	件路径	Android/c	lata/com.hi bs_adcp/ 11_112351 117_1	uace.easys 流量測验 /data/Stati 02822	ail/files/jo on_20231	配置文	件路径	Android/d _2023111 11	ata/com.h bs_adcp 1_112351 7_102822	uace.easys /流量测验 /data/Stati /easysail.n	ail/files/jo on_20231 av	
	探头入7	水深(m)	0.150	设置的	的育区	自动	深度单	元尺寸	自动	深度	<b>東元数</b>	自动	
>	盐	度	0.00	水跟踪	脉冲数	自动	底斑鉤	脉冲数	自动	<b>36</b> 8	s数b	0.1667	
1	<u>।</u>	Atuto	水边	巨夷(m)		TRYAS		**	Wi(m <sup>1</sup> /s)	100年15	·決羅(m <sup>1</sup> /s)	祭注	
2	ones	30444	L	R				+ 001510	Call (1979)	35453 T +0	on all of the second	181/L	
3	x-3103	348.088	3.00	3.00	\$001_202	31117_103	3603.PD0	-30	1.463	-40	5.367		
4		339.367	3.00	3.00	\$002_202	31117_103	3705.PD0	-501	9.270				
5				_				_					
6										-			
7	第三测码			-				_		5			
8					L								
9		测验项目		38	811	315	12	39	R13		测量成果	-	
			144	在測	18:01	任則	建则	在則	983H	311.00	(平15) (2)(7)	应用值	
-	80		/5)	-301,463	-509.270	-				-403	(01		
	10	1921010 (m	(c)	0.954	1 101	-	-			10	173		
	最大流速(m/s)		1.017	1.017				-	10	117			
5			0.00	0.00					0.0	000			
	A	最大水深(n	1	1.00	1.00					1.0	000		
										-	-		

Figure 4.18: *Excel* results table viewing

# 4.9.4 REAL-TIME OUTPUT

The software provides the function of real-time display of flow velocity data, and the user can click on the flow velocity amplitude map window at the bottom left of the map interface to enlarge the window during the collection process, and the flow velocity amplitude map displays information in real time during the recording process, including water depth, flow velocity, surface depth, bottom depth, river bottom depth and other information, and randomly tests the task for dynamic changes. Click the parameters at the bottom of the map interface to enter the parameter detail interface, which displays data such as flow information, hydrological information, and ADCP information in real time.



Figure 4.19: Flow velocity equivalence graph full-screen page

	nnected Manual	6	Disconnected 🚔 💷 🙁		6 42% 🖄 124 ms	
			Parameters			$\times$
SN	3553944	ADCP SN		Measured Q	0.000m³/s	
Connect Methods	4G	💥 Hydrological II	nformation	Bottom Q	0.000m³/s	
Base Data		Flow Direction	0.00°	Left Q Bight O	0.000m³/s	
Good Bins	0	Flow Velocity	0.00m/s	Total Q	0.000m³/s	
Valid Ensemble Invalid Ensemble	0	Line Distance Track Length	0.00m 0.00 m	Sounder Info	rmation	
Invalid Ensemble Percentage	0.000%	Track Direction	0.00°	Mode	High Freq	
Ensemble Number Ensemble Time	0	🎉 GNSS Informa	tion	Temperature Salinity	0.0°C 0.00‰	
Duration	0.00s	Latitude	030"28'21.4824792"N 114"25'27.4886472"E	Sound Velocity	1500.00m/s	
Antenna Offset		Height	34.493m	Voltage	0.130m 17.860V	
Phase Center Antenna X	0.015m -0.171m	HDOP Correction Delay	0.609 Os	Min Depth Max Depth	0.00m 250.00m	
Antenna Y Water Surface H	0.000m 0.150m	HRMS VRMS	526.80cm 425.90cm	Attitude		
🙏 Navigation Inform	ation	Battery Info		Pitch	-6.90°	
Cruising Mileage	4.13 km 0.00 m	Battery 1 Power Battery 2 Power	62.00% 42.00%	Yaw	51.10*	
Home Dist	0.00 m	Battery 1 Voltage	19.2V	Hotor Speed		
RC Dist	1065 16 km	Rattery 2 Voltage	18 3V	Innut Direction	0	

Figure 4.20: Detailed parameters

# 4.9.5 HISTORICAL DATA BACKTRACKING

The software supports viewing the elapsed data of the last test, after entering the test project, select the test task, and then click the traffic summary button to view the last test data, note that you can only view the last recorded test data, for example, the first time two times recorded, the second time three times recorded, the third time after entering the test project to select the test task, you can only view the second test data, so it is generally recommended to create a new test task when starting a new test task.



Figure 4.21: List of quiz tasks

# CHCNAV EASYSAIL

# **5. SOFTWARE SETTINGS**

This section describes the general settings for EasySail software



# **5.1 COMMON SETTINGS - SI UNIT SETTINGS**

Temperature and distance units can be switched in the general settings interface.

#### 1) Distance units

Meters, international feet, United States feet can be set.

#### 2) Temperature unit

It can be set in degrees Celsius °C and °F degrees Fahrenheit.

#### 3) Flow Units

Cubic meters per second, cubic international feet per second, cubic United States feet per second.

#### 4) Area units

square meters, square international feet, square United States feet.

Not Logged In       Common Settings         D About       >         About       >         Unit Setting       >         Privacy Settings       >         Check for updates       >         Update Records       >	Not Logged In       Common Settings         Distance       Meter (m) •         About       >         Distance       Common Settings         Unit Setting       >         Privacy Settings       >         Check for updates       >         Vupdate Records       >	Not Logged In       Common Settings         D About       >         D About       >         D Init Setting       >         D Init Settings       >         D Privacy Settings       >         D Check for updates       >         D Update Records       >		
Distance   Distance   Meter (m) ·   Distance   Meter (m) ·   Temperature   °C ·   Discharge   m³/s ·   Discharge   m² ·   Discharge   m² ·	Distance     Meter (m) ·       ① About     >       ① About     >       ① Unit Setting     >       ② Privacy Settings     >       ② Check for updates     >       △ Update Records     >	Distance   Meter (m) ·   About   Unit Setting   Privacy Settings   Check for updates   Area	Com	mon Settings
About >   Unit Setting >   Privacy Settings >   Check for updates >   Area m²< •	Image: About       >         Image: Discharge       °C · ·         Image: Discharge       Discharge         Image: Discharge       m³/s · ·         Image: Discharge       Area         Image: Discharge       m² · ·         Image: Discharge       - · ·         Image: Discharge       - · ·         Image: Discharge       - · · ·         Image: Discharge       - · · · ·         Image: Discharge       - · · · · · · · · · · · · · · · · · · ·	About >   Unit Setting >   Privacy Settings >   Check for updates >   Update Records >	Distance	Meter (m) -
Unit Setting     >       Privacy Settings     >       Discharge     m³/s       Check for updates     >       Update Records     >	Unit Setting     >       Privacy Settings     >       Discharge     m³/s •       Check for updates     >       Area     m² •	Unit Setting     >       Privacy Settings     >       Discharge     m³/s •       Check for updates     >       Q Update Records     >	>	°C 🗸
Privacy Settings Discharge   Marea m³/s   Marea m²   Wpdate Records >	Privacy Settings   Privacy Settings   Check for updates   Area     m²/s     Im²	Privacy Settings   Privacy Settings   Check for updates   Area     m²/s     Im²/s     Area	>	
Check for updates       >         P Update Records       >	Check for updates > Area m <sup>2</sup> ▼	Check for updates >   Update Records >	Discharge	m³/s ←
□ Update Records >	Update Records >	□ Update Records >	> Area	m² •
			>	
				Distance  Temperature  Discharge  Area

Figure 5.1: Software General Settings

# **5.2 PRIVACY SETTINGS**

Displays the necessary permissions and information necessary for the operation of this software.

<	Settings
Net Logged In	Privacy Settings
Not Logged III	∧ Rover information
(i) About >	This function is used to obtain the location information of the mobile terminal when running the CHC USV ground station APP.
Unit Setting	∧ USV GPS information
Privacy Settings	This function is used to obtain the navigation information of the USV when running the CHC USV ground station APP.
Check for updates     >	∧ USV hardware information
问 Update Records >	This function is used to obtain the hardware information of the USV when running the CHC USV ground station APP for online version upgrade.
	<ul> <li>Voyage dynamic data reporting</li> <li>This function is used for the USV ground station APP to actively report the location information of the USV.</li> </ul>
	∧ Improvement plan

In order to continuously improve our product programs and enhance your user experience, we will collect your sailing information in order to optimize our product design.

#### Figure 5.2: Software privacy settings



# **5.3 CHECK FOR UPDATES**

Check the update interface to check the app version number, sounder firmware version number,

GD100 platform firmware version number, control firmware version number, check and update app

## version and firmware version.

	Check for updates	
Not Logged In	APP Version CHECK FOR UF	PDATES 1.4.0.20240926
(i) About	> Sounder firmware version	Unknown
Unit Setting	> GD100 firmware version CHECK F	OR UPDATES Unknown
Privacy Settings	> Control firmware version	Unknown
Check for updates	> ADCP firmware version	Unknown
印 Update Records	> Multi beam firmware version	Unknown
	Figure 5.3: Checking for updates	

 $\overline{}$ 

# **5.4 IMPRINT**

You can view the change notes for each version in the release notes.

<		Settings	
Not Logged In		Update Records	
		EasySail v1.4.0 Update description:	^
(i) About	>	Details 1. CORS login: Add swas access point	
Unit Setting	>	2. Add A4-Lite, Ab-V1.1 3. Coordinate System: Automatically Obtain Central Meridian 4. Coordinate system: Import grid files	
Privacy Settings	>	<ol> <li>Measuring ruler: Add multi-point continuous measurement</li> <li>One click matching of remote control</li> <li>Single beam history record point display(300 thousand)</li> </ol>	
Check for updates	>	8. Add video view hidden switch 9. Target point marked in blue (auto mode) 10. Diestarge measurement: add clock	
Update Records	>	11. Support saving polygon points 12. Clear waypoints and polygon points	
		<ol> <li>Add USV type setting function</li> <li>Navigation control function: add a secondary confirmation box</li> <li>Fix known issues</li> </ol>	

EasySail v1.3.0 Update description:

Details

 Add ADCP measure discharge function : flow velocity profile, discharge summary table, save and sharing excel file

Figure 5.4: Release notes



