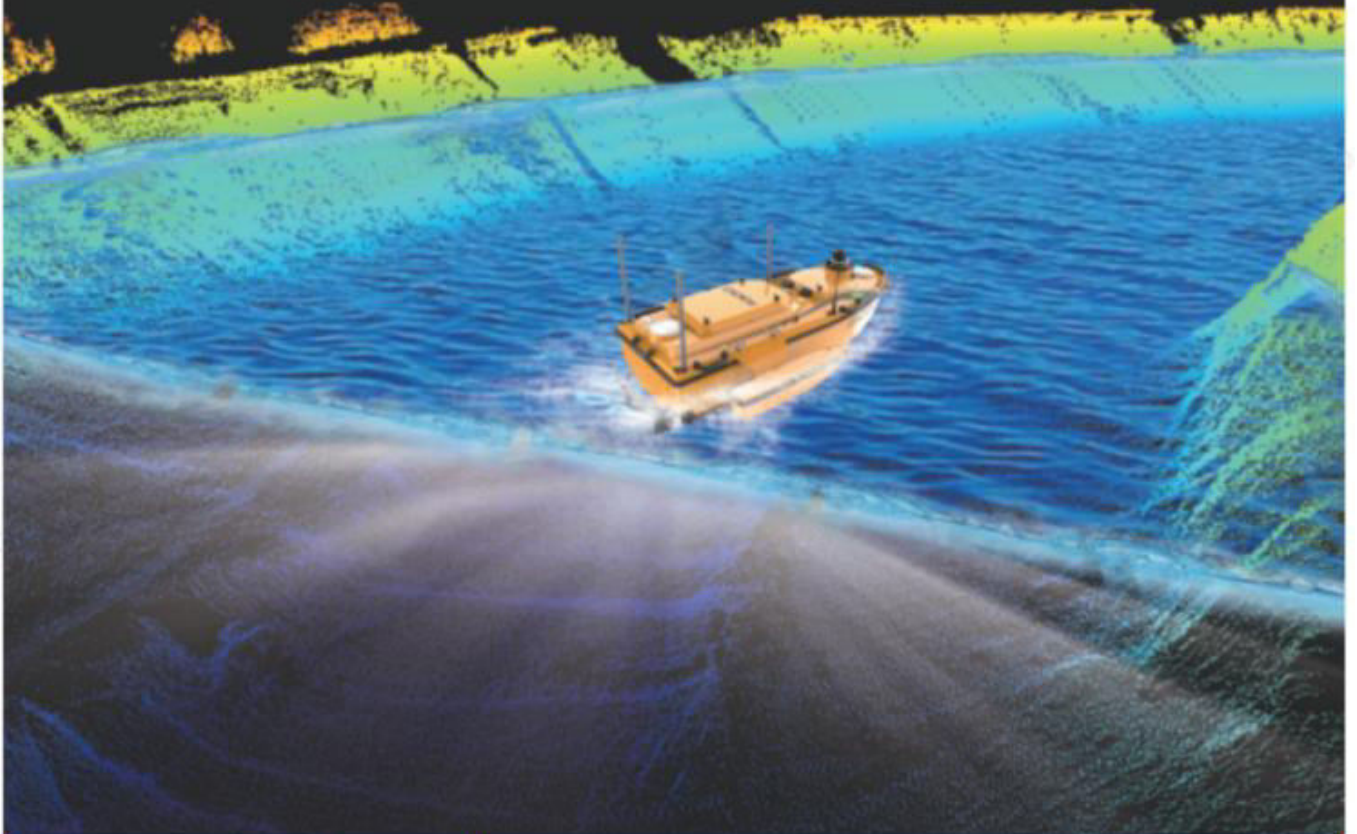


CHCNAV
华测导航

华微6号

无人测量船



-  碳纤维船身, 轻便坚固
-  可拆三体设计, 方便运输
-  绝对直线技术
-  水上水下一体化

Manual Revision

Document No.: CHCNAV-CPSYSM-APACHE6-V1.0-202507

Revision Date	Revisions	Revision staff	illustrate
2025.07	1	Cai Wei	This manual only contains the hardware introduction, hardware assembly and EasySail software operation of HUAWEI No.6 unmanned boat.

Preface

Instructions for Use

Welcome to Shanghai Huace Navigation Technology Co., Ltd. (referred to as Huace or Huace Navigation)Huawei No. 6Unmanned boat user manual, this manual is applicable to the unmanned boat produced by Shanghai Huace Navigation Technology Co., Ltd.Huawei No. 6Hardware installation and software operation of unmanned vessels.

Introduction

This manual is for Shanghai Huace NavigationHuawei No. 6Description of the unmanned ship hardware installation and software operation.

Experience Requirements

In order to help you better use Huace NavigationHuawei No. 6For unmanned boat products, Huace Navigation recommends that you read this manual carefully.Huawei No. 6If you are not familiar with unmanned boat products, please contact Huace Navigation Company according to the following contact information to obtain more services.

How to contact CTI

Service Hotline	400-620-6818
Company Name	Shanghai Huace Navigation Technology Co., Ltd.
Headquarters Address	Huace Space-Time Intelligent Industrial Park, Xianghuaqiao Street, Qingpu District, Shanghai
Base Address	Huace Space-Time 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 your customer service needs, including our emergency 24/7 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.

Waterdepthreferencedtothetransducer.

\$__DBT,xx,f,xx,M,xx,FhhCRLF

Safety technical tips



Notice:

The contents of the attention tips are usually special places of operation, which require your special attention. Please read them carefully.



warn:

Warnings are usually very important. Failure to follow the warnings may result in instrument damage, data loss, system crash, and even personal safety.



hint:

This symbol indicates additional information that can help you avoid problems or that you should consider when using the feature described.

Copyright

This manual is copyrighted by Shanghai Huace Navigation Technology Co., Ltd. (The content only includes Huawei No. 6 unmanned boat and its related accessories) The company has the right to treat it as confidential information. The company has the right to change this manual and the product, equipment or software specifications described in this manual without prior notice.

Disclaimer of liability

Before using this product, please be sure to read the instruction manual carefully, which will help you use this product better. Shanghai Huace Navigation Technology Co., Ltd. will not be held responsible for any losses caused by your failure to operate this product in accordance with the instruction manual or your failure to correctly understand the instruction manual and misoperate this product.

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

We have checked the consistency of the contents described in the printed materials with the hardware and software, but we cannot rule out the possibility of deviations. The figures in the instruction manual are for reference only. If there are any discrepancies with the software, please refer to the latest version of the software.

Technology and Services

If you have any technical questions, please contact Shanghai Huace Navigation Technology Co., Ltd. by phone and we will answer your questions in a timely manner.

Related information

You can find this manual in the following ways:

1. Obtained by contacting Shanghai Huace Navigation Technology Co., Ltd.

Your suggestion

If you are interested in Huace Navigation Huawei No. 6 unmanned boat If you have any suggestions or comments, please contact us. Your feedback will greatly improve the quality of our products.

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1. Product Overview

This chapter introduces Huawei No. 6 unmanned boat Features

1.1 Introduction

Huawei No. 6 unmanned boat, as the flagship product of Shanghai Huace Navigation Technology Co., Ltd., is widely praised for its large space, multi-carrying, ultra-light all-carbon fiber structure automatic unmanned boat platform. The unmanned boat integrates dual GNSS positioning receivers, stable and reliable hull attitude sensors and inertial navigation modules (IMU), ensuring high-precision navigation and measurement capabilities in various complex environments. Its GNSS/INS controller can maintain high accuracy during transient GNSS interruptions, allowing the hull to achieve uninterrupted measurement even when passing through complex terrain such as bridge tunnels.

Huawei No. 6 unmanned boat With its excellent absolute straight line technology and automatic return function, it can maintain stable navigation in complex environments such as turbulence, ensuring the continuity and accuracy of measurement data. At the same time, its built-in acoustic radar (sonar) technology can effectively avoid obstacles and ensure the safe operation of the unmanned ship.

1.2 Features

1.2.1 Huawei No. 6 unmanned boat Features

1) Large space, multiple loads

Huawei No. 6 unmanned boat It has a spacious space and can flexibly carry a variety of surveying and mapping instruments, such as iWBMS series Multi-beam bathymetric systems and three-dimensional laser scanners, etc., enable the simultaneous collection of surface and underwater data.

2) Full carbon fiber construction

The hull is made of all carbon fiber material, which is not only light (the whole boat hull It weighs only 15Kg) and greatly enhances the sturdiness and corrosion resistance of the hull, making it easier to transport and deploy.

3) Absolute Linear Technology

Equipped with the absolute straight line technology independently developed by Huace Navigation, it can accurately travel in a straight line according to the planned route, reduce the impact of wind and waves, ensure the strip coverage during multi-beam scanning, and improve measurement accuracy.

4) Detachable three-body design

The float is detachable, taking into account both logistics transportation and offshore wind and wave environment. The size of the float can be customized according to wind and wave conditions to ensure the stability and safety of the unmanned ship in severe sea conditions.

5) High performance detection system

It integrates dual GNSS positioning receivers, a stable and reliable hull attitude sensor and an inertial navigation module (IMU), which can maintain high accuracy during transient GNSS outages and achieve uninterrupted measurement.

6) Automatic return and obstacle avoidance

It is equipped with an automatic return function and uses acoustic radar (sonar) technology to avoid obstacles to ensure the safe operation of the unmanned ship.

1.2.2 iWBMSseriesMultibeam echo sounder features

1) High-precision measurement

iWBMSseriesThe multi-beam echo sounder supports a center frequency of 400Khz and is adjustable within the range of 200Khz-700Khz, with extremely high measurement accuracy and resolution. The number of beams reaches 256-512 with equal angles and equal distances, and the measurement range is wide, which can meet the measurement needs of different water depths and complex terrains.

2) Integrated design

It has highly integrated sonar, position attitude and heading functions, and can be connected to an external laser radar. It is easy to operate and install, and does not require complicated installation and calibration processes.

3) Efficient data collection

It adopts integrated packaging, which is small and light, and can be operated in a single transport box. It is equipped with all-Chinese software, which can efficiently collect and process underwater terrain data, bringing customers a more extreme measurement experience.

4) Wide applicability

It can measure vertical surfaces such as shoals, channel slopes, dams, and dock walls, and is widely used in underwater object positioning, offshore construction, underwater archaeology, and shipwreck salvage.

1.2.3 Combination product features

1) Integrated measurement above and below water

Huawei No. 6 unmanned boatEquippediWBMSseriesThe multi-beam echo sounder can obtain the integrated high-precision three-dimensional data above and below the water required for port and river dredging in a single voyage, thereby improving measurement efficiency.

2) High precision and stability

The combination of the excellent performance of the unmanned vessel and the depth sounder ensures the high accuracy and stability of the measurement data, providing reliable information support for the planning, construction and maintenance of water conservancy facilities.

3) Intelligent operation

The unmanned boat has automatic cruising and obstacle avoidance functions. The depth sounder is easy to operate and does not require complicated calibration. It realizes intelligent operation and reduces the risk of human intervention and errors.

1.2.4 Preparation before assembly:

1. Technical data preparation

1) Read the technical manual in detail

Read carefullyHuawei No. 6 unmanned boatandiWBMSseriesTechnical manual of multibeam echo sounder, learn about the technical parameters, performance indicators,

installation requirements and operation procedures of the equipment.

2) Learn about device compatibility

Confirm the compatibility between the unmanned vessel and the echo sounder, including data interface, communication protocol, power supply requirements, etc., to ensure that the equipment can be seamlessly connected.

2. Equipment inspection and debugging

1) Equipment appearance inspection

rightHuawei No. 6 unmanned boat and WBMS series A multibeam echo sounder is used to conduct a visual inspection to ensure that the equipment is intact and has no signs of deformation, cracks or damage.

2) Functional testing

Before assembly, the unmanned boat and depth sounder are subjected to functional tests, including power supply test, communication test, sensor test, etc., to ensure that all functions of the equipment are normal.

3. Installation Environment Assessment

1) Water Environment Assessment

Conduct an environmental assessment of the waters to be measured, including water depth, water flow speed, water quality, obstacle distribution, etc., to ensure that the unmanned vessel and depth sounder can operate in a safe and stable environment.

2) Weather conditions considered

Pay attention to weather forecasts and choose suitable weather conditions for assembly and measurement work to avoid bad weather causing damage to equipment or affecting measurement accuracy.

4. Installation tools and material preparation

1) Professional Tools

Prepare necessary installation tools, such as screwdrivers, wrenches, pliers, electric drills, etc., as well as special connecting wires, fixing brackets, etc.

2) Safety protection

Equipped with necessary safety protection supplies, such as safety helmets, gloves, protective glasses, etc., to ensure the safety of personnel during the assembly process.

5. Staff training and division of labor

1) Technical training

Provide technical training to personnel involved in assembly and measurement to familiarize them with equipment operation, installation procedures and precautions.

2) Clear division of labor

Make reasonable division of labor according to personnel skills and experience, clarify their respective responsibilities and tasks, and ensure the smooth progress of assembly and measurement work.

6. Emergency plan formulation

1) Equipment failure response

Develop an emergency plan for equipment failure, including the process of troubleshooting, repairing or replacing equipment, and the preparation of spare equipment.

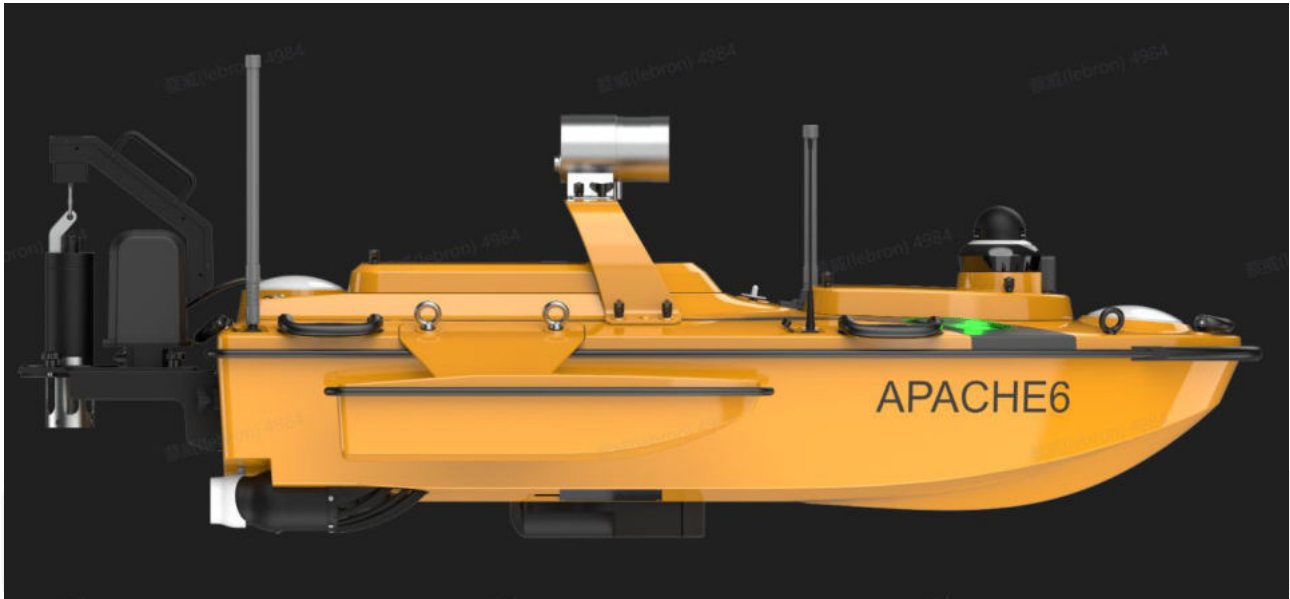
2) Safety emergency response

Develop safety emergency response plans, including water accident handling and personnel rescue, to ensure rapid and effective response in emergency situations.

2. Huawei No. 6 unmanned boat Hardware Introduction

This chapter introduces Huawei No. 6 unmanned boat System composition and functional characteristics

2.1 Huawei No. 6 (APACHE6)







1) Directional satellite search antenna

Providing real-time directions to unmanned vessels.

2) Positioning satellite search antenna

Provide real-time positioning for unmanned ships.

3) Remote control antenna (RC&WIFI)

Enhance the remote control signal of unmanned ships.

4) 4G Antenna

Enhance the 4G signal strength of unmanned ships.

The 4G mode is the most commonly used mode. It can transmit data through 4G and log in to CORS to obtain differential signals.

5) Radio Antenna

Enhance the unmanned ship radio signal.

Receives differential signals sent from GNSS base stations via radio.

6) Servomotor

Shallower draft, less scratching, and provides forward and backward power for the unmanned boat, reducing the turning radius of the unmanned ship.

7) Camera

It can transmit the image in front of the camera in real time and supports 360° rotation.

8) switch

Hull There is a button on the backswitch, Long press 3s Start the unmanned boat.

9) Indicator Lights

There is an indicator light on each side of the hull.

The red indicator light on the left is the star search light. If the red light is always on, it means the initialization is complete. The number of times the red light flashes indicates the number of stars searched. For normal operation, the red light should be always on.

The green indicator light on the right is the differential signal light. A steady green light indicates a fixed solution, a flashing green light indicates a floating solution, and an off light indicates that no differential data has been received.

10) floating body

Enhance wind and wave resistance to ensure the safety of unmanned ships and the accuracy of data collection in severe weather conditions

11) Single beam transducer

The single-beam transducer is integrated on the unmanned ship and is used to transmit and receive acoustic signals.

12) iWBMS Multibeam Echo Sounder Mounting Bracket

For fixing multibeam echo sounder transducer to Huawei No. 6 unmanned boat Moon Pond

13) iWBMS multibeam echo sounder installation moon pool

Multibeam echo sounder transducer installation location

14) iWBMS Multibeam Echo Sounder Transducer**15) iWBMS Multibeam Echo Sounder Sonar Interface Unit**

Mainframe of the multibeam echo sounder measurement system

2.2 GD100 Master Controller



Figure 2.5: GD100 main control six views

Interface definition:

- 1) GNSS1 connected to the unmanned boat rear antenna
- 2) GNSS2 is connected to the front antenna of the unmanned ship;
- 3) POWER is the power supply line for GD100
- 4) SIGNAL is used for sending and receiving data from unmanned ships;
- 5) The SIM card slot can be connected to the user's SIM card
- 6) The LAN1 network port is usually connected to the unmanned ship camera to provide network;
- 7) RC interface connects to the unmanned boat RC antenna base
- 8) 4G interface connected to 4G antenna base
- 9) The RADIO interface is connected to the radio RADIO antenna base.



Notice:

Only LAN1 port can communicate on the network, LAN2 port cannot communicate.

2.3 D270 Single Beam Depth Sounder

The D270 single-beam echo sounder of Shanghai Huace Navigation Technology Co., Ltd. is a high-precision and convenient water depth measurement equipment independently developed by the company. The echo sounder has added a water temperature detection sensor in a breakthrough way, which can automatically correct the sound speed according to the water temperature in real time, thereby significantly improving the accuracy of water depth measurement. At the same time, it supports mobile phone WiFi connection and uses the Linux operating system, which is convenient for users to set parameters and display map tracks. It has built-in 8GB storage space, and field measurements can be completed without carrying a bulky computer. The D270 also has intelligent functions such as shallow water reminders and data abnormality reminders. It supports 200Khz and 25Khz dual-frequency switching to adapt to different water quality environments. It is widely used in river section measurement, reservoir storage capacity calculation, and waterway dredging volume measurement, providing users with efficient and accurate data support.



Figure 2.6: D270 single beam echo sounder mainframe appearance

Interface definition:

- 1) Transducer connection transducer cable
- 2) Signal connects power supply cable and data transmission cable

2.4 Unmanned ship indicator light

2.4.1 Unmanned ship navigation indicator light description:

- 1) The red light is always on: The unmanned boat has completed initialization and can be switched to automatic mode for measurement.
- 2) Flashing red light: The unmanned boat initialization is not completed. The number of flashes indicates the number of satellites searched. Operations cannot be performed at this time.
- 3) Red light off: The unmanned boat is not powered on. Check the power supply. The actual

status indicator of GD100 shall prevail.

- 4) Green light is always on: Unmanned vessel positioning status - fixed solution (there is a delay of 5-8 seconds from fixed to light status display on the software).
- 5) Green light flashes: Unmanned vessel positioning status - floating solution.
- 6) Green light is off: Unmanned vessel positioning status - single point solution.
- 7) The red and green lights flash alternately: The firmware is being upgraded. Please do not turn off the power. The drone will automatically restart after the upgrade is successful.



Notice:

The main control indicator light is abnormal. When the unmanned boat has not been initialized, the red and green lights are always on. This indicates that the GD100 is faulty and you need to contact the technical support engineer for repair.

2.5 Camera

The cameras on the HUAWEI series of unmanned boats of Shanghai Huace Navigation Technology Co., Ltd., as an important part of this series of unmanned boats, integrate high-precision and high-definition image acquisition technology. These cameras not only support real-time video transmission to ensure the intuitiveness and safety of remote control, but also have strong environmental adaptability and can work stably under various complex water conditions. The camera is a 360° omnidirectional video, and the EasySail software can be used to adjust the direction of the camera screen, capture images, and record pictures.

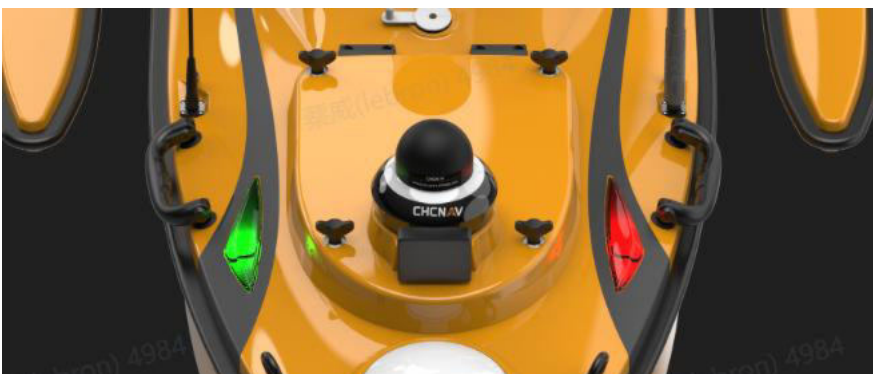


Figure 2.7: 360° PTZ camera

2.6



2.7 9S battery

The battery of this unmanned boat is highly integrated, and the power monitoring is also encapsulated inside. It adopts the most advanced impedance tracking algorithm, and the capacity error is within 1%. At the same time, there are accurate calculation methods for battery aging and self-discharge during use, and the remaining time can be accurately predicted for different usage modes of electrical equipment. This product has high-precision capacity calculation and high-stability safety guarantee, which fully guarantees the safety and reliability of user use.



Figure 2.9: 9S battery appearance

Table 2.1: 9S battery electrical parameters

Serial number	project	unit	Required Parameters		Remark
1	Rated capacity	mAh	≥23Ah		The capacity of a battery after being charged according to the standard and discharged according to the standard.
2	Nominal voltage	V	32.4V		After charging according to the standard, discharge according to the standard, the average voltage during the discharge process.
3	Charging method		Constant current/constant voltage		CC/CV
4	Charging limit voltage	V	37.8		4.29
5	Discharge end voltage	V	27		18V corresponds to 0% power
6	Maximum charging current	continuous	A	10-12A	
7	Maximum discharge current	continuous	A	50-60A	
8	weight	Kg	About: 4.5 ± 0.3		
9	Internal resistance	mΩ	200		Tested under AC1kHz condition

10	Size (HXWXL)		mm	MAX(235.8X122.6X87)	Unit: mm
11	Operating temperature	Charge	°C	0~45	
		Discharge	°C	-20~60C	
12	Storage temperature	1 month	°C	-20~60C	About 50% charged
		3 months	°C	-20~45C	
		1 year	°C	-20~25°C	
	Storage humidity		RH	65±20%	

2.7.1 Battery Usage Guide

If the capacity is inaccurate or changes suddenly during use, please replace the battery. **Charge to 100% Wait two hours** Then use the battery to discharge until the system shuts down, then remove the battery. **place 5 Hour** Then use the charger to charge the battery. After a complete cycle, the capacity will be displayed accurately without jumping.



Notice:

For safety reasons, do not short-circuit the positive and negative poles of the battery during use, and do not disassemble the battery without permission or throw the battery into fire.



hint:

For the user, discharging the battery until the system shuts down means loading the battery into the unmanned boat and powering it on until the battery level reaches 0%..

2.7.2 Battery preservation

- 1) The battery should be stored in a well-ventilated and dry environment. The temperature should usually be kept between -20 and 35°C and the humidity should be below 75%. Avoid placing the battery in an environment where the temperature exceeds 35°C or is below -20°C.
- 2) The battery should be kept away from fire, heat sources and corrosive substances. It is prohibited to store it in the open air or in direct sunlight, and it is prohibited to store it together with flammable and explosive items.
- 3) New and old batteries should be stored separately to avoid batteries in different states from affecting each other;
- 4) Do not store the battery for a long time after it is completely discharged to avoid

over-discharge of the battery and damage to the battery cell.

- 5) For batteries stored for a long time, the battery status should be checked regularly and necessary maintenance should be performed. It is recommended to charge and discharge the battery once every three months and keep the battery level between 40% and 60% to avoid full charging or full discharge.
- 6) The warehouse where batteries are stored must meet fire safety requirements. It is recommended to use brick walls for solid separation and use closed, explosion-proof or other corresponding safe electrical lighting equipment;
- 7) **Regularly check the battery connector for looseness, deformation, cracks, rust or damage, and check the battery casing for damage, bulging or deformation, etc. (non-rechargeable batteries)**If there are any, it is forbidden to continue using it. It should be placed in a safety box such as an explosion-proof cabinet, and contact a professional battery recycling company immediately for disposal;
- 8) The battery needs to be kept between 40% and 60% before storage to avoid long-term storage causing battery depletion, which affects battery performance and life;

2.7.3 Battery Safety Precautions

2.7.3.1 Leakage treatment

The electrolyte is corrosive and contact may cause skin irritation and chemical burns. If contact with battery electrolyte occurs, take the following actions:

- 1) **Inhalation:**
Evacuate the contaminated area, get fresh air immediately, and seek medical help immediately.
- 2) **Eye Contact:**
Immediately flush eyes with plenty of water for at least 15 minutes without rubbing, and seek medical help immediately.
- 3) **Skin contact:**
Wash contact area immediately with plenty of water and soap and seek medical help immediately.
- 4) **Intake:**
Get medical help immediately.

2.7.3.2 Recycling

- 1) Please dispose of used batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste. Improper battery disposal may cause environmental pollution or explosion.
- 2) Faulty batteries are strictly prohibited from being reused and must be scrapped as soon as

possible to avoid environmental pollution.

- 3) Avoid exposing used batteries to high temperatures or direct sunlight.
- 4) Avoid exposing used batteries to high humidity or corrosive environments.

2.7.3.3 Other considerations

- 1) It is strictly forbidden to throw the battery into fire or water. It is forbidden to continue to use the battery that has been soaked in water. Please contact our after-sales service and return it to the factory for inspection and treatment;
- 2) It is strictly forbidden to short-circuit the positive and negative poles of the battery, otherwise it will cause a short circuit in the battery and cause danger;
- 3) The battery is strictly prohibited from being subjected to mechanical vibration, drop, collision, puncture by hard objects and pressure shock, otherwise it may cause battery damage or fire;
- 4) It is strictly forbidden to disassemble, modify or damage the battery (such as inserting foreign objects, squeezing by external force, immersing in water or other liquids) to avoid battery leakage, smoke, release of flammable gas, thermal runaway, fire or explosion;
- 5) Do not expose the battery to high temperature environments or around heating devices, such as high temperature sunlight, fire sources, transformers, heaters, etc. Battery overheating may cause leakage, smoke, release of flammable gases, thermal runaway, fire or explosion;
- 6) The battery is a closed system and no gas will be released under normal operation. If it is subjected to extreme abuse, such as fire, puncture, extrusion, lightning strike, overcharging or other severe conditions that may cause thermal runaway of the battery, it may cause battery damage or abnormal chemical reactions inside the battery, resulting in electrolyte leakage or the generation of flammable gas. The site should ensure that the flammable gas emission measures are normal to avoid burning or corrosion of equipment;
- 7) After each operation is completed, check whether there is water stain in the battery interface and deal with it in time;
- 8) Faulty or obsolete batteries are strictly prohibited from being reused and must be scrapped as soon as possible. Please follow local laws and regulations or contact our after-sales service for repairs;
- 9) When the battery exceeds its service life (does not meet the service life determination), it is prohibited to continue using it. Please contact our after-sales service department to return the

battery to the factory for inspection and processing;

Life span determination: within three years from the date on the label;



Notice:

- 1) The service life determination standards must be strictly followed, and batteries with a service life of more than three years must be returned to the factory for inspection;
- 2) Press and hold the battery check button. If the indicator light does not light up, the battery needs to be returned to the factory for inspection.

2.8 Battery Charger Use



Figure 2.10: 9S battery dual-channel charger appearance

1. First, insert the charger AC plug into the power socket. The charger LED indicator light should be green. If the indicator light is off, the red and green lights are flashing, or the red light is always on, stop charging and check whether the charger output is short-circuited or the input power plug is loose.
2. After the charger's LED working indicator lights up green, insert the charger's output plug into the battery device jack to be charged. The indicator light will turn red, indicating that the charger is charging the battery.
3. When charging is complete (this may take 1 second depending on the battery capacity and initial charge), ~10 hours) The LED indicator will automatically turn green, indicating that the battery is fully charged and the charger enters the constant voltage charging state. Long-term constant voltage charging is safe and harmless to the battery pack;
4. After charging is completed, first unplug the charger's output plug, then unplug the charger's AC power plug, and place the charger in a safe place.



warn:

- 1) Before charging, please confirm whether the charger you are using is compatible with the battery to be charged (this charger is sold and used in conjunction with the equipment that uses the battery); **It is prohibited to use non-matching chargers to charge the unmanned**

boat battery or use other chargers to charge the unmanned boat battery.

- 2) The charger is for indoor use only and is not allowed to be exposed to water or rain. **Charge in a dry, well-ventilated environment, away from heat sources, flammable and explosive items, and do not charge near the bedroom**
 - 3) There is high voltage inside, do not open the casing;
 - 4) The charger must not be placed in a high temperature, flammable or explosive environment for charging;
 - 5) Do not use the charger to recharge (Exceeding the service life, damage, or destruction, the subsequent instructions will clearly define [non-rechargeable]) Battery charging for use;
 - 6) If you have any quality problems during use, please contact us directly Shanghai Huace Navigation Please contact after-sales, no unauthorized repairs are allowed.
-

2.8.1 Charger performance

2.8.1.1 Input characteristics:

Working AC voltage range: AC90~260V;

Rated working input AC voltage: AC100~240V;

Input operating frequency: 50~60HZ;

Charger no-load input power: $\leq 20W$

Rated maximum input power: $\leq 570W$

2.8.1.2 Output characteristics:

Charger no-load output voltage: DC37.4V-38.2V

Normal working output voltage): DC27-37.8V;

Rated operating output current (constant current): 5.4A-6.6A;

The charger is compatible with the battery pack specifications: 9 cells 8-40H;

Rated output power: $\leq 227W$ 2 double group

Charger working efficiency: $\geq 80\%$;

The red charging light indicates that the charger is charging;

The green charging light indicates that the charger is in the state of waiting to be charged or fully charged;

The condition for the charging red light to turn green: 0.30AI0.90A or $V_{out} 37.8V$;

Conditions for charging red and green lights flashing alternately: abnormal charger protection;

2.8.1.3 Protection features:

- 1) Overcurrent protection: When the current of the charger and the supporting equipment exceeds the rated working current, the charger stops working immediately. After the fault is eliminated, the charger can resume working state.
- 2) Short circuit protection: When the positive and negative poles of the charger output are short-circuited, the charger automatically protects itself from output voltage. After the short circuit protection is released, the charger will work again.

2.8.1.4 Environmental characteristics:

Normal operating temperature: 0~+40°C;

Storage temperature: -20~+70°C;

Normal working environment humidity: +95%RH

2.8.2 Notes on charging and discharging

- 1) Make sure to use the charger that comes with the product package. Do not use low-quality or uncertified chargers to charge lithium batteries.
- 2) Avoid charging in high or low temperature environments. Do not charge in direct sunlight or high temperature environments. The battery charging temperature range is 0~45°C.
- 3) If the battery temperature is below 0°C, the battery needs to be preheated to ensure that it reaches a safe charging temperature; if the battery temperature is above 40°C, measures need to be taken to cool it down, such as stopping the use of the battery or using a cooling system;
- 4) The battery must be protected from overcharging during charging. The charging time should not be too long. It is best to unplug the charger within one hour after the light turns on. Do not leave the battery connected to the charger for a long time.
- 5) If you find that the battery is swollen, deformed or leaking during use, stop using it immediately and contact our after-sales service. Do not force the battery to charge or discharge.
- 6) When using multiple batteries at the same time: make sure the production dates of the batteries are within one year of each other, and avoid using old and new batteries together; fully charge all batteries before use, and avoid using fully charged and partially charged batteries together;
- 7) It is strictly forbidden to overload the battery, especially when the battery is low;
- 8) Charge in a dry, well-ventilated environment, away from heat sources, flammable and explosive items, and do not charge near the bedroom;
- 9) Do not charge the battery after it is completely used up. Charge it when the battery level is less than 10%, which can effectively extend the battery life.
- 10) Do not charge the battery immediately after use. It is recommended to wait at least half an hour to ensure that the battery has cooled down before charging.
- 11) It is recommended that the battery charging process be carried out in a dedicated explosion-proof cabinet, or have a dedicated person supervise it;
- 12) The temperature range of the battery during discharge should be controlled between -20 and 60°C. If the temperature is too high or too low, it will affect the performance and life of the battery.

3. EC10 Android Remote Control

This chapter introduces the hardware components and functional features of the

EC10 Android remote control

3.1 EC10 Android Remote Control



Table 3.1: EC10 Android remote control parameters

Display	10.1-inch industrial touch screen + sunlight viewable screen
Resolution	19201200
Android	Android 9.1
Memory	RAM 4GB, storage capacity 64GB
Communication frequency	800MHz/1.4GHz/2.4GHz
Communication distance	Digital radio normal 2km, maximum 3km, 4G unlimited
Battery capacity	20000mAh
Working endurance	5 hours
Charging	36W fast charge, charging time 4 hours

power	
interface	USB port, Nano SIM card slot, LAN port, audio port, HDM port, TF card supports up to 128GB, Type-C
button	Main joystick 2, secondary joystick 2, knob 2, button 8
Hull control	Physical button control manual/automatic, hover control, integrated software control hull, route planning, underwater terrain data collection

3.2 Remote Control Parts Introduction

- ① 开关按键
- ② 前进/后退摇杆
- ③ 向左/向右摇杆
- ④ 自动/手动切换按键
- ⑤ 悬停按键
- ⑥ 天线



- 1) **On/off key:** Remote control power button, long press to turn on/off.
- 2) **Forward/Backward:** Control the unmanned boat forward and backward. Only the forward and backward directions are effective, and the left and right directions are invalid.
- 3) **Turn left/right:** Control the steering of the unmanned boat. Only left and right directions are valid, and front and back directions are invalid.
- 4) **Automatic/manual switch button:** Switch the mode of the unmanned boat. Supports manual and automatic modes.
- 5) **Hover Button:** Control hover.
- 6) **Remote control antenna:** Used for remote control of unmanned boats. Note that the unmanned boat needs to be equipped with two corresponding RC antennas.

⚠ warn:

- 1) The physical buttons are subject to actual appearance and are subject to change without further notice.
- 2) The joystick of the remote control is a sensitive device. Operations such as flicking the stick

or pressing it with gravity are prohibited.

3.3 Remote Control Interface Introduction

1) HDMI interface:

High Definition Multimedia Interface (HDMI) is a fully digital video and sound transmission interface that can send uncompressed audio and video signals. You can use a video capture card combined with the computer-side OBS-Studio-30.1.2 software to project the remote control screen image to the computer screen

2) SIM card slot:

SIM (Subscriber Identity Module) card is an IC card held by mobile users of GSM system, called [Subscriber Identification Card]. When you need to frequently use 4G mode to connect to the unmanned boat and are troubled by the tediousness of frequently starting the mobile phone hotspot, you can consider inserting the SIM card to connect the remote control to the network and obtain mobile data to access the Internet.

3) USB-A interface:

The USB-A interface is the most common type of USB interface standard and is usually used to connect to a computer or other host device. It is usually used to connect external devices such as printers, keyboards, mice, storage devices, etc. The USB-A interface is usually a rectangle with four connection pins, two of which are used for data transmission and the other two for power supply. It is often used to transfer or copy engineering maps or results data through a USB flash drive.

4) Type-C interface:

The USB-Type-C interface is a newer USB interface standard that has many advanced features, such as reversible plugs, higher data transfer speeds, greater power transfer capabilities, etc. The shape of the USB-C interface is a smaller oval and can be inserted in any direction, so there is no need to worry about the direction of the plug. It is often used for charging through a standard charger or directly connecting the remote control to a personal computer through a data cable to copy data, and the computer will pop up the corresponding mobile device.

5) LAN port:

LAN (Local Area Network) interface is a local area network interface. Its main purpose is to connect the router to the local area network. The LAN interface is usually on the router and is mainly used to output signals. By connecting the network card interface of the computer with a network cable, the computer can access the Internet. Generally, the remote control and the computer are connected by a network cable so that they are in the same network segment, so that the computer can support the connection of the unmanned boat through the intranet.

6) Micro-SD card slot:

Secure Digital card is referred to as SD card. SD card memory card is an independent storage medium used in mobile phones, digital cameras, portable computers, MP3 and other digital products. MicroSD card is more compact, with a size of 11mm×15mm×1.4mm. It is often used by users to expand the capacity of remote controls, and supports up to 128GB of additional memory expansion.

7) PPM interface:

PPM is a way to combine control signals from multiple channels into a single signal for transmission. Through the PPM input interface, the device controller can receive the PPM

signal from the connected remote control and parse the control values of each channel, such as throttle, direction, pitch, etc. This interface is not commonly used.



3.4 Remote control charging

The EC10 remote controller has a built-in integrated rechargeable lithium battery, which is compatible with the market standard TYPE-C interface (such as USB chargers for mobile phones, cameras and other digital products) for charging. Using the official standard Type-C charger, it takes 4 hours to fully charge in the normal shutdown state.



! warn:

- 1) Use the official standard charger to charge the remote control. If you do not use the original charger, it is recommended to use a USB charger that complies with the PSE standard and has a specification of 9V/4A;
- 2) To keep the remote control battery in the best condition, please make sure to fully charge the remote control every 3 months;
- 3) If the ground terminal emits smoke, odor, or leaks during charging, please do not continue charging the ground terminal and send it to our company for repair.
- 4) Do not charge this product within reach of infants to avoid the risk of electric shock. Do not charge this product in an environment exceeding 60°C.

3.5 Environmental conditions for use

- 1) Ambient temperature: -10°C~+45°C.
- 2) Storage temperature: -20°C~+50°C.
- 3) Relative humidity: Not exceed 85%.
- 4) The place of use is not allowed to have explosive media, the surrounding medium should not contain gases and conductive media that corrode metals and destroy insulation, and it is not allowed to be filled with water vapor or have serious mold.
- 5) The place of use should have facilities to protect against rain, snow, wind, sand and dust.

3.6 Remote control maintenance and repair

For long-term storage, please store the remote control in a dry and ventilated place, away from direct sunlight to prevent overheating of the battery. If the remote control needs to be stored for more than one month, the remote control battery must be charged to 70-80% regularly to avoid battery exhaustion.

The recommended storage temperature range is +22°C to +28°C

Do not store the battery in a place below -20 degrees Celsius or above 45 degrees Celsius.

3.7 Remote control transportation and storage

warn:

To avoid possible injury and loss, be sure to observe the following: Always keep children away from parts of the remote control as wires and small parts may be dangerous to them.

Notice:

- 1) Do not immerse the remote control in water. If it does, please wipe it with a soft dry cloth in time, turn off the power immediately, and return it to our after-sales service for inspection.
 - 2) Do not mechanically impact, crush, or puncture the battery, and do not drop the battery.
-

4.EC10 Android remote control IPC

This chapter detailsHow to use the EC10 Android remote control software to remotely control the IPC in the Huawei 6 unmanned boat

4.1 Software Installation

4.1.1 Android Remote Control:

- 1) Install remote control software such as Sunflower remote control software/Todesk that relies on network connection;
- 2) Install Anydesk, a remote control software for direct LAN connection. (Available from<https://anydesk.com.cn/zhs>Download and install)

4.1.2 Industrial Computer

- 1) Install remote control software such as Sunflower remote control software/Todesk that relies on network connection;
- 2) Install Anydesk, a remote control software for direct connection to the LAN;
- 3) Install CMS/Qinsy field acquisition software;
- 4) Install the GUI multi-beam display and control software.

Remote access to industrial computers

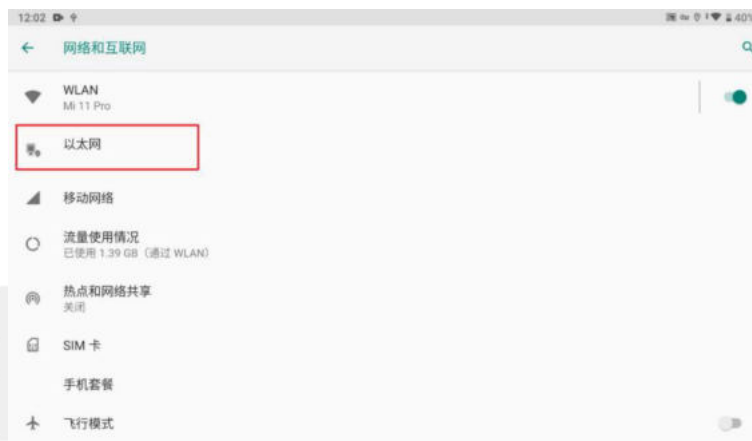
4.1.3 EC10 remote control connection

1. First open the remote control system settings and click [Network & Internet];



picture4.1:EC10 Android Remote Control Settings Page

2. Click [Ethernet];



picture4.2:EC10 Android Remote Control Network and Internet

3. Confirm that [Ethernet] is turned on, then click Configure Ethernet to view the remote control network segment. As shown in the figure, the IP address network segment is 144. Log in to the backend of the unmanned boat web page, [System Settings] - [Remote Control Settings] - Remote Control Type select H30; if the displayed network segment is 53, select M12 for the remote control type.

Make sure the remote control IP address is in the same network segment as the GD100 and the ship's internal industrial computer (microcomputer).



picture4.3:EC10 Android Remote Control Ethernet Settings

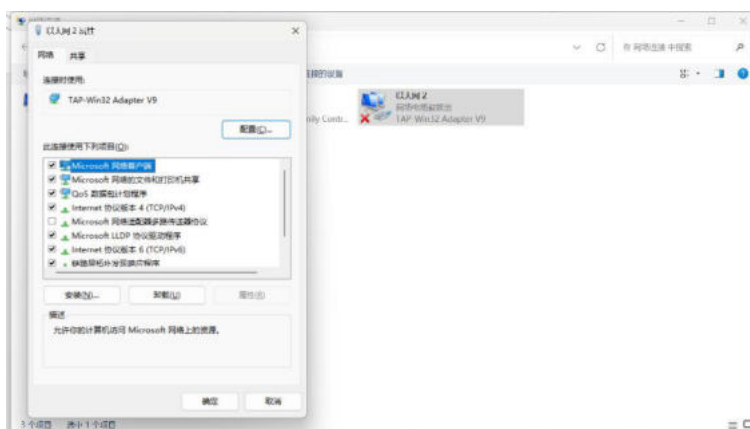
4.1.4 Industrial computer configuration

1. When using Anydesk to connect through a LAN, you need to ensure that:
2. Set up Anydesk [Unattended Access] and set the corresponding access password. It is recommended to set it to Admin1234 for easy memorization.;



picture4.4: Anydesk software configuration unattended access

3. Ensure that there is no need to update the Win10 system of the industrial computer;
4. *Anydesk* After the configuration is completed, enter the industrial computer system settings, open [Network and Internet Settings], click [Change adapter settings], check the Ethernet interface connected to the network cable between the switch and the industrial computer, double-click to open or right-click Ethernet and click Properties



picture4.5:Network Adapter Settings

5. Double-click [IPV4] and change it to [Use the following IP address] in the properties.;

**hint:**

It is recommended to configure IPV4 to the following recommended values.

Use the following IP address

IP address: 192.168.144.150

Subnet mask: 255.255.255.0

Default Gateway: 192.168.144.254

Use the following DNS server addresses

Preferred DNS server: 8.8.8.8

Alternate DNS server: 114.114.114.114

Click Advanced Options to add a group of IP addresses for WBMS multi-beam communication

IP address: 192.168.53.150

Subnet mask: 255.255.255.0

6. Normally, when the configuration is completed and applied successfully, you can see that the Ethernet port is sending and receiving data.
7. After the configuration is complete, you can try to open *GUI* Use the multi-beam display and control software to connect and check whether the multi-beam communication link is normal. At the same time, you can use the EC10 remote control to enter the IP address of the industrial computer through Anydesk to connect remotely and check whether the connection can be successful.

5. EasySailConduct route planning

This chapter introduces The process of route planning for Huawei No. 6 unmanned ship using EasySail software

5.1 Multibeam

underwater

topography Measurement Specification (part)

1) Bathymetric horizontal resolution

The minimum horizontal resolution of multi-beam sounding is not less than 5% of the measured depth. The horizontal resolution of multi-beam sounding refers to the horizontal distance between adjacent water depth points.

2) Beam coverage

Multi-beam underwater topography measurement should adopt the full coverage measurement method of the measurement area. For full coverage measurement, in addition to the overlapping coverage requirements of adjacent survey lines, the ship speed should also be controlled to ensure that the vertical incident beam at the bottom of the ship meets the full coverage requirements along the track direction.

3) Amplitude measurement coverage

The amplitude measurement of adjacent measurement lines should ensure that there is no less than 10% overlap of the small beam measurement amplitude measurement. Effective beam coverage is the part of invalid edge beams under the consideration of measurement system performance, environmental conditions and accuracy.

4) Cruise test specifications

The multi-beam bathymetric system should be fully operational before water depth measurement can be carried out. Before formal data collection, the survey vessel should enter the survey line in advance and maintain a stable ship speed and heading. During the survey line operation, the survey vessel should maintain a stable heading and avoid emergency turns.

5) Maximum ship speed formula reference

The ship speed should be kept uniform during the measurement. The ship speed can be adjusted appropriately according to the measurement needs to maintain data quality and sounding density, and the maximum ship speed should be controlled to ensure that the central beam can overlap along the track direction. The maximum ship speed is calculated using the following formula:

$$v = 2 \times \tan\left(\frac{\theta}{2}\right) \times (H - D) \times P$$

Where:

v——maximum ship speed, in meters per second (m/s);

θ ——longitudinal beam angle, in degrees ($^{\circ}$);

H——the shallowest water depth on the survey line, in meters (m);

D——draft of transducer, in meters (m);

P——The actual emissivity of the multibeam sounding system, in Hertz (Hz).

5.2 Unmanned ship connection

5.2.1 4G mode connects to unmanned boat

1. The remote control is connected to the 4G network, such as a mobile phone hotspot or a SIM card is inserted, to ensure that the Internet can be accessed normally;
2. Select the corresponding server and enter the SN number (i.e. **Serial number on GD100**), password (**Admin1234**) and other information, just click the connection;

The screenshot shows a mobile application interface titled '连接设备' (Connect Device). At the top, there are two tabs: '无人船测量' (Unmanned Boat Measurement) and 'D270测深仪' (D270 Depth Sounder). Below the tabs, there are several configuration options:

- 连接方式** (Connection Method): Two buttons, '4G网络' (4G Network) which is selected with a blue checkmark, and '数传' (Data Transmission).
- 服务器** (Server): A dropdown menu showing '中国服务器' (China Server).
- 用户名** (Username): A dropdown menu showing '9999839'.
- 密码** (Password): A text input field with masked characters '*****' and an eye icon to toggle visibility.
- 视频接入** (Video Input): Two radio buttons, '萤石云' (Ezviz Cloud) and '无' (None), with '无' being selected.

At the bottom of the form is a large blue button labeled '连接' (Connect).

Figure 11.1: Unmanned boat 4G mode connection page

After entering the basic information, click Connect. If the connection fails, the software will pop up a dialog box [Connection failed, please check the 4G antenna, ESIM card dialing and traffic plan, etc.]. You can follow the prompts in the dialog box to check one by one.



hint:

<http://service.huace.cn/rechange?sn=>

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

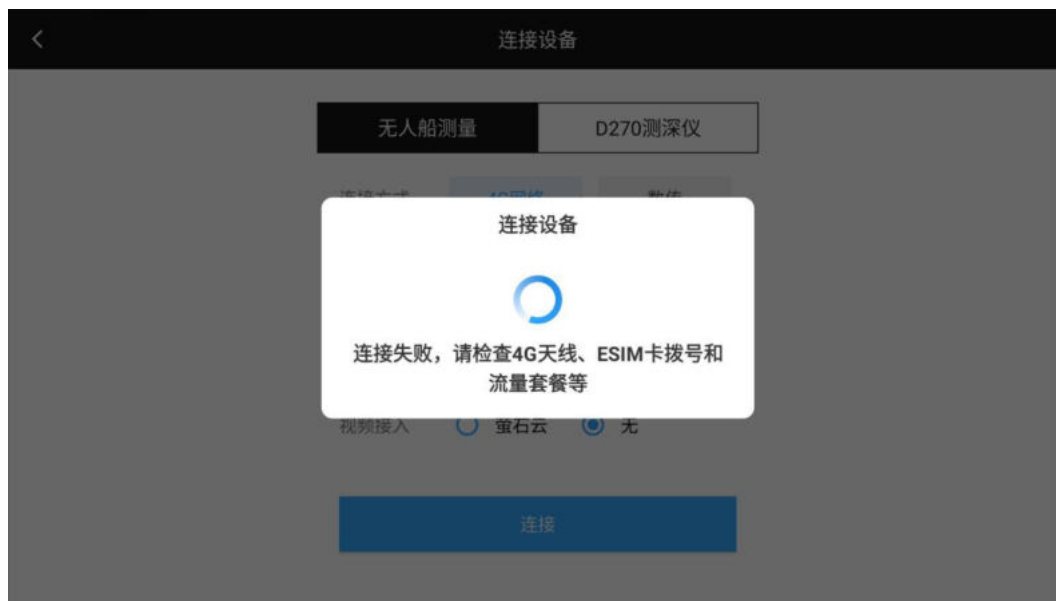


Figure 11.2: Pop-up window showing connection failure in 4G mode of unmanned boat

5.2.2 Digital transmission mode connects to unmanned boat

1. If the current device is an EC10 Android system remote controller, select EC10 remote controller type, otherwise select M12 (need to connect to the WiFi of the unmanned boat, the WiFi name is: APACHE2.4G-XXXXXXX);
2. Use the remote control to turn on the Ethernet switch, and the network segment must be 144;
3. The unmanned boat must be equipped with 2 RC antennas;
4. It is recommended that the two antennas on the remote control be placed vertically upwards to facilitate signal reception;
5. There must be no obstructions in the straight line between the unmanned boat and the remote controller;
6. If you want to view the camera image, select video access. At this time, the image is transmitted to the EC10 remote control through the 144 network segment. At this time, the delay is lower and it is smoother.



Figure 11.3: Unmanned ship data transmission mode connection page

5.3 Engineering Management

The project management interface can display all saved projects. Click [Project Route] to enter the project management interface, which displays a 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. After opening the project, enter the map interface. You can enter the management mode through the [Manage] button to perform multiple selection/delete/copy/share operations on the project files. When customers need to search for individual tasks, they can enter the name in the [Search Box] to search for tasks, and fuzzy queries are supported.



Figure 11.4: Topographic Survey Project Management List

5.4 New Construction

The steps for the new construction of topographic survey are as follows:

Click Create Project and set the coordinate system. You can select the commonly used coordinate system. In the commonly used coordinate system interface, you can select the saved commonly used coordinate files and delete the files.

1) Scan QR code

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

2) Custom

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

3) Predefined

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

4) Import from file

Import a .crd or .dc file to import a coordinate system

< 新建工程

名称 测区_20231212195327

套用工程 ☐

坐标系 WGS84 >

确定

Figure 11.5: New project initial page



Figure 11.6: Select the coordinate system for a new project



Figure 11.7: Predefined coordinate systems



Figure 11.8: More operations on coordinate system parameters

The coordinate system parameter interface can be used to customize the coordinate system. The configurable items are: ellipsoid, projection, datum conversion, plane correction, elevation fitting, correction parameter setting. The coordinate system can be customized according to user needs.

1) Generate QR code

Generate a QR code for the currently set coordinate system;

2) Scan QR code

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

3) Load from a common coordinate system

Enter the commonly used coordinate system module and directly select the commonly used coordinate system;

4) Save to common coordinate system

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

5) Import from file

Import coordinate files from local directories and read directly; support file search;

6) Shared Coordinate System

You need to log in to the Huace Cloud account to share the coordinate system; generate a 4-digit sharing code, and use the Huace sharing code tool on the PC to read the shared coordinate system parameter file. The sharing code is valid for 30 minutes;



Figure 11.9: How to generate a route

7) New Construction

New projects support two methods for route planning, namely hand-drawn routes and imported files.

8) Importing files

The current software imports files that support waypoint files (.waypoints), polygon files (.poly, .kml, .kmz, .dwg, .dxf), etc. to create route tasks or polygon graphics.



Notice:

The imported file does not support too many waypoints (up to 500), too large an area, and any two points that are greater than 10km cannot be generated.

5.4.1 Introduction to topographic survey engineering parameters

1) Source ellipsoid

The default is WGS84. The ellipsoid here is the target ellipsoid. You can select a suitable ellipsoid name in the drop-down list according to project requirements.

坐标系参数	
名称	China CGCS 2000
椭球	投影 基准转换 平面校正 高程拟合 校正参数
椭球类型	国家2000
长半轴	6378137.0000000
扁率倒数	298.2572221010
坐标轴正方向	东北
下一步	

Figure 11.10: Coordinate system parameters - ellipsoid

2) projection

Select the projection method in the drop-down list as needed, and change the central meridian, latitude origin, mean latitude, length ratio, easting additive constant, northing additive constant, and projection surface height.

坐标系参数	
名称	China CGCS 2000
椭球	投影 基准转换 平面校正 高程拟合 校正参数
投影类型	高斯投影
中央子午线	117:00:00.0000000E
纬度原点	000:00:00.0000000N
长度比	1.0
东向加常数[m]	500000.0
北向加常数[m]	0.0
平均纬度	000:00:00.0000000M
下一步	

Figure 11.11: Coordinate system parameters - projection



hint:

EasySail After updating to version 1.4.0, the [Get Central Meridian] function is added when entering the central meridian position. It can obtain the local central meridian of the device in the case of RTK star search.

3) Datum conversion

In the conversion model, you can choose Bursa seven parameters/three parameters/strict seven parameters/grid, and you can also set the coordinate transition mode to XYZ unchanged/BLH unchanged

The screenshot shows the '坐标系参数' (Coordinate System Parameters) interface. The '名称' (Name) field is set to 'China CGCS 2000'. The '基准转换' (Datum Conversion) tab is selected, showing '转换方式' (Conversion Method) as '无参数' (No parameters) and '坐标过渡方式' (Coordinate Transition Mode) as 'XYZ不变' (XYZ unchanged). A blue '下一步' (Next Step) button is at the bottom.

Figure 11.12: Coordinate system parameters - datum transformation

4) Plane Correction

The conversion model of horizontal adjustment can choose ordinary four-parameter and TGO horizontal adjustment. It also supports selecting or externally importing horizontal grid north/east

The screenshot shows the '坐标系参数' (Coordinate System Parameters) interface with the '平面校正' (Plane Correction) tab selected. The '投影类型' (Projection Type) is set to '无' (None), and the '插值方法' (Interpolation Method) is '双线性内插' (Bilinear interpolation). The '水平格网 北' (Horizontal Grid North) and '水平格网 东' (Horizontal Grid East) are both set to '无' (None), with '导入' (Import) buttons next to each. A blue '下一步' (Next Step) button is at the bottom.

Figure 11.13: Coordinate system parameters - plane correction

5) Elevation Fitting

The fitting model can be selected from fixed difference, plane fitting, surface fitting and TGO vertical adjustment. The geoid model can be selected from none, EGM96.ggf, ARM_GEOID_GEO.ggf, sa2010.grd. The interpolation method can be selected from bilinear interpolation, spline interpolation and quadratic interpolation.

The screenshot shows the 'Coordinate System Parameters' screen for Elevation Fitting. The title bar is black with a back arrow and the text '坐标系参数'. Below the title bar is a form with a '名称' (Name) field containing 'China CGCS 2000'. The form has a tabbed interface with tabs for '椭球' (Ellipsoid), '投影' (Projection), '基准转换' (Datum Conversion), '平面校正' (Plane Correction), '高程拟合' (Elevation Fitting), and '校正参数' (Correction Parameters). The '高程拟合' tab is selected. It contains three rows: '拟合方法' (Fitting Method) with a dropdown menu set to '无' (None), '大地水准面模型' (Geoid Model) with a dropdown menu set to '无' (None) and an '导入' (Import) button, and '插值方法' (Interpolation Method) with a dropdown menu set to '双线性内插' (Bilinear Interpolation). At the bottom is a blue button labeled '下一步' (Next Step).

Figure 11.14: Coordinate system parameters - elevation fitting

6) Calibration parameters

You can set offsets such as north offset/east offset/elevation.

The screenshot shows the 'Coordinate System Parameters' screen for Calibration parameters. The title bar is black with a back arrow and the text '坐标系参数'. Below the title bar is a form with a '名称' (Name) field containing 'China CGCS 2000'. The form has a tabbed interface with tabs for '椭球' (Ellipsoid), '投影' (Projection), '基准转换' (Datum Conversion), '平面校正' (Plane Correction), '高程拟合' (Elevation Fitting), and '校正参数' (Correction Parameters). The '校正参数' tab is selected. It contains three rows: '北偏移' (North Offset) with a text input field containing '0.0', '东偏移' (East Offset) with a text input field containing '0.0', and '高程' (Elevation) with a text input field containing '0.0'. At the bottom is a blue button labeled '下一步' (Next Step).

Figure 11.15: Coordinate system parameters - calibration parameters

5.5 Equipment self-test

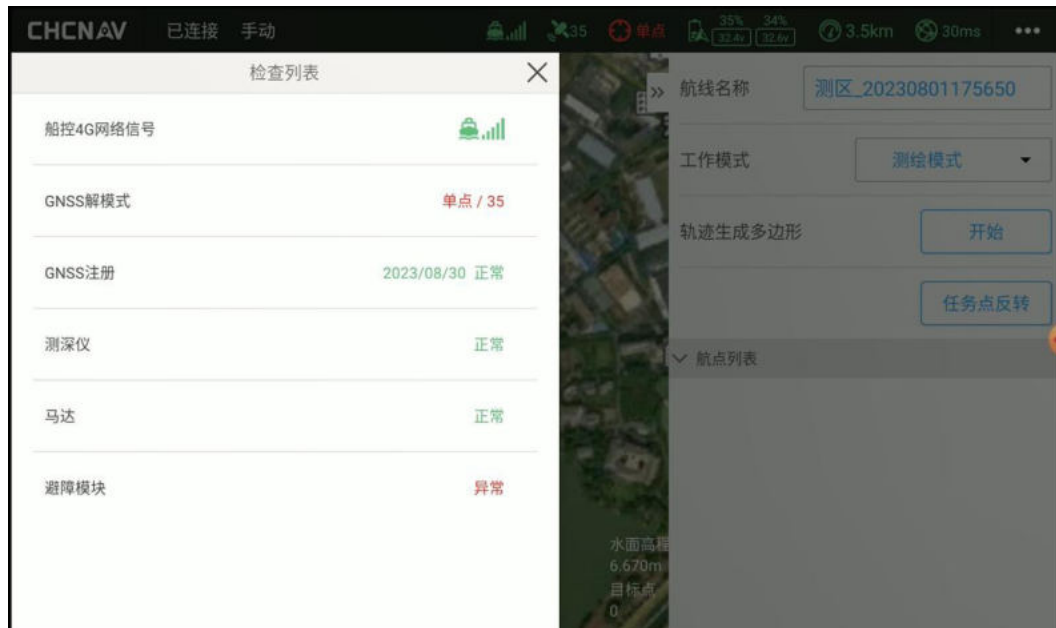


Figure 11.16: Topographic survey equipment self-test page

1) Ship control 4G network signal

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

2) GNSS solution mode

Positioning solution status, 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] will be displayed in green; if the expiration time is less than or equal to 48 hours, [Expiration in 2 days + Expiration date] will be displayed in yellow; if the expiration time is less than or equal to 24 hours, [Expiration in 1 day + Expiration date] will be displayed in yellow; if it is expired, [Expired] will be displayed in red.

4) depth sounder

A successful connection is displayed in green.

5) motor

The connection is successful and the display will turn green. For the first connection, it will

show an abnormality. Push the vertical rod to check the wind direction and power of the motor, and it will turn green.

6) **Obstacle Avoidance Module**

A successful connection is displayed in green.



5.6 Topographic Survey Route Planning

5.6.1 Hand-drawn route

The current steps for creating a new route are: click the map once to generate a task point, click the map multiple times to generate task points one after another and confirm the navigation position and direction in the order of click generation; you can add task points by dragging the [+] point on the route. The current operations on task points include deleting one point and deleting all points. You can also switch the task point properties in the route list point property drop-down box [task point (green) sampling point (purple), return point (red), hover point-unlimited (yellow), hover point-time (yellow, hover time can be set according to needs)].



Figure 11.17: Point attributes

Notice:

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

5.6.2 Polygon route drawing

The current logic of generating routes after creating a polygon is to click once on the map to generate a polygon boundary point, click three times in a row to generate a triangle, and click the map again to continue adding polygon boundary points. When the left edit polygon button is selected, you can move it by dragging it, or delete the selected point (click to select the polygon

point to be deleted, click the single point delete button (X);



Figure 11.18: Polygonal planning

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

5.6.3 Trajectory generation polygon

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



Figure 11.19: Trajectory generation polygon - start



Figure 11.20: Trajectory generates polygons - end

Click the [End] button, then set the route direction angle and route spacing, and click the [Generate] button to generate a preset route within the polygonal area.



Figure 11.21: Adjusting the course direction angle/course spacing

5.6.4 Importing files

When creating a new project for the first time, select Import File. The current software imports file formats that support waypoint files (.waypoints), polygon files (.poly, .kml, .kmz, .dwg, .dxf), etc. to create route tasks or polygon graphics;



Notice:

Importing files does not support too many waypoints, the upper limit is 500.



Figure 11.22: Hand-drawn route/import file

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



Figure 11.23: Importing files in edit mode

5.7 Routes

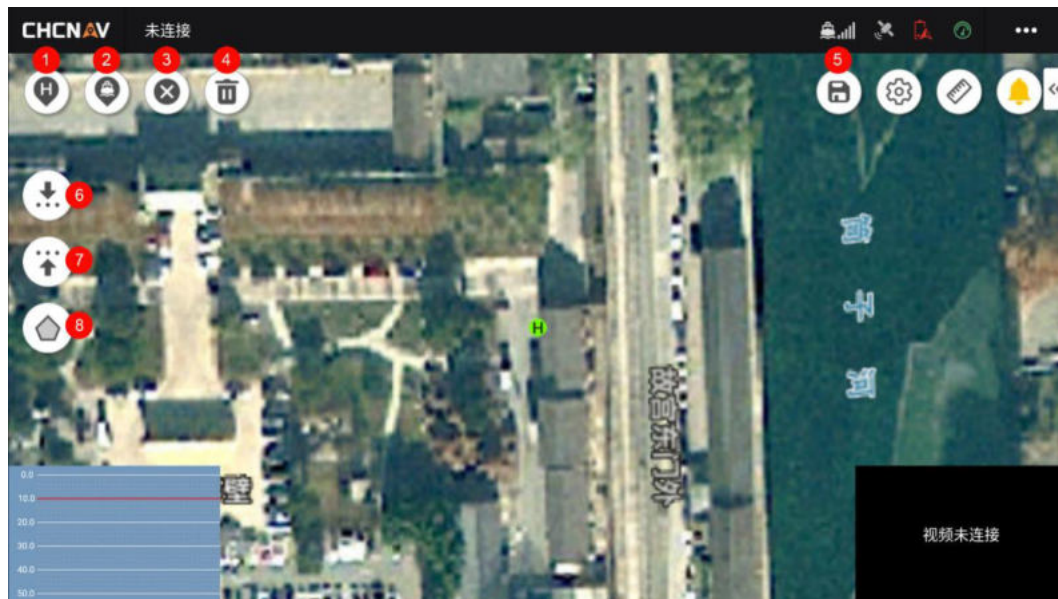


Figure 11.24: Function buttons on the topographic survey route editing page

1) Mark Home Point

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

2) Mark a point at the ship's current position

When the unmanned ship is connected and the software is in edit mode, click the button to generate a mission point at the current position of the unmanned ship.

3) Delete a point

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

4) Clear all points

Click this button and a pop-up window will appear. Select the point type (task point/polygon point) to be cleared.

5) Save route

Click this button to save the route. After saving the route, you can start the measurement work normally.

6) Upload route

Click this button to upload the drawn mission route to GD100.

7) Download routes

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

8) Draw polygons

Click this button to draw a polygonal range line in the software.



5.8 Topographic Survey Main Interface

Long press an icon to display the function information of the current icon.

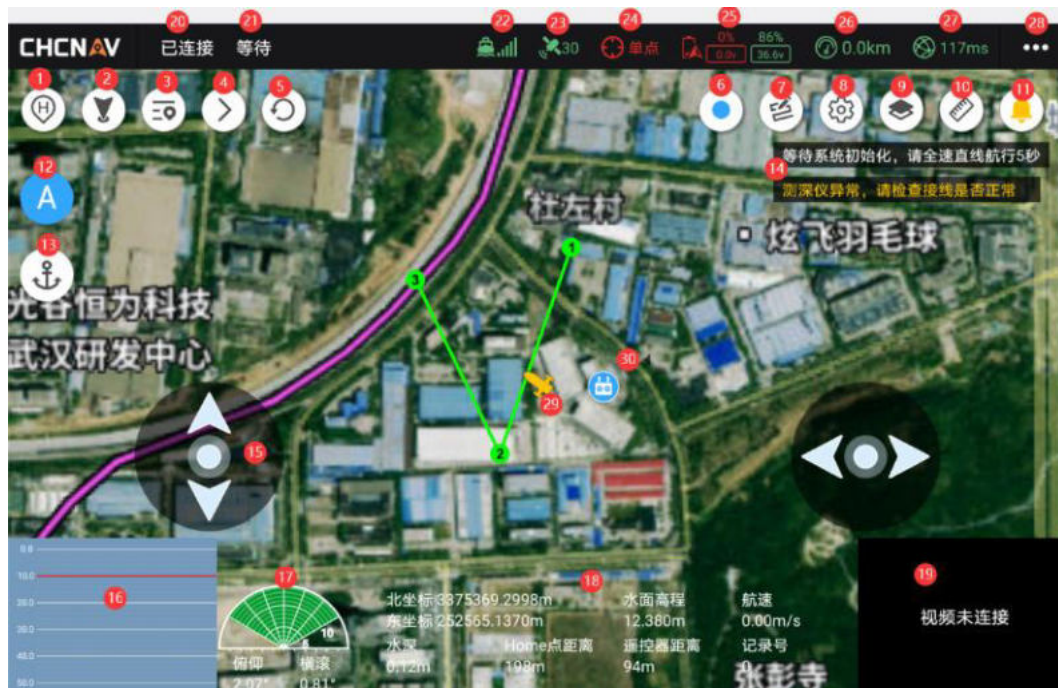


Figure 11.26: Topographic survey start measurement page function buttons

1) Sail to Home Point

After clicking, the unmanned boat switches to the return state and automatically sails to the set Home point;

2) Sailing here

Click the button to switch to the selected state. Click the map to generate point G, and the unmanned boat will switch to the guidance mode and drive to point G. Click the map again to change the target point. Click the [Sail here] button again to switch to the unselected state to turn off the navigation guidance setting, but the unmanned boat will complete the last guidance task.

3) Set the target point

Click this button to pull down and display the current mission point list. Select the corresponding mission point number and the unmanned ship will sail to the numbered position (note: it needs to be switched to automatic mode).

4) Next destination

Click this button and the unmanned ship will sail to the next target point.

5) Re-task

Click this button and the unmanned ship will return to point 1 and restart the mission, sailing from point 1 to the last mission point.

6) Start/Stop Recording

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

7) Edit route

Create a new project and enter the map interface. At this time, it is in the route editing mode. Users can operate the route (draw waypoints, delete waypoints, upload, download, etc.).

8) Map Settings

Click this button to set map tracking and map rotation

9) Layers

Click this button to display layer options, including route routes and record points, which can be manually checked and cancelled. After cancellation, the corresponding layer information can be hidden on the map.

10) ruler

Click this button to select it. Click any two points on the map to see the record and direction angle between the two points in real time. Click this button again to cancel the display.

11) Bell

Real-time messages will pop up and display automatically. There are two types of real-time messages: one is long-lasting, such as [System initialization, full speed for 5 seconds]. This message must be processed before it will automatically disappear within 5 seconds. If you ignore it, the message will remain. The other is a temporary prompt, which will automatically disappear within 5 seconds after popping up, such as [Shoal alarm, please leave the area]. The disappeared message will appear in the bell message list. The message list can be popped up by clicking the bell button. If you want to close the list, click the bell button again.

12) Automatic/manual switching

Switch between automatic and manual navigation modes.

13) Hover/Unhover toggle

Toggle hover and unhover mode.

14) Real-time messaging

Real-time messages pop up automatically. Please refer to No.11.

15) Suspended joystick

Control the throttle and direction of the unmanned boat. In the general settings bar, you can set the visibility. This joystick will only be displayed after saving the route.

16) Depth Sounder Waveform View

Real-time display of depth sounder waveform.

17) Common sensor information column

Latitude and longitude, geodetic height, speed, water depth, distance to target point, target point, record number.

18) Camera

Real-time preview of camera image transmission.

19) Connection Status

Display the connection status of the current device in real time.

20) Sailing Mode

Display the current unmanned ship's navigation mode information in real time.

21) Unmanned ship 4G signal

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

22) Search star number

Real-time display of GPS satellite search number.

23) GPS solution status

Single point, inertial navigation, floating, fixed.

24) Battery level

Remaining power and battery voltage.

25) Range

The current remaining battery power and the mileage it can support.

26) Delay

The network communication quality of the current device connection. Unit - milliseconds.

Within 300ms, it means the current network is good. 300-600ms, it means the network

fluctuates and the communication quality is average. Above 600ms, it means the network quality is poor.

27) Device Settings Module

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



5.9 Parameter settings

5.9.1 General - Boat Control Settings

1) Write Parameters

The drop-down list shows the name of the ship type parameter file (.param). Select the corresponding ship type name and click [Write].

2) Save 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. Manual input is also supported.

It takes effect in real time.

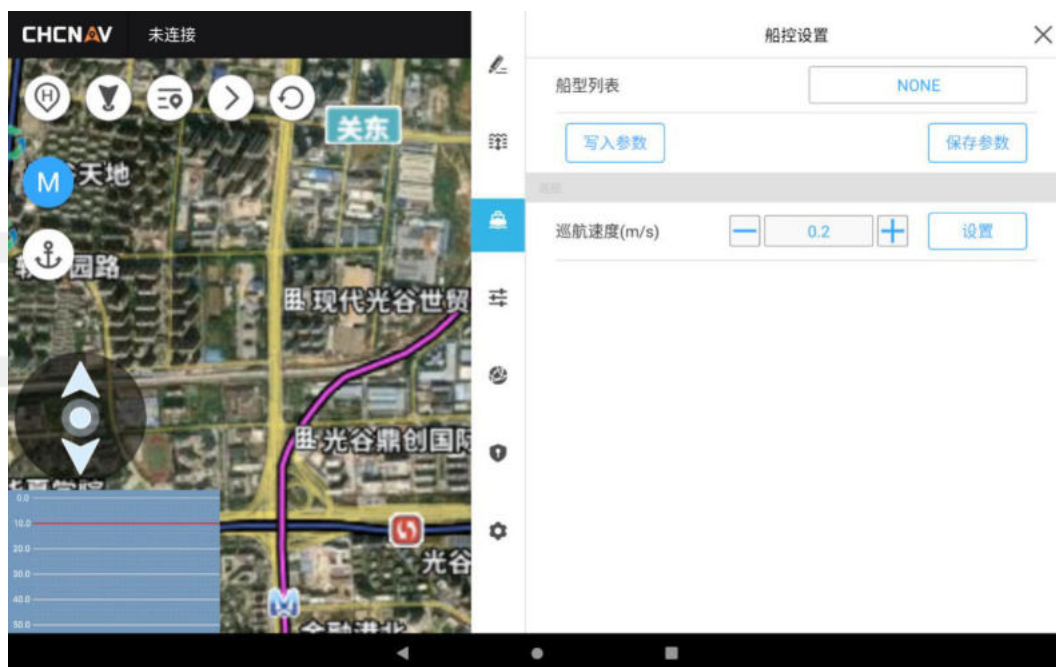


Figure 11.29: Parameter settings - ship control settings

5.9.2 General-System Settings

1) Shoal Backwards

Function switch, turn on this function, the unmanned boat will automatically reverse and leave after entering the shoal.

2) Automatic obstacle avoidance

Function switch, turn on this function, the unmanned boat will automatically bypass or stop when it finds an obstacle in front.

3) Lost contact and returned

Function switch, turn on this function. Once the remote control is disconnected (the remote control is far away from the unmanned boat), it can automatically return after a period of time (loss of connection time).

4) Low battery return

Function switch, turn on this function, if the battery power is low, the unmanned boat will automatically return.

5) Remote Control Pairing

After the remote controller is turned on, if it is not paired with the boat, you can use this button to pair it with the remote controller.

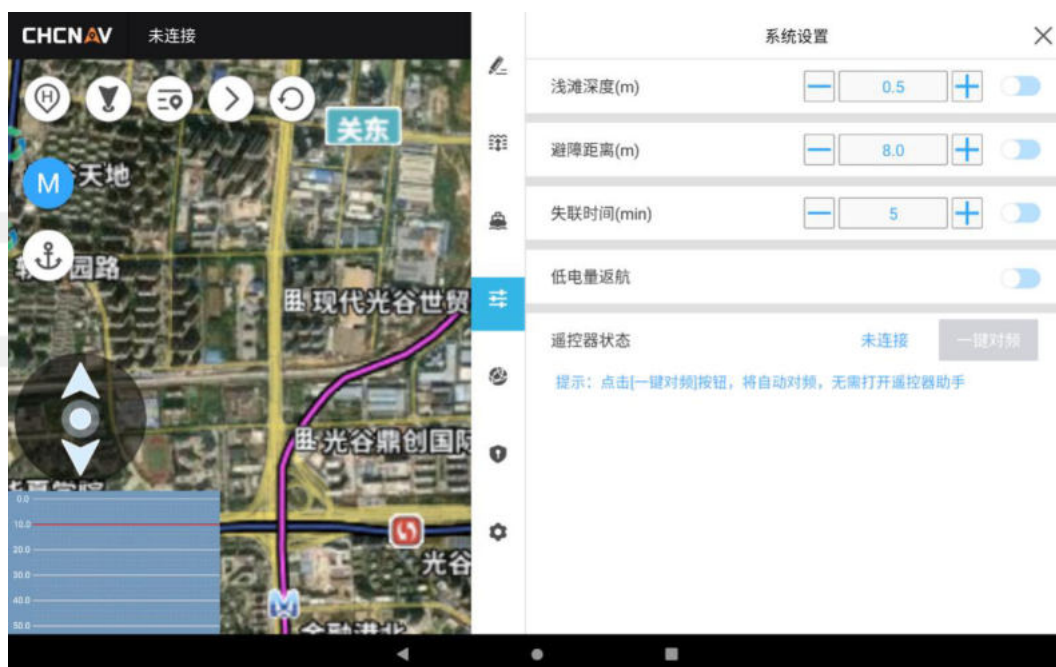


Figure 11.30: Parameter Settings - System Settings

5.9.3 General - CORS Login

This interface allows you to view the current CORS login status. You can also manually enter parameter information to log in to CORS.

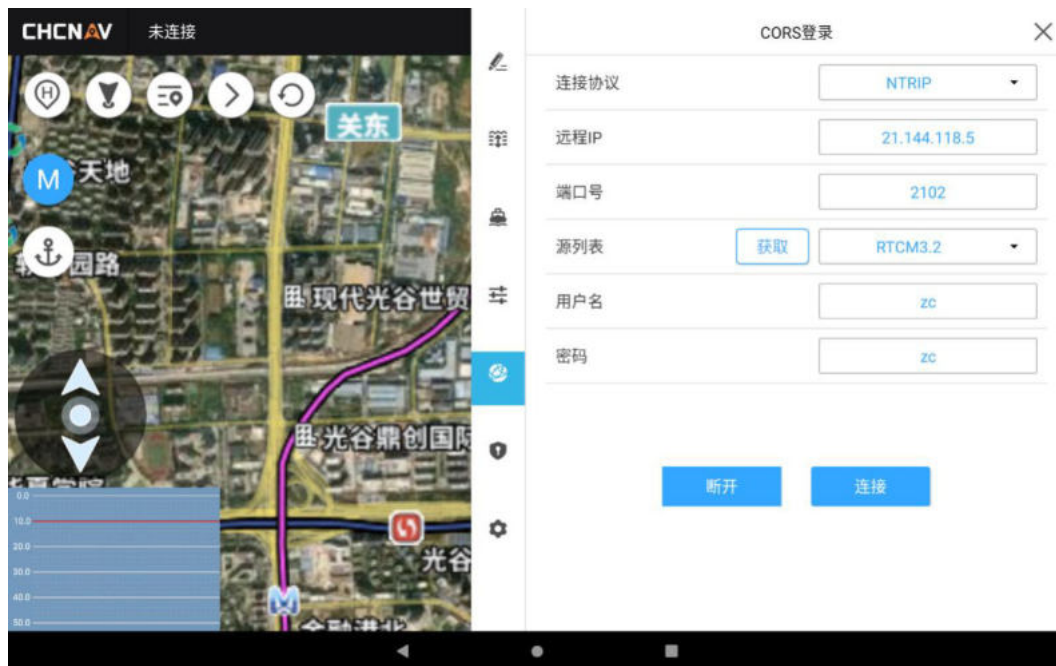


Figure 11.31: Parameter Settings - CORS Login

In the connection protocol, you can pull down and select the SWAS Huace built-in account, and then just click to connect.

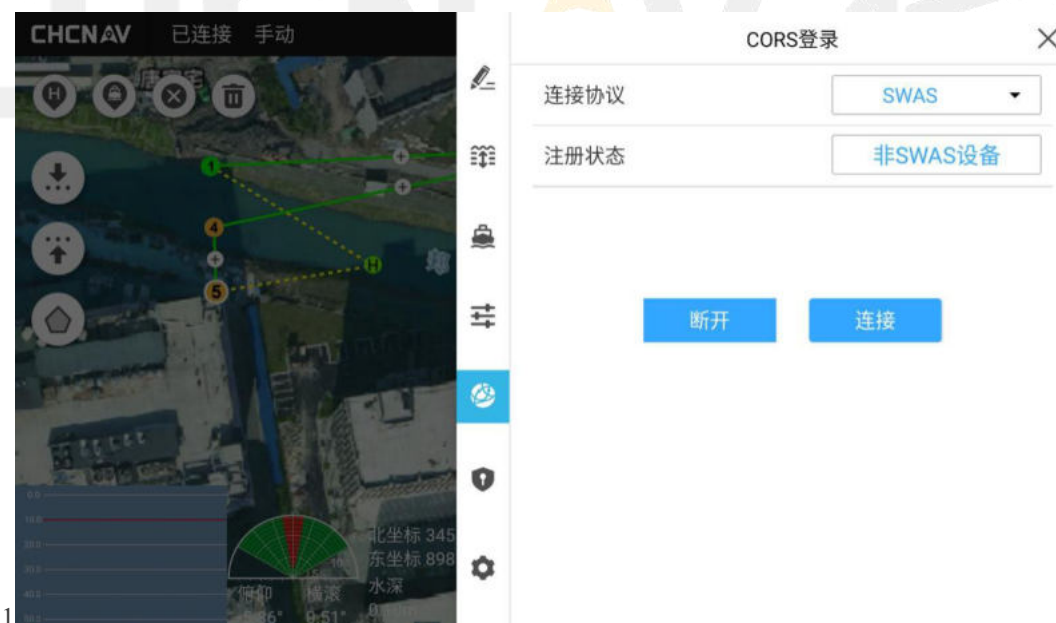


Figure 11.32: Parameter Settings - CORS Login

5.9.4 General-GNSS Registration

It can display the current unmanned ship's SN number, GNSS registration period, registration code and other information.

If the GNSS is expired, you can contact the technical staff to apply for a registration code, then enter the new registration code in the registration code position in the figure below, and click the Register button to complete the registration.



Figure 11.33: Parameter Settings - GNSS Registration

5.9.5 General-Map/Joystick Settings

1) Map Source

Support Tiandi Map, ARCGIS and customization.

2) Virtual joystick

Set the display and hiding of the virtual joystick. It will only be displayed after saving the project.

3) show

The map and video view switches. Each switch is full screen or half screen.

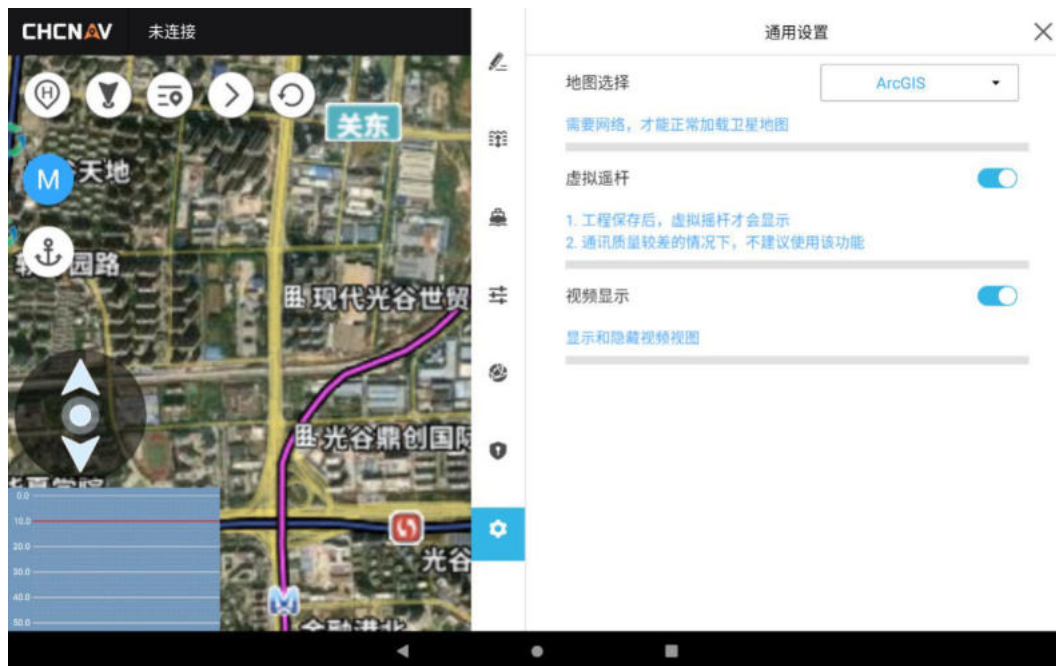


Figure 11.34: Parameter Settings - General Settings

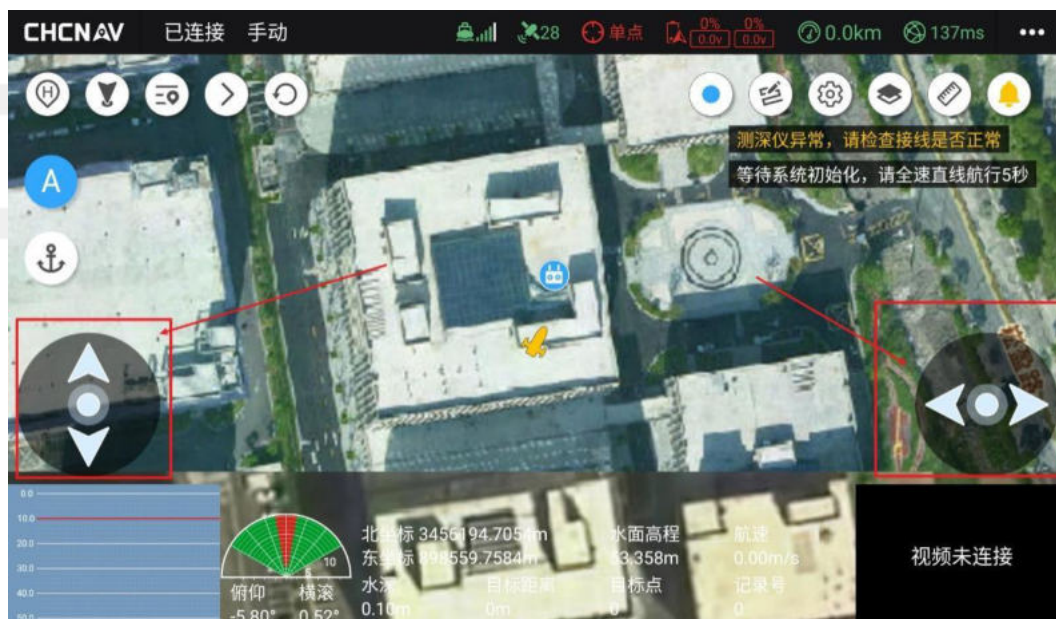


Figure 11.35: Virtual joystick

5.9.6 Map/Video Switch

- 1) Click the view box in the lower right corner to switch between the map and video interfaces. Supports half-screen switching and full-screen switching. Half-screen and full-screen settings can be set in the [General Settings] interface.
- 2) The video full screen interface has platform rotation, photo and video functions on the right.

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 upper right corner of the gimbal, which can be used to open and close the video stream freely.

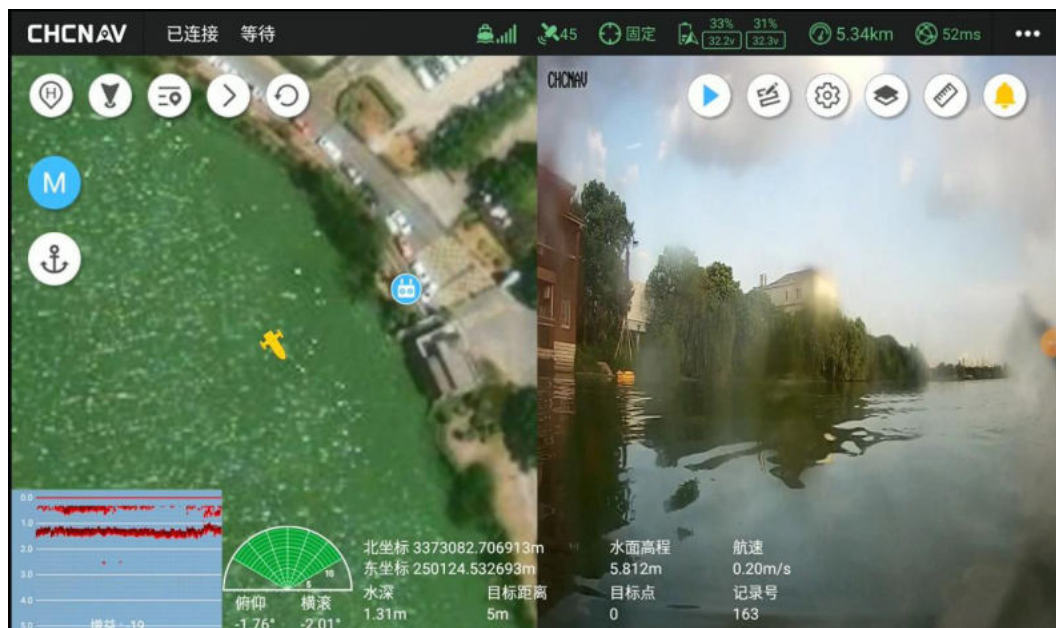


Figure 11.36: Camera/Work Page Half Screen



Figure 11.37: Camera full screen page

HUAWEI Series Unmanned Ship Web Management System

This chapter introduces the system parameters of the HUAWEI series unmanned boat web page background

After establishing a connection with the unmanned ship, you can access the unmanned ship web management system to view the status of the unmanned ship and control data output. There are two access methods:

- 1) **Method 1:**After connecting to the AutoPlanner/EasySail software via 4G (INTER), open the browser and enter 192.168.0.254 in the address bar to access it.
- 2) **Method 2:**Through TCP, the mobile device connects to GD100 via a network cable Connect GD100 via LAN1 or WIFI, open the browser, and enter 192.168.144.254 in the address bar to access.



Notice:

Through TCP connection, the device network segment needs to be modified to be consistent with GD100.



Figure 12.1: Login page of the unmanned ship web management system

Username (default):**admin**

Password (default):**Admin1234**

6.1 Unmanned ship status

6.1.1 System Status

In the system status bar, you can query network status, GNSS information, battery status, activity status, control status, depth sounder status and other information.

In 4G connection mode, you need to check the network status bar, network signal strength, dialing status and remaining ESIM traffic.



Figure 12.2: System Status

6.1.2 Location Status

This interface is used to view the unmanned ship GNSS rear antenna position and other related information.



Figure 12.3: Position Status

6.1.3 Location History

Enter the point name and click the measurement point to record the current position.



Figure 12.4: Location History

6.2 satellite

6.2.1 Satellite Tracking Table

This interface displays the currently tracked satellite information in a table format.

卫星编号	类型	高度角	方位角	L1伪距	L2伪距	L5伪距	是否使用
4	GPS	44	303	39.490	42.420	0.000	否
18	GPS	86	317	44.740	46.090	0.000	是
26	GPS	87	21	42.860	43.330	0.000	是
27	GPS	50	185	44.720	43.190	0.000	是
28	GPS	36	180	36.480	37.290	0.000	是
31	GPS	59	77	49.170	42.090	0.000	是
9	GLONASS	27	202	20.870	42.220	0.000	是
4	GLONASS	47	365	36.880	44.690	0.000	是
8	GLONASS	21	321	29.180	38.720	0.000	是
14	GLONASS	46	343	37.480	44.390	0.000	是
15	GLONASS	18	289	0.000	38.530	0.000	是
23	GLONASS	28	88	25.230	0.000	0.000	是
24	GLONASS	33	121	30.490	42.990	0.000	是
1	BDS	44	141	20.800	32.540	0.000	是
2	BDS	33	233	0.000	38.290	0.000	否
3	BDS	30	199	31.280	32.530	0.000	是
6	BDS	76	4	33.890	34.410	0.000	是
7	BDS	57	221	31.600	34.370	0.000	是
9	BDS	61	331	31.360	33.410	0.000	是
10	BDS	42	221	28.980	35.830	0.000	是
14	BDS	23	295	24.380	36.740	0.000	否
16	BDS	38	181	36.480	36.540	0.000	是
21	BDS	28	309	29.870	0.000	0.000	是
24	BDS	18	389	24.280	0.000	0.000	否

Figure 12.5: Satellite Tracking Table

6.2.2 Satellite tracking chart

This interface displays the currently tracked satellite information in the form of a histogram.



Figure 12.6: Satellite tracking diagram

6.2.3 Sky map

This interface displays the satellite zenith image.

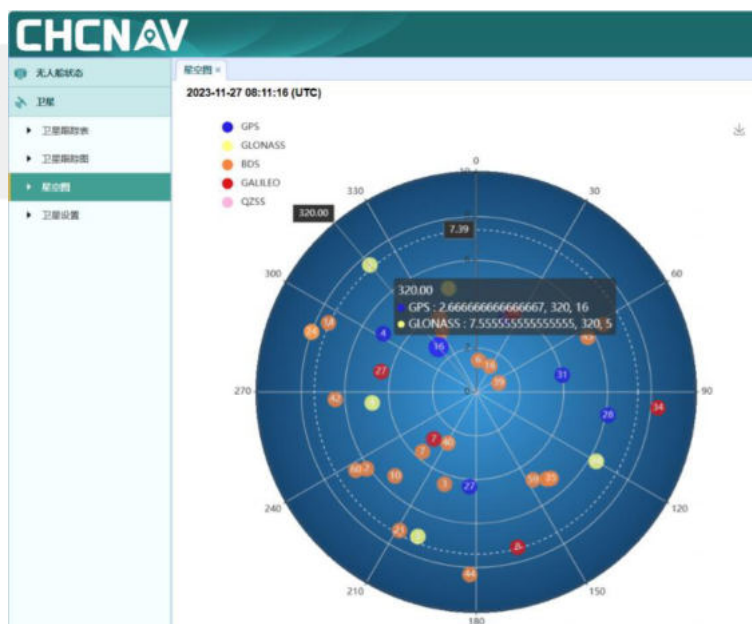


Figure 12.7: Sky map

6.2.4 Satellite settings

This interface can disable or enable tracked satellites.



Figure 12.8: Satellite settings



6.2.5 Account Management

No modification required by default



Figure 12.13: Account Management

6.3 Data Recording

6.3.1 Data Recording

The internal storage space of the unmanned boat GD100 is 28G by default, which is divided into 8 record storage folders. The record1 folder automatically records data when it is turned on by default, and the record2 folder synchronizes the HydroSurvey and EasySail software for data recording.

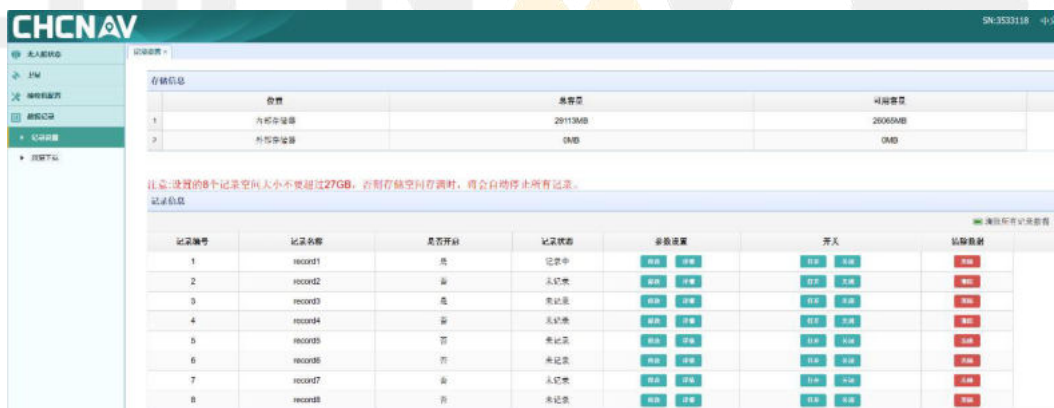


Figure 12.14: Data Recording

When the corresponding record folder is in closed state, you can click the Modify button in the parameter setting bar to modify the settings of the corresponding record folder.



Figure 12.15: Data logging settings

In the parameter setting column, click the details button to view the settings of the corresponding record folder.



Figure 12.16: Data logging settings view

Click the Clear button to clear the data in the current folder, and click Clear all recorded data to clear the data.

6.3.2 Data Download

The unmanned boat GD100 stores data internally to avoid data loss.



Figure 12.17: Data download

After clicking the download button, the browser will automatically open and enter this interface.

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
gilc-data/	2023-Nov-27 07:58:10	-	Directory
repo_3533118/	1980-Jan-13 00:00:30	-	Directory
radio_file	1970-Jan-01 00:00:05	0.0K	application/octet-stream

lighttpd/1.4.35

Figure 12.18: Data download window

Parent Directory Click to return to the parent directory of the current directory.

Click gilc-data to enter the following interface.

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
19800113/	1980-Jan-13 00:02:36	-	Directory
20231117/	2023-Nov-17 04:15:54	-	Directory
20231120/	2023-Nov-20 07:17:04	-	Directory
20231121/	2023-Nov-21 01:54:52	-	Directory
20231123/	2023-Nov-23 09:01:14	-	Directory
20231124/	2023-Nov-24 11:40:10	-	Directory
20231125/	2023-Nov-25 05:03:24	-	Directory
20231127/	2023-Nov-27 07:58:10	-	Directory

lighttpd/1.4.35

Figure 12.19: gilc-data storage

Click on any folder. Here we take the 20231120 folder as an example.

The following files are data processed by the combined navigation algorithm and are used by R&D personnel to analyze problems.

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
030008_ant_pos.nmea	2023-Nov-20 03:00:24	0.0K	application/octet-stream
030008_gps_pos.txt	2023-Nov-20 03:20:22	588.7K	text/plain
030008_ins_pos.txt	2023-Nov-20 03:00:24	0.0K	text/plain
030008_log.txt	2023-Nov-20 03:19:28	2.6K	text/plain
030025_com.txt	2023-Nov-20 03:20:22	2.2M	text/plain
030025_fifo.txt	2023-Nov-20 03:20:22	9.1M	text/plain
071704_com.txt	2023-Nov-20 09:32:18	15.4M	text/plain
071704_fifo.txt	2023-Nov-20 09:32:18	62.4M	text/plain
071746_ant_pos.nmea	2023-Nov-20 07:17:04	0.0K	application/octet-stream
071746_gps_pos.txt	2023-Nov-20 09:32:18	3.9M	text/plain
071746_ins_pos.txt	2023-Nov-20 07:17:04	0.0K	text/plain
071746_log.txt	2023-Nov-20 09:31:22	8.1K	text/plain

lighttpd/1.4.35

Figure 12.20: gilc-data corresponding to date data

Click repo- to enter the following interface

Index of /mnt/repo_3533118/

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
ppk/	1980-Jan-14 07:57:44	-	Directory
push_log/	1980-Jan-01 00:00:00	-	Directory
record_1/	2023-Nov-27 08:21:30	-	Directory
record_2/	2023-Nov-25 07:46:14	-	Directory
record_3/	1980-Jan-01 00:00:00	-	Directory
record_4/	1980-Jan-01 00:00:00	-	Directory
record_5/	1980-Jan-01 00:00:00	-	Directory
record_6/	1980-Jan-01 00:00:00	-	Directory
record_7/	1980-Jan-01 00:00:00	-	Directory
record_8/	1980-Jan-01 00:00:00	-	Directory

lighttpd/1.4.35

Figure 12.21: Repo data page

Data stored in the ppk folder

Each file named after the date contains a raw file and an HCN file.

Index of /mnt/repo_3533118/ppk/20231116/

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
024212_raw.txt	2023-Nov-16 02:50:44	6.5M	text/plain
025221_raw.txt	2023-Nov-16 04:05:20	55.9M	text/plain
055635_raw.txt	2023-Nov-16 06:14:56	14.0M	text/plain
063321_raw.txt	2023-Nov-16 07:25:36	40.0M	text/plain
085414_raw.txt	2023-Nov-16 09:26:20	24.9M	text/plain
092701_raw.txt	2023-Nov-16 09:27:38	485.0K	text/plain
Moving_024156.HCN	2023-Nov-16 02:50:44	4.7M	application/octet-stream
Moving_025156.HCN	2023-Nov-16 04:05:20	39.9M	application/octet-stream
Moving_055628.HCN	2023-Nov-16 06:14:56	9.3M	application/octet-stream
Moving_063256.HCN	2023-Nov-16 07:25:36	26.1M	application/octet-stream
Moving_085344.HCN	2023-Nov-16 09:26:20	17.9M	application/octet-stream
Moving_092709.HCN	2023-Nov-16 09:27:38	347.9K	application/octet-stream

lighttpd/1.4.35

Figure 12.22: PPK data storage

Index of /mnt/repo_3533118/push_log/

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
ftp_push.log	1980-Jan-01 00:00:00	0.0K	text/plain

lighttpd/1.4.35

Figure 12.23: push_log data

[recordX] folder, record1 and record2 are commonly used,

Taking record1 as an example, the folder contains .dep and .sd files. The .dep file records coordinates and water depth information, and the .sd file records waveform information.

Index of /mnt/repo_3533118/record_1/

Name	Last Modified	Size	Type
Parent Directory/		-	Directory
Web1_2023-10-14-11-15-09.dep	2023-Oct-14 03:26:46	611.1K	application/octet-stream
Web1_2023-10-14-11-15-09.sd	2023-Oct-14 03:26:46	2.0M	application/octet-stream
Web1_2023-10-21-10-58-55.dep	2023-Oct-21 03:07:38	469.0K	application/octet-stream
Web1_2023-10-21-10-58-55.sd	2023-Oct-21 03:07:38	1.3M	application/octet-stream
Web1_2023-11-04-14-41-17.dep	2023-Nov-04 06:46:22	256.3K	application/octet-stream
Web1_2023-11-04-14-41-17.sd	2023-Nov-04 06:46:22	848.1K	application/octet-stream
Web1_2023-11-05-17-19-01.dep	2023-Nov-05 09:31:36	638.0K	application/octet-stream
Web1_2023-11-05-17-19-01.sd	2023-Nov-05 09:31:36	2.0M	application/octet-stream
Web1_2023-11-05-17-30-46.dep	2023-Nov-05 09:43:16	646.5K	application/octet-stream
Web1_2023-11-05-17-30-46.sd	2023-Nov-05 09:43:16	2.0M	application/octet-stream
Web1_2023-11-05-17-42-25.dep	2023-Nov-05 09:54:56	648.2K	application/octet-stream
Web1_2023-11-05-17-54-05.dep	2023-Nov-05 10:06:36	640.2K	application/octet-stream
Web1_2023-11-05-17-54-05.sd	2023-Nov-05 10:06:36	2.0M	application/octet-stream
Web1_2023-11-05-18-05-45.dep	2023-Nov-05 10:18:16	639.6K	application/octet-stream
Web1_2023-11-05-18-05-45.sd	2023-Nov-05 10:18:16	2.0M	application/octet-stream

Figure 12.24: record data

6.3.3 Serial Port

This interface is used to set the GD100debug serial port to forward NMEA data, differential data, positioning data, water depth data, etc.

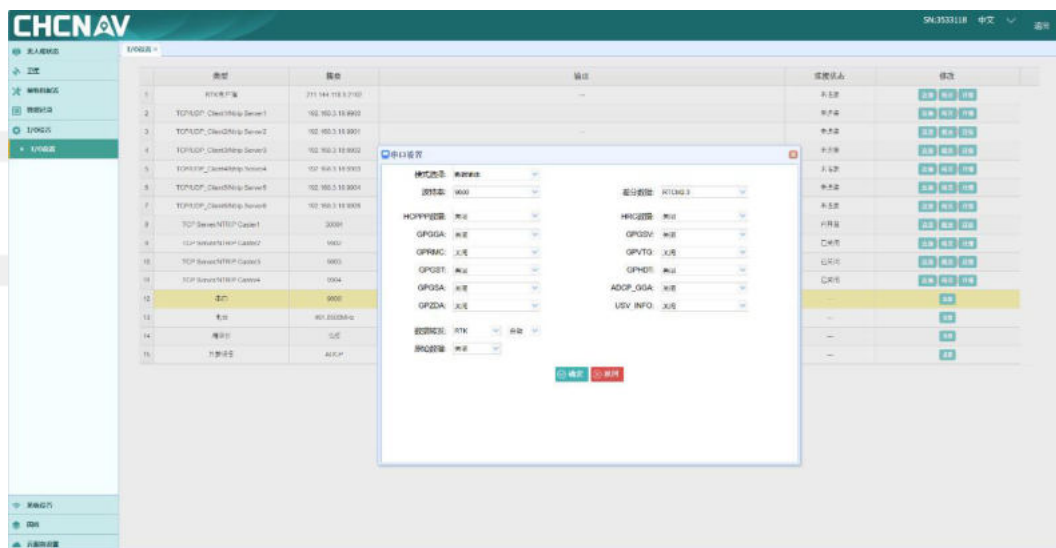


Figure 12.29: Serial port

6.4 System Settings

6.4.1 Network Settings

After the user inserts his own SIM card into the GD100 card slot, he needs to log in to the interface, switch the card type to SIM, and dial successfully. The unmanned boat uses the E-SIM card by default. Other parameters remain unchanged by default.



Figure 12.34: Network settings

6.4.2 Radio Settings

When using the radio mode, the unmanned boat needs to connect an external radio antenna, turn on the switch, set the corresponding radio protocol, baud rate and radio channel, and wait for the differential signal light of the unmanned boat to be green and steady before operation.



Figure 12.35: Radio Station Settings

6.4.3 ESC mode setting

By default, no modification is required. For an unmanned boat equipped with a power box (PowerBox), if you need to adjust the ESC parameters, turn on this switch first, modify the ESC parameters, and restart the unmanned boat.



Figure 12.39: ESC mode settings

6.4.4 Remote Control Settings



Figure 12.40: Remote Control Settings

6.4.5 Ship type settings

After the unmanned boat starts self-checking, it will automatically identify the current unmanned boat model in an open and unobstructed environment and apply relative deviation. If the boat type is incorrectly identified, you can manually select the boat type.



Figure 12.41: Ship type settings

6.5 firmware

6.5.1 Firmware Information

This interface can view the firmware version information.



Figure 12.43: Firmware information

6.5.2 Hardware version

This interface can view the hardware version information.



Figure 12.44: Hardware version

6.5.3 Firmware Upgrade

This interface is used for firmware upgrade. For details on firmware upgrade operations, see the appendix.



Figure 12.48: Firmware upgrade

Note: The radio can only be used for receiving data and cannot transmit data externally.

The parameter values listed in this document are all theoretical values or values measured by Huace Navigation testers in a specific controlled test environment (please see the specific description of the item). In actual use, the results may vary to varying degrees due to individual differences in products, firmware versions, usage conditions, usage methods and usage environments. Please refer to the actual usage. In order to provide the most accurate product information and parameter values, Huace Navigation may adjust and revise the textual description, parameter values and other contents of this document in real time to match the actual product performance, specifications and other information. Due to real-time changes in product batches and production supply factors, if it is necessary to make the above modifications and adjustments, no special notice will be given. Please refer to the real-time information on the official website.

appendixU: After-sales service

- 1) If you have any questions about the maintenance of the unmanned boat, you can call 400-620-6818, extension 5, to consult the technicians;
- 2) You can search the WeChat public account [Huawei Travel World], click [Send Message] - [User Guide] to view the instruction manual;
- 3) If repair is required, please contact the technician in the relevant area and describe the problem you encountered. After analyzing the problem, the technician will fill out the repair application procedure with you and assist you in completing the repair.



华测导航官方公众号



华微游世界公众号

FCC warning statements:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The device has been evaluated to meet general RF exposure requirement This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 40cm between the radiator & your body.