



ES-224 Echo Sounder
User Manual

Manual Revision

SATLAB GEOSOLUTIONS AB

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ES-224

ECHO SOUNDER



Preface

Introduction

Welcome to the Satlab Freyja receiver. This introduction describes how to use this product.

Experience requirement

To help you use the Satlab series products better, Satlab suggests that you read the instructions carefully. If you are unfamiliar with the products, please refer to www.satlab.com.se

Tips for safe use



Notice: These are special operations and need your special attention. Please read them carefully.

The contents here are very important as the wrong operation may damage the machine. This can lead to the loss of data, or break the system and endanger your safety.

Exclusions

Before using the product, please read these operating instructions carefully, as they will help you to use it better. Satlab Geosolutions AB. assumes no responsibility if you fail to operate the product according to the instructions, or operate it wrongly because you have misunderstood them.

Satlab is committed to constantly perfecting the product' s functions and performance, improving its service quality, and reserves the right to change these operating instructions without notice.

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

Technology and service

If you have any technical issues, please call the Satlab technology department for help, and we will answer your question.

Relevant information

You can obtain this introduction by:

Purchasing Satlab products: this manual is found in the instrument container and will help you to operate the instrument.

Logging on to the Satlab official website and downloading the electronic version of this introduction from Partner Center: <http://members.satlab.com.se//>

Advice

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

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Preface 错误! 未定义书签。

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Chapter 1

Overview

This chapter contains:

- Principles of Echo Sounder
- Features
- Specifications

1.1 Principles of Echo Sounder

1.1.1 Principles of ES-224 Echo Sounder

We suppose that the velocity of sound wave spreads in water is V . The probe of the transducer loads pulse sound wave signals. Then, the sound wave is sent to the bottom of the water through the probe and is received by the probe when the sound wave reflects. Thus, it records the duration that the sound wave signals go and return, as indicated in Figure 1-1.

$$Z = vt / 2$$

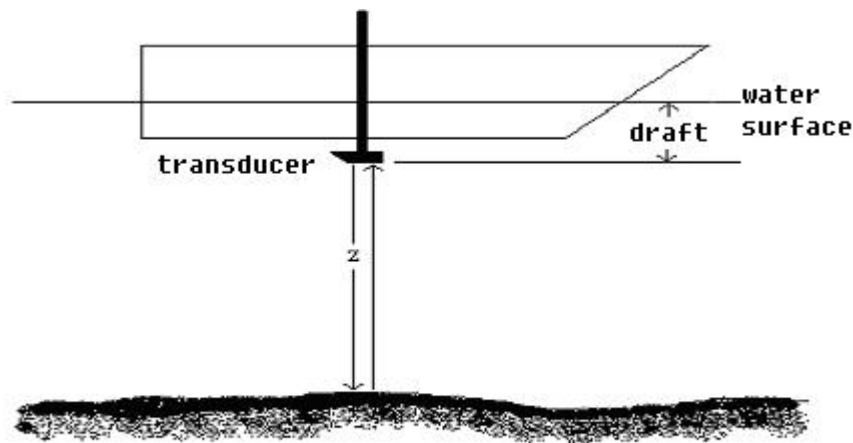


Figure 1-1-1 Principle of Echo

Z is the length between the probe and the seabed and the depth of water is $Z + \text{draft}$.

The ES-224 is a single-beam dual-frequency echo sounder that transmits and receives both high-frequency and low-frequency signals from the bottom of the water. The analog front-end components (transmitting and receiving) of the high-frequency and low-frequency sound channels and the signal processing are independent and do not affect each other.

Low-frequency acoustic waves and high-frequency acoustic waves in water transmission have different physical characteristics. Water absorption of low-frequency signals is weaker than high-frequency signals so the transmission of low-frequency signals is stronger. In the presence of underwater sediments, low-frequency sound waves can penetrate the soft medium under the water and measure the real water bottom. Therefore, the dual-frequency echo sounder can provide information about the topography and sediments under the water. The user can grasp the navigable water depth data of the port by this information, which is of great significance to the port engineering and dredging project.

1.1.2 Technology of Tracking

Although the principle of echo sounder is simple, underwater situations are often so complex the signal is not easy to be identified. There is also interference echo from fish and other things and there may be a second-trace echo, or triple-trace echo in the offshore area because of different submarine reflection conditions. Therefore, we must take measures to track and get real echo signals from the bottom.

Submarine Gate Tracking (Time Gate Tracking)

Time Gate can be understood as a time range. As indicated in Figure 1-1-2, the depth of water doesn't change greatly between two soundings (about 0.1 seconds) because the bottom changes imperceptibly. Supposing the percentage of water depth variation is $\pm 10\%$, we will open a time window from the foregoing $10\% \times Z$ (the reflection interval is Z) to the latter $10\% \times Z$ for the correct echo wave time. $(100\% \pm 10\%) \times Z$ is called the width of the time window and only the echo wave that is received in the time window will be recognized as the real signal. If there is no echo within the time window, the width of the time window will amplify to search echo until there is a correct echo available.

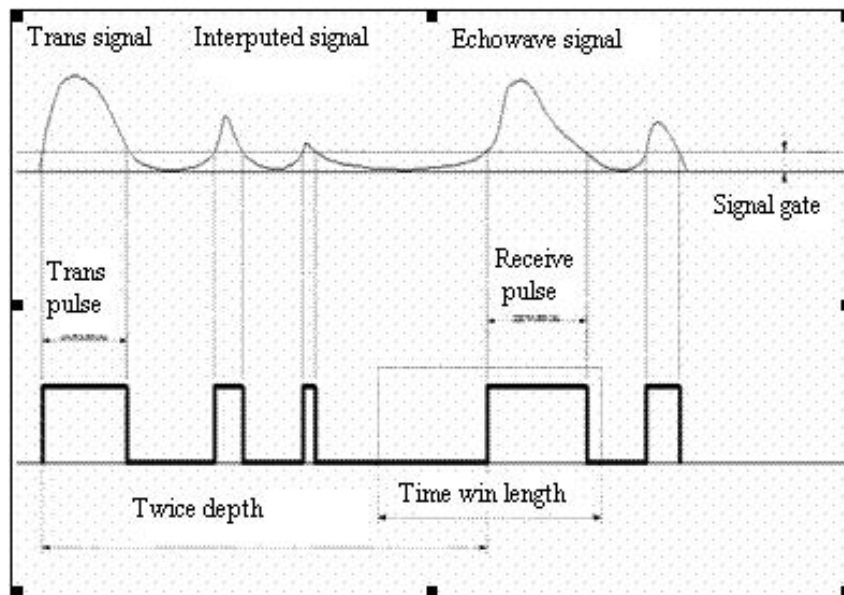


Figure 1-1-2 Tracking Technique of the Time Gate

Pulse Width Selection

Generally speaking, the width of the echo pulse from the bottom is larger than the pulse width of interferential signals and second-trace echo. The correct one can be distinguished as it has the largest pulse width. Meanwhile, it works with the help of time window technology.

Signal Threshold Control

The signal threshold can be amplified to filter interferential signals if there is much interference in the surveying area or environment. However, the signal threshold can't be amplified too much so that

weaker signals can be filtered. Different signal thresholds will influence the precision of echo sounding. Hence, selecting a proper signal threshold helps restrain interference and track stably.

Signal Gain Control (SGC)

SGC can measure the intensity of the echo pulse signal. When the echo pulse signal is excessively strong, the amplifier of the automatic control receiver will reduce the gain to avoid too much interference signal. When the echo pulse signal is excessively small, the amplifier of the automatic control receiver will increase the gain to receive the echo pulse. The range of SGC is the key to judging the receiver channel performance. The SGC range of the Satlab echo sounder is 80 Db, which can be adjusted manually or automatically.

Time Varied Gain Control (TVG)

Sound intensity reduces exponentially when it spreads in the water. In order to keep signal range stable, TVG will control the receiver amplifier to increase by contraries. This is the principle of TVG, as indicated in Figure 1-1-3.

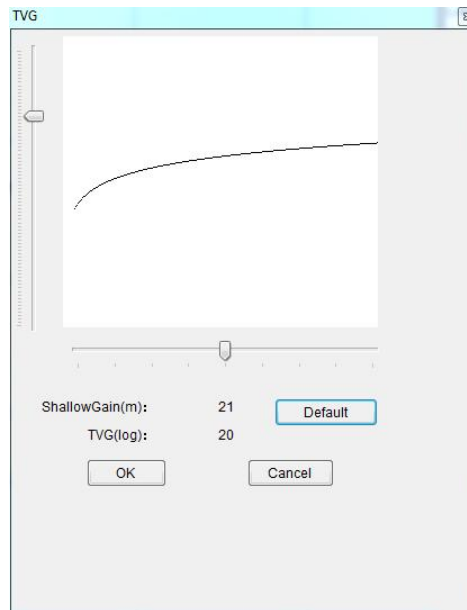


Figure 1-1-3 TVG

1.2 Features

1. Fully digital design. Overlay of the analog signal and bathymetry data for fast and accurate water depth reading.
2. Combination of high and low frequency. Real-time display for silt thickness.
3. High signal-to-noise ratio signal processing circuitry for measurements in complex water.
4. Adapted to different frequency band transducer. Advanced algorithms to maximize the bathymetric effect of high and low frequencies of the echo sounder.

5. Powerful SLHydro Sounder hydrographic software integrates bathymetry, navigation, and post processing.

1.3 Specifications

Table 1-3-1 Technical Parameters

Frequency	High: 200kHz Low: 24kHz
Maximum Transmitting Power	400W@200kHz 1200W@24kHz
Depth Range	0.15~300m/1.0~900 ft.@200kHz 0.8~2000m/2.4~6000 ft.@24kHz
Accuracy	0.01m / 0.1 ft. +/- 0.1% of depth @ 200kHz 0.10m / 0.30 ft. +/- 0.1% of depth @24kHz
Resolution	0.01m / 0.10 ft @200kHz 0.10m / 0.30 ft @24kHz
Sound Velocity	1370~1700m/s
Ping Rate	Maximum 30Hz
Output Data Format	Standard NMEA 0183, DESO 25, ODOM, Knudsen, Bathy, Echotrac, Satlab
Screen	17 inches with resolution: 1280 x 1024@60Hz
CPU	1.92GHz, Quad-Core (windows 7)
RAM	2GB
Storage	128GB SSD
Interfaces	RS-232*3, USB*4, Power Port*1, Transducer Port*1, VGA*1
Input Power Consumption	10~30VDC or 220VAC 80 watts
Operating Temperature	-20°C~70°C
Weight	9.5 kg (20lbs.)
Dimensions	H: 480mm (18.8 in)×W: 360mm (14.1 in)×D: 110mm (4.3 in)
Material of Shell	High Strength ASA
Certification	CE, EN 60945

Chapter 2

Introduction of ES-224

This chapter contains:

- Front Face of the Host
- Rear Face of the Host
- Side Face of the Host
- Other Accessories
- Size Chart

2.1 Front Face of the Host

The front face of the host is shown in Figure 2-1-1. It is composed of a display screen, measuring function keys: digital keys, sounding functional keys, and USB interfaces.



Figure 2-1-1 Front Face

1. Power Indicator 2. Power Button 3. Measuring Function Keys 4. USB Interfaces*3
5. Sounding Function Keys

- Power button: turn on/off the host.

Power on: Press and hold the power button for 1 second to turn it on.

Power off:

1. Click Computer *Start->Shutdown*.

2. Press and hold the power button for more than 3 seconds. When the power indicator flashes, the software automatically will close and power off.

3. Press and hold the power button for more than 5 seconds and then release the button after the power indicator is off, and the device will be forced to shut down.

- Measuring function keys: locking, line changeover, recording, marking, and other common function keys for measuring.

- Sounding function keys: depth sounding, playback automatically, and other common function keys for measuring.

- USB interfaces: there are three USB ports under the lid.

2.2 Rear Face of the Host

The rear interface of ES-224 series products includes a transducer interface, DC 10-30V power interface, COM1/2/3 serial data interface, VGA display output interface, and USB universal serial interface.



Figure 2-2-1 Rear Face

2.3 Side Face of the Host



Figure 2-3-1 Side Face

As shown in Figure 2-3-1, the bracket can support the host after being fixed. The angle of the bracket can be adjusted randomly by loosening bracket screws.

2.4 Other Accessories

Transducer



Figure 2-4-1 Transducer

The center frequency of the high-frequency unit is 200KHz and the center frequency of the low-frequency unit is 24KHz. The beam angle of high frequency-3dB is 5 degrees and the beam angle of low frequency-3dB is 25 degrees. The length of the cable is 10 meters and the connector adopts a 7-pin aviation socket.

Table 2-4-1 Pin Definition of 7-pin Aviation Socket

Pin	1	2	3	4	5	6	7
Definition	\	High frequency -	High frequency +	\	Low frequency +	Low frequency -	\

AC Power Adapter

Voltage range: 100~240V, frequency: 50/60 Hz.



Figure 2-4-2 Adapter

Table 2-4-2 Pin Definition

Pin	1	2	3
Definition	+	-	\

Keyboard and Mouse

Wireless mouse and keyboard. The steps to use are as follows:

1. Prepare two AA batteries and put them in the keyboard and mouse respectively.
2. Take the USB Bluetooth module out of the mouse and plug it into the USB port of ES-224.
3. Turn the switch 'On' at the bottom of the mouse and you can use the keyboard and mouse.



Figure 2-4-3 Keyboard and Mouse

DC Power Cable

DC voltage: 10~30V, input current: max 4A.



Figure 2-4-4 DC Power Cable

Data Cable

10 meters. It's a standard serial cable. There are two DB9 ports, one is male and one is female.



Figure 2-4-5 Data Cable

UC-1 Cable

Used to connect Satlab GNSS receiver to ES-224. One port is a 5-pin, one port is a DB9 serial port.



Figure 2-4-6 UC-1 Cable

2.5 Size Chart

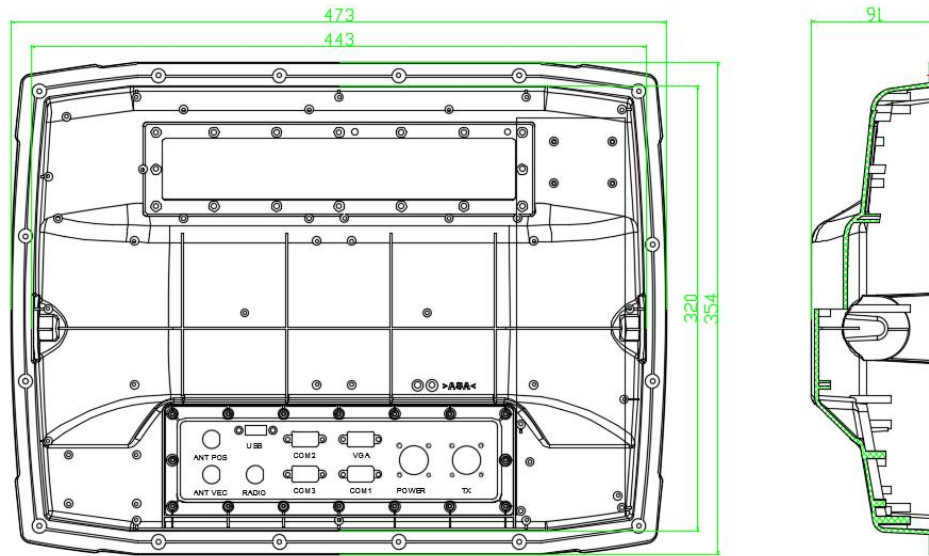


Figure 2-5-1 Size Chart

Installation Cautions

1. Avoid being exposed to direct sunlight and high temperature. Avoid strong vibration.
2. Do not unplug the power when the power is on. DC regulated power supply of 10-30V is recommended.
3. Make sure there is enough space behind the host to install the plug and cable.
4. Non-professional personnel shall not disassemble the equipment. If you have any questions, please contact the retailer as soon as possible.

