



HydroBoat 1200

User Manual



HydroBoat 1200

Manual Revision

HydroBoat 1200

Revision Date	Revision Level	Description
Mar. 2024	2	HydroBoat 1200 User Manual

Introduction

Welcome to the Satlab HydroBoat 1200. 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.

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Chapter 1

Overview

This chapter contains:

- Principles of HydroBoat 1200

1 Overview

1.1 Principles of HydroBoat 1200

Underwater topographic survey refers to obtaining the plane position and elevation of rivers, lakes, reservoirs and other waters through measuring instruments, and drawing underwater topographic maps according to the corresponding scale. There are generally two traditional underwater topographic surveying methods.

One is the combination of bathymetric rod and total station to realize the data acquisition of the bathymetric point, which requires the person on the boat to use the bathymetric rod to determine the depth of the water, and at the same time, the person on the shore through the total station to measure the position and elevation of the bathymetric point. This mode of operation is less efficient, the depth measurement distance depends on the length of the bathymetric rod, and the accurate positioning of the survey line cannot be realized.

Another traditional measurement method is to use the sounder to carry out the measurement, that is, the sounder is fixed on a larger ship with someone at the helm, and the sounder is responsible for the acquisition of bathymetric data and the measurement of position and elevation during the operation. This method realizes the automation of bathymetric positioning, effectively reduces the labor intensity, improves the efficiency, and is a more commonly used method of underwater topographic measurement. However, because of the use of larger vessels, can not operate in shallow water, and the accuracy of the line positioning depends on the driver's ability to steer, the line positioning often has a relatively large deviation.



Figure 1-1 Traditional measurement

With the continuous progress of science and technology, the development of surveying and mapping instruments tends to be more simplified, integrated and integrated. Unmanned survey vessel technology is integrated GNSS positioning technology, sonar bathymetry technology and other multi-functional underwater topographic survey system, which will be real-time positioning, underwater bathymetry, remote communication, autonomous navigation and obstacle avoidance and other functions integrated into the flexible and compact unmanned ship, which makes the underwater topographic surveying operations safer and more efficient.



Figure 1-2 HydroBoat-1200

The working principle of the HydroBoat 1200 is that while the shipboard GNSS receiver receives the differential signals from the satellite transferred from the reference station, the depth sounder sends ultrasonic waves downward for echo sounding, which will get a set of accurate data with east coordinate, north coordinate, elevation and water depth, and then through the remote control or the software to plan the route, the ship will be sailing into the area to be measured to carry out the automatic measurement.

Chapter 2

Hardware Introduction

This chapter contains:

- Front of the Boat
- Bottom of the Boat
- Remote Controller

2 Hardware Introduction

2.1 Front of the Boat

The Front of the boat is shown in Figure 2-1. It is composed of a millimeter wave radar , Antenna, camera, and remote control indicator.



Figure 2-1 Front

- ①—Remote Antenna(2.4G) ②—Gns1 Position Antenna ③—On/Off Button
 ④—Solution Status Indicator ⑤—Network Antenna(4G) ⑥—Radio Antenna
 ⑦—Propeller ⑧—Indicate Light ⑨—Camera
 ⑩—Millimeter-wave Radar ⑪—Gns2 Heading Antenna

- Millimeter wave radar: For Collision Avoidance System
- 4G antenna: For receiving 4G signal.
- 2.4G antenna: For remote control boats.
- Heading antenna: For heading
- Position antenna: For positioning.

2.2 Bottom of the boat

The Bottom of the boat is shown in Figure 2-2. It is composed of two propellers and one transducer.

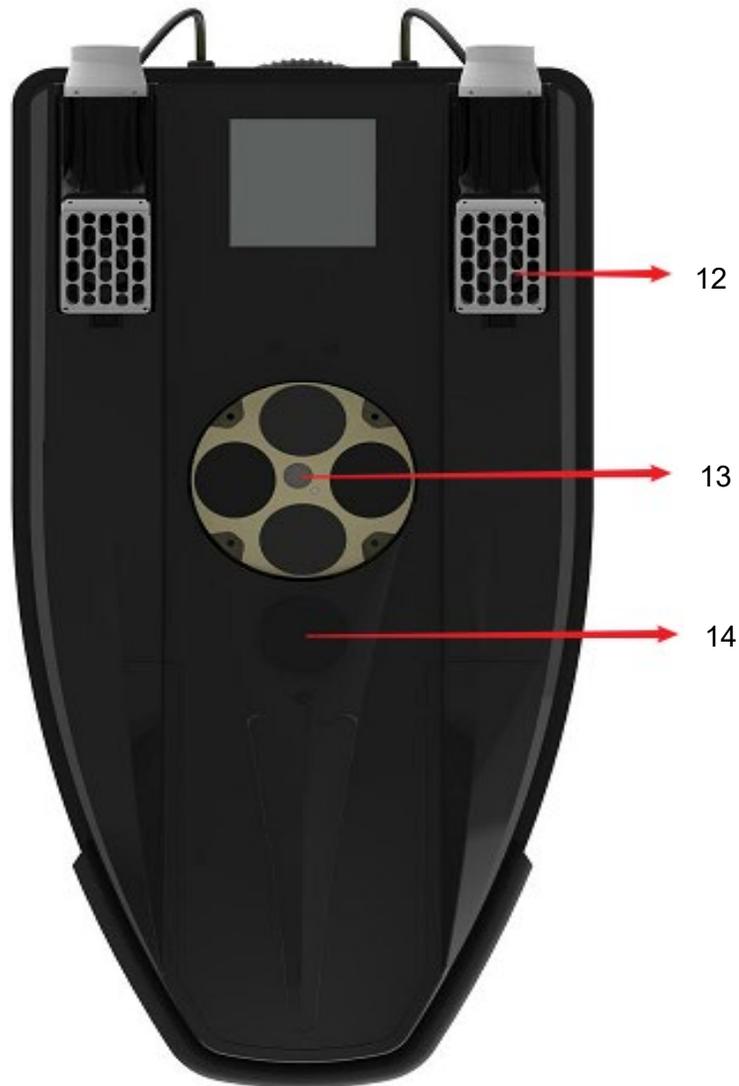


Figure 2-2 Bottom

12. Waterproof Grass Filter 13. Moon Pool 14. Transducer

- ① SW1
- ② SW2
- ③ SW4
- ④ Forward/Backward
- ⑤ Left/right
- ⑥ On/Off



Figure 2-3 Remote Controller

As shown in Figure 2-3, the structure of the remote controller has many switches, here are the descriptions of the functions corresponding to the different buttons:

SW1, upper is engine unlock, center is engine lock while the 3rd is N/A.

SW2, Return: the boat return back to the home point.

SW4, Switching the boat's Manual/Cruise mode.

Manual: the boat can only be operated by the controller.

Cruise: the boat sails automatically according to the course. and can also be operated manually.

Forward/backward controls the fore and aft direction of the boat.

Turn left/right controls the right and left direction of the boat.

Switch, remote controller On/Off.

Chapter 3

Features of HydroBoat 1200

This chapter contains:

- System Features
- Structural design
- Mechanical system
- Intelligent Control System

3 Features of HydroBoat 1200

3.1 System Features

- ◆ *Measurement at startup, One key connection, measurement at startup*
- ◆ *No need for shore base, No need to set up base station, no need for computer, operating range 2km*
- ◆ *Android platform, 7-inch high-definition Android remote control, built-in navigation/control/depth sounding software.*
- ◆ *High-precision bathymetry, Ultra-shallow water, large water depth, analog signal superimposed on bathymetric data.*
- ◆ *Anti-collision and Anti-subsidence, Millimeter wave radar intelligent obstacle avoidance, anti-sinking double hull design, full-speed impact does not affect the use.*

3.2 Structural design

- ◆ *M-bottom design, low resistance, high load capacity High energy efficiency.*
- ◆ *Compact and lightweight boat for one-person operation.*
- ◆ *IP67 waterproof, battery, integrated box (control, communication, depth measurement, positioning integration) and other core components built-in, waterproof, high stability.*
- ◆ *Dual GNSS antennas support high-precision orientation, more accurate online*
- ◆ *Anti-crash and wear-resistant, equipped with thickened crash bars and wear-resistant wearing parts.*
- ◆ *Anti-sinking double hull design.*
- ◆ *Navigation light design, can show the communication status and positioning signal status.*

3.3 Mechanical system

- ◆ *Intelligent modular, highly integrated battery with built-in power management system for safety and efficiency.*
- ◆ *Culvert propeller, waterproof grass entanglement, easy transportation and launching, support shallow water operation.*
- ◆ *High speed, strong thrust, full speed up to 6m/s.*
- ◆ *Unplugged design for quick removal and replacement*

3.4 Intelligent Control System

- ◆ *Millimeter wave radar, intelligent obstacle avoidance.*
- ◆ *Shallow water alarm, automatic reversing in shallow water.*
- ◆ *Adaptive flow rate for more accurate on-line.*
- ◆ *Support one-click hover.*
- ◆ *Low battery return, lost connection return (multiple return methods).*
- ◆ *360-degree pan-tilt camera, support for surveillance picture capture.*

Chapter 4

Specifications of HydroBoat 1200

This chapter contains:

- Table 4-1 Vehicle Specifications
- Table 4-2 Power and Electrical Parameters
- Table 4-3 Communication Control
- Table 4-4 GNSS
- Table 4-5 Single Beam Echo Sounder
- Table 4-6 IMU

4 Specifications of HydroBoat 1200

Table 4-1 Vehicle Specifications

Hull dimension (L*W*H)	1229 mm*600 mm*438 mm
Hull weight	10kg
Material	Carbon fiber, Rubber Bumper
Anti-wave & Wind	3rd wind level & 2nd wave level
Waterproof	IP67
Indicator light	Two anti-fog explosion lamps to indicate the status of localization and communication.
Camera	360° omnidirectional video

Table 4-2 Power and Electrical Parameters

Propeller Type	Quick Release Culvert Propellers
Power	1000 W
Speed	0.1~6 m/s
Battery Capacity	29.04 V/34.3 Ah (Typical)/29.04 V/33.27 Ah(Rated)
Battery Endurance	40 km@1.5 m/s
Battery Safety	Power Display, High-temperature/Over-current/Short-circuit Protection

Table 4-3 Communication Control

Type	2.4 GHz Wireless Technology (1.7 km); 4G Network
GNSS Differential Types	Radio; Network; Controller Differential
Navigation Mode	Manual or Auto-Pilot
Data Storage Methods	Simultaneous Support for Ship-side Storage and Controller Broadcast

Table 4-4 GNSS

Channel	1408
Position Accuracy	RTKH: $\pm 8 \text{ mm} + 1 \text{ ppm}$; V: $\pm 15 \text{ mm} + 1 \text{ ppm}$;
	DGNSSH: $\pm 0.4 \text{ m} + 1 \text{ ppm}$; V: $\pm 0.8 \text{ m} + 1 \text{ ppm}$;
	SingleH: 1.5 m ; V: 2.5 m;
Directional Accuracy	$\leq 0.2^\circ$
Timing Accuracy	$\leq 20 \text{ ns}$

Table 4-5 Single Beam Echo Sounder

Depth range	0.15m - 200m
Accuracy	$\pm 0.01\text{m} + 0.1\% \times D$ (D is the depth of water)
Frequency	200 kHz
Beam angle	$5 \pm 0.5^\circ$
Data Formats	Standard NMEA, DESO 25, ODOM, Knudsen, Bathy, Echotrac ;

Table 4-6 IMU

Refresh Rate	200 HZ
Position Accuracy	< 1 m/30 s
Directional Accuracy	$\leq 2.1^\circ / \text{h}$



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