HydroBoat 1500 With HydroBeam M4

User Manual

HydroBoat 1500

HydroBeam M4

Manual Revision

HydroBoat 1500 With HydroBeam M4

Revision Date	Revision Level	Description
July. 2024	1	HydroBoat 1500 With HydroBeam M4 User Manual

Introduction

Welcome to the Satlab HydroBoat 1500 with HydroBeam M4. This introduction describes how to use this product.

Experience Requirement

In order to help you use Satlab series' products better, we suggest you carefully read the instructions. If you are unfamiliar with the products, please refer to http://www.Satlab.com.cn/

Tips for Safe Uses

Notice: The contents here are special operations and need your special attention. Please read them carefully.

Warning: The contents here are very important. Wrong operation may damage the machine, lose data, break the system and endanger your safety.

Exclusions

Before using the product, please read these operating instructions carefully: they will help you to use it better. Satlab Surveying Instrument Co., Ltd assumes no responsibility if you fail to operate the product according to the instructions, or operate it wrongly due to misunderstanding the instructions.

Satlab is committed to constantly perfecting product functions and performance, improving service quality and we reserve the right to change these operating instructions without notice.

We have checked the contents of the instructions the software and hardware, without eliminating the possibility of error. The pictures in the operating instructions are for reference only. In case of non-conformity with products, the products shall prevail.

Technology and Service

If you have any technical issues, please call Satlab's technology department for help.

Relevant Information

You can obtain this introduction by:

1. Purchasing Satlab products: you will find this manual in the instrument container to guide you on operating the instrument.

2. Logging onto the Satlab official website, downloading the electronic version introduction at "Download center" "Partners" "Partner center".

Advice

If you have any comments and suggestions for this product, please email info@Satlab.com.se. Your feedback will help us to improve the product and service.

Chapter 1

Product Introduction

This chapter contains:

- 1.1 HydroBoat 1500 USV Introduction
- 1.2 HydroBeam M4 Multibeam Introduction

1 Product Introduction

1.1 HydroBoat 1500 USV Introduction

The HydroBoat 1500 is a versatile, intelligent USV that can perform underwater topographic surveys of lakes, rivers, and reservoirs by carrying the HydroBeam M4 Portable Multibeam Echo Sounder system. Equipped with a high-precision GNSS receiver and IMU for position and orientation, the HydroBoat 1500 ensures sub-meter accuracy even when satellite signals are blocked. It features a lightweight and robust hull with IP67-waterproof, as well as four powerful propellers on the sides that enhance mobility and flexibility, allowing it to easily adapt to diverse aquatic environments and efficiently complete underwater terrain surveys.

The front of the HydroBoat 1500 is shown in Figure 1-1.

Figure 1-1 Front

1. GNSS directional antenna
2. Millimeter wave radar
3. Camera
4. Cabin cover
5. Indicator light
6. GNSS position antenna
7. Radio antenna
8. 4G network antenna
9. 2.4G remote antenna
10. Hull switch button

The bottom of the boat is shown in Figure 1-2.

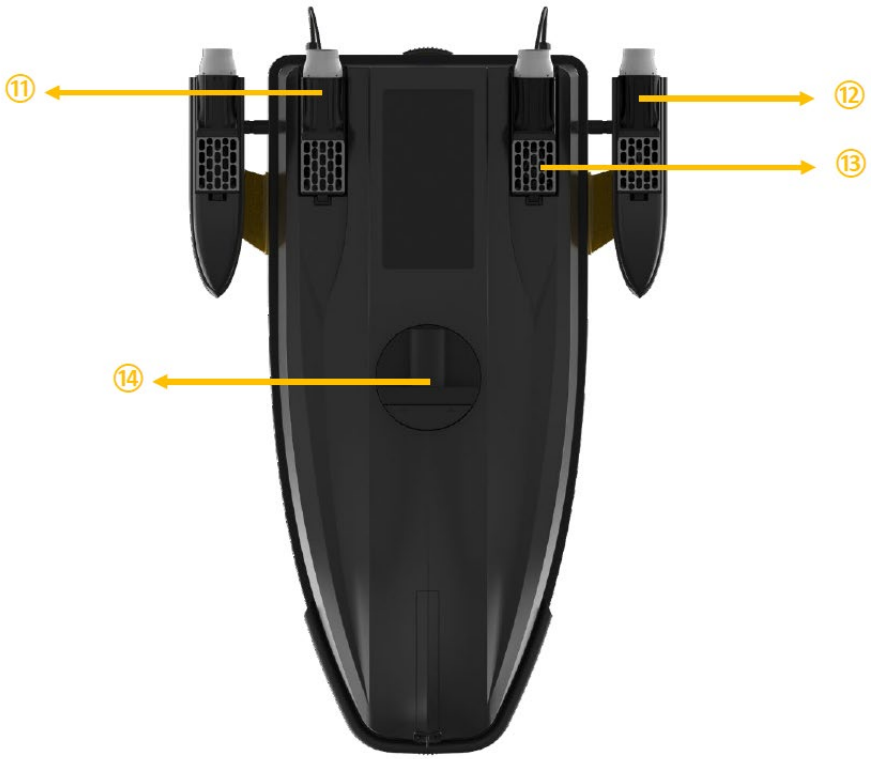

Figure 1-2 Bottom

11. Propeller
12. Aileron
13. Waterproof grass netting
14. Moon pool

1.2 HydroBeam M4 Multibeam Introduction

1.2.1 Small size and light weight

The HydroBeam M4 integrates IMU and surface sound speed meter into the transducer, which greatly reduces the wiring steps and makes it easier for customers to use. The transducer is round and only Φ228mm*175mm in size, which is compatible with common USV in the market. The weight of the transducer is only 5.9Kg, which is much lighter and more convenient for installation and transportation.

Figure 1-3 HydroBeam M4 Multibeam

1.2.2 Highly integrated and calibration-free

Figure 1-4 HydroBeam M4 Multibeam

The HydroBeam M4 acoustic transducer effectively integrates a high-precision inertial guidance system and surface acoustic velocimeter inside the transducer to enhance the reliability and ease of use of the system. The inertial navigation system is capable of providing highly accurate positioning, attitude, lift and bow data for multibeam surveys. The built-in high precision inertial guidance has several benefits:

- Ui f!bujuvef!usbotgpsn bujpo!pguf!jof sjbmhvjebodf!tztuf n!dbo!usvnz!sf gfhdu!ui f!bujuvef! di bohf!pguf!n vmjc f bn!usbotevdf s!evsjoh!ui f!n f btvsf n f oulqspdf tt<

- Frjm jobujpo!pgdopn qnjdbuf e!bujuvef !dbmjcsbujpo!tuf qt!jo!ui f !f bsmz!tubhf -!SpmjQuch !dbmjcsbujpo! dbo!cf !ejtqf otf e!x ju <
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1.2.3 Unique beam forming technology and bottom detection technology

The HydroBeam M4 beam formation uses the Fourier transform technology to ensure the speed of multibeam operation. Bottom detection uses the energy method and phase method of joint detection, its central beam energy is high, using energy detection technology, the edge of the beam echo energy is weaker, the effective beam footprint is larger, using the phase detection method, the middle and the edge of the beam between the use of the energy and phase of the joint detection technology, which ensures that the bottom detection of all the beams to achieve better measurement accuracy.

1.2.4 The strip coverage angle is adjustable online, with a maximum sweep width of 150°, supporting tilt installation.

The HydroBeam M4 has an on-line, real-time selection of the strip coverage angle, which can be varied according to different measurement needs, ranging from >30°to 150°, to "take care" of key scanning areas.
For special areas, such as vertical structures like quay walls, wind piles or columns, the transducer can be physically tilted up to 45°.

1.2.5 Work mode on-line adjustable, support up to 1024 beam acquisition

The working modes can be selected from equal angles, equal distances, high density modes to adapt to different underwater terrains, taking into account the sweep width and accuracy.
In the underwater terrain is relatively flat area, can choose isometric mode.
When the underwater terrain is complicated and changes greatly, isometric mode can be selected.
Under high density mode, 1024 water depth points can be obtained from single ping data, which can greatly improve the ability to distinguish small underwater targets, pipelines, shipwrecks and other target objects.

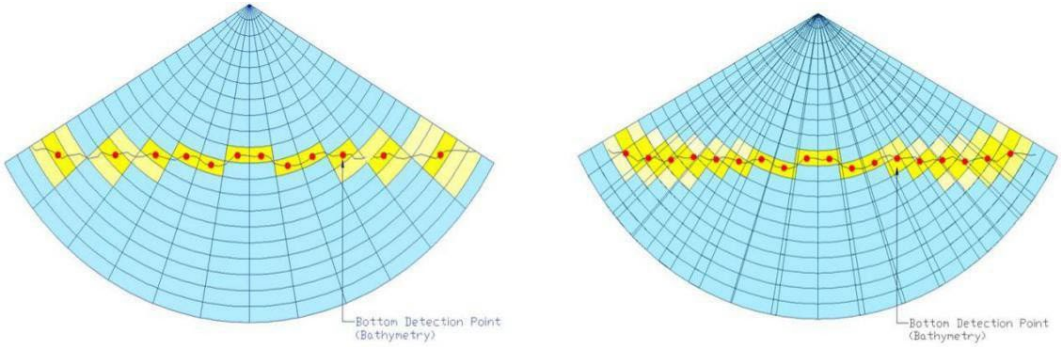


Figure 1-5 Different working modes

1.2.6 Real-time roll stabilization function

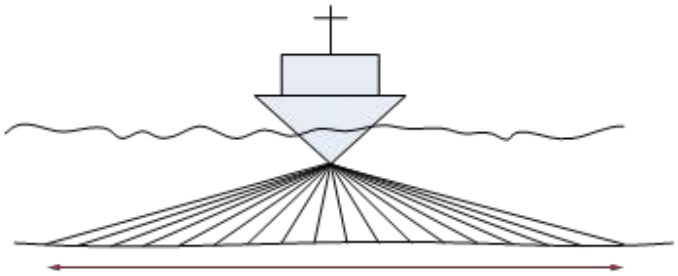


Figure 1-6 multibeam sweep

In the case where the ship is not rocking, the multibeam sweep is shown in the figure above, giving a symmetrical sweep just below the transducer. However, in practice, there are attitude changes in the ship, and if there is no roll stabilization, the shape of the measurement range will be as shown in the figure below.

Figure 1-7 no roll stabilization

If the multibeam has the function of transverse rocking stabilization, under a certain amplitude of the ship's rocking, the effect of the measurement range is as shown in the figure below, which can effectively improve the work efficiency when full coverage is required for underwater measurements.

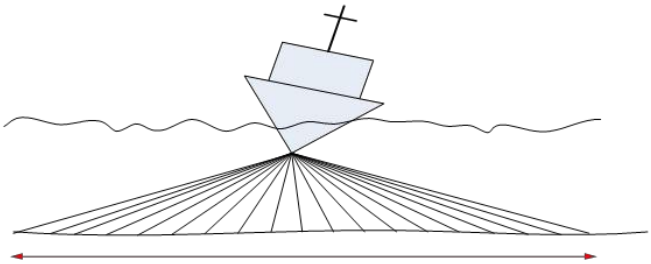


Figure 1-8 Real-time roll stabilization

The HydroBeam M4 can provide ±10°roll stabilization. In general, during measurement operations, if the ship's hull rocks more than 8° due to wind and waves, the measurement should be stopped. This shows that the HydroBeam M4 provides roll stability that is above the specification requirements.

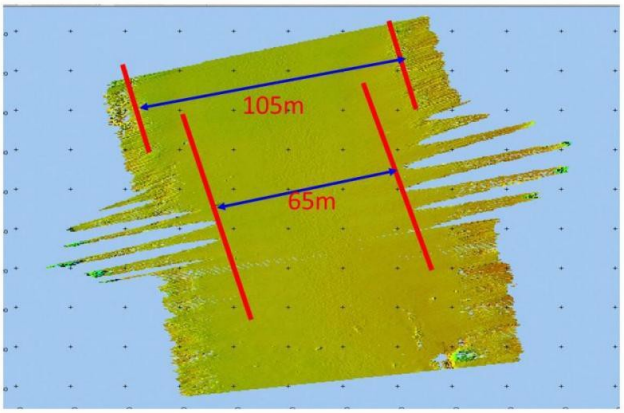


Figure 1-9 About 40% more efficient with full coverage

In the figure above, for the same strip, the swath width with roll stabilization is 105 meters and the swath width without traverse stabilization is 65 meters under the same measurement conditions, which is about 40% more efficient with full coverage.

Chapter 2

Hardware Introduction

This chapter contains:

- 1.1 HydroBoat 1500 USV Introduction
- 1.2 HydroBeam M4 Multibeam Introduction

2 Hardware Introduction

2.1 HydroBoat 1500 Hardware Introduction

HydroBoat 1500 package list table:

Item	Number
HydroBoat 1500 USV（Hull）	1
Multibeam Mini-PC	1
2.4GHz Antenna	1
4G Antenna	1
Radio Antenna	1
Propeller Protective Net Set	2
Toolkit	1
Hexagon Socket Cylindrical Screws（M4*6）	5
Hexagon Socket Cylindrical Screws（M8*14）	10
Hexagon Socket Cylindrical Screws（M8*70）	10
Gasket（M8*12*1） Installation of seals	20
Multibeam Seals （15cm draft）	1
Multibeam Seals （20cm draft）	1
Controller Box（Android Controller、Type-C charger、Controller strap）	1
Strip cushion	2
USV transport box	1
Battery Use and Maintenance Manual	4
Battery Charger	3
Battery	6
Battery Transport Case10	3

Note: Be sure to check that the equipment is complete and that the screws and gaskets (waterproof stripping) are accounted for during operation.

The following three pictures show the front, rear and side views of the HydroBoat 1500 with the 2.4GHz antenna, 4G antenna and radio antenna installed:

Figure 2-1 Front view.

Figure 2-2 Rear View.

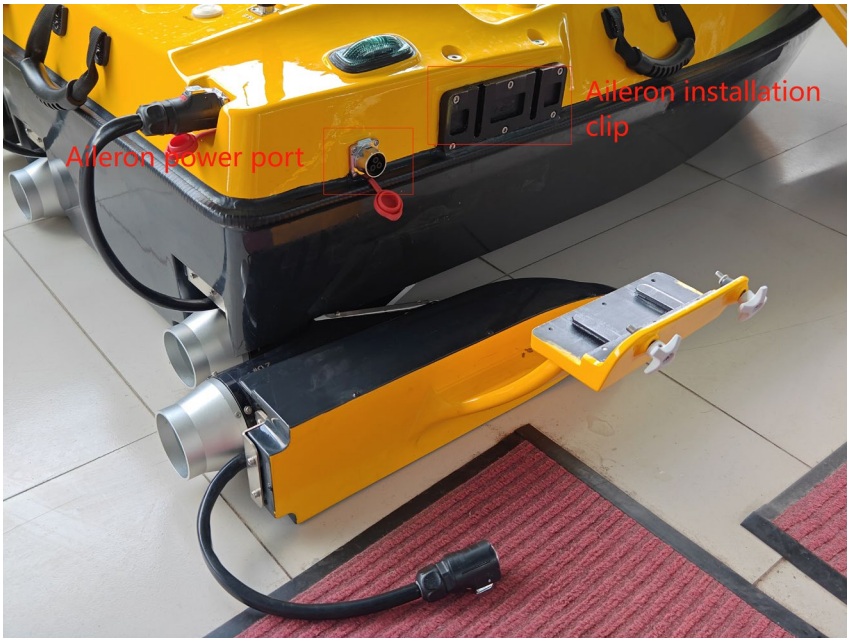


Figure 2-3 Side View

Note: The HydroBoat 1500 external power switch controls power to the boat control box and propellers, the built-in power switch controls power to the multibeam deck unit and Mini PC, as shown in the figure below:

Figure 2-4 External Power Switch

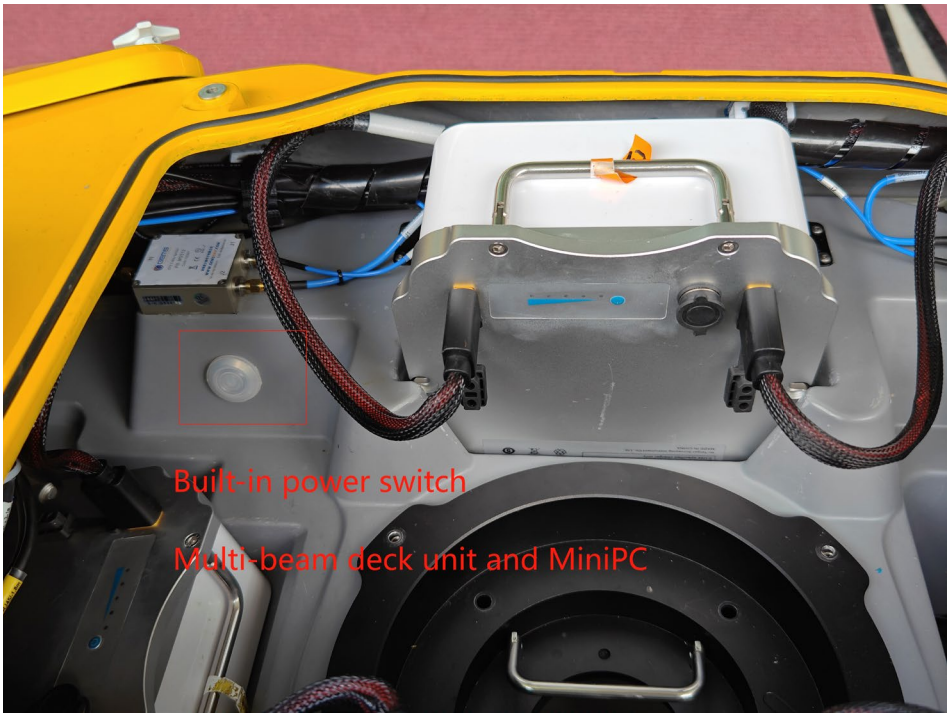


Figure 2-5 Built-in Power Switch

The HydroBoat 1500 USV's traveling power is provided by four propellers, including two ailerons and two main propellers.

Note: The ailerons only provide forward power, not involved in left or right turn.

Figure 2-6 Ailerons

The interior of the USV is shown in the figure below:

Bin A: multibeam deck unit and Mini PC (deck unit on top, Mini PC on bottom)

Bin B and C: two batteries (to power the boat control box and propellers).

Bin D: Moon pool for multibeam transducer.

Bin E: Boat control box and one battery (to power the multibeam deck unit and Mini PC).

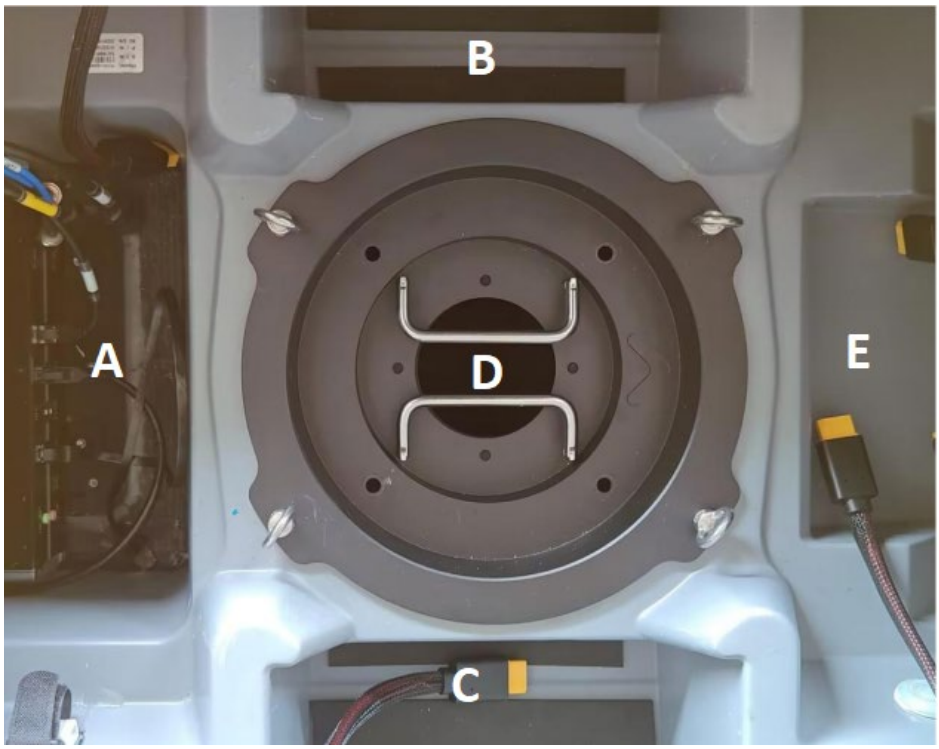


Figure 2-7 Interior of the USV

The USV boat control box is shown below:

Figure 2-8 Boat control box

Each interface has a one-to-one corresponding line for connection, when connecting, you only need to connect to the corresponding label on the line.

Note: The [ADCP] interface can provide differential data for the multibeam deck unit. If the boat position is a Single Point, you can log on to 192.168.144.28 (USV boat control system), and switch the working mode of [Interface] - [RS232] from [ADCP] to [Differential Data].

The multibeam deck unit is shown below:

Figure 2-9 Multibeam deck unit

In normal connection, [PPS IN] and [EXT.MRU] do not need to be wired, and [DGNSS] connects to the external differential data, which is transmitted from the ADCP port by the boat control box.

[LAN1] is used to configure the built-in IMU, and [LAN2] is used to transmit the multibeam data (Transmission of multibeam data needs a gigabit cable to ensure proper data transfer).

[ANT1] and [ANT2] are connected to the Direction and positioning antennas respectively.

The rest of the ports can be connected one by one according to the label on the line.

The USV Mini PC is shown below:

The Mini PC box should be placed upside down in the cabin of the boat, and the power port has a special cable for connection; the network port is used to connect the [LAN1] and [LAN2] ports of the multibeam deck unit, and is generally connected to the [LAN B] and [LAN C]. After remote connection to Mini PC, you can check the Ethernet name of Mini PC and connect it according to the Ethernet name one by one.

Note: The Mini-PC will have two Ethernet networks named SONER and IMU, and the IP of both IMU and multibeam is 192.168.4.xx, so there is no problem with reversing the two network cables. The purpose of connecting by Ethernet name is to accurately determine the problem by the status of the network cable connection in the event of a connection abnormality.

Special Note: [LAN D] can only access the network cable labeled [LAN4], which is the network port used for remote connection, so be sure to connect it correctly during installation.

After making sure that the power line of the Mini-PC is connected, press the switch of the Mini-PC to turn on the computer. If the power is turned on normally, the indicator light of the Mini-PC will be on; and if the connection is normal (built-in IMU, multibeam and remote connection), the indicator light of the LAN will be on.

Before closing the cover and launching the water, you can judge whether the connection is normal or not according to whether the LAN indicator is flashing normally or not.

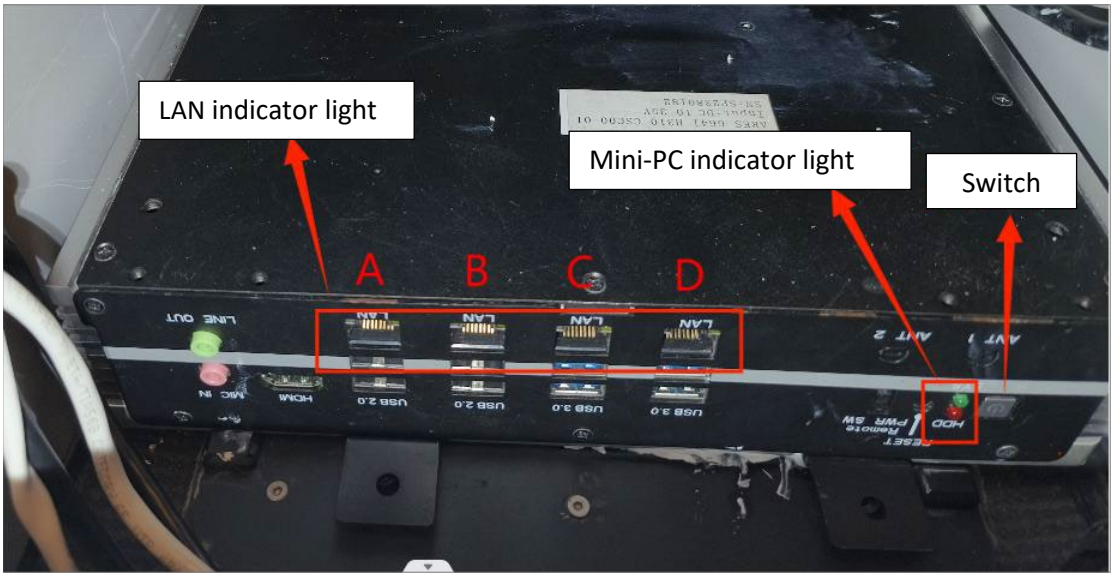


Figure 2-10 Mini PC

2.2 HydroBeam M4 Multibeam Hardware Introduction

The HydroBeam M4 multibeam system on HydroBoat 1500 USV consists of a multibeam probe, a multibeam mounting bracket, a gasket, hexagon socket cylindrical screws, a multibeam deck unit (described in 2.1. HydroBoat 1500), and cables, which are shown in the following diagram:

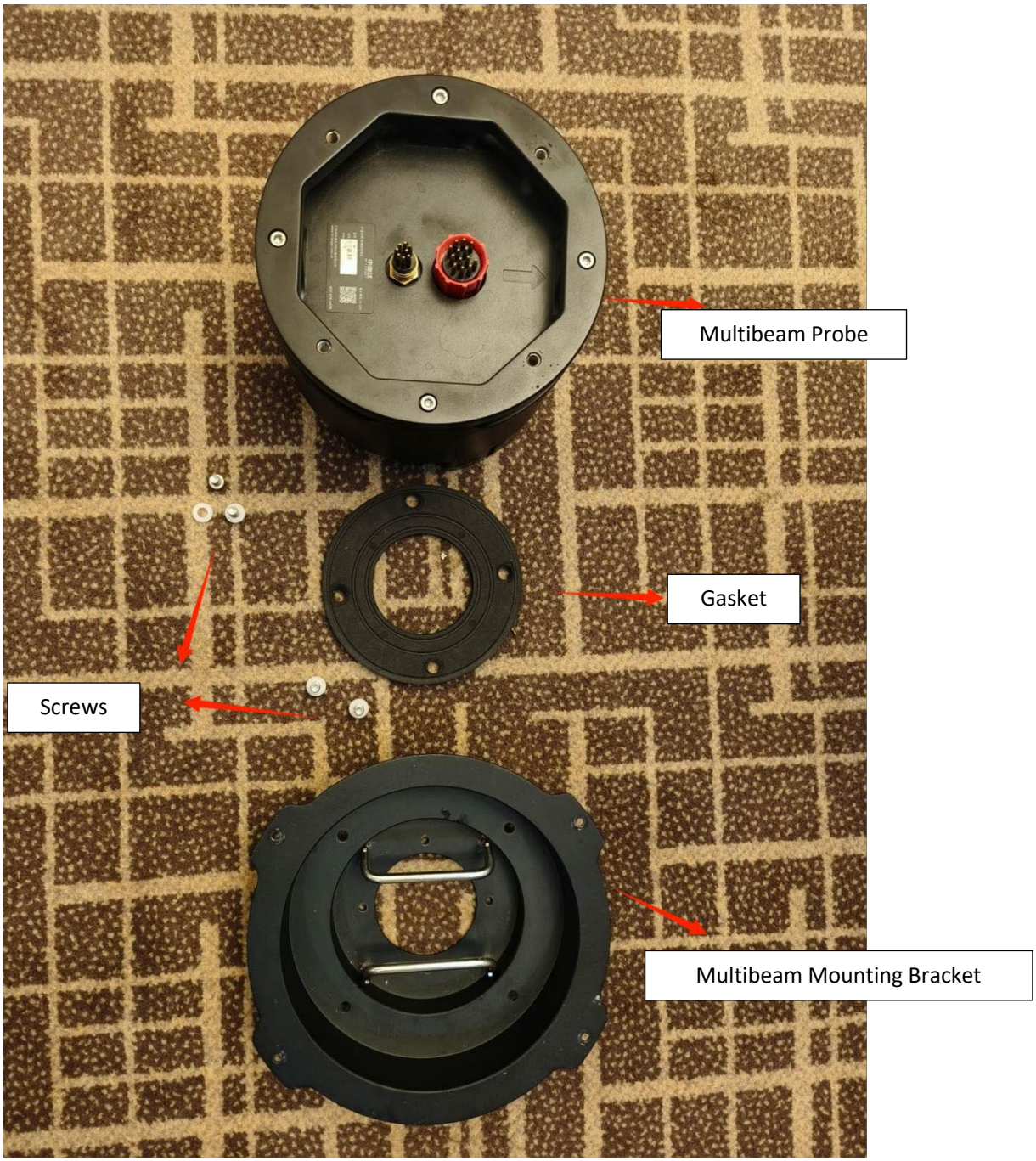


Figure 2-11 HydroBeam M4 multibeam system

Chapter 3

HydroBoat 1500 With HydroBeam M4 Operation

Introduction

This chapter contains:

- Hardware Installation Process
- Software Installation Process

3 HydroBoat 1500 With HydroBeam M4 Operation Introduction

3.1 Hardware Installation Process

3.1.1 Before installing the HydroBoat 1500 with HydroBeam M4 hardware, make sure to check if the equipment is complete? Check the equipment for damage? Troubleshoot any possible problems with the equipment (e.g., check the propellers for debris, etc.), make sure everything is in order before proceeding with the installation.

3.1.2. There are two options for hardware installation, one is shore installation, the other is water installation; considering the weight factor of HydroBoat 1500 itself, the weight of all the installed underwater is large, generally choose the water installation method, but the field environment of the water installation method is more demanding, so according to past experience to make the following suggestions:

- If the number of people on the site is enough, the launching place is wide horizontally and the longitudinal trend is slow, to meet the many people lifting the boat traveling, you can choose to launch the water after the installation is completed on the shore;
- If the launching location water flow is relatively smooth and there is no reef and other hard objects under the water surface, you can choose to install on the water, need to pay attention to the cabin and the waterproofing of all interfaces.

Note: The above method is only for reference, the specific installation and launching method should also be formulated according to the site conditions.

3.1.3. Determine the condition of the equipment and the way of installation and launching, check whether the wiring of the industrial computer, the multibeam deck unit and the boat control box inside the cabin is correct and whether it is fixed firmly (the industrial computer and the boat control box are fixed by screws, and the multibeam deck unit is fixed by the card slot).

A. The Multibeam Deck Unit needs to be coated with thermally conductive silicone grease, which is sticky, on the bottom before fixing it to the bay:

Figure 3-1 Deck unit coated with thermally conductive silicone grease

Place in the slot to secure after application:

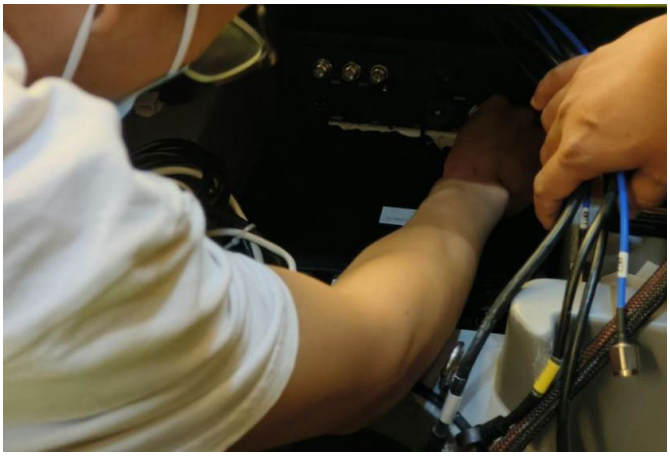


Figure 3-2 Fix in the slot

After installation, connect the cables according to the labels on the cables corresponding to the interfaces (described in 2.1.3 Middle Deck Unit)

Figure 3-3 Connect the cables according to the labels on the cables corresponding to the interfaces

B. When installing the Mini-PC, you need to turn it upside down and fix it with screws (see the red box), there is a power connector at the back of the Mini-PC, make sure to connect it, connect the three network cables to the network ports in turn, LAN4 must be connected to the rightmost port, and the remaining two cables should check the name of the Ethernet ports in the computer of the Mini-PC to be connected. (Introduced in 2.1.3 for Mini-PC)

Figure 3-3 Fix Mini-PC with screws

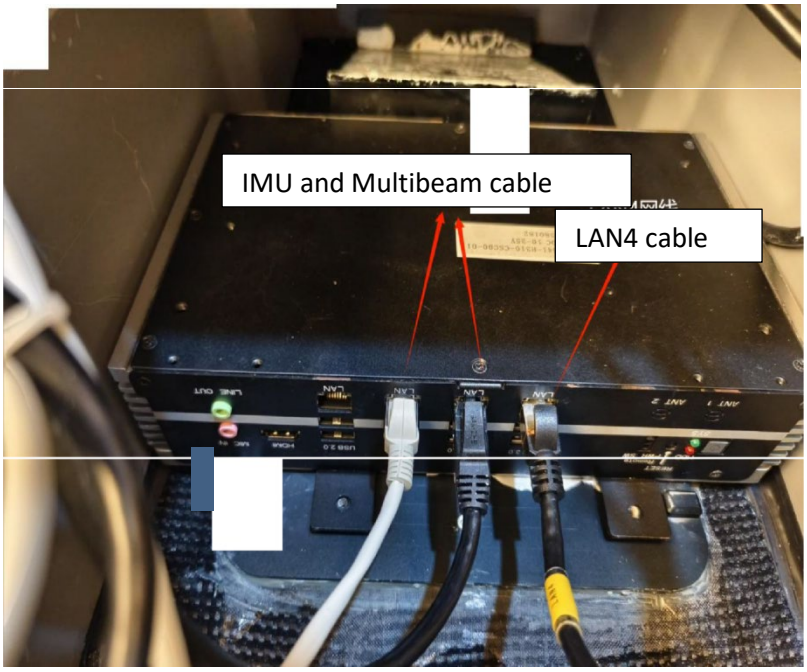


Figure 3-4 IMU and Multibeam cable、LAN4 cable

C. The boat control box is usually connected at the factory, and is briefly described here. According to the label on the line and the interface one-to-one corresponding to the connection, the extra cable is for the single beam for the reservation, in this paper will not be described.

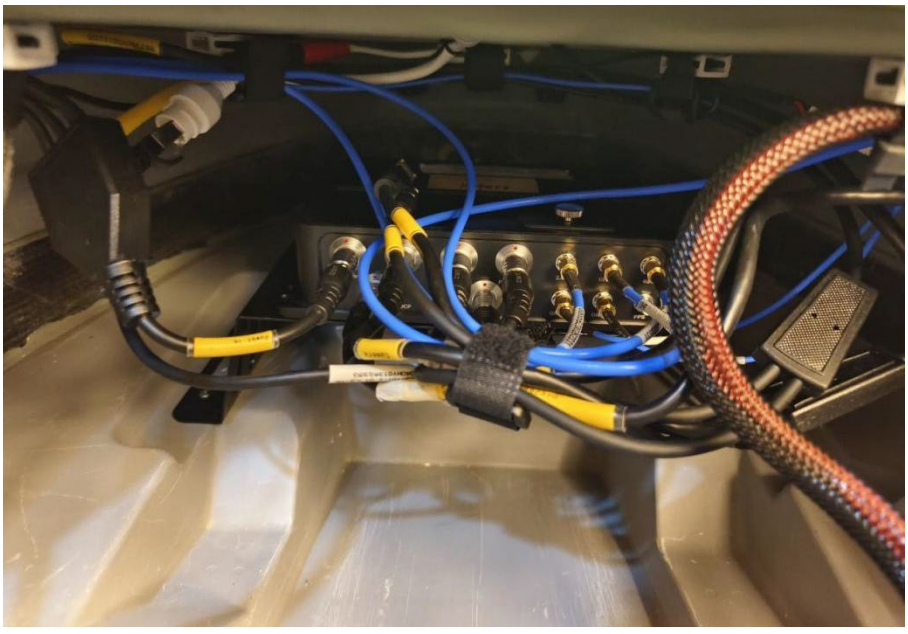


Figure 3-5 boat control box

3.1.4. After making sure that the internal wiring in the cabin is correct, begin installing the multibeam probe. It is necessary to place the HydroBoat 1500 USV on top of the strip cushion prior to installation to prevent the bottom of the multibeam transducer from touching the bottom.

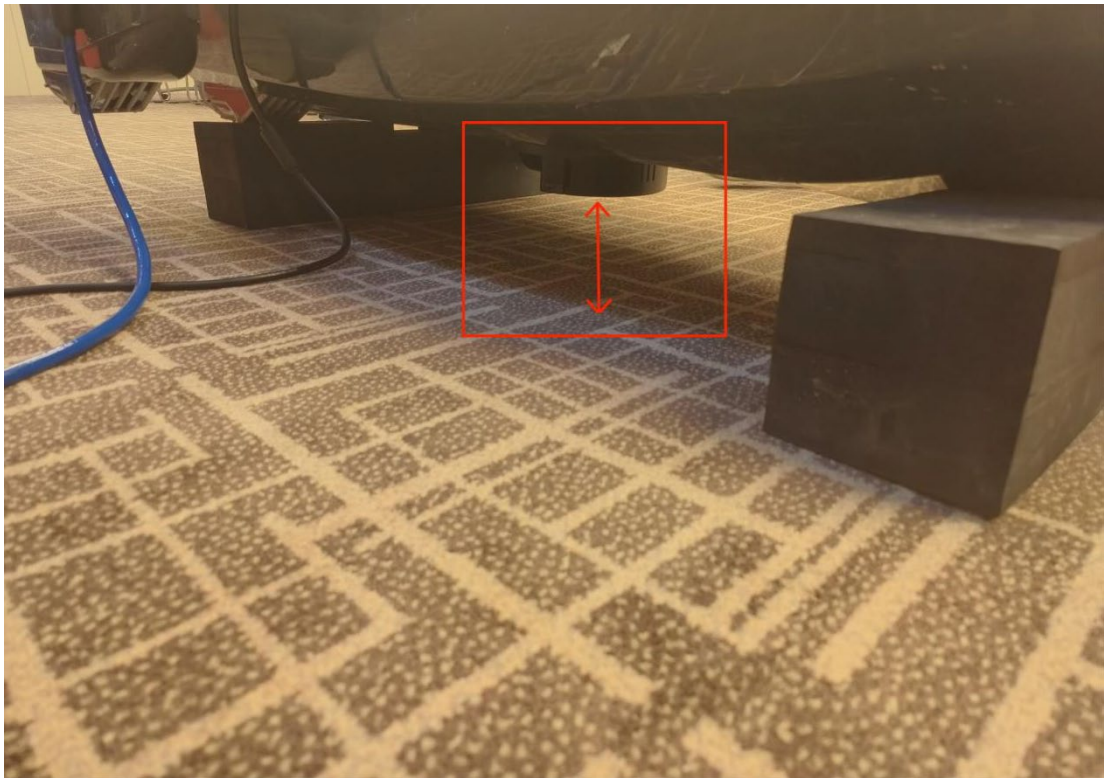


Figure 3-6 Prevent the bottom of the multibeam transducer from touching the bottom.

Take out the waterproof sponge and put it on the protruding part of the multibeam mounting bracket and align it with the screws; then put it on the multibeam transducer to make sure that it is tightly fitted; it should be noted that the two handles of the mounting bracket should be parallel with the two ports of the multibeam transducer when installing, so as to make sure that the sound speed of the multibeam transducer can be oriented towards the bow of the ship when it is installed inside the cabin; after installing the mounting bracket, waterproof sponge and multibeam transducer together, tighten the screws to make sure that they fit closely.

(If possible, it is recommended to leave the installed multibeam transducer in a bucket of water for a long time, with the water higher than the mounting bracket, to check whether there is any water seepage.)

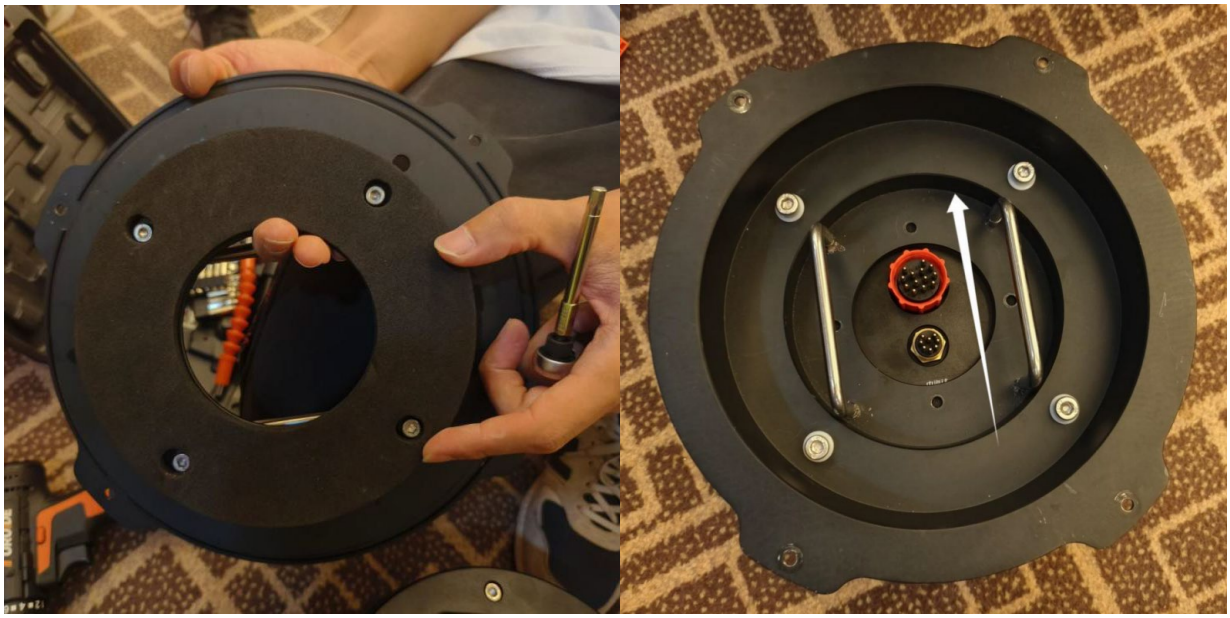


Figure 3-7 Multibeam mounting bracket

Place the installed transducer in the cabin, install the connector with the red waterproof sleeve toward the bow of the ship (the principle of sound speed toward the bow of the ship), and tighten the screws to ensure that the bracket and the moon pool are tightly fitted;

After the transducer is installed, the cable can be connected to the transducer connector end first, and then to the multibeam deck unit end after installing the batteries; or the cable can be connected after installing the batteries; (convenient for coiling)

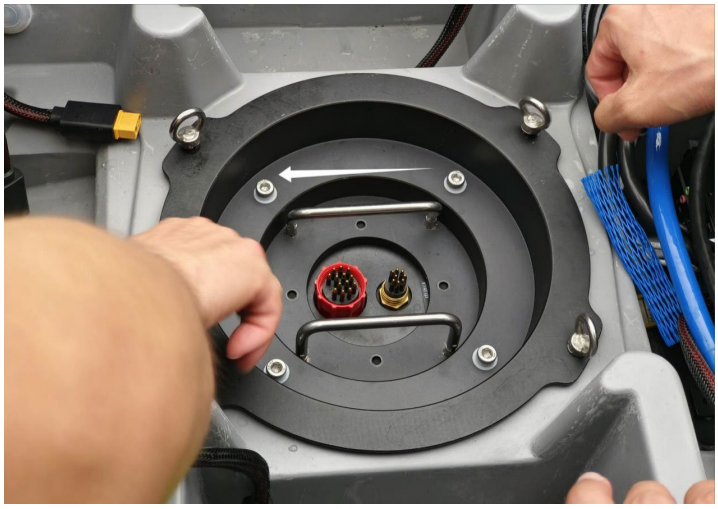


Figure 3-8 Place the installed transducer in the cabin

If you choose to install it on the water, it is more convenient to install the multibeam transducer first and then install the battery. Because the moon pool is hollow in the center, when launching the boat, you need to put it down gently to avoid water seeping into the cabin from the moon

pool, and when installing the multibeam transducer, you also need to put it down gently to avoid water being pressed into the cabin. Due to the long power cable, care should be taken to avoid water from the moon pool when launching the power cable.

3.1.5 After installing the multibeam transducer, start installing the batteries.

The distribution of batteries inside the cabin is shown in the figure below; the three batteries are divided into three sections, B1, B2 and B3, and there are six battery connection lines, marked Left and Right on the casing of the connection lines (e.g., the two lines of B1 are B1L and B1R).

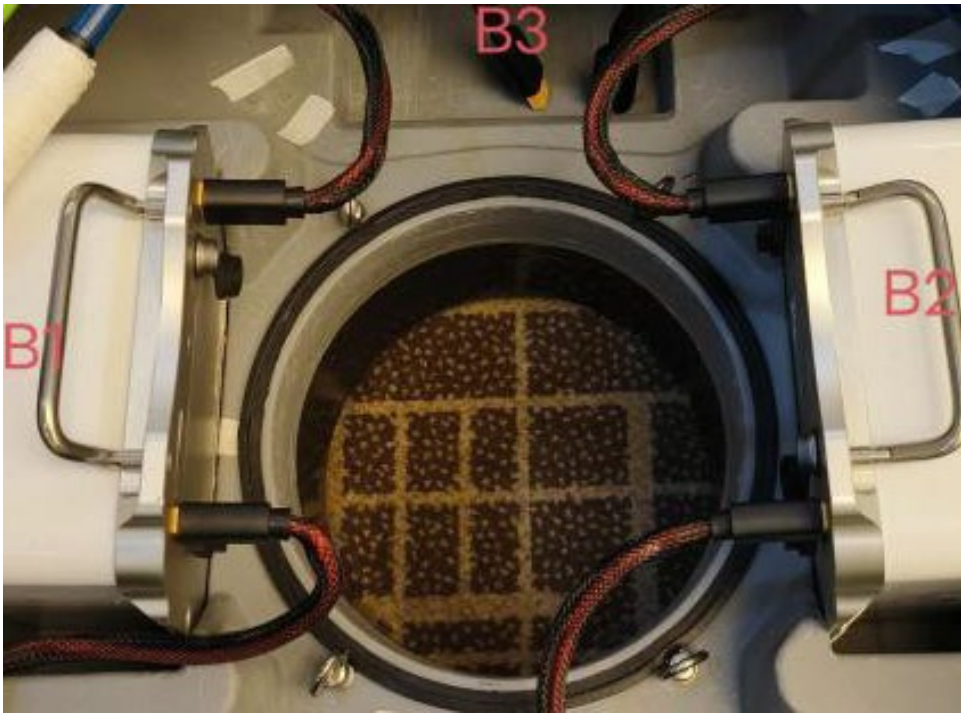


Figure 3-9 Battery Installation Diagram

It is necessary to pay attention to the left and right side of the batteries not to be reversed when connecting them and to access the corresponding batteries according to the markings on the lines (not the line from B1 to B2).

It is recommended to install the batteries at B3 first and then install the batteries at B1 and B2 in turn. When connecting the batteries, it is necessary to pay attention to the fact that the left and right sides of the batteries should not be reversed, and connect the corresponding batteries according to the markings on the wires (the wire of B1 should not be connected to B2).

It is recommended to install the batteries in B3 first, and then install the batteries in B1 and B2 in turn.

If you choose to install on the water, also follow the above recommended order, due to the long length of the HydroBoat 1500 USV, the B1 and B2 batteries need to be installed from their respective sides, care needs to be taken that the hull does not go out of its own control when rotating to the other side, to prevent the loss of control of the unpowered hull.

3.1.6. The interior installation of the ship's cabin contents is complete, and the installation of the exterior equipment has begin.

When installing the HydroBoat 1500 flank, note that there is a distinction between left and right flanks, when installing the flanks, 1 and 2 need to be aligned and snapped downwards, and then tighten the screws to strengthen the fixation. After making sure that the ailerons are fixed, connect the cables to the connectors (3 and 4) in line with each other.

If you choose to install on the water, to avoid water ingress into the connector, it is recommended to lift the bottom of the boat by hand when tightening the screws, so that there is a counter force to facilitate the installation.

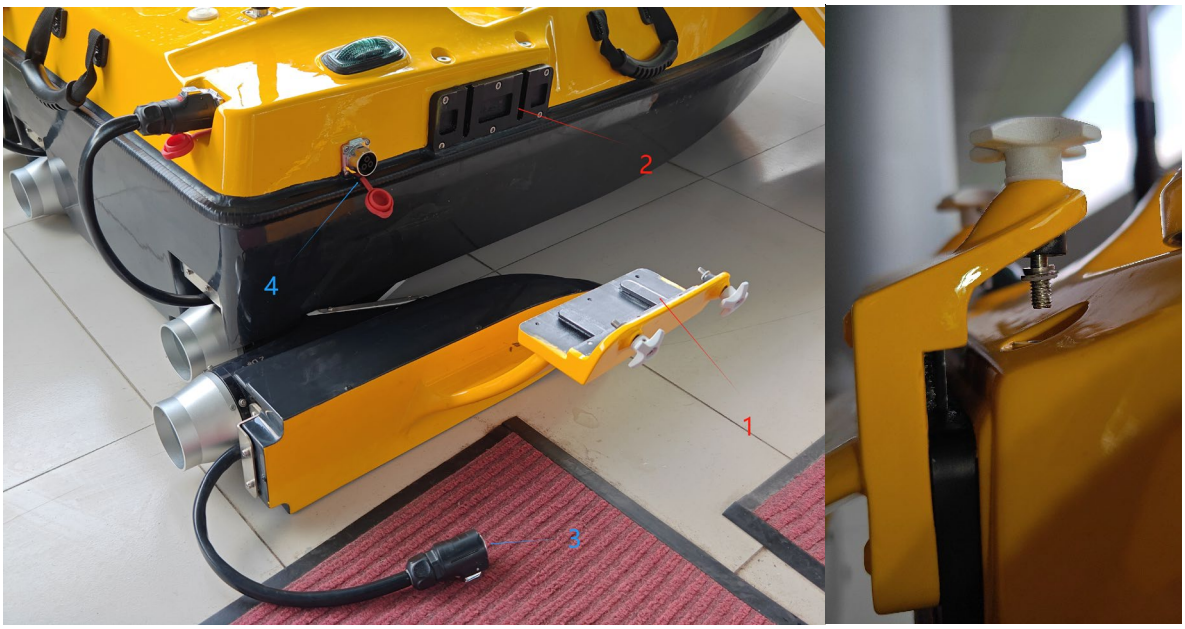


Figure 3-10 Aileron Installation

Install the 2.4G antenna, 4G antenna and radio antenna, and be careful not to bend these three antennas excessively to prevent irreversible damage. Ensure that the power switch of the multibeam deck unit and industrial computer in the cabin has been turned on, the power light of the industrial computer is normally on, the three network port indicator lights are flashing normally, and make sure that the battery handle is put down before covering the boat cover, and the four screws are aligned with the holes and tightened. After the end, open the power

switch at the stern, wait for the self-test to pass and push the push rod, respectively, forward, backward, left, right, to check whether the wind out of the propeller is normal.

After making sure that there is no error, set the coordinate parameters in the remote control according to the customer's requirements or project requirements, and at the same time connect the WiFi in advance to load the local satellite map, which is convenient for automatic demarcation; enter the interface of the controller to check whether the solving state is fixed and set the return point.

Open the hotspot of the controller, use the shore computer to remotely connect to the industrial control machine to see if the Ethernet is connected normally, briefly enter the multibeam display and control software to see if the transducer is working normally, and whether the attitude positioning and directional data are accessed normally (the time should not be too long, a simple test can be done) and enter the multibeam acquisition and post-processing software to see if the solution state is fixed, or you can also directly enter the display and control software to see if the positioning is fixed (specifics will be given in the above GGA statement). You can also check whether the positioning is fixed directly from the GGA statement listed above in the display and control software (details will be introduced in the software operation).

After making sure that there is no error, the controller SW1 is pushed to the center (locked), and the USV is launched into the water.

If you choose to install on the water, it is recommended to install the three antennas before launching the boat. When installing the cover, press the cover gently with your hand to make it align with the holes and then screw it tightly, and during the time, you can turn on the power switch at the rear of the boat to prevent the boat from being disconnected from the control.

3.2 Software Installation Process

3.2.1. Connect to USV normally and connect to cell phone hotspot to load local base map. Create a new project and parameterize it according to the parameters provided by the customer, if there is no demand, you need to set the central meridian at the very least.

After setting, open the hotspot in the drop-down box of controller, shore computer open WiFi and connect. The account password can be viewed at the hotspot configuration of the controller.

Figure 3-11 Controller

3.2.2. After the computer connects to the controller hotspot successfully, open the [Hi-NTConnect] software, click on the remote computer, enter the [Remote computer] interface, click on Get Info, get the information of the HydroBoat 1500 USV, make sure that the fuselage number is correct, check whether the bridge connection is shown as online; if it is shown to be online, then it proves that the connection has been successful, if it is shown to be disconnected, check if the LAN4 cable on the industrial control machine is If it shows online, the connection is successful.

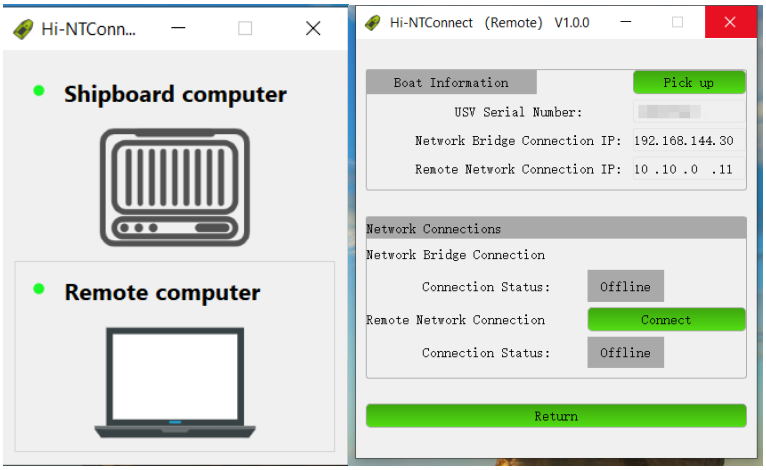


Figure 3-11 Hi-NTConnect

3.2.3. Open the Remote Desktop Connection that comes with win10/win11: just search for [Remote Desktop Connection] at the start.

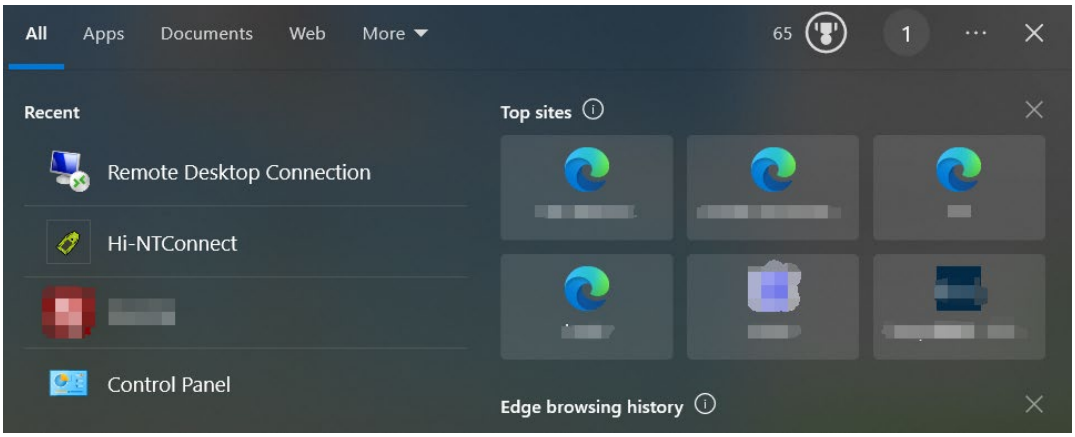


Figure 3-12 Remote Desktop Connection

You can also use the Ctrl+R shortcut and type "mstsc" to bring up "Remote Desktop Connection".

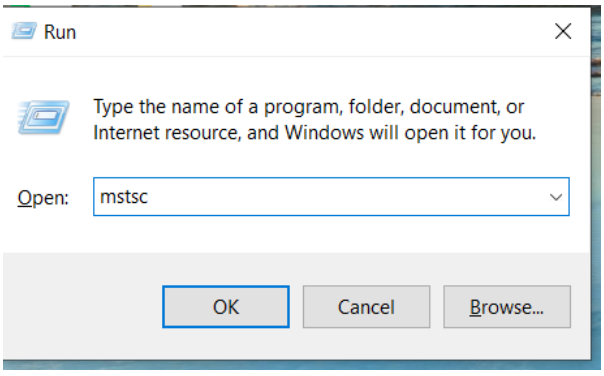


Figure 3-13 Remote Desktop Connection

3.2.4. Input IP: 192.168.144.30, input account: admin, password: admin, you can remotely enter into the desktop of the industrial control machine.

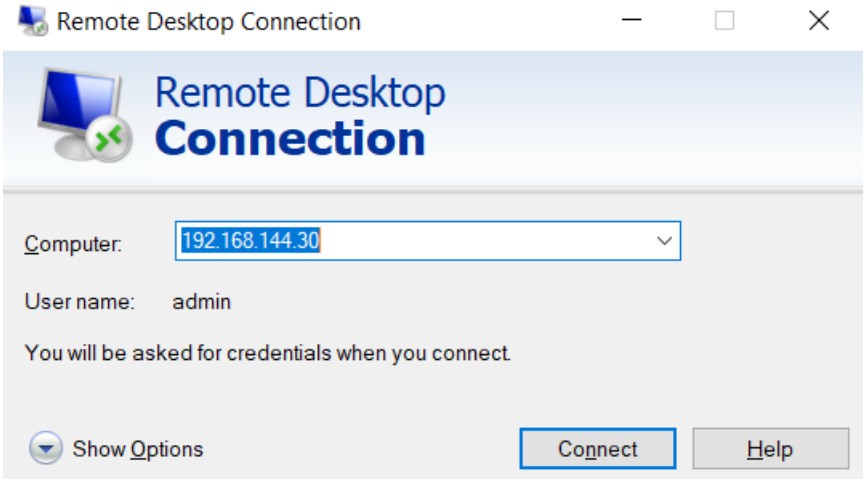


Figure 3-14 Remote Desktop Connection

3.2.5. Open the multibeam display and control software, select [Real-time Acquisition], select [8140P], click OK to enter the display and control interface.

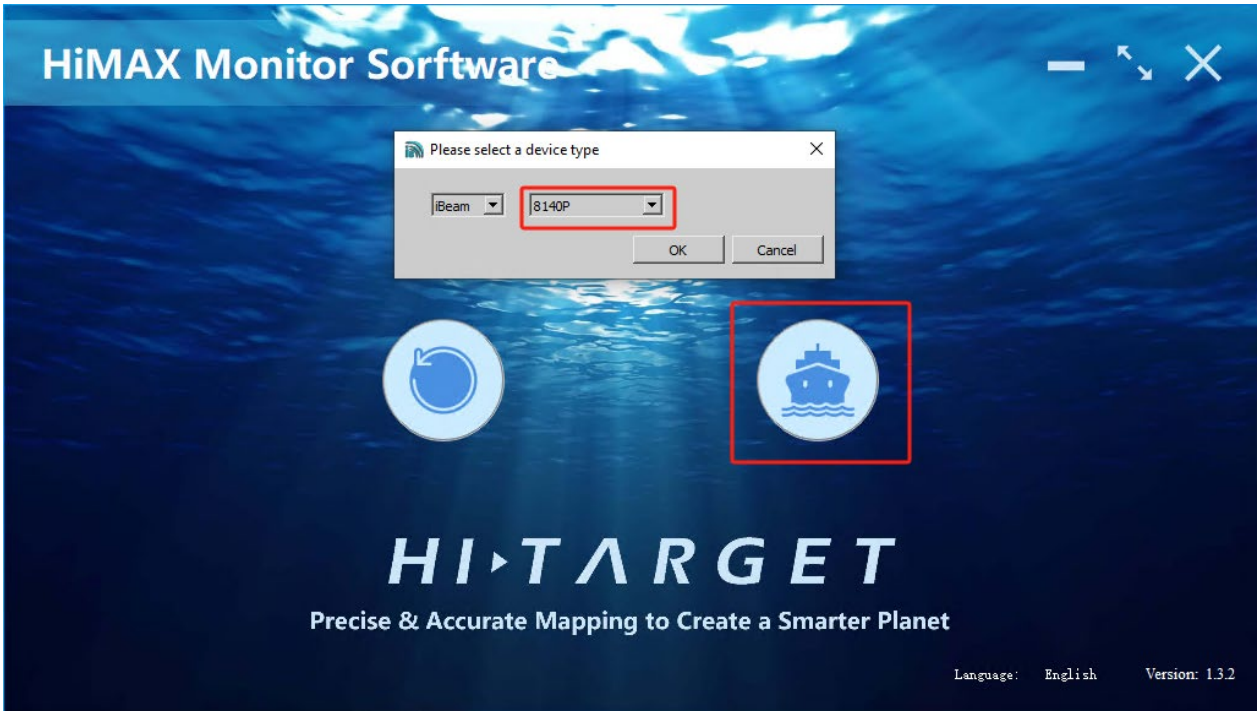
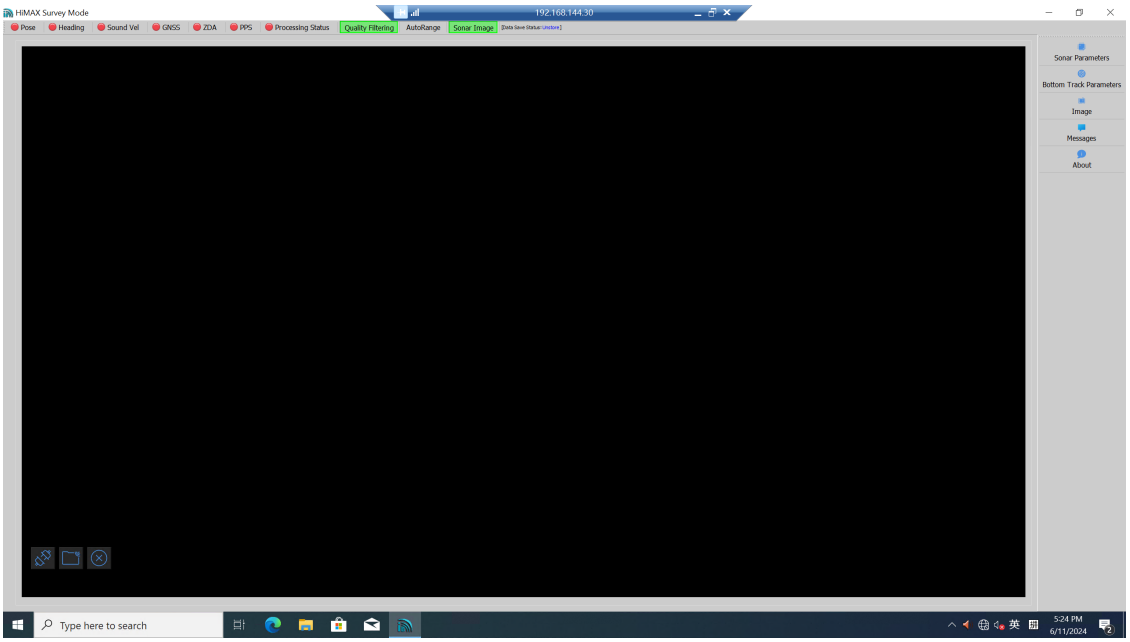


Figure 3-15 Multibeam display and control software

Click on the bottom left corner of the [Connect], wait a moment to connect successfully, the center of the screen shows the echo, the upper right corner shows the relevant parameters. Adjust the baud rate of the ZDA to 115200, the speed of sound is 19200, and the others are

115200, if the baud rate is correct or shows red, check whether the built-in is not selected. Make sure the upper column is all green.



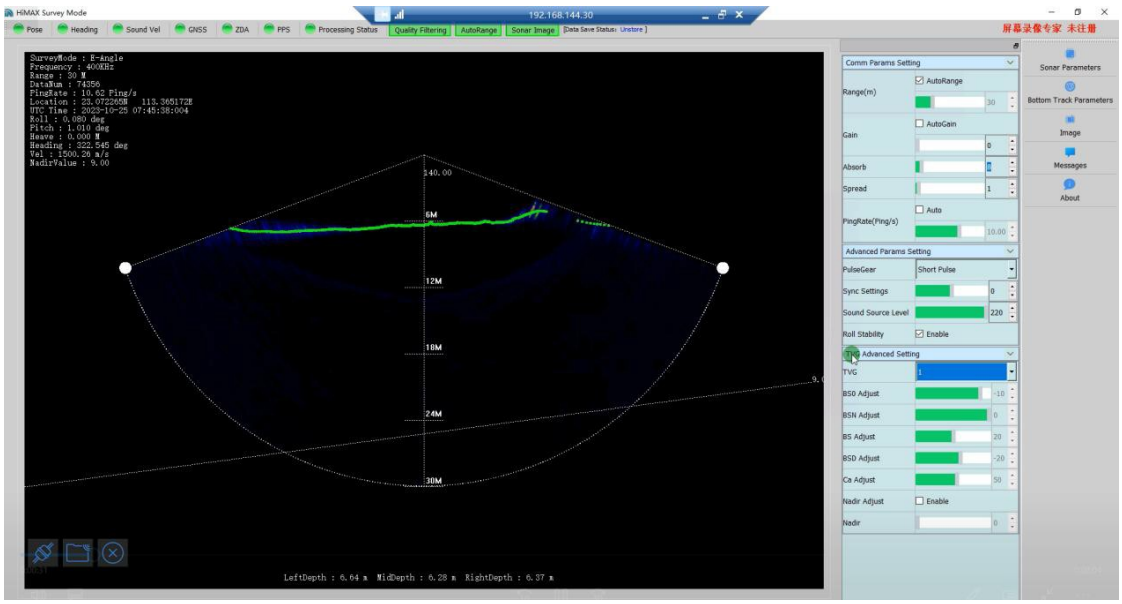


Figure 3-16 Multibeam display and control software

3.2.6. Mid Depth and Left&Right Depth can be viewed under the main display interface. Multibeam post-processing software presents the center water depth (the depth of water at the transducer position). The Left&Right Depths are the intersections of the left, center and right lines with the digital signal.

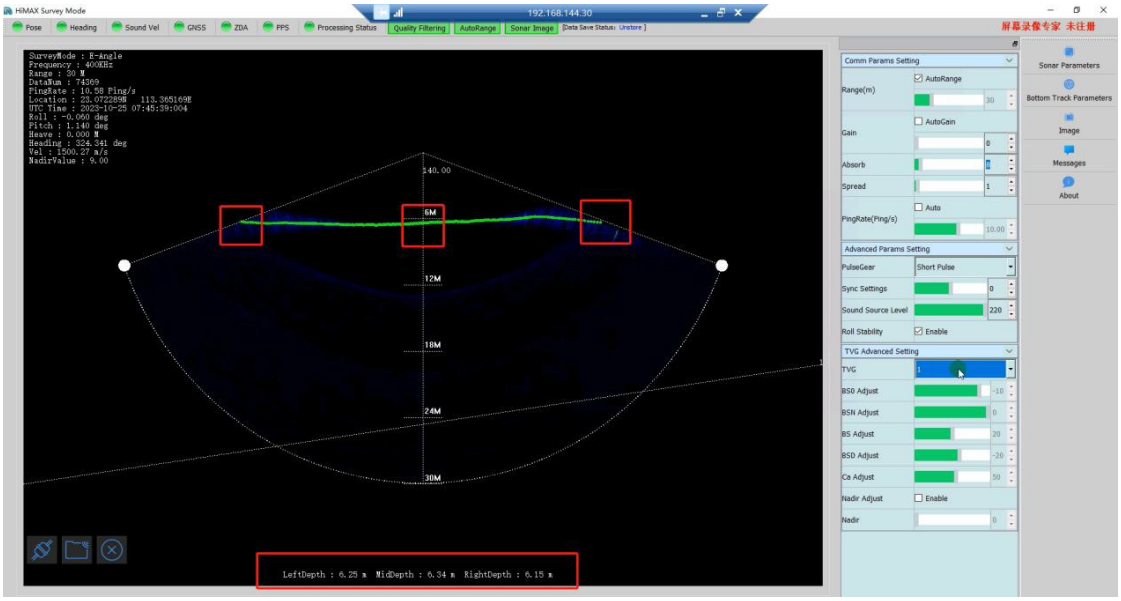


Figure 3-17 Multibeam display and control software

Multibeam display and control software generally adjusts the parameters according to the image condition, and the setting of the range generally makes the bottom tracking (green line) located in 1/3 or 1/4 position of the range, and it can also set the automatic range.

On the right side of the display and control interface, [Sonar Parameters] generally adjusts the gain, absorption and diffusion parameters to make the bottom tracking normal, and [Bottom Tracking Parameters] generally adjusts the [Beam Opening Angle], which is adjusted according to the echo condition, and the actual parameter settings of the display and control software are shown in the instruction manual of HiMAX Multibeam Display and Control Software.

Note: A high ping rate can cause the remote operation to lag.

3.2.7. The display and control software can not be closed after connecting, open the multibeam acquisition and post-processing software, and establish the project and parameter settings according to the customer's needs and project requirements.

Click [Equipment Connection], select iBeam Multibeam Series for [Instrument Type], click [Start Test], and the data displayed at the test result will be normal, and the test window will have data sliding, which means that the multibeam post-processing software is connected normally.

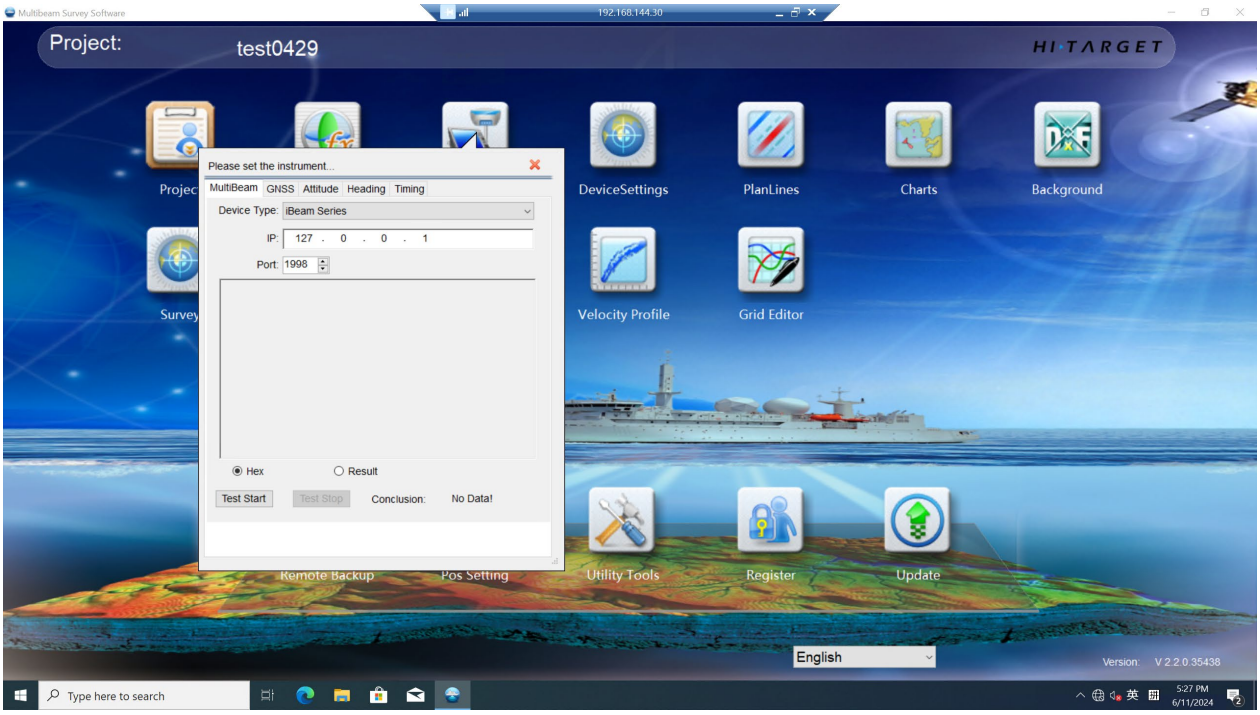


Figure 3-18 Equipment Connection

Note: If the transducer is not placed in water for the connectivity test, the display software will show that there is no speed of sound coming in, and the connection will not be successful during the connectivity test in the multibeam post-processing software. If you want to test connectivity in air for a short period of time, you need to give a fixed value to the speed of sound to make sure that the speed of sound is not a factor in the connectivity test.

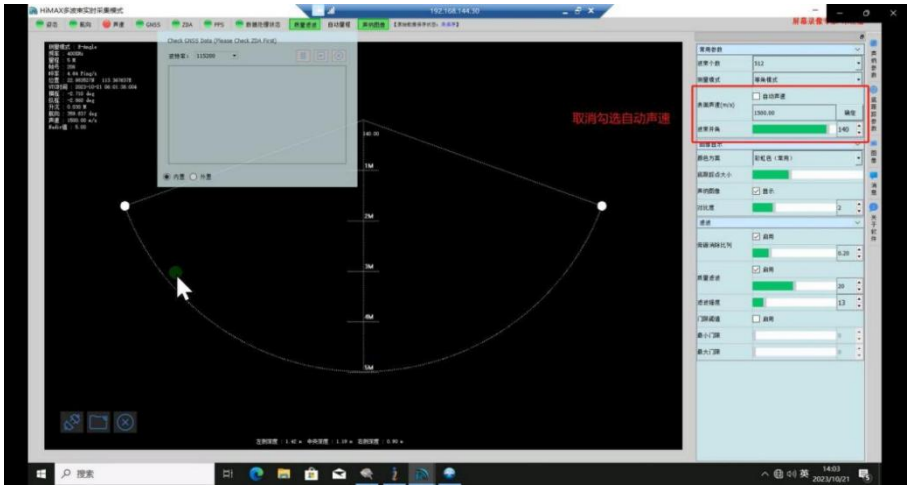


Figure 3-19 Multibeam display and control software

Because the HydroBeam M4 is fixedly mounted in the HydroBoat 1500 USV and the inertial guidance is built into the transducer, each offset in the vessel design is a fixed value, which can

be entered according to the [System Configuration] in the USV control system or according to the figure below.

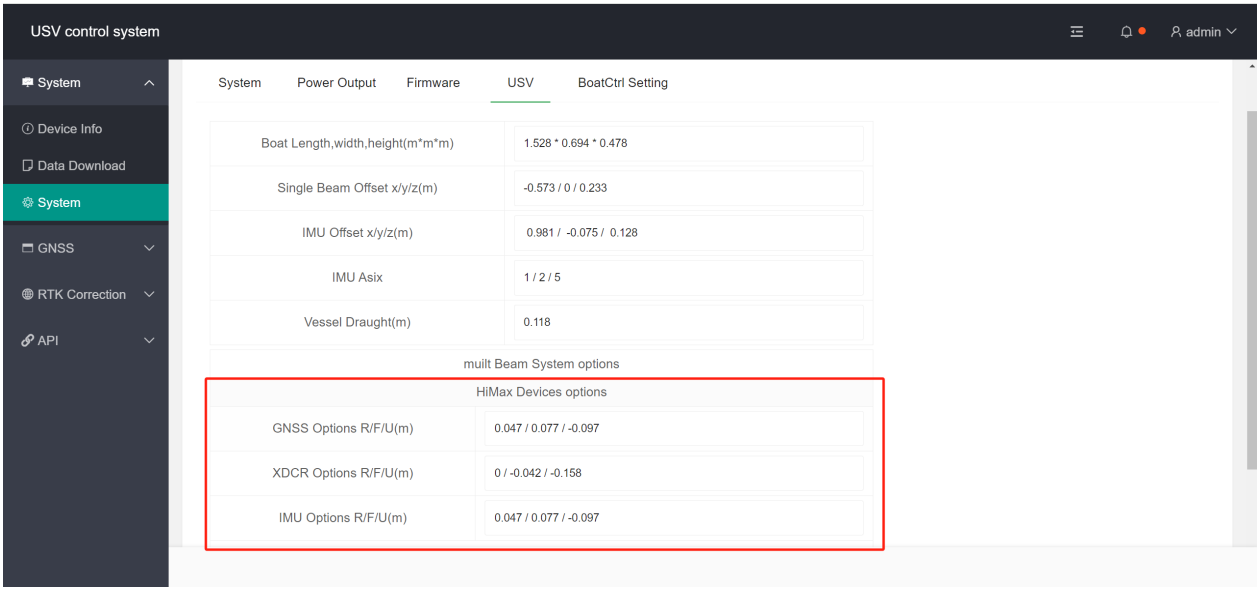


Figure 3-20 System Configuration

Although the HydroBeam M4 is fixedly installed in the HydroBoat 1500 USV, it is recommended to run a calibration line to get a more accurate calibration value after each re-installation.

After the above settings are completed and confirmed to be correct, enter the multibeam measurement interface [New Grid] and start the operation. At this time, make sure to check whether the solution status is fixed solution, if not, you need to connect the controller hotspot login 192.168.144.28 (USV ship control system), and switch the working mode of [Interface] - [RS232] from [ADCP] to [Differential Data].

The operation mode is divided into automatic line running and manual line running, which is selected according to the site conditions. Automatic line running needs to plan the route on the controller, set the line spacing and speed, and then run the line automatically. On the other hand, manual line running is done by determining the line spacing and setting the planned line in the multibeam measurement interface and then running the line manually to ensure the accuracy of the line every time. Regardless of automatic or manual line running, the data of sweeping measurement during the turn do not need to be recorded.

For specific software operation and post-processing operation, please refer to the instruction manual of HiMAX Multibeam Acquisition Post-Processing Software.

3.3 MRU-PD Configuration operations

Open the USR-VCOM software, click the drop-down arrow beside [Search] and select [USR-TCP232-E45].

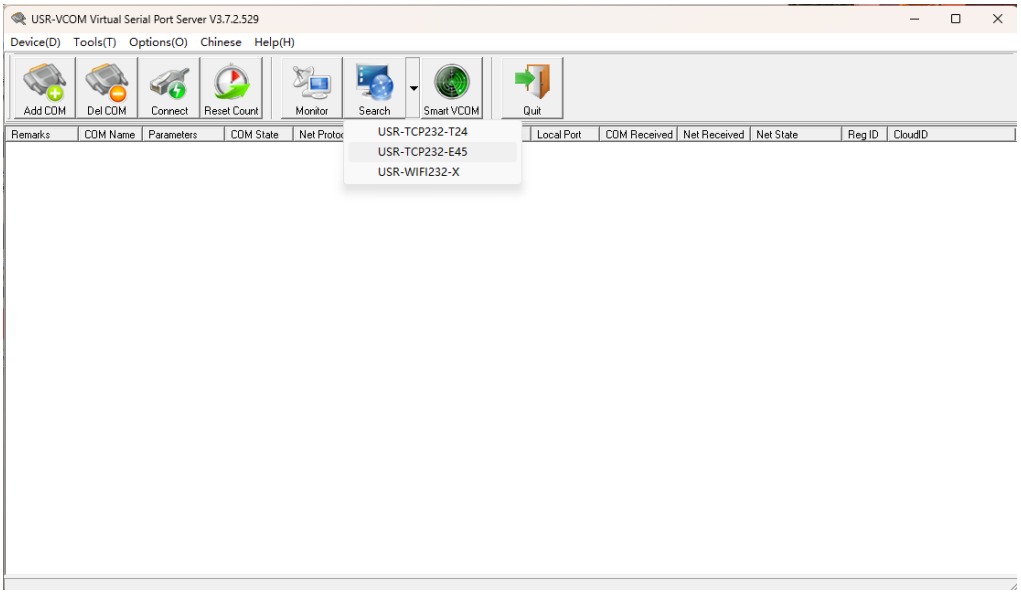


Figure 3-21 USR-VCOM software

Enter the configuration interface, click [Search Device], the device IP and name will pop up in the window, select the pop-up information.

Select Port0 in the right port, click [Connect Virtual COM], make sure that the [Remote Port] is 23 and the [Virtual COM] is COM1 in turn. (COM1 is connected to the IMU software)

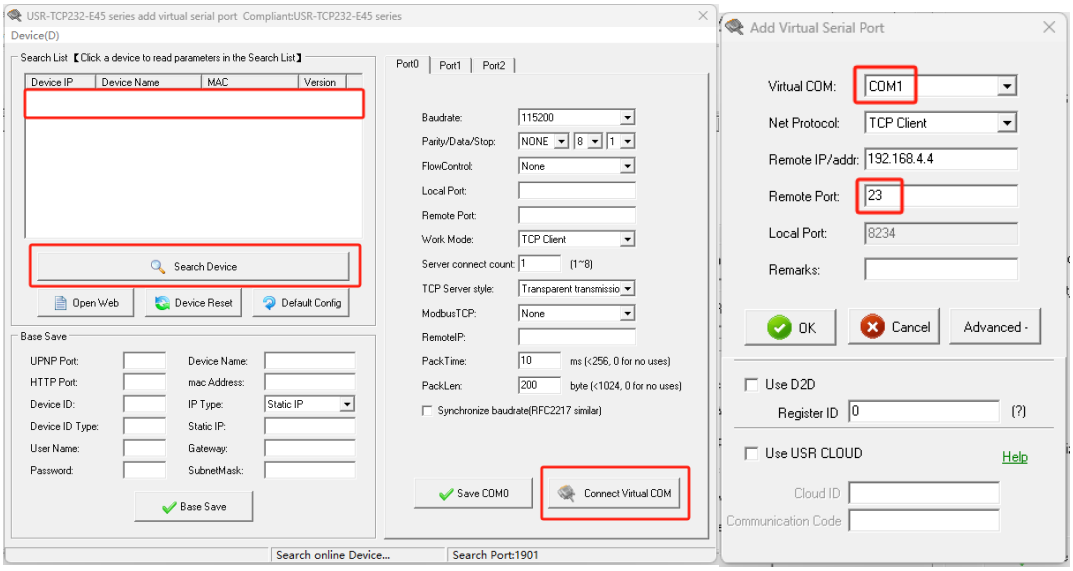


Figure 3-22 Connect Virtual COM

Once the USR-VCOM is configured, do not exit, just minimise the software. Open MRU-PD software (IMU configuration software) to configure the offset and COM port.

Open the MRU-PD software, click the small aircraft icon to enter the following interface:

Firstly, click [Options] - [Test Options] to configure the COM port of the inertial guide:

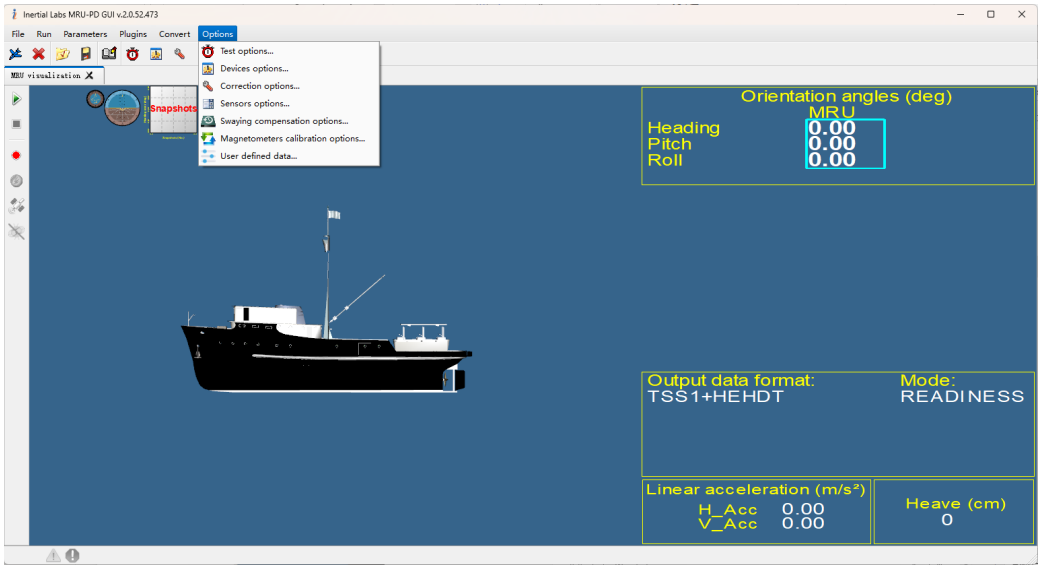


Figure 3-23 MRU-PD software

Make sure that [Serial port] is selected as COM1 set by USR-VCOM, and [Baud rate] is 115200, and the output data format is selected as TSS1.

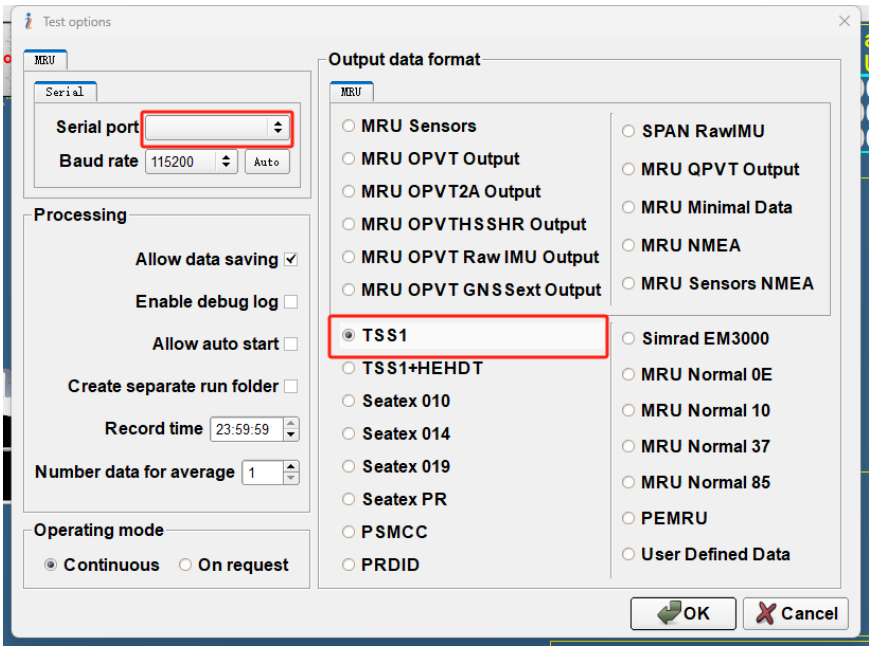


Figure 3-24 Test options

Ensure that there is no problem with the above settings, click [Options] - [Devices option], configure the offset: primary and secondary antenna:

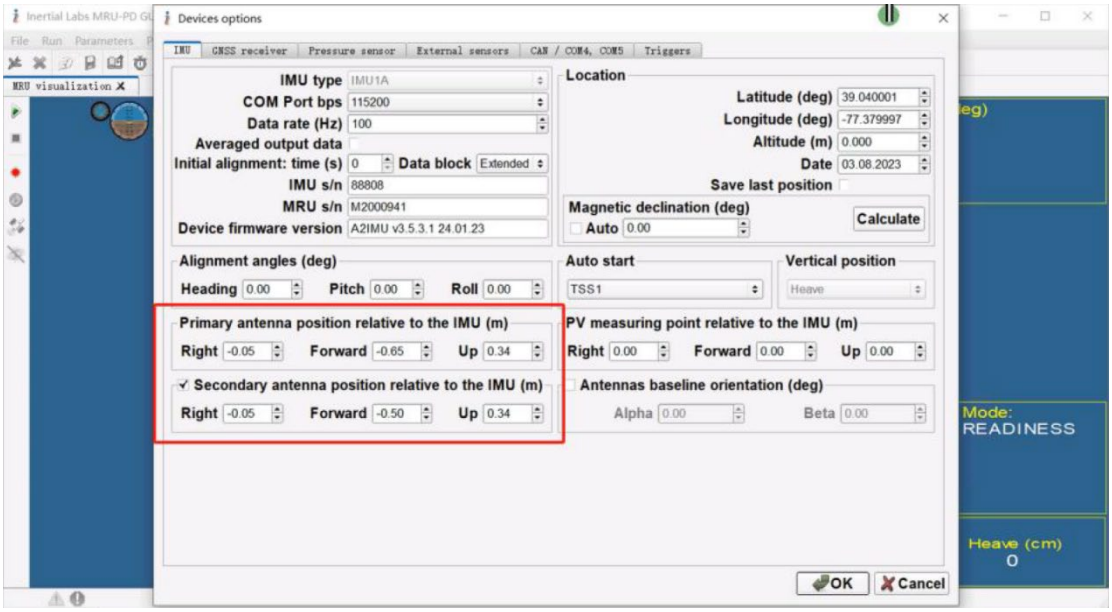


Figure 3-25 configure primary and secondary antenna offset

Offsets can be viewed in the USV Control system (192.168.144.28):

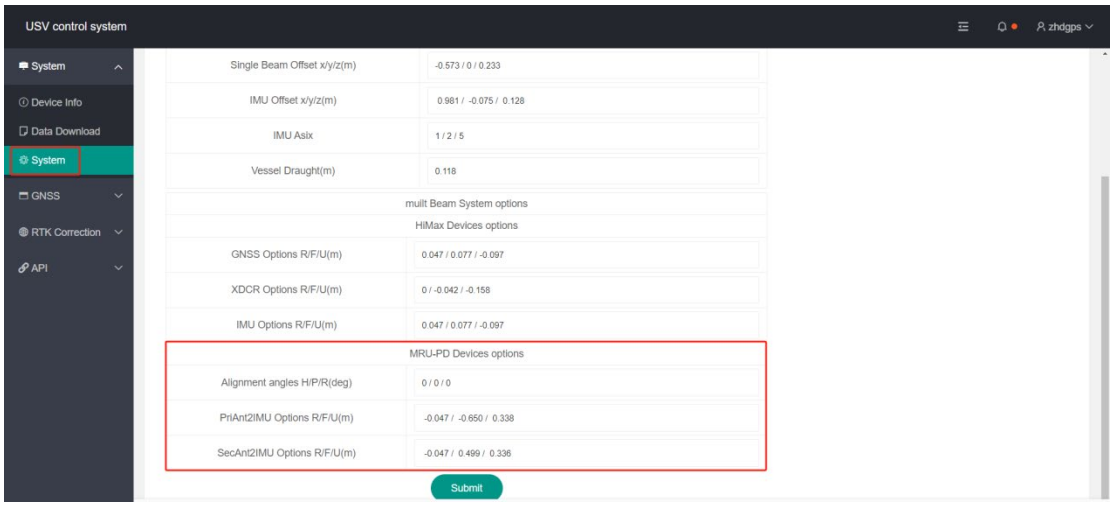


Figure 3-26 USV Control system

Make sure the offset is correct (note the ± sign), click OK, go back to the main interface, click the left start button; after hearing a ding-dong sound, the Pitch and ROLL appear to change the value, which represents the IMU configuration is successful.

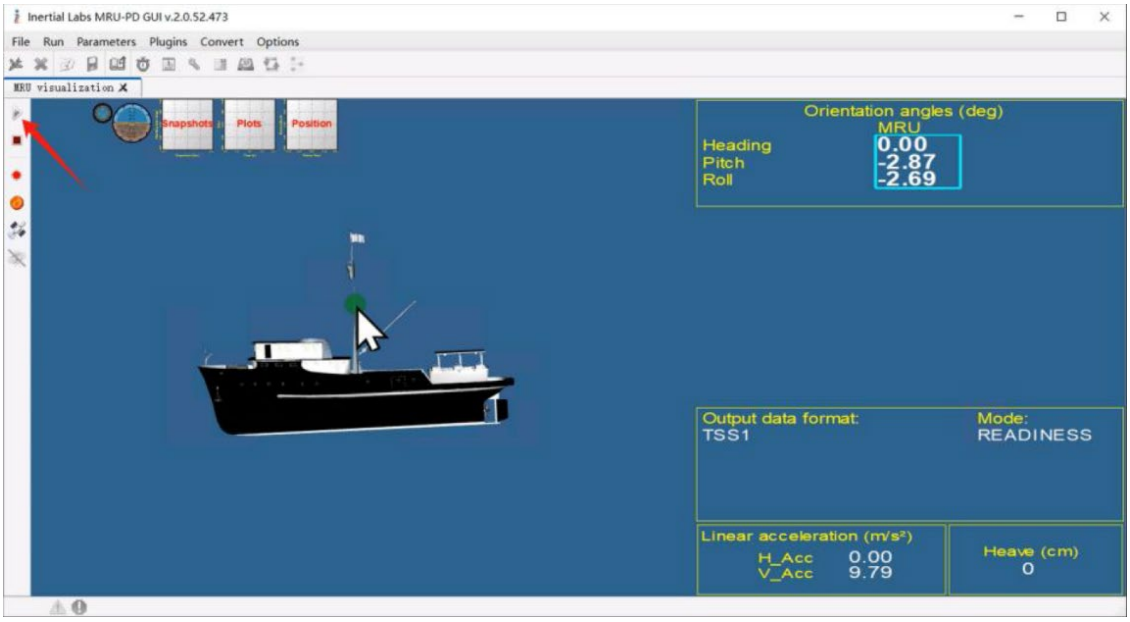


Figure 3-37 IMU configuration is successful

Special note: Because the differential data of multibeam under HydroBoat1500 system is provided by ship control, so it is different from the operation of manned ship.

In MRU-PD, you need to select COM. in [Devices options] - [GNSS receiver] in [GNSS Port3]：

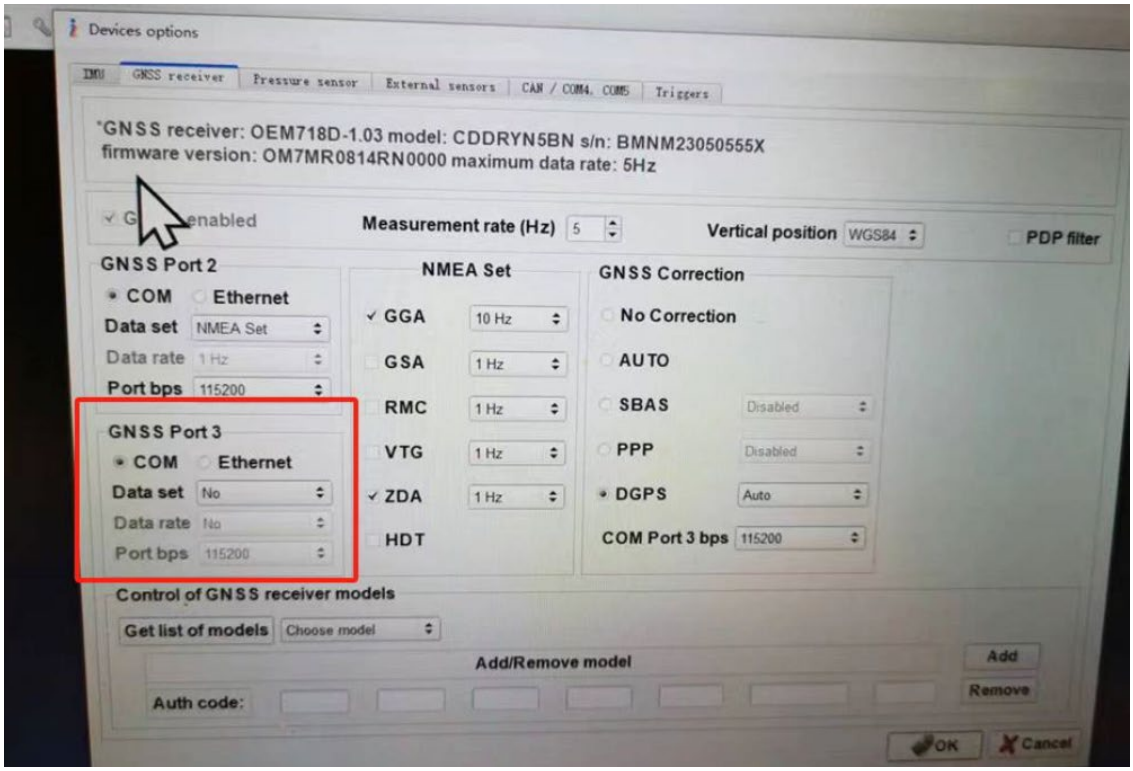


Figure 3-38 Select GNSS receiver COM

[Vertical position] select [MSL], MSL is the elevation, WGS84 is the ellipsoid height:

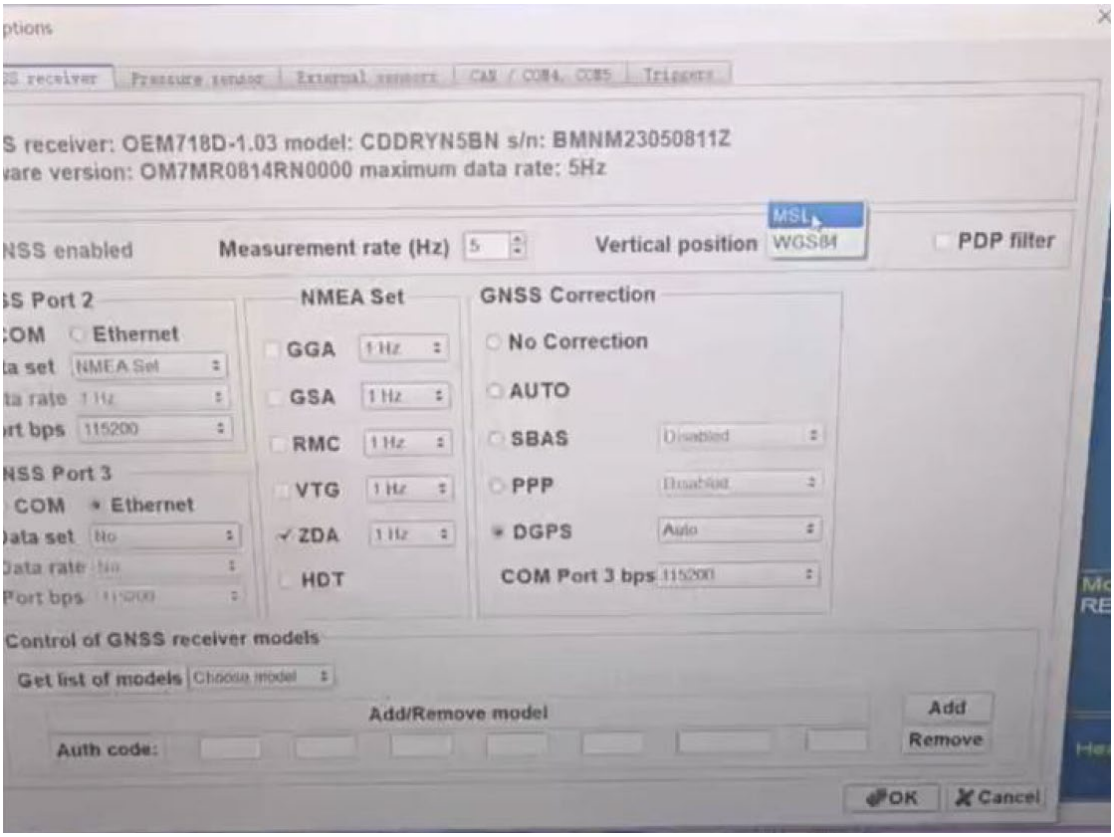


Figure 3-38 Select Vertical position

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