

User Manual for Echologger Dual-Frequency Echosounders

EU D24 / ECT D24 / ECS D24 / ETH D24
EU D710/ ECT D710 / ECS D710 / ETH D710
EU D052 / ECT D052
EU D032 / ECT D032

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1. INTRODUCTION

The Echologger Dual Frequency Echosounders are compact single-beam devices engineered for precise underwater depth measurement. Designed with versatility and integration in mind, these echosounders are available in a range of models and mounting options to suit both stationary and mobile platforms such as USVs, ROVs, AUVs, and UAVs. In addition to delivering accurate depth profiling, they also generate echograms from backscatter data along the water column, offering valuable insights into submerged vegetation, sediment layers, and suspended targets—making them ideal for a wide range of hydrographic and environmental applications.

The Echologger dual-frequency line includes models such as the D24, D710, D052, and D032, each offering simultaneous low and high-frequency operation (e.g., 50 kHz and 200 kHz) to optimize detection in varying bottom conditions.

Ultra-Compact and Lightweight

Renowned for their ultra-compact housings and low weight, the Echologger dual-frequency echosounders are purpose-built for deployment on USVs, drones, portable kits, and tight installation spaces. Devices start at just a few hundred grams, making them ideal for small unmanned platforms and fieldwork in remote environments.

Dual Frequency Capability

These echosounders transmit at two independent frequencies, allowing users to capture both detailed upper-layer resolution and robust penetration through soft or vegetated bottoms. This dual-mode operation enhances adaptability across a broad range of survey scenarios, from shallow rivers to deep reservoirs.

Robust Acoustic Performance

Each unit is equipped with a high-precision transducer and supports digital signal processing for enhanced accuracy. The optional Auto Mode further simplifies operations by adjusting settings based on bottom type and water depth, reducing configuration time for non-expert users.

Rugged and Reliable

Encased in acetal, stainless steel or hard-anodised aluminium, these units are depth-rated up to 6,000 m depending on model, withstanding harsh marine conditions. Designed for low power consumption and long-duration deployment, they support integration with a wide array of navigation and data logging systems.

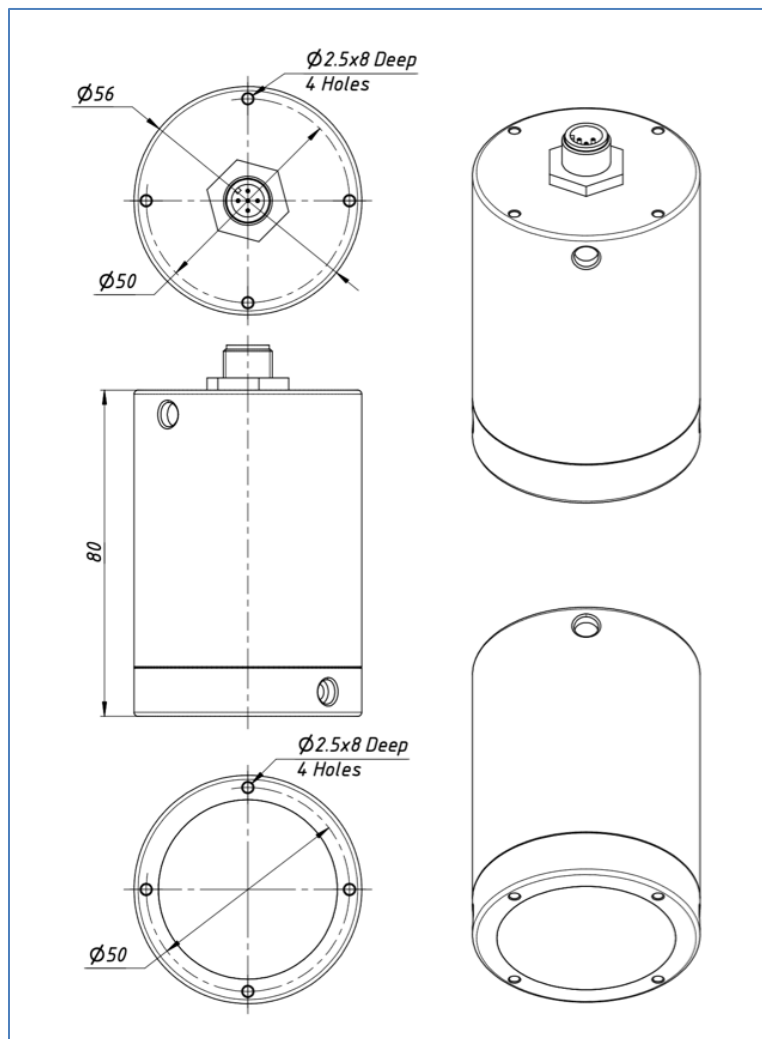
Typical Applications

- Unmanned bathymetric surveys (USVs, drones).
- Inland water body mapping.
- Dredging support and sediment monitoring.
- Hydrographic survey in confined or hard-to-reach environments.
- Underwater robotic navigation support.

2. Dimensions

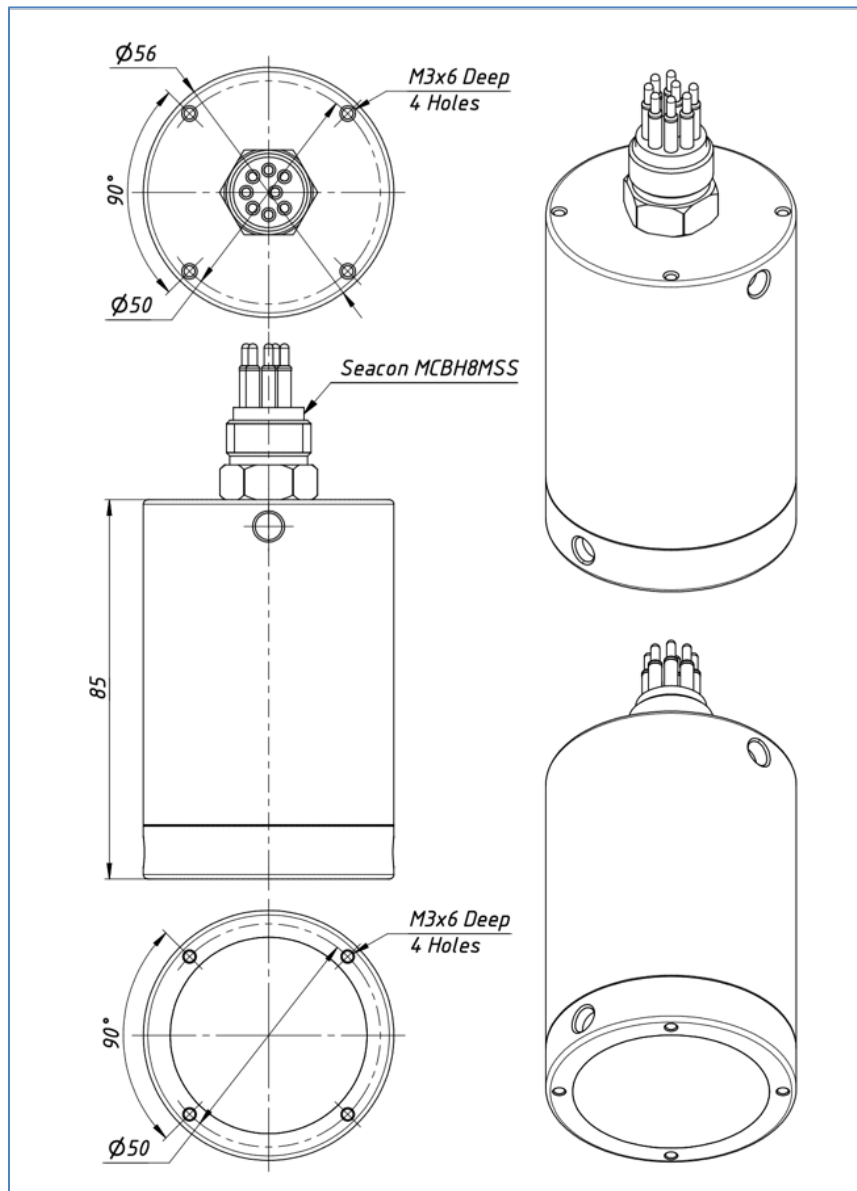
(1) EU D24 / ECT D24S / EU D710 / ECT D710S

- “S” indicates models for surface vehicles (depth rating: 1 m)
- Circular housing with bottom-facing transducer
- Mounting holes: $\varnothing 2.5$ (4 holes)
- Diameter: $\varnothing 56$ mm
- Height: 80 mm
- Material: Acetal



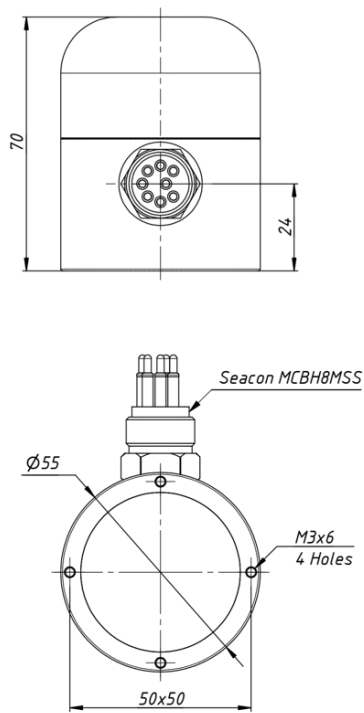
(2) ECT D24-100 / ECT D710-100

- Top-mounted Seacon connector for 100 m depth rating
- Mounting holes: M3x6 Deep (4 holes)
- Diameter: $\varnothing 56$ mm
- Height: 85 mm
- Material: Acetal
- Optional depth ratings: 1000 m and 6000 m (Aluminum version)

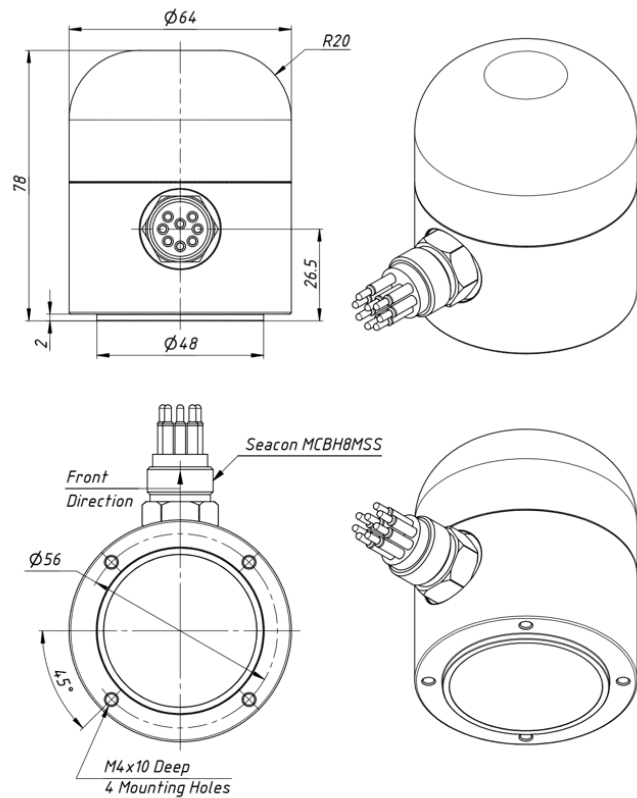


(3) ECS D24 / ECS D710

- Side-mounted Seacon connector
- Available depth ratings:
 - ECS D24-100: 100 m
 - ECS D24-1000: 1,000 m
 - ECS D24-6000: 6,000 m
- Material: Aluminum



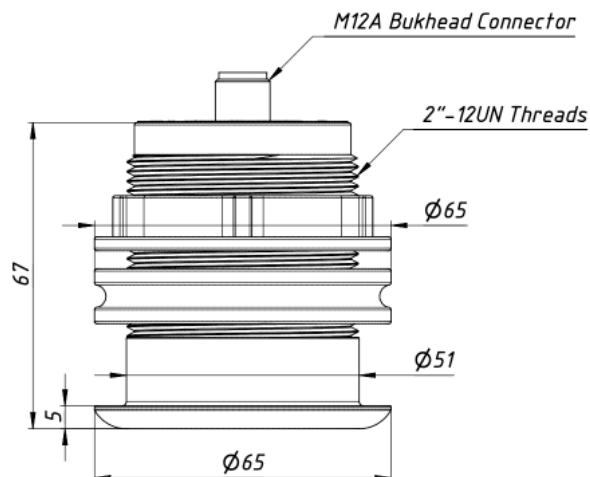
100m or 1,000m rating



6,000m rating

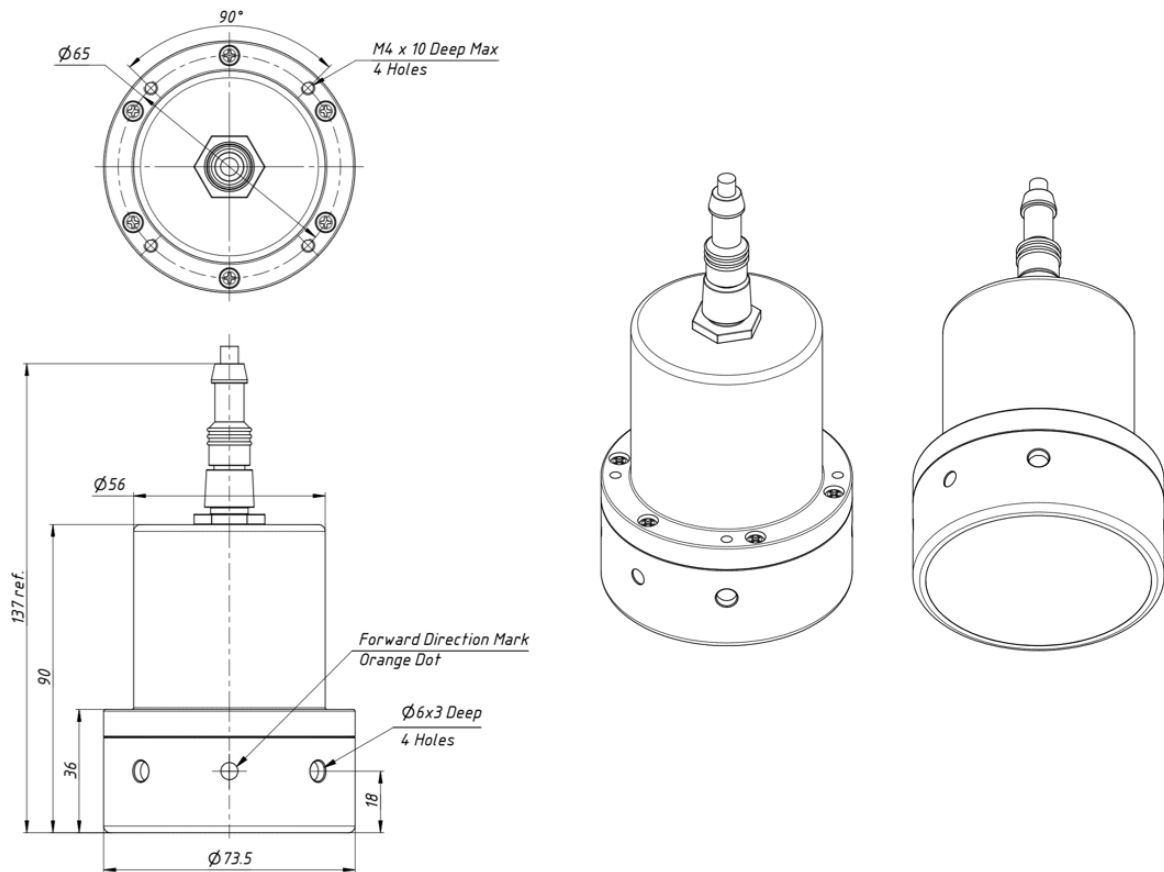
(4) ETH D24 / ETH D710

- Features a hull-mountable design



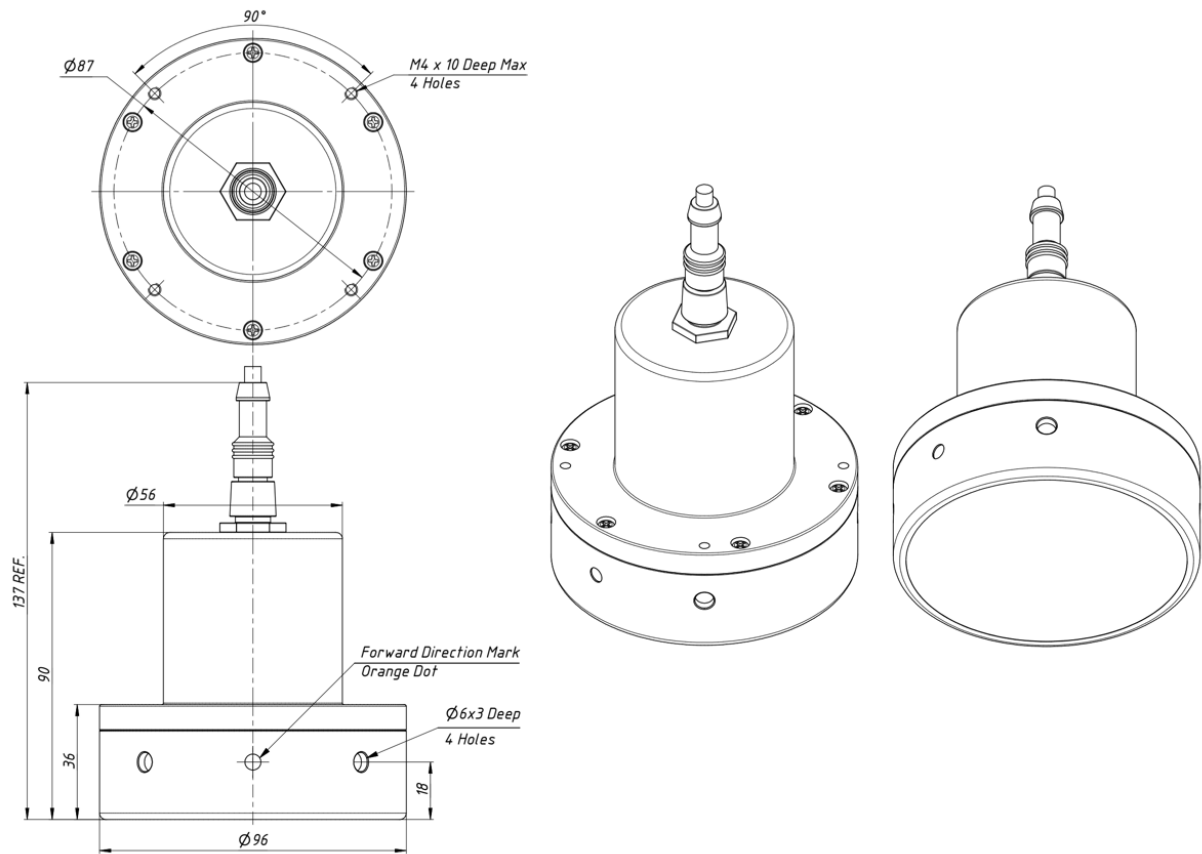
(5) EU D052 / ECT D052S

- For surface vehicles (depth rating: 1 m)
- Diameter: $\varnothing 73.5$ mm, Height: 90 mm (w/o connector)
- Material: Acetal



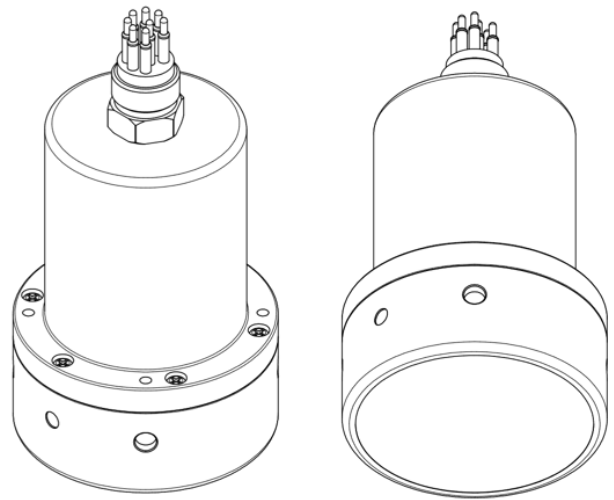
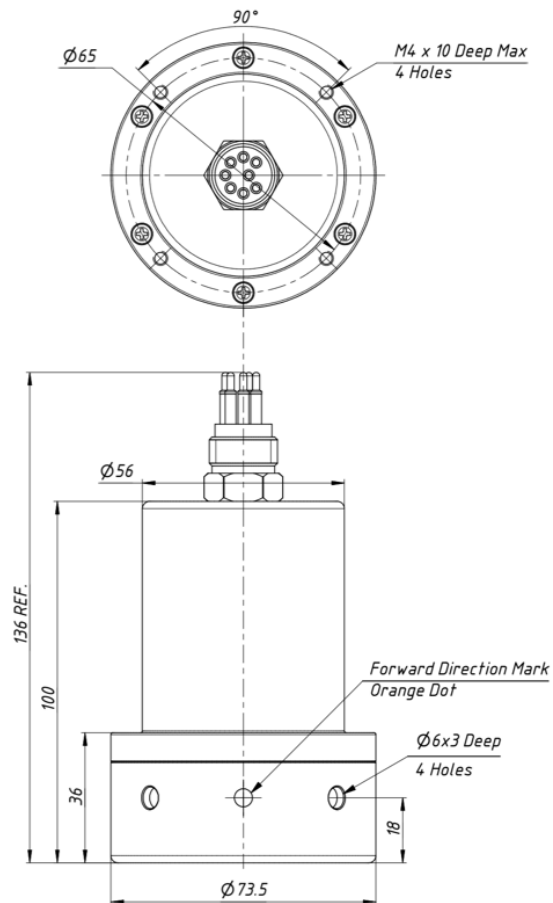
(6) EU D032 / ECT D032S

- For surface vehicles (depth rating: 1 m)
- Diameter: $\varnothing 96$ mm, Height: 90 mm (w/o connector)
- Material: Acetal



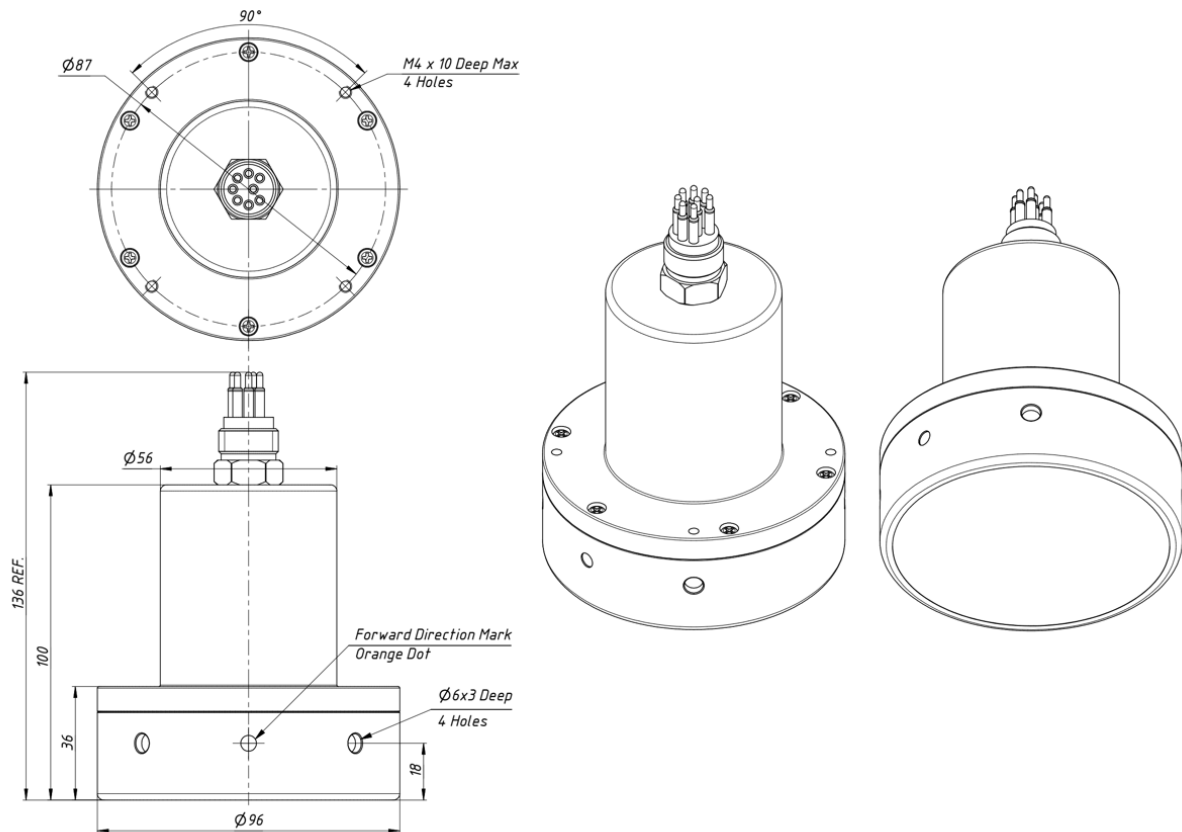
(7) ECT D052-100

- Top-mounted Seacon connector for 100 m depth rating
- Diameter: $\varnothing 73.5$ mm, Height: 100 mm (w/o connector)
- Material: Acetal



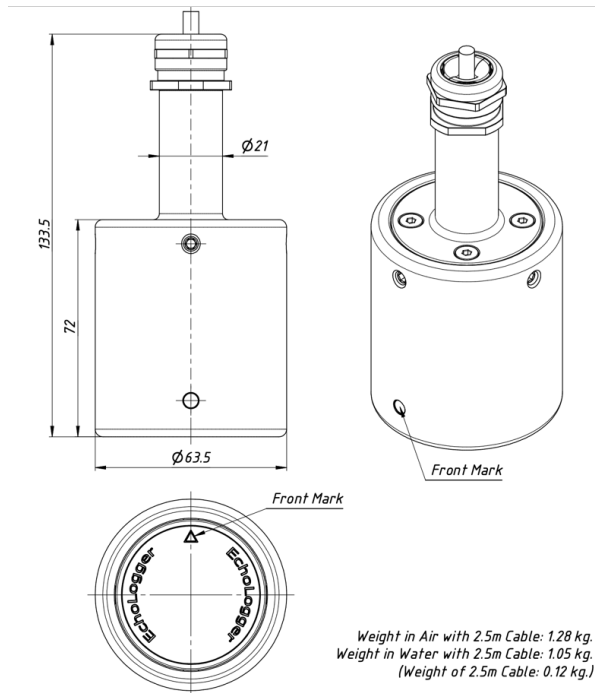
(8) ECT D032-100

- Top-mounted Seacon connector for 100 m depth rating
- Diameter: Ø96 mm, Height: 100 mm (w/o connector)
- Material: Acetal

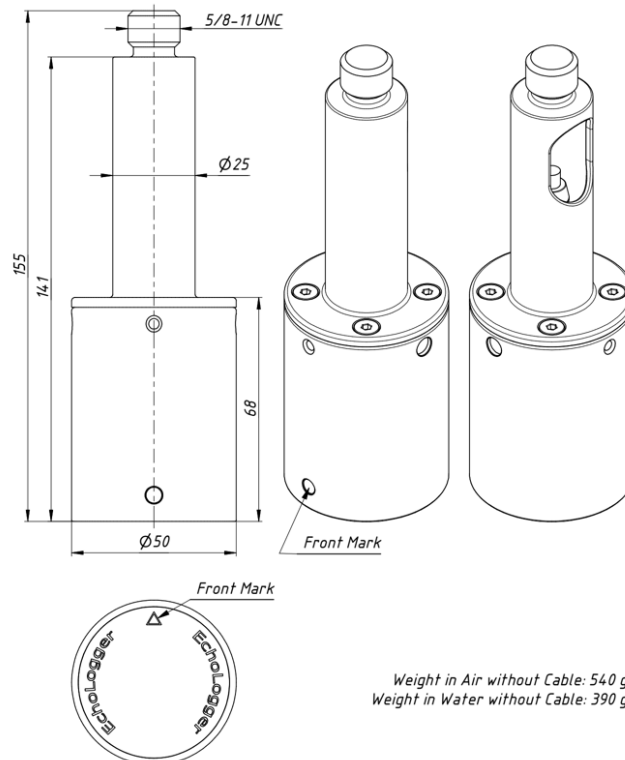


(9) ECT D24SSG / ECT D24SSP

- SSG: Stainless steel housing with cable grip, optimized for drone-based deployment.
- SSP: Stainless steel housing with pole mounting rod, suitable for fixed vertical installations.
- Form factor compatibility : ECT200, ECT400 & ECT D710

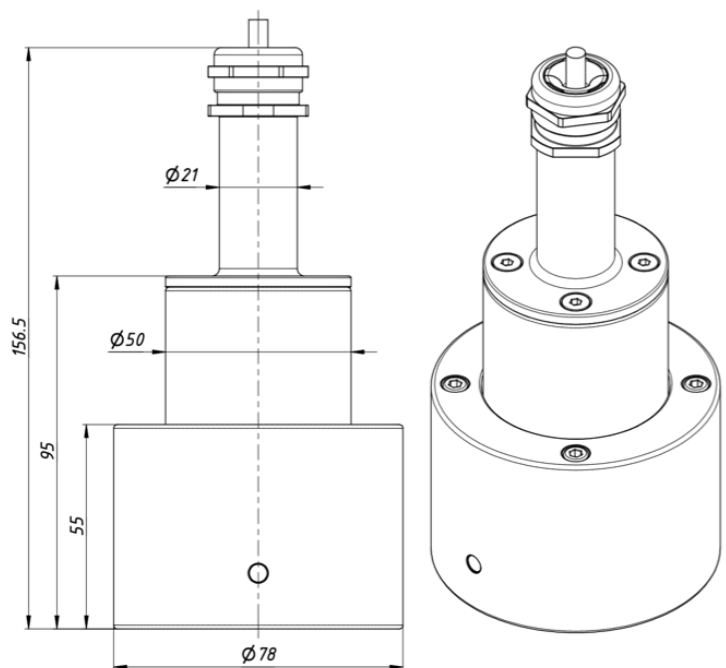


ECT D24SSG



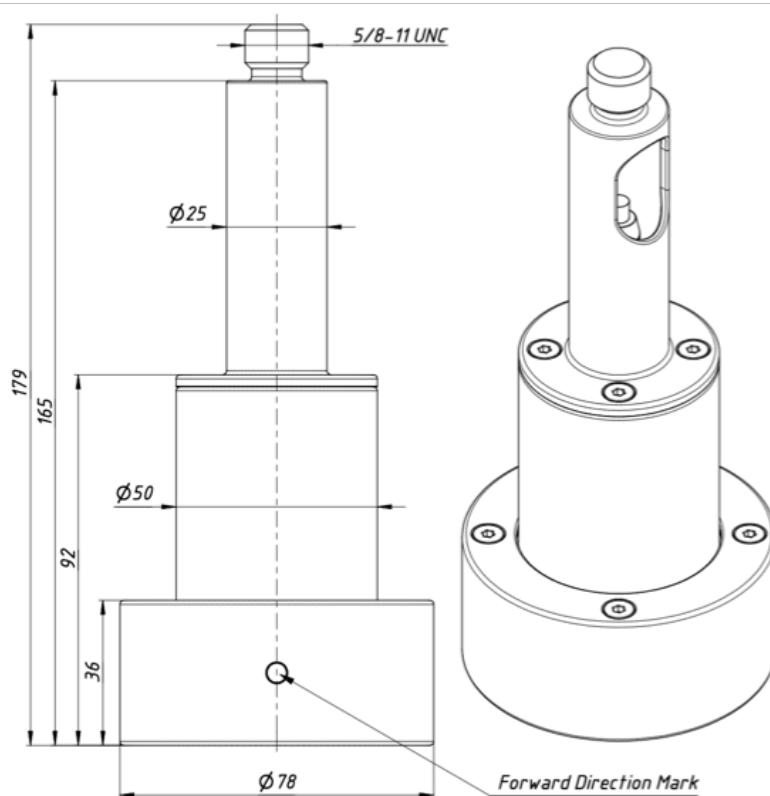
ECT D24SSP

(10) ECT D052SSG / ECT D052SSP



Weight in Air with 2.5m Cable: 1.45 kg.
 Weight in Water with 2.5m Cable: 1.12kg.
 (Weight of 2.5m Cable: 0.12 kg.)

ECT D052SSG



ECT D052SSP

3. Connection

3.1 EU D24 / ETH D24U / EU D710 / ETH D710U / EU D052 / EU D032 – USB Interface

Connect the device to a PC via the USB port (plug and play).

If the PC requires a driver to recognize the USB device, it can be downloaded from the following links:

FTDI USB Driver:

<http://www.ftdichip.com/Drivers/VCP.htm>

3.2 ECT D24 / ECS D24 / ETH D24S / ECT D710 / ECS D710 / ETH D710S / ECT D052 / ECT D032

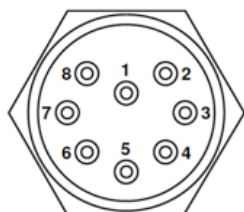
■ RS232 or RS485 Interface

Connect a power supply (10–75 VDC) to the device.

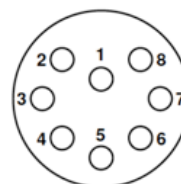
Connect the device to a PC via RS232 directly or via RS232/RS485 to USB converter.

(1) 8-pin Seacon connection (for ECT D24, ECT D710, ECT D052, ECT D032)

Micro WET-CON Bulkhead Connector Male Plug
Seacon MCBH8MSS



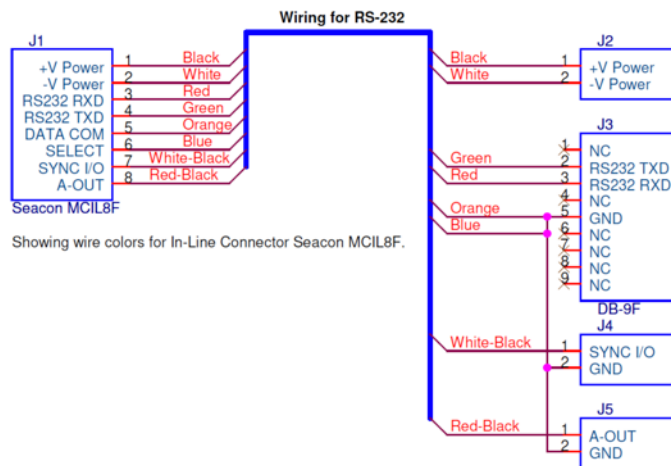
Micro WET-CON In-Line Connector Female Socket
Seacon MCIL8F



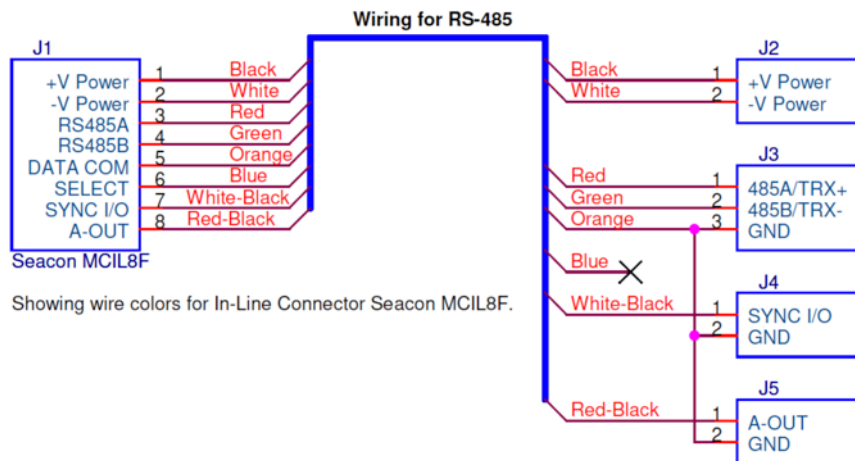
Cable Connector pinout:

Pin number	Signal name	Description
1	+V Power	Input Power = +10V ... +75V DC, 2W max. Reverse Polarity protected
2	-V Power	Common wire for Power
3	485A / 232RXD	RS-485 Input/Output line "A", or RS-232 Input
4	485B / 232TXD	RS-485 Input/Output line "B", or RS-232 Output
5	DATA COM	Common wire for Data Lines and for SYNC, A-OUT
6	SELECT	Interface Type Select Pin: Not Connect for RS-485, Short to DATA COM for RS-232.
7	SYNC I/O	Synchronization Input/Output line (S/W selectable). Input Pulse Length of more than 1us.
8	A-OUT	Analog Output: 1.25V, 2.5V, 5V, 10V max (S/W selectable). Distance or Envelope

■ RS232



■ RS485

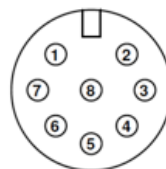


(2) LTW connector for surface vehicles (for ECT D24S, ETH D24S, ECT D710S, ETH D710S, ECT D052S, ECT D032S)

Bulkhead Connector, Male
LTW M12A-08PMMS-SH8002
Front View



Cable Mount Connector, Female
LTW 12-08BFFA-SL8001
Front View

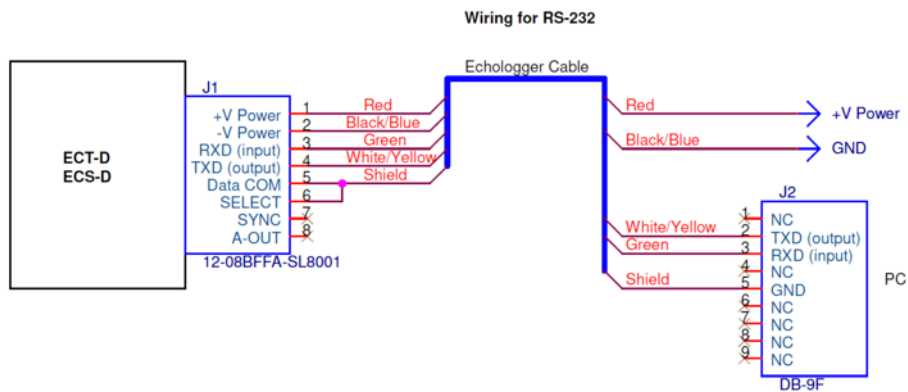


ECT-D-S, ECS-D-S Bulkhead Connector pinout:

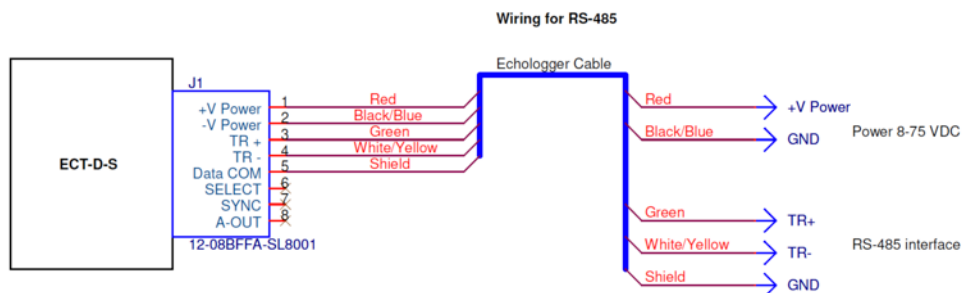
Pin number	Signal name	Description
1	+V Power	Input Power = +10V ... +75V DC, 2W max. Reverse Polarity protected
2	-V Power	Common wire for Power
3	485A / 232RXD	RS-485 Input/Output line "A", or RS-232 Input
4	485B / 232TXD	RS-485 Input/Output line "B", or RS-232 Output
5	DATA COM	Common wire for Data Lines and for SYNC, A-OUT
6	SELECT	Interface Type Select Pin: Not Connect for RS-485 , Short to DATA COM for RS-232.
7	SYNC I/O	Synchronization Input/Output line (S/W selectable). Input Pulse Length of more than 1us.
8	A-OUT	Analog Output: 1.25V, 2.5V, 5V, 10V max (S/W selectable). Distance or Envelope

Signal Lines (3, 4, 5, 6, 7, 8) Galvanically Isolated from Power Lines (1, 2).

■ RS232



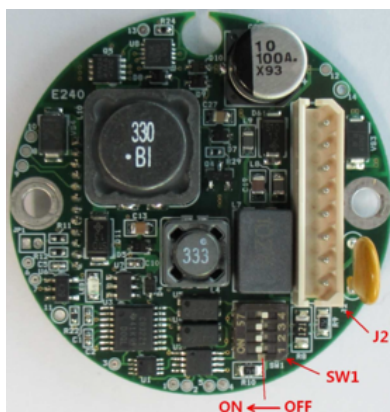
■ RS485



NOTICE:



- **RS232/RS485 Switching:** Can be switched at the interface board level if needed.



SW1 (4 position DIP switch)

Interface Mode	1	2	3	4
RS485 not Loaded, not Biased	OFF	OFF	OFF	OFF
RS485 Loaded 120 ohm	ON	OFF	OFF	OFF
RS485 Loaded 120 ohm and Biased	ON	ON	ON	OFF
RS232 Selected *	X	X	X	ON

J2 (Molex 5267-08)

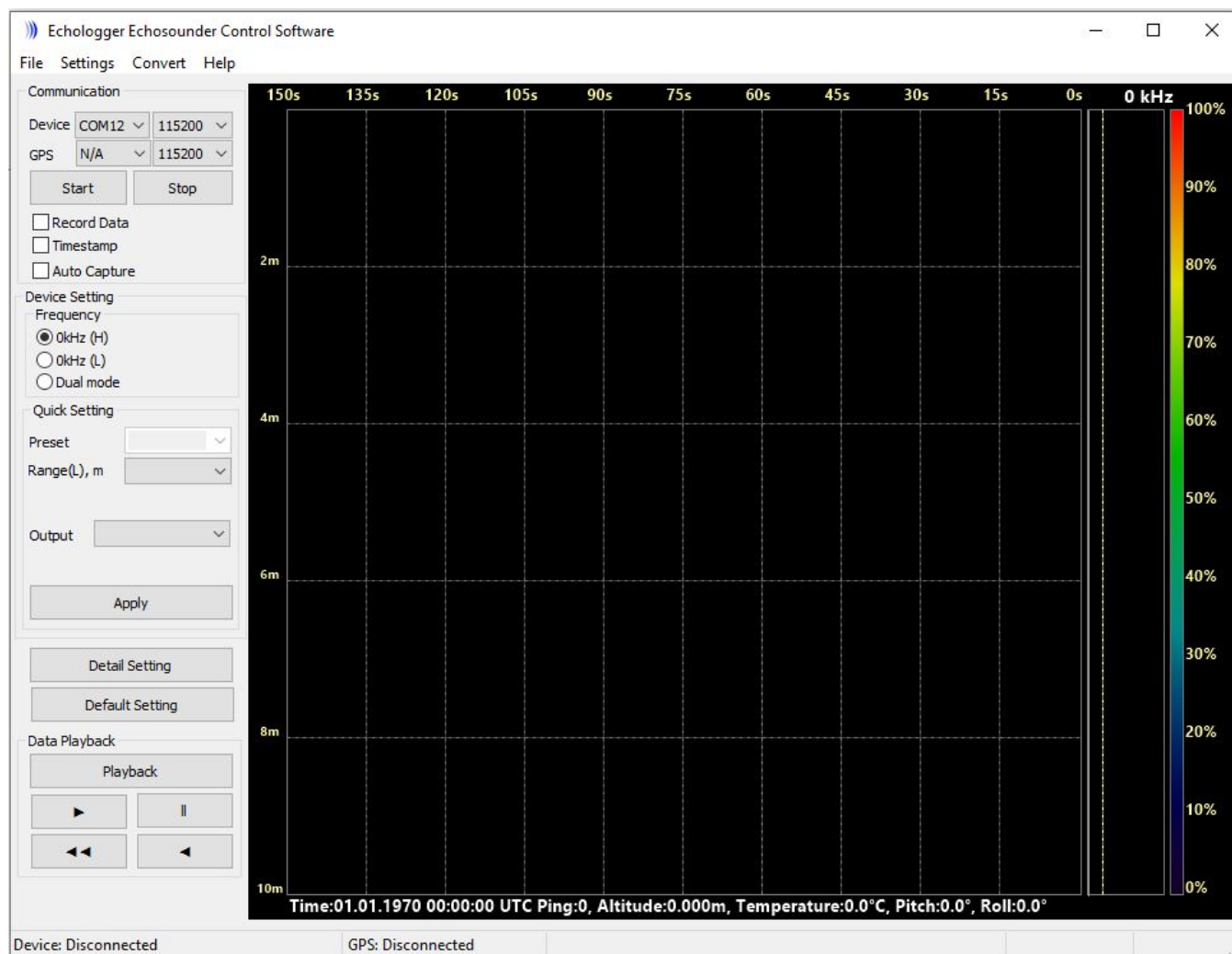
Pin	Signal	Description
1	+V Power	Input Power = +10V ... +75V DC, 2W max. Reverse Polarity protected
2	-V Power	Common wire for Power
3	485A / 232RXD	RS-485 Input/Output line "A", or RS-232 Input
4	485B / 232TXD	RS-485 Input/Output line "B", or RS-232 Output
5	DATA COM	Common wire for Data Lines and for SYNC, A-OUT
6*	SELECT	Interface Type Select Pin: Not Connect for RS-485, Short to DATA COM for RS-232.
7	SYNC I/O	Synchronization Input/Output line (S/W selectable). Input Pulse Length of more than 1us.
8	A-OUT	Analog Output: 1.25V, 2.5V, 5V, 10V max (S/W selectable). Distance or Envelope

Signal Lines (3, 4, 5, 6, 7, 8) Galvanically Isolated from Power Lines (1, 2).

4. GUI Control Software

4.1 Launching the software

Open the most recent version of: Echologger Echosounder Control Software



4.2 Communication Setup

Communication

Device
COM12
115200

GPS
N/A
115200

Start
Stop

☐ Record Data
☐ Timestamp
☐ Auto Capture

Step 1: Configure Serial Ports

- Select the appropriate COM port for the echosounder.
- If using a GPS, select its COM port and baud rate.
- If no GPS is connected, select N/A.

Step 2: Set Communication Speeds

- The default baud rate is 115200 bps.
- Ensure that the selected baud rate matches the device's setting.

Step 3: Start Communication

- Click Start to initiate communication with the connected device(s).
- Click Stop to disconnect the device from the program.

Optional Settings:

- Record data: Tick this box to begin recording raw data to the PC.
- New files are generated every time this setting is toggled or any parameter is changed.
- Mark Timestamp: Displays timestamps on the screen.
- Auto Capture: Automatically saves page-by-page screenshots to the Working folder.

4.3 Connection Errors

If the device is not properly connected, an error message will appear.

To resolve this:

- Check the Serial Port Number
- Check the Serial Port Speed (Baud Rate)

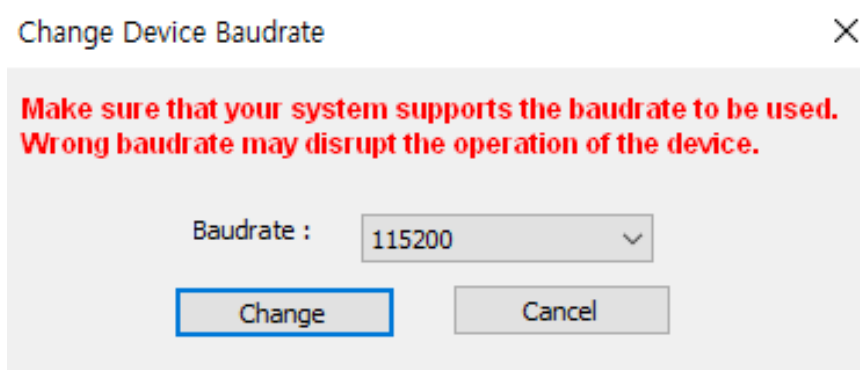
WARNING!



- If either value is incorrect, the program will show “Echosounder is not connected”.

4.4 Changing the Baud Rate

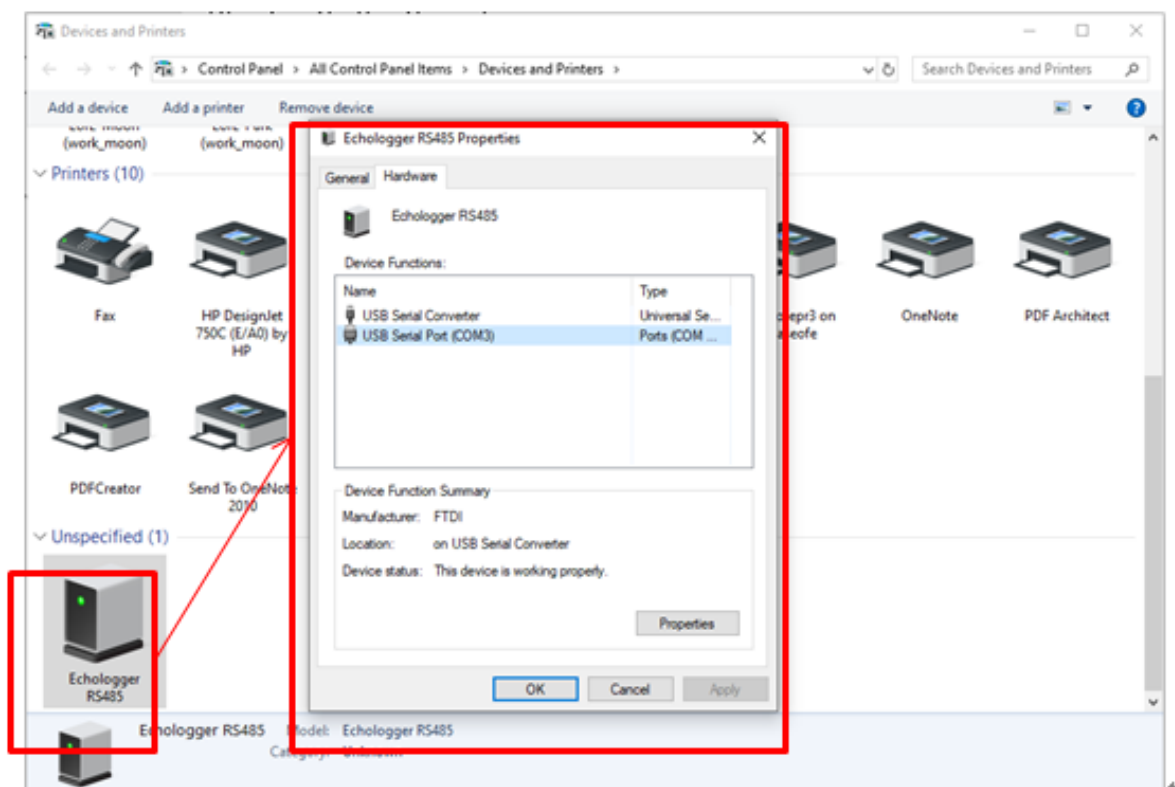
- Navigate Menu bar : Settings > Change Baudrate.



NOTICE:



- To find the correct COM port on Windows 10: Go to Control Panel > Devices and Printers.



4.5 Quick Setting

Configure main parameters:

- Frequency, Range, and Output
- Click Apply to activate

Device supports:

- Single mode: 30 kHz, 50 kHz, 200 kHz, 450 kHz, 750 kHz or 1MHz frequencies (device-dependent)
- Dual mode: both frequencies simultaneously

Device Setting

Frequency

☐ 450kHz (H)

☒ 200kHz (L)

☐ Dual mode

Quick Setting

Preset Preset 1 ▼

Range(L), m

Output Altin

AutoSet

Sampling rate, Hz 50000 ▼

Apply

Detail Setting

Default Setting

Device Setting

Frequency

☐ 450kHz (H)

☐ 200kHz (L)

☒ Dual mode

Quick Setting

Preset Preset 1 ▼

Range(H), m

Range(L), m

Output Altin

AutoSet

Sampling rate, Hz 50000 ▼

Apply

Detail Setting

Default Setting

Single
Dual

Preset:

- Default: Factory settings
- Preset 1: For hard bottom
- Preset 2: For general bottom
- Preset 3: For soft bottom
- AutoSet : Key parameters determined automatically

NOTICE:



- When using any preset (except AutoSet), any modification to the parameters will result in user-defined (Custom) settings.

Range:

- Range (H): For high frequency (e.g., 200 kHz)
- Range (L): For low frequency (e.g., 50 kHz in dual mode)

Output Formats:

- Altimeter NMEA: NMEA 0183 format.
- Echo Txt 10/12 bit: ASCII text format with full internal resolution; results in large file sizes.
- Echo Bin 12 bit: Binary format with full internal resolution.
- Echo Bin 8 bit: Binary format with 12-bit data compressed to 8-bit; approximately 2% data loss due to compression.
- DESO-25 (Metric Mode)
- Altimeter Dual
- Sonarmite DFX
- Sonarmite OLD

Other Settings:

- Sampling Rate (Hz): Fixed, related to bin size.
- Default Setting: Resets parameters to factory defaults.

4.6 Detail Setting

Settings (Single)

Common

450kHz (H)

Range, m100
Ping Interval, secAUTO
Tx Length, μs25
Tx Power, dB0
Gain, dB0
TVG spread coef.20
TVG absorb, dB/m0.14
-20dB Attenuator, μs0

Altimeter

Deadzone, mm300
Threshold, %20
Offset, mm0
Sound speed, m/s1500.0
Median filter5
Average filterOFF
Data Output rate0.5

Smooth

☐ Enabled
Sampling number1
Data Output rate0.5

☒ Median
☐ Average

Set

Cancel

Single

Settings (Dual)

Common

200kHz (L)450kHz (H)

Range, m200100
Ping Interval, secAUTO
Tx Length, μs5025
Tx Power, dB0
Gain, dB00
TVG spread coef.2020
TVG absorb, dB/m0.060.14
-20dB Attenuator, μs00

Altimeter

Low frequencyHigh frequency

Deadzone, mm500300
Threshold, %2020
Offset, mm00
Sound speed, m/s1500.0
Median filter5
Average filterOFF
Data Output rate0.5

Smooth

☐ Enabled
Sampling number1
Data Output rate0.5

☒ Median
☐ Average

Set

Cancel

Dual

Parameter	Description
Ping intervals	Interval applied to each frequency : In Dual, time between frequencies is half. Pulse length in microseconds. Affects signal strength. Pulse power (0 dB max, -48 dB min). Receive gain in dB. For time-variable gain (TVG): $TVG(R) = K * \log(R/R_0) + R * ATL$
Tx Length	
Tx Power	
Gain	
TVG Spread	

Parameter	Description
Coefficient	
TVG Absorb	Absorption coefficient in dB/m.
Attenuator	Time interval to attenuate -20 dB input.
Deadzone	Area of initial echo suppression (in mm).
Threshold	Signal threshold (%) to detect altitude.
Offset	Device position offset (in mm).
Sound Speed	Sound velocity for distance calculation (m/s).
Median/Average Filter	Set filter size (e.g., 0–21 for Median, 0–12 for Average).

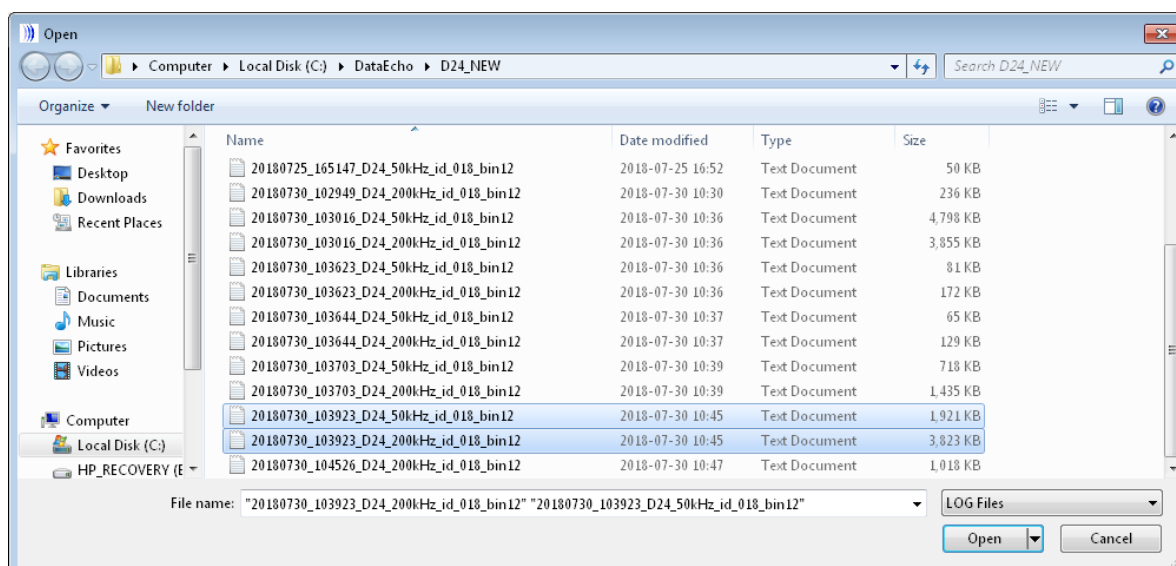
Smooth Mode:

- Enabled: Enables data smoothing
- Sampling Number: Number of samples to average
- Outrate: Output rate of smoothed data
- Filter Type: Median or Average

4.7 Playback

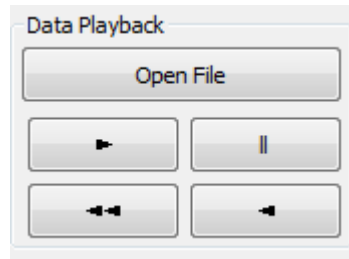
Open File:

- Single mode: Select one file
- Dual mode: Select two matching files (use Ctrl or Shift)
- Error: Selecting unmatched dual files causes an error



Play and Rewind:

- Control Playback Speed (1 ~ 16)
- Rewind (10 or 100 pings back)



Note:

- Playback settings will reflect those saved in the file.
- File naming format:
- `yyyymmdd_hhmmss_Mode_Frequency_id_xxx_format.log`
e.g.,
20241104_171945_Dual_200kHz_id_999_nmea.log
20241104_174724_Dual_450kHz_id_999_bin8.log

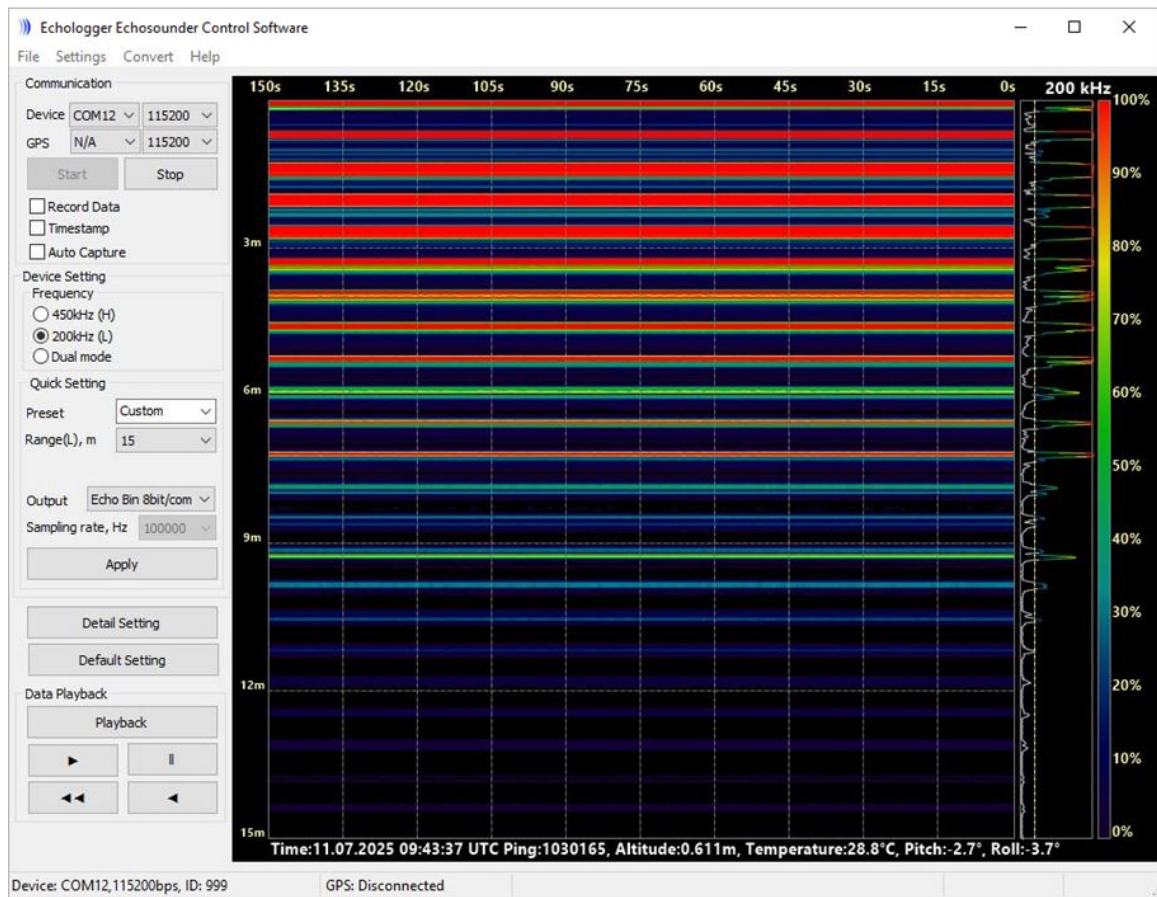
4.8 Echogram Viewer (backscatter data)

Displays last 10 sec to 5 min of backscatter data

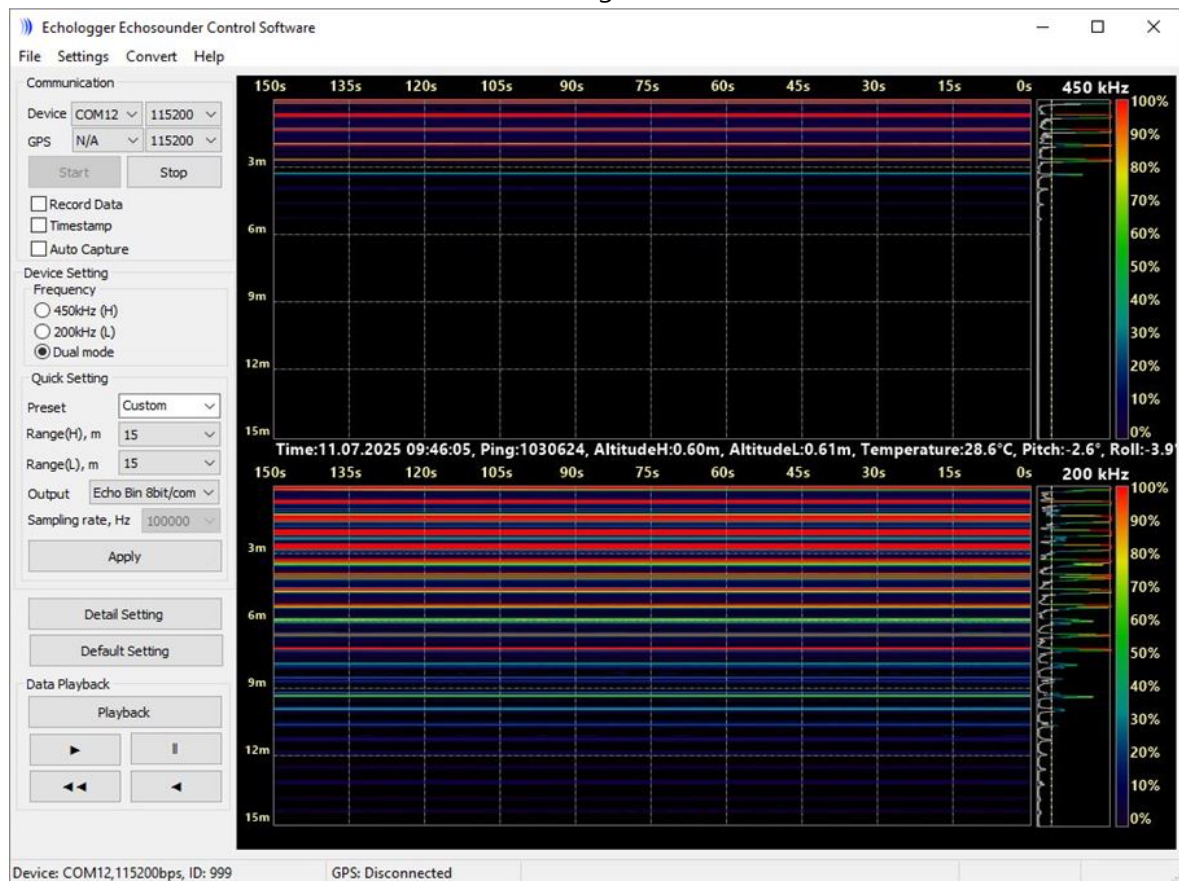
- Y-Axis (Range): Adjust using mouse scroll
- X-Axis (Time): Adjust with Shift + scroll
- Full-screen: Ctrl + Left Click
- Screenshot: Right Click (saved in Working folder)

Measurement Info

- UTC time
- Ping number
- Altitude (distance)
- Temperature
- Tilt (Pitch & Roll)



Single

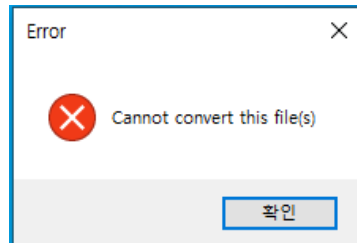


Dual

4.9 Menu bar

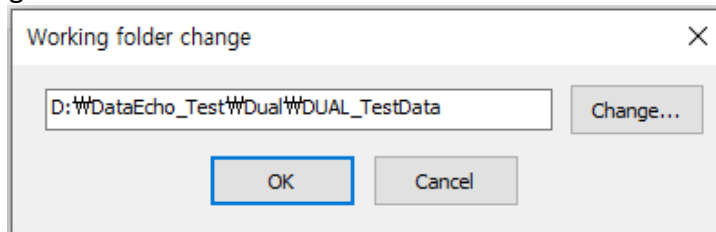
Convert

- Bin/Txt to SEG-Y : Convert selected binary or txt files to SEG-Y format
- Bin to Txt : Converts a selected binary file to text (TXT) format.
- Files are saved in the Working folder
- Unsupported formats will trigger an error message

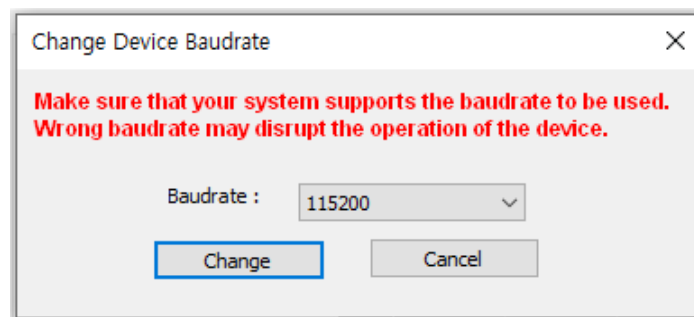


Settings >> Working Folder

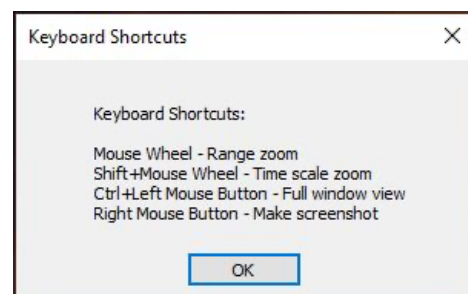
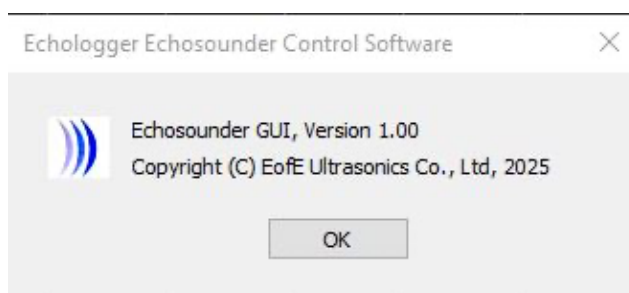
- Define storage location for all data and screenshots



Settings >> Change Baudrate.



Help



4.10 Sampling Rate

The sampling rate is relevant only in Echosounder mode. The GUI automatically sets the maximum sampling rate based on the selected range:

1–50 m: 100 kHz
 60–100 m: 50 kHz
 120–200 m: 25 kHz

Command Line Configuration :

Use the `#samplfreq` command to set the internal ADC sampling frequency. This setting applies only to Echosounder modes. The valid fixed values are:

100 kHz
 50 kHz
 25 kHz
 12.5 kHz
 6.25 kHz

If 0 (default) is selected, the sampling frequency is automatically set according to the `#range` value, based on internal memory availability.

4.11 Altitude Measurement Setup

For most applications, use the Default, Preset, or AutoSet parameters available in the Quick Setting menu. These options are designed to simplify setup and provide reliable performance across common operating conditions.

Default: Factory-defined standard settings

Preset 1–3: Optimized for specific bottom types (hard, general, soft)

AutoSet: Automatically configures key parameters based on current conditions

NOTICE:



- When any modification is made to a preset (except AutoSet), the configuration becomes user-defined.

User-Defined Settings (Advanced Use Only)

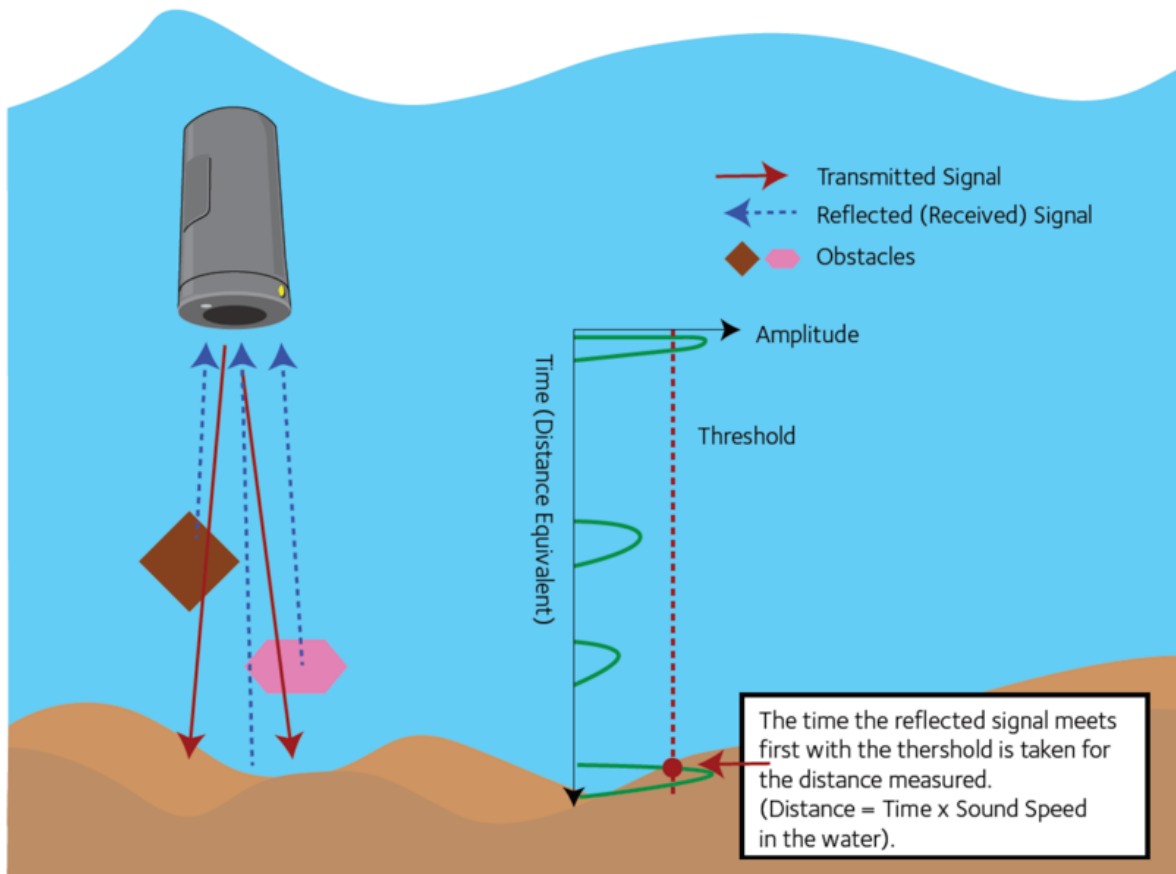
Altitude is calculated based on where the reflected signal first crosses the defined Threshold. Proper tuning of Threshold, Deadzone, and Gain is essential for correct altitude measurements.

Key Concepts (Illustrated)

(1) How Altitude is Measured

The time when the reflected signal first meets the threshold is used to calculate distance.

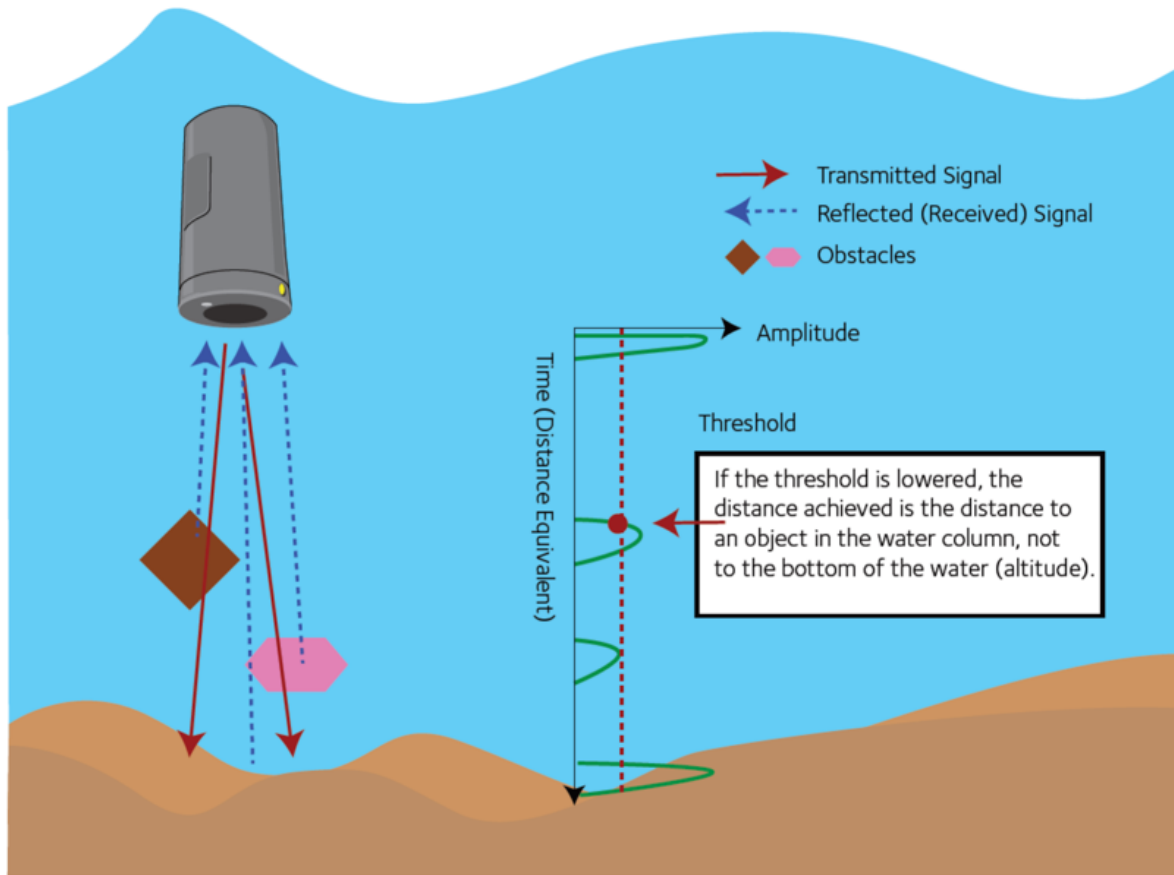
Distance = Time × Sound Speed in Water



(2) Effect of Incorrect Threshold

If the Threshold is set too low, weak reflections from mid-water obstacles (not the bottom) may cross it first.

This results in incorrect altitude readings—distance is measured to the object, not to the seabed.

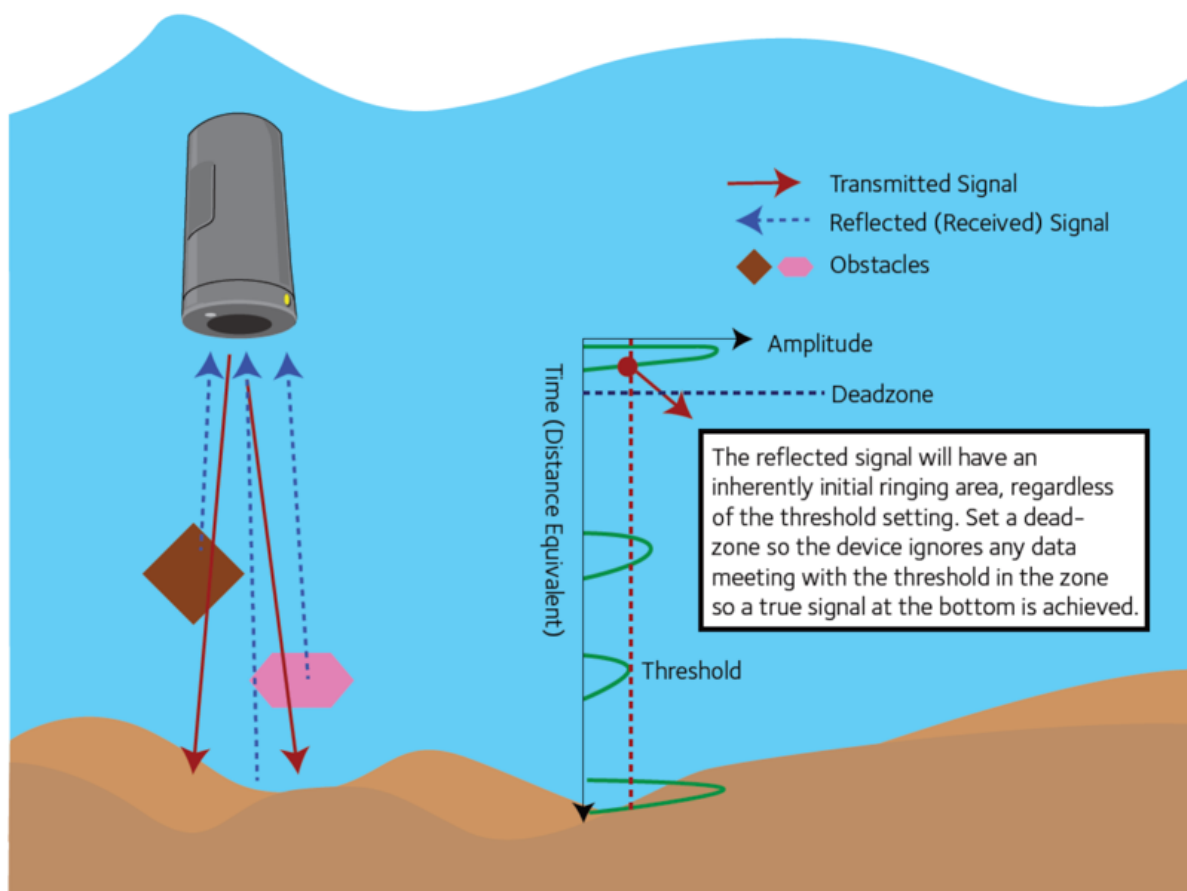


(3) Using Deadzone to Eliminate False Readings

Reflected signals often contain initial ringing noise near the transducer.

The Deadzone defines a time (or distance) range to ignore signals close to the sensor, preventing false bottom detection from early reverberation.

A properly set Deadzone ensures the system detects the true bottom.



Practical Guidelines

Threshold: Set as low as possible, but still above noise/clutter. Avoid picking up reflections from mid-water obstacles or noise.

Deadzone: Set large enough to mask initial ringing and reverberation effects near the transducer.

Gain: Increase to ensure sufficient echo strength (saturation), but monitor for amplified unwanted signals.

Fine-tuning should always be done in Echogram Mode, where the full backscatter data is available for visual feedback. For more information See “Measurement Principles (EchoLogger Echosounders)”

* Default settings

Common Settings

Parameter	D032	D052	D24	D710
#rangeh	100000 mm	100000 mm	50000 mm	10000 mm
#rangl	100000 mm	100000 mm	50000 mm	10000 mm
#interval	1.000 sec	1.000 sec	1.000 sec	1.000 sec
#pingonce	0	0	0	0
#txlengthh	50 μ sec	50 μ sec	20 μ sec	10 μ sec

Parameter	D032	D052	D24	D710
#txlengthl	300 μ sec	200 μ sec	50 μ sec	15 μ sec
#txpower	0.0 dB	0.0 dB	0.0 dB	0.0 dB
#gainh	0.0 dB	0.0 dB	0.0 dB	0.0 dB
#gainl	0.0 dB	0.0 dB	0.0 dB	0.0 dB
#tvemode	1	1	1	1
#tvgabsh	0.050 dB/m	0.050 dB/m	0.140 dB/m	0.340 dB/m
#tvgabsl	0.006 dB/m	0.011 dB/m	0.060 dB/m	0.240 dB/m
#tvgsprdh	15	15	15	15
#tvgsprdl	15	15	15	15
#attnh	200 μ sec	200 μ sec	0 μ sec	0 μ sec
#attnl	200 μ sec	200 μ sec	0 μ sec	0 μ sec

Altimeter Settings

Parameter	D032	D052	D24	D710
#sound	1500 mps	1500 mps	1500 mps	1500 mps
#deadzoneh	500 mm	500 mm	300 mm	100 mm
#deadzonel	1500 mm	800 mm	500 mm	100 mm
#thresholdh	10%	10%	10%	10%
#thresholdl	10%	10%	10%	10%
#offseth	0 mm	0 mm	0 mm	0 mm
#offsetl	0 mm	0 mm	0 mm	0 mm
#medianflt	2	2	2	2
#movavgflt	1	1	1	1
#nmeadbt	1	1	1	1
#nmeadpt	0	0	0	0
#nmeamtw	1	1	1	1
#nmeaxdr	1	1	1	1
#nmeaema	0	0	0	0
#nmeazda	0	0	0	0
#nmeerate	0.000 sec	0.000 sec	0.000 sec	0.000 sec
#nmeadptoff	0.000 m	0.000 m	0.000 m	0.000 m
#nmeadpzero	1	1	1	1

Input/Output Settings

Parameter	D032	D052	D24	D710
#output	3	3	3	3
#samplfreq	0	0	0	0
#speed or #baudrate	115200	115200	115200	115200
#uartflow	0	0	0	0
#time	0	0	0	0

Synchronization Settings

Parameter	D032	D052	D24	D710
#syncextern	0	0	0	0
#syncextmod	1	1	1	1
#syncoutpol	1	1	1	1

Analog Output Settings

Parameter	D032	D052	D24	D710
#anlgmode	0	0	0	0
#anlgrate	0.100 V/m	0.100 V/m	0.100 V/m	0.100 V/m
#anlgmax	4	4	4	4

Multinode Interface Settings

Parameter	D032	D052	D24	D710
#mniface	0	0	0	0
#mnid	1	1	1	1
#mnsync	0	0	0	0

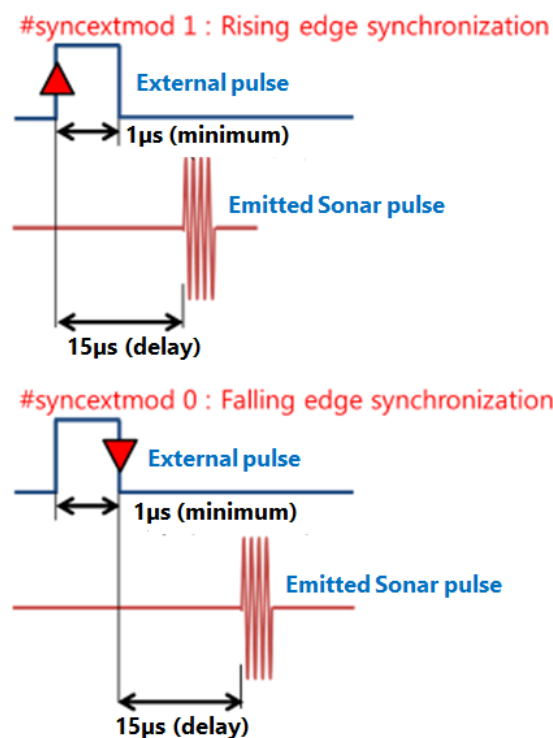
5. Synchronization

Selecting synchronization parameters is only available through a terminal program.

Procedure:

- Start a terminal program and configure the correct port settings (COM number and baud rate).
- Power on the echosounder. After initialization, the device will begin operation and start transmitting data strings.
- Press the **Enter** key to stop the data transmission. The device is now ready for command input.
- Type `#info` to display the current device settings.
- Use the command `#syncextern` to select the synchronization mode:
 - 0 for internal sync mode (default)
 - 1 for external sync mode
 In internal sync mode (`#syncextern = 0`), the device transmits sync pulses with a duration equal to the pulse length and an amplitude of approximately 4.5V.
- Use the command `#syncoutpol` to set the polarity of the transmitted sync pulse:
 - 0 for inverting pulse
 - 1 for positive pulse (default)
- Use the command `#syncextmod` to define the triggering edge for external sync mode:
 - 0 for falling edge
 - 1 for rising edge (default)
- After configuring all parameters, enter `#go` to start operation.

E-Dual Synchronization with an external pulse



6. Data Output Formats

(1) Echogram Text Output (#output 2 or #output 4)

This mode provides text-based output including NMEA 0183 messages.

When #OutputMode = 2:

Echo data samples are 10-bit values ranging from 0 to 1023

When #OutputMode = 4:

Echo data samples are 12-bit values ranging from 0 to 4095

Output Parameters Description

Parameter & Value	Description
#DeviceID D24USB001 Type USB	Device ID number and type
#TimeWork 343589.814	Working time in seconds
#Ping 48727	Internal ping count
#Altitude 0.4964	Measured altitude
#Temperature 28.05	Temperature in degrees Celsius
#NSamples 400	Number of echo signal samples per record
#Resolution,mm 7.500	Distance resolution between echo samples, in millimeters
#Sampling_Freq., Hz 100000	Sampling frequency in Hertz
#SoundSpeed, m/s 1500.00	Current sound speed in meters per second
#Tx_Freq. ,Hz 447000	Transmitting frequency in Hertz
#Range,m 3.0	Measurement range in meters
#Interval,sec 0.100	Interval between pulses, in seconds
#Threshold,% 10	Detection threshold as a percentage of full scale
#Offset,m 0.000	Range offset in meters
#Deadzone,m 0.200	Dead zone range in meters
#PulseLength,microsec 50	Transmit pulse length in microseconds
#TxPower,dB -6.000	Transmitter power in decibels
#TVG_Gain -6.000	Time-Varying Gain (TVG) - receiver gain in decibels
#TVG_Slope 1.000	TVG slope (currently not used)
#TVG_Mode 1	TVG operation mode
#OutputMode 4	Output data mode
#Pitch, deg 1.200	Pitch angle from tilt sensor ($\pm 90^\circ$ range on X-axis)
#Roll, deg 0.600	Roll angle from tilt sensor ($\pm 90^\circ$ range on Y-axis)

Echo Signal Data

##DataStart to ##DataEnd: Raw echo signal samples

Values depend on #OutputMode:

10-bit (0–1023)

12-bit (0-4095)

NMEA 0183 Output Data follows the raw echo signals.

- Time and Date:
 - \$SDZDA – UTC time and date information
- Depth Measurement:
 - \$SDDBT – Depth below transducer (in feet, meters, and fathoms)
- Tilt Sensor Data:
 - \$SDXDR – Transducer measurements including:
 - Pitch (PTCH)
 - Roll (ROLL)
 - Echo max. amplitude (EMA)
- Temperature:
 - \$SDMTW – Water temperature in Celsius
- Position and Navigation: data saved when a GPS module is connected
 - \$GPGGA – Global positioning data (latitude, longitude, fix quality, etc.)
 - \$GPRMC – Recommended minimum specific GPS/Transit data

(2) NMEA Output (#output 3)

In this mode, the device transmits NMEA 0183 formatted messages. Refer to the NMEA 0183 specification for details.

Message	Meaning	Description	Format example
#F	Current Frequency	Active frequency in dual mode	#F FREQUENCY Hz*hh<CR><LF>
\$SDZDA	Time and Date	UTC, day, month, year, and local time zone.	\$xxZDA,hhmmss.ss,dd,mm,yyyy,hh,mm*hh<CR><LF>
\$SDDBT	Depth below transducer	Water depth referenced to the transducer's position. Depth value expressed in feet, meter and fathoms.	\$xxDBT,FEET,f, METRES,M, FATHOMS,F*hh<CR><LF>
\$SDDPT	Water Depth	Water depth relative to the transducer, the depth offset of the transducer, and maximum depth that the sounder can detect a seabed (all in meters only). Positive offsets provide distance from the transducer to the water line. Negative offsets provide distance from the transducer to the keel.	\$xxDPT,DATA_METRES,OFFSET_METRES*hh<CR><LF>
\$SDMTW	Mean Temperature of Water	Water temperature in degrees centigrade.	\$xxMTW,TEMPERATURE,C*hh<CR><LF>

\$SDXDR	Transducer Measurements	Provide information about pitch/roll and Maximum Amplitude of Echo signal	\$xxXDR,A,X.X,D,PTCH,A,X.X,D,ROLL*hh<CR><LF> \$xxXDR,A,X.XX,P,EMA*hh<CR><LF>
\$GPGGA	GPS GGA Data	Saved Data(GPS)	Refer to GPS NMEA DataFormat
\$GPRMC	GPS RMC Data	Saved Data(GPS)	Refer to GPS NMEA DataFormat

Note: <CR><LF> represents carriage return and line feed.

(3) Echogram Binary Output (#output 100 or #output 101)

The system supports two binary echogram data formats:

12-bit linear format

8-bit companded format

Each binary output consists of two parts:

Header

Echogram

Header Format

Field	Size (bytes)	Description	Data Type	Comments	Example Value
magic	8	Magic value	char[]	Identifier	"ECHOLOGG"
packetid	2	Packet ID	char[]	"EC" for echo, "GP" for GPS	"EC"
length	4	Total packet length	uint32	Includes header	42–26760

Echogram Data Format

Field	Size (bytes)	Description	Data Type	Comments	Value Range
time	4	Unix timestamp (UTC)	uint32	Seconds since Jan 1, 1970	0 – ULONG_MAX
timems	4	Millisecond component	uint32		0 – 999
pingnum	4	Ping number	uint32		0 – ULONG_MAX
altitude	4	Measured altitude	float		0 – 200
temperature	4	Water temperature	float		-10 – +50 °C
pitch*	4	Tilt X (pitch)	float	Available if tilt sensor is active	-90 – +90 °
roll*	4	Tilt Y (roll)	float	Available if tilt sensor is active	-90 – +90 °
dataformat	4	Echo sample format	int32	0 = 12-bit, 1 = 8-bit companded	0 or 1
samplesnum	4	Number of samples	int32		144 – 30000
range	4	Measurement range	float		150 – 200000 mm
frequency	4	Operating frequency	int32		5000 – 200000 Hz
samplingrate	4	Sampling rate	int32		25000 – 100000 Hz
samples	144–13340	Echo amplitude samples	uint16[] or uint8[]	Format depends on dataformat	0–4095 (12-bit), 0–255 (8-bit)

* pitch and roll fields are included only if tilt data is available.

8-bit Companded to 12-bit Linear Conversion Table

: For systems using the 8-bit companded echogram format (dataformat = 1), use the following lookup table to convert each 8-bit sample (0–255) into its corresponding 12-bit linear amplitude value (0–4095) for accurate visualization and signal processing.

uint16_t uncompond8to12[256] = {

```
0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,
16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31,
32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47,
48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63,
65, 67, 69, 71, 73, 75, 77, 79, 81, 83, 85, 87, 89, 91, 93, 95,
97, 99, 101, 103, 105, 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127,
131, 135, 139, 143, 147, 151, 155, 159, 163, 167, 171, 175, 179, 183, 187, 191,
195, 199, 203, 207, 211, 215, 219, 223, 227, 231, 235, 239, 243, 247, 251, 255,
263, 271, 279, 287, 295, 303, 311, 319, 327, 335, 343, 351, 359, 367, 375, 383,
391, 399, 407, 415, 423, 431, 439, 447, 455, 463, 471, 479, 487, 495, 503, 511,
527, 543, 559, 575, 591, 607, 623, 639, 655, 671, 687, 703, 719, 735, 751, 767,
783, 799, 815, 831, 847, 863, 879, 895, 911, 927, 943, 959, 975, 991, 1007, 1023,
1055, 1087, 1119, 1151, 1183, 1215, 1247, 1279, 1311, 1343, 1375, 1407, 1439, 1471, 1503, 1535,
1567, 1599, 1631, 1663, 1695, 1727, 1759, 1791, 1823, 1855, 1887, 1919, 1951, 1983, 2015, 2047,
2111, 2175, 2239, 2303, 2367, 2431, 2495, 2559, 2623, 2687, 2751, 2815, 2879, 2943, 3007, 3071,
3135, 3199, 3263, 3327, 3391, 3455, 3519, 3583, 3647, 3711, 3775, 3839, 3903, 3967, 4031, 4095
};
```

(4) Saved Binary Output Using GUI

Binary data saved via the Echologger Control Software follows a structured format consisting of a Header and Data section.

Header Format (88 Bytes)

Field	Size (bytes)	Description	Data Type	Comments	Value Range
magic	4	Magic identifier	uint32	Fixed value	"DUAL" (ASCII)
size	4	Header size	uint32	Total header length	Varies
time	4	UNIX time	uint32	Seconds since Jan 1, 1970 (UTC)	0 – ULONG_MAX
timems	4	Millisecond portion of time	uint32		0 – 999
utctime	4	System UTC time	uint32		0 – 4294967295
pingnum	4	Ping number	uint32		0 – ULONG_MAX
samplingrate	4	Sampling rate	int32		25000 – 100000 Hz
dataformat	4	Echo sample format	int32	0 = 12-bit, 1 = 8-bit companded	0 or 1
samplesnum	4	Number of echo samples	int32		144 – 30000
range	4	Measurement range	float		150 – 200000 mm
frequency	4	Operating frequency	int32		5000 – 200000 Hz
reserved	4	Reserved field	int32	Not used	—
altitude	4	Measured altitude	float		0 – 200 m
temperature	4	Water temperature	float		-10 – +50 °C
pitch*	4	Tilt X	float	Available if tilt sensor is active	-90 – +90°
roll*	4	Tilt Y	float	Available if tilt sensor is active	-90 – +90°
gpslatitude	4	GPS latitude	float	In radians	Any
gpslongitude	4	GPS longitude	float	In radians	Any
gpsaltitude	4	GPS altitude (not used)	float	Reserved	Any
gpstime	4	GPS timestamp (UNIX)	uint32	Seconds since Jan 1, 1970	0 – ULONG_MAX
gpsPDOP	4	Position dilution of precision (3D)	float		0 – 100
gpsvalid	4	GPS fix status	int32	0 = invalid, 1 = valid	0 or 1

* Fields pitch and roll are only present if tilt data is available.

Data Section

Field	Size (bytes)	Description	Data Type	Value Range
samples	2 × N	Echo amplitude samples	uint16[]	0 – 4095

Number of samples (N) is defined in the samplesnum field in the header.

(5) Simple Altimeter Output (#output 1)

Outputs only the current measured altitude in meters. In dual mode, it also includes the frequency header.

Format

#F <FREQUENCY> Hz*hh<CR><LF> (Dual Mode only)

<ALTITUDE_IN_METERS><CR><LF>

Example:

0.1235

0.1234

0.1233

0.1234

Example (Dual)

#F 450000 Hz

0.1235

#F 200000 Hz

0.1234

#F 450000 Hz

0.1234

#F 200000 Hz

0.1234

(6) DESO-25 (Metric Mode) Output (#output 6)

Outputs current measured altitude in meters using the DESO-25 format.

Format:

D<A|B><ALTITUDE> m<CR><LF>

DA – High frequency

DB – Low frequency

Example:

DA00006.12 m

DB00006.16 m

(7) Altimeter Dual Output (#output 7)

Outputs dual frequency altimeter readings with timestamp.

Format:

Dual : <YYYYMMDD>, <hhmmss.ms> <ALTITUDE_HIGH> <ALTITUDE_LOW>

Example:

Dual : 20181210, 120545.32 3.456 2.567

(8) Sonarmite DFX Output (#output 8)

Outputs dual frequency altitude, temperature, and voltage.

Format:

1 <ALTITUDE_HIGH> <ALTITUDE_LOW> <TEMPERATURE> <VOLTAGE> 7

Example:

1 3.46 2.57 26.8 11.0 7

(9) Sonarmite OLD Output (#output 9)

Outputs high frequency altitude and voltage in legacy Sonarmite format.

Format:

1 <ALTITUDE_HIGH> 0 0 0 <VOLTAGE> 100 0

Example:

1 3.46 0 0 0 0.0 100 0

7. Commands description

(1) Basic Settings

Command	Description	Values	Unit
#help, #info, ?	Show device info and command list	N/A	N/A
#default	Set all settings to default	N/A	N/A
#reset	Reset device (use after changing serial port speed)	N/A	N/A
#descript	Set device description text	1–31 characters	text
#setfreqlow, #setfl	Set single low frequency mode	N/A	N/A
#setfreqhigh, #setfh	Set single high frequency mode	N/A	N/A
#setfreqdual, #setfd	Set dual frequency mode	N/A	N/A
#echo	Enable/disable terminal echo	0/1	N/A
#go	Start the device for measurement	N/A	N/A
#auto	Enable/disable auto setting mode	0/1	N/A
#preset	Preset settings for bottom type	0–3	N/A
#range	Set active frequency range	1000–200000	mm
#rangeh, #rangel	Set range for high/low frequency	1000–200000	mm
#interval	Set ping interval	0 or 0.01–10	sec
#threshold, #thresholdh, #thresholdl	Set detection threshold	10–80	% of FS
#offset, #offseth, #offsetl	Set offset to compensate mounting	±1000	mm
#deadzone, #deadzoneh, #deadzonel	Set dead zone range	0–1000	mm
#txlength, #txlengthh, #txlengthl	Set TX pulse length	10–1000	µsec

Command	Description	Values	Unit
#sound	Set speed of sound	1000–2000	m/s
#output	Set output mode	1/2/3/4/6/7/8/9/100/101	N/A
#altiprec	Set output decimal precision in Altimeter mode	1–4	digit
#gain, #gainh, #gainl	Set receiver gain	±60	dB
#tvemode	Set TVG mode	0–4	N/A
#tvgabs, #tvgabsh, #tvgabsl	Set TVG absorb. coefficient	0–2	dB/m
#pingonce	One-shot ping or continuous mode	0/1	N/A
#time	Set current UTC time	0–4294967295	sec
#speed, #baudrate	Set UART speed	2400–3000000	baud
#syncextern	Set external synchronization mode	0/1	N/A
#syncextmod	Set ext. sync edge	0: falling, 1: rising	N/A
#syncoutpol	Set sync pulse polarity	0: negative, 1: positive	N/A
#nmeadbt, #nmeamtw, #nmeaxdr, #nmeaema, #nmeazda	NMEA message enable	0/1	N/A

General Commands

#help, #info, ?

Display device information and available commands.

#default

Restore all settings to default values.

#reset

Restart the device. Required after changing UART speed.

#descript

Set the device description string (up to 31 characters).

Displayed in #info and returned by an empty #descript command.

Frequency Mode Commands

#setfreqlow, #setfl

Set low-frequency single mode.

#setfreqhigh, #setfh

Set high-frequency single mode.

#setfreqdual, #setfd

Enable dual-frequency mode.

Operation and Input Settings

#echo

Enable/disable echo for typed characters (0 = off, 1 = on).

#go

Start measurement process.

#auto (*Auto Mode*)

#auto 1: Enable AutoSet (altitude mode with automatic optimization)

#auto 0: Disable AutoSet (manual configuration required)

#preset (*Bottom Type Preset*)

0: Default

1: Hard bottom

2: Normal bottom

3: Soft bottom

Range and Timing Settings

#range, #rangeh, #rangel

Set working range for active/high/low frequency.

Allowed fixed values: 1000 to 200000 mm.

#interval

Ping interval in seconds:

0: Auto (minimum possible interval)

0.01 ~ 10: Manual interval

Threshold and Offset Settings

#threshold, #thresholdh, #thresholdl

Detection threshold (% of full scale): 10–80%

#offset, #offseth, #offsetl

Measurement offset (± 1000 mm)

#deadzone, #deadzoneh, #deadzonel

Define dead zone (0–1000 mm)

Transmit and Sound Settings

#txlength, #txlengthh, #txlengthl

TX pulse length: 10–1000 μ s

#sound

Speed of sound in medium: 1000–2000 m/s

Output Settings

#output

Select output mode:

1: Simple altimeter
2: 10-bit text echo sounder
3: NMEA
4: 12-bit text echo sounder
6: DESO-25
7: Altimeter dual
8: Sonarmite_DFX
9: Sonarmite_OLD
100: 12-bit binary
101: 8-bit binary (companded)
#altiprec (*Altimeter Precision*)
Set decimal places in altimeter mode (1–4).
Format: #altiprec X
Example: #altiprec 3 → three decimal places

Gain and TVG Configuration

#gain, #gainh, #gainl
Receiver gain: -60 to +60 dB
#tvgmode
Time Variable Gain mode:
1: gain + $K \cdot \log(R)$ + TL·R
2: gain + $K \cdot \log(R)$
3: gain only
4: gain + TL·R
#tvgabs, #tvgabsh, #tvgabsl
Absorption coefficient: 0–2 dB/m

Ping and Time Settings

#pingonce
1: Single ping with #go
0: Continuous mode (default)
#time
Set time as seconds since 1970-01-01 00:00 UTC.
Required before using #go for accurate timestamping.

Communication Settings

#speed, #baudrate
UART communication speed:
2400 to 3000000 bps
3000000 bps only via USB
#syncextern
External synchronization: 0 (off), 1 (on)
#syncextmode, #syncextmod
Sync polarity:
0: Falling edge
1: Rising edge
#syncoutpol
Output pulse polarity: 0 (negative), 1 (positive)

NMEA Message Enable Commands

#nmeadb

Enable/disable NMEA DBT (Depth Below Transducer):

0: Disabled

1: Enabled

#nmeadpt

Enable/disable NMEA DPT (Depth):

0: Disabled

1: Enabled

#nmeamtw

Enable/disable NMEA MTW (Water Temperature):

0: Disabled

1: Enabled

#nmeaxdr

Enable/disable NMEA XDR (Transducer Data) for tilt values:

0: Disabled

1: Enabled

#nmeaema

Enable/disable NMEA XDR for EMA (Echo Maximum Amplitude):

0: Disabled

1: Enabled

#nmeazda

Enable/disable NMEA ZDA (Time & Date):

0: Disabled

1: Enabled

Note: The #time command must be set for accurate ZDA output.

(2) Extended Settings

Command	Description	Values	Unit
#txpower	Set transmit power level	0 ~ -40	dB
#tvgsprd	Set spreading law coefficient for active frequency	10 ~ 40	N/A
#tvgsprdh	Set spreading law coefficient for high frequency	10 ~ 40	N/A
#tvgsprdl	Set spreading law coefficient for low frequency	10 ~ 40	N/A
#attn	Set attenuator turn-on time for active frequency	0 ~ 300000	μsec
#attnh	Set attenuator turn-on time for high frequency	0 ~ 300000	μsec

Command	Description	Values	Unit
#attnl	Set attenuator turn-on time for low frequency	0 ~ 300000	µsec

#txpower

Set transmit power level (0 to -48 dB).

Reducing the power helps optimize echo response in near-field measurements.

#tvgsprd, #tvgsprdh, #tvgsprdl

Set the spreading loss coefficient (K) for the Time Variable Gain (TVG) equation $K \cdot \log(R)$:

Active frequency: #tvgsprd

High frequency: #tvgsprdh

Low frequency: #tvgsprdl

Valid range: 10 to 40

#attn, #attnh, #attnl

Configure the turn-on time (in microseconds) for a -20 dB input signal attenuator.

If the value > 0, the attenuator activates at the specified delay after pulse transmission:

Active frequency: #attn

High frequency: #attnh

Low frequency: #attnl

Valid range: 0 to 300,000 µs

(3) Output Settings

Command	Description	Values	Unit
#samplfreq	Set ADC sampling frequency	6250–100000 or 0	Hz
#medianflt	Set median filter (odd window)	0 or 3–21	N/A
#moveavgflt	Set moving average filter window	0 or 2–12	N/A
#nmeerate	Set NMEA output rate	0 or 0.1–2.0	sec
#nmeadpzero	Set DPT/DBT zero output when not detected	0/1	N/A
#nmeadptoff	Set NMEA DPT offset	±50	m

#samplfreq

Set internal ADC sampling frequency (Hz) for echo sounder modes:

Fixed values: 6250, 12500, 25000, 50000, 100000

0: Auto-select based on #range and internal memory.

Note: Improper settings may cause a “Buffer overrun” and auto-restart.

#medianflt

Set median filter window (odd values only):

0: Auto mode (filtering based on output rate ÷ interval)

3–21: Fixed filtering window

<3: Filter disabled

#moveavgflt

Set simple moving average (SMA) filter window:

0: Auto mode (based on output rate ÷ interval)

2–12: Fixed window

<2: Filter disabled

Note: Both filters cannot be set to 0 simultaneously. Filtering occurs before output rate is applied.

#nmeerate / #outrate

Set output interval for NMEA or altimeter data (seconds):

0: Same as #interval

0.1–2.0: Output interval (must be a multiple of #interval)

Only available in single-frequency altimeter mode. Automatically disabled in dual/echo modes.

#nmeadpzero

Configure output for missing DPT/DBT values:

0: No value if distance not detected

1: Output 0.0 if distance not detected

#nmeadptoff

Apply offset to NMEA \$SDPT data:

Range: ±50 meters

Positive: Distance to surface

Negative: Distance to keel

(4) Analog Output Settings

Command	Description	Values	Unit
#anlgmode	Set analog output mode	0/1	N/A
#anlgrate	Set voltage per meter output rate	0.005–10	V/m
#anlgmax	Set maximum output voltage	1/2/3/4	V

#anlgmode

Select analog output mode (if available):

0: Distance output

1: Echo envelope output (sampled every 80 µs)

#anlgrate

Set voltage-per-meter output rate:

Range: 0.005–10 V/m

#anlgmax

Set maximum analog output voltage:

Options: 1, 2, 2.5, 4 V

Resolution (based on 12-bit DAC):

10 V: 12-bit

5 V: 11-bit

2.5 V: 10-bit

1.25 V: 9-bit

(5) Multi-node Interface Settings

Command	Description	Values	Unit
#mniface	Enable multi-node interface	0/1	N/A
#mnid	Set node ID in multi-node network	1–240	N/A
#mnsync	Set multi-node sync mode	0/1/2	N/A

#mniface

Enable or disable multi-node interface:

0: Disabled

1: Enabled

#mnid

Set the node ID in a multi-node network:

Range: 1–240

#mnsync

Select synchronization mode for multi-node operation:

0: Internal

1: External

2: Synchronization packet

8. Specifications

(1) EU D24 / ECT D24 / ECS D24 / ETH D24

Acoustic Frequency	200 kHz / 450 KHz
Beam width	10° / 5° Conical (-3dB)
Transmit Pulse Width	10 µsec ~ 200 µsec
Transmit Power	Max. 50 W, adjustable
TVG Control	Up to 60 dB,
Gain Control	-30 dB to +30 dB
Input Signal Attenuator (-20dB)	Activation time 0~300,000 µSec
Ranges	0.5 m ~ 200 m (200 kHz)
	0.15 m ~ 100 m (450 kHz)
Repetition (Ping) Rate	100 Hz max
Sampling Rate (Profiling mode)	Max 100 kHz; adjustable, or auto mode (default)
Water Column Resolution	Appx. 7.5 mm @ 100 kHz sampling
Altimeter Range Resolution	1.0 mm
Temperature sensor Resolution	0.1°C
Tilt sensor integrated	Dual-axis (Roll & Pitch) ±90°
	Inclination data resolution 0.1°
Synchronization	Outward / Inward (S/W selectable)
Analog Output Interface	1.25V, 2.5V, 5V, 10V max (S/W selectable)
	Distance or Envelope
Digital Output Interface	EU D24 / ETH D24U: USB 2.0
	ECT D24 / ECS D24: / ETH D24S: RS-232, RS-485 (selectable by Pin of Cable Connector)
Communication Speed	EU D24 / ETH D24U: 4800 ~ 921600, 3M baud (115200 baud default)
	ECT D24 / ECS D24 / ETH D24S: 4800 ~ 921600 baud (115200 baud default)
Data Output Format	Profile 12bit/10bit resolution ASCII Text
	Profile 12bit resolution Binary
	Profile 8bit Binary (12bit compressed to 8bit floating-point)
	Altitude NMEA0183
Configuration and Data reading	Altitude Simple
	Echologger Echosounder Control Program or any Terminal program
Multi node Internetworking (RS485 only)	Up to 32 units
Connector	EU D24 / ETH D24U: LTW 12-05PMMS-SH8003 & 5m USB 2.0 Cable
	ECT D24S ETH D24S: LTW M12A-08PMMS-SH8002
	ECS D24 / ECT D24: SEACON MCBH8MSS
Power supply	EU D24 / ETH D24U: USB Powered, 2W max ECS D24 / ECT D24 / ETH D24S: 10 ~ 75 VDC, 2W max, Internally isolated

Operation Temperature	-10°C +50°C
Operating Depth	EU D24 / ECT D24S / ETH D24 : 1m (for surface vehicle) ECT D24 / ECS D24: 100m (up to 6000m)
Housing	EU D24 / ECT D24S / ETH D24 : Acetal (1m) IP68
	ECS D24: Aluminum (100m, 1000m, 6000m)
	ECT D24: Acetal (100m), Aluminum (1000m, 6000m)
Dimensions (without connector)	EU D24: D56 mm x L80 mm
	ECS D24: D55 mm x L70 mm (100m, 1000m), D64 mm x L78 mm (6000m)
	ECT D24: D56 mm x L85 mm (100m, 1000m), D64 mm x L90 mm (6000m)
	ETH D24 : D65 mm x L67
Weight (in air)	EU D24: 240g
	ECS D24: 320g (100m, 1000m), 540g (6000m)
	ECT D24: 280g (100m rate), 420g (1000m rate), 650g (6000m)
	ETH D24: 200g

(2) EU D052 / ECT D052

Acoustic Frequency	50 kHz / 200 KHz
Beam width	27° / 7° Conical (-3dB) (echo mode)
Transmit Pulse Width	100µsec ~ 1000µsec
Transmit Power	Max. 30 W, adjustable
TVG Control	Up to 60 dB,
Gain Control	-30 dB to +30 dB
Input Signal Attenuator (-20dB)	Activation time 0~300000 µSec
Operating Distance Range	1 m ~ 200 m (50 kHz)
	0.5 m ~ 200 m (200 kHz)
Repetition (Ping) Rate	100 Hz max
Sampling Rate	Max 100 kHz; adjustable, or auto mode (default)
Water Column Resolution	Appx. 7.5 mm @ 100 kHz sampling
Altimeter Range Resolution	1.0 mm
Temperature sensor Resolution	0.1°C
Tilt sensor integrated	Dual-axis (Roll & Pitch) ±90°
	Inclination data resolution 0.1°
Analog Output Interface	1.25V, 2.5V, 5V, 10V max (S/W selectable)
	Distance or Envelope
Digital Output Interface	EU D052: USB 2.0
	ECT D052: RS-232, RS-485 (selectable by Pin of Cable Connector)
Communication Speed	EU D052: 4,800 ~ 921,600, 3M baud (115,200 baud default)
	ECT D052: 4800 ~ 921,600 baud (115,200 baud default)
Data Output Format	Profile 12bit resolution ASCII Text
	Profile 10bit resolution ASCII Text
	Profile 12bit resolution Binary

	Profile 8bit Binary (12bit compressed to 8bit floating-point)
	Altitude NMEA0183
	Altitude Simple
Configuration and Data reading	Echologger Echosounder Control Software
	or any Terminal program
Multi node Internetworking (RS485 only)	Up to 32 units
Connector	EU D052: LTW 12-05PMMS-SH8003
	ECT D052S: LTW M12A-08PMMS-SH8002
	ECT D052: SEACON MCBH8SS
Power supply	EU D052: USB Powered, 2W max
	ECT D052: 10 ~ 75 VDC, 2W max, Internally isolated
Operation Temperature	-10°C +50°C
Operating Depth	EU D052 / ECT D052S: 1m (for surface vehicle)
	ECT D052C: 100m
Housing	Acetal
Dimensions	Ø74 mm x L90 mm (without connector)
Weight	460g (without cable)
Other features	Use both frequencies simultaneously or separately Compatible with major hydro-graphic softwares (Hypack, HydroMagic, HydroPro, Echoview etc.)
	GPS integrated data

(3) EU D032 / ECT 032

Acoustic Frequency	30 kHz / 200 KHz
Beam width	26° / 5° Conical (-3dB) (echo mode)
Transmit Pulse Width	100µsec ~ 1,000µsec
Transmit Power	Max. 30 W, adjustable
TVG Control	Up to 60 dB,
Gain Control	-30 dB to +30 dB
Input Signal Attenuator (-20dB)	Activation time 0~300000 µSec
Operating Distance Range	1.5 m ~ 200 m (30 kHz)
	0.5 m ~ 200 m (200 kHz)
Repetition (Ping) Rate	100 Hz max
Sampling Rate	Max 100 kHz; adjustable, or auto mode (default)
Water Column Resolution	Appx. 7.5 mm @ 100 kHz sampling
Altimeter Range Resolution	1.0 mm
Temperature sensor Resolution	0.1°C
Tilt sensor integrated	Dual-axis (Roll & Pitch) ±90°
	Inclination data resolution 0.1°
Analog Output Interface	1.25V, 2.5V, 5V, 10V max (S/W selectable)
	Distance or Envelope
Digital Output Interface	EU D032: USB 2.0
	ECT D032: RS-232, RS-485 (selectable by Pin of Cable Connector)

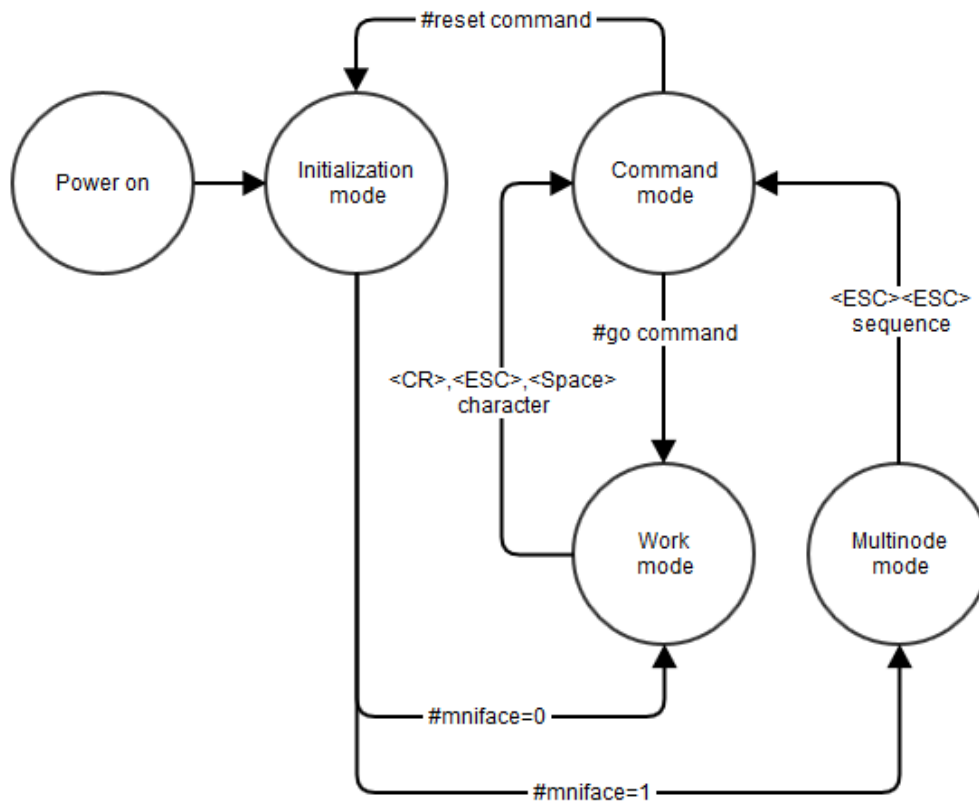
Communication Speed	EU D032: 4,800 ~ 921,600, 3M baud (115,200 baud default) ECT D032: 4800 ~ 921,600 baud (115,200 baud default)
Data Output Format	Profile 12bit resolution ASCII Text Profile 10bit resolution ASCII Text Profile 12bit resolution Binary Profile 8bit Binary (12bit compressed to 8bit floating-point) Altitude NMEA0183 Altitude Simple
Configuration and Data reading	Echologger Echosounder Control Software or any Terminal program
Multi node Internetworking (RS485 only)	Up to 32 units
Connector	EU D032: LTW 12-05PMMS-SH8003 ECT D032S: LTW M12A-08PMMS-SH8002 ECT D032: SEACON MCBH8SS
Power supply	EU D032: USB Powered, 2W max ECT D032: 10 ~ 75 VDC, 2W max, Internally isolated
Operation Temperature	-10°C ~ +50°C
Operating Depth	EU D032 / ECT D032S: 1m (for surface vehicle) ECT D032C: 100m
Housing	Acetal
Dimensions	Ø96 mm x L90 mm (without connector)
Weight	740g (without cable)
Other features	Use both frequencies simultaneously or separately Compatible with major hydro-graphic softwares (Hypack, HydroMagic, HydroPro, Echoview etc.) GPS integrated data

(4) EU D710 / ECT D710 / ECS D710 / ETH D710

Acoustic Frequency	750 kHz / 1 MHz
Beam width	3.5° / 2.5° Conical (-3dB)
Transmit Pulse Width	10 µsec ~ 100 µsec
Transmit Power	Max. 40 / 30W, adjustable
TVG Control	Up to 60 dB,
Gain Control	-30 dB to +30 dB
Input Signal Attenuator (-20dB)	Activation time 0~300,000 µSec
Ranges	0.03 m ~ 50 m (750 kHz) 0.02 m ~ 30 m (1MHz)
Repetition (Ping) Rate	100 Hz max
Sampling Rate (Profiling mode)	Max 100 kHz; adjustable, or auto mode (default)
Water Column Resolution	Appx. 7.5 mm @ 100 kHz sampling
Altimeter Range Resolution	1.0 mm
Temperature sensor Resolution	0.1°C
Tilt sensor integrated	Dual-axis (Roll & Pitch) ±90° Inclination data resolution 0.1°

Synchronization	Outward / Inward (S/W selectable)
Analog Output Interface	1.25V, 2.5V, 5V, 10V max (S/W selectable)
	Distance or Envelope
Digital Output Interface	EU D710 / ETH D710U: USB 2.0 ECT D710 / ECS D710 / ETH D710S: RS-232, RS-485 (selectable by pins)
Communication Speed	EU D710 / ETH D710U: 2400 ~ 921600, 3M baud (115200 baud default) ECT D710 / ECS D710 / ETH D710S: 2400 ~ 921600 baud (115200 baud default)
Data Output Format	Profile 12bit/10bit resolution ASCII Text Profile 12bit resolution Binary Profile 8bit Binary (12bit compressed to 8bit floating-point) Altitude NMEA0183 Altitude Simple
Configuration and Data reading	Echologger Echosounder Control Software or any Terminal program
Multi node Internetworking (RS485 only)	Up to 32 units
Connector	EU D710 / ETH D710U: LTW 12-05PMMS-SH8003 & 5m USB 2.0 Cable ECT D710S / ETH D710S: LTW M12A-08PMMS-SH8002 ECS D710 / ECT D710: SEACON MCBH8MSS
Power supply	EU D710/ ETH D710U: USB Powered, 2W max ECS D710 / ECT D710 / ETH D710S: 10 ~ 75 VDC, 2W max, Internally isolated
Operation Temperature	-10°C +50°C
Operating Depth	EU D710 / ECT D710S / ETH D710: 1m (for surface vehicle) ECT D710 / ECS D710: 100m (up to 6,000m)
Housing	EU D710 / ECT D710S / ETH D710: Acetal (1m) IP68 ECS D710: Aluminum (100m, 1000m, 6000m) ECT D710: Acetal (100m), Aluminum (1000m, 6000m)
Dimensions (without connector)	EU D710: D56 mm x L80 mm ECS D710: D55 mm x L70 mm (100m, 1000m), D64 mm x L78 mm (6000m) ECT D710: D56 mm x L85 mm (100m, 1000m), D64 mm x L90 mm (6000m) ETH D710: D65 mm x L67 mm
Weight (in air)	EU D710: 240g ECS D710: 320g (100m, 1000m), 540g (6000m) ECT D710: 280g (100m rate), 420g (1000m rate), 650g (6000m) ETH D710: 200g

Appendix 1: Echosounder Multi-node Protocol Description



To operate in multi-node mode:
 Enable the interface using: #mniface 1
 Assign a unique node ID using: #mnid
 Set synchronization type using: #mnsync

All configuration must be done in command mode.

(1) Packet Structure

All multi-byte values (int16, int32, float32) use Little-Endian format (LSB first).

Packet Composition

Header

Payload Data

Footer

Header Structure

Field	Size (Bytes)	Description	Data Type	Comments	Example Values
Magic	2	Magic sentence	uint8[2]	Start sequence	"PK"
Node ID	1	Node identifier	uint8	1–240, 0 = broadcast	0–240
Channel ID	1	Channel identifier	uint8	0–127: request, 128–255: response	0, 1, 254

Field	Size (Bytes)	Description	Data Type	Comments	Example Values
Reserved	1	Reserved byte	uint8	Not used	—
Data Length	1	Payload length	uint8	0–240	—
Time	4	Internal timestamp (ms)	uint32	Suggest internal time	0–ULONG_MAX
CRC	2	Header CRC (CCITT)	uint16	CRC-16/CCITT	0–65536

Footer Structure

Field	Size (Bytes)	Description	Data Type	Comments	Value
Data CRC	2	CRC of payload data	uint16	0xFFFF if Data Length is 0	0–65536
Magic	2	End marker	uint8[2]	Carriage return + line feed	<CR><LF>

Note: Maximum packet size (Header + Payload + Footer) = 256 bytes

(2) Packet Types

a. Synchronization Packet

Used when #mnsync is set to *packet synchronization*. Transmission is triggered only on receiving this packet.

Node ID = 0: Broadcast to all nodes

Node ID = X: Target specific node

Channel ID = 0

Data Length = 0

No response expected

b. Shutdown Packet

Node-specific command to power down a unit.

Channel ID = 254

Remains shut down until power-cycled.

c. Data Request Packet

Sent independently of ping timing.

Channel ID = 1

Requests latest sensor data.

d. Data Response Packet

Response to a request packet.

Channel ID = 129 (MSB of 1)

Same structure as request packet, with payload.

(3) Payload Data Structure (Data Response)

Field	Size (Bytes)	Description	Data Type	Range
Altitude	4	Altitude measurement (m)	float32	0 – 200
Temperature	4	Water temperature (°C)	float32	-10 – +50
Pitch	4	Pitch angle (°)	float32	-90 – +90
Roll	4	Roll angle (°)	float32	-90 – +90
EMA	4	Echo maximum amplitude (% FS)	float32	0 – 100%

Appendix2. Minimum Interval (Repetition time) vs. Range

Interval is minimum time required between pings. If the value is smaller than the time required, actual interval will increase further. For example, if it was set 1 second, although it should be at least 1.1 second, then actual interval will increase to 2 seconds (next pinging time).

The tables only represent at Single freq. mode, therefore, for Dual freq. mode, consider double the interval. Note that the two frequencies never ping at the same time, but alternatively.

RS232 at 38,400 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.33	0.36	0.05	0.01	0.01	0.02	0.01	0.06	0.10
2	0.44	0.46	0.05	0.01	0.01	0.02	0.01	0.09	0.17
5	0.77	0.79	0.05	0.01	0.01	0.02	0.01	0.21	0.39
10	1.30	1.33	0.05	0.02	0.02	0.02	0.02	0.39	0.74
20	2.37	2.41	0.05	0.03	0.03	0.03	0.03	0.76	1.46
50	5.61	6.56	0.08	0.08	0.08	0.08	0.08	1.86	3.63
100	12.53	13.93	0.15	0.15	0.15	0.15	0.15	3.70	7.23
150	9.82	11.35	0.21	0.21	0.21	0.21	0.21	2.82	5.42
200	13.79	16.11	0.28	0.28	0.28	0.28	0.28	3.83	7.37

RS232 at 57,600 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.22	0.24	0.04	0.01	0.01	0.01	0.01	0.04	0.07
2	0.29	0.31	0.04	0.01	0.01	0.01	0.01	0.07	0.11
5	0.51	0.53	0.04	0.01	0.01	0.01	0.01	0.14	0.26
10	0.87	0.89	0.04	0.02	0.02	0.02	0.02	0.27	0.50
20	1.59	1.62	0.04	0.03	0.03	0.03	0.03	0.52	0.99
50	3.76	4.40	0.08	0.08	0.08	0.08	0.08	1.27	2.44
100	8.41	9.34	0.15	0.15	0.15	0.15	0.15	2.51	4.87
150	6.62	7.64	0.21	0.21	0.21	0.21	0.21	1.95	3.68
200	9.29	10.83	0.28	0.28	0.28	0.28	0.28	2.65	5.00

RS232 at 115,200 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.12	0.12	0.02	0.01	0.01	0.01	0.01	0.02	0.04
2	0.15	0.16	0.02	0.01	0.01	0.01	0.01	0.04	0.06
5	0.26	0.27	0.02	0.01	0.01	0.01	0.01	0.08	0.14
10	0.45	0.46	0.02	0.02	0.02	0.02	0.02	0.14	0.26
20	0.81	0.83	0.03	0.03	0.03	0.03	0.03	0.27	0.51
50	1.92	2.24	0.08	0.08	0.08	0.08	0.08	0.67	1.26
100	4.29	4.76	0.15	0.15	0.15	0.15	0.15	1.33	2.52
150	3.42	3.93	0.21	0.21	0.21	0.21	0.21	1.08	1.95
200	4.80	5.56	0.28	0.28	0.28	0.28	0.28	1.46	2.64

RS232 at 230,400 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.06	0.07	0.01	0.01	0.01	0.01	0.01	0.02	0.02
2	0.08	0.08	0.01	0.01	0.01	0.01	0.01	0.02	0.03
5	0.14	0.14	0.01	0.01	0.01	0.01	0.01	0.04	0.07
10	0.23	0.24	0.02	0.02	0.02	0.02	0.02	0.08	0.14
20	0.42	0.43	0.03	0.03	0.03	0.03	0.03	0.15	0.27
50	1.00	1.15	0.08	0.08	0.08	0.08	0.08	0.37	0.67
100	2.21	2.44	0.15	0.15	0.15	0.15	0.15	0.74	1.32
150	1.81	2.06	0.21	0.21	0.21	0.21	0.21	0.64	1.08
200	2.53	2.92	0.28	0.28	0.28	0.28	0.28	0.87	1.46

RS232 at 460,800 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.04	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.02	0.02
5	0.09	0.90	0.01	0.01	0.01	0.01	0.01	0.04	0.05
10	0.15	0.16	0.02	0.02	0.02	0.02	0.02	0.08	0.09
20	0.28	0.29	0.03	0.03	0.03	0.03	0.03	0.14	0.16
50	0.67	0.75	0.08	0.08	0.08	0.08	0.08	0.35	0.40
100	1.44	1.55	0.15	0.15	0.15	0.15	0.15	0.70	0.79
150	1.20	1.33	0.21	0.21	0.21	0.21	0.21	0.61	0.68
200	1.66	1.86	0.28	0.28	0.28	0.28	0.28	0.83	0.92

RS232 at 921,600 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2	0.04	0.04	0.01	0.01	0.01	0.01	0.01	0.02	0.02
5	0.07	0.07	0.01	0.01	0.01	0.01	0.01	0.04	0.04
10	0.12	0.13	0.02	0.02	0.02	0.02	0.02	0.07	0.08
20	0.24	0.25	0.03	0.03	0.03	0.03	0.03	0.14	0.16
50	0.58	0.60	0.08	0.08	0.08	0.08	0.08	0.35	0.40
100	1.20	1.29	0.15	0.15	0.15	0.15	0.15	0.70	0.79
150	1.01	1.06	0.21	0.21	0.21	0.21	0.21	0.61	0.68
200	1.39	1.47	0.28	0.28	0.28	0.28	0.28	0.83	0.91

RS485 half-duplex interface at 38,400 baud (#hdpause = 50ms)

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.38	0.41	0.10	0.06	0.06	0.06	0.06	0.11	0.15
2	0.48	0.52	0.10	0.06	0.06	0.06	0.06	0.14	0.22
5	0.81	0.84	0.10	0.06	0.06	0.06	0.06	0.26	0.44
10	1.35	1.38	0.10	0.06	0.06	0.06	0.06	0.44	0.79
20	2.42	2.46	0.10	0.06	0.06	0.06	0.06	0.81	1.51
50	5.65	6.63	0.10	0.08	0.08	0.08	0.08	1.91	3.68
100	12.62	14.03	0.15	0.15	0.15	0.15	0.15	3.74	7.28
150	9.89	11.43	0.21	0.21	0.21	0.21	0.21	2.87	5.47
200	13.87	16.18	0.28	0.28	0.28	0.28	0.28	3.88	7.42

RS485 half-duplex interface at 57,600 baud (#hdpause = 50ms)

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.27	0.29	0.08	0.06	0.06	0.06	0.06	0.09	0.12
2	0.34	0.36	0.08	0.06	0.06	0.06	0.06	0.12	0.16
5	0.56	0.58	0.08	0.06	0.06	0.06	0.06	0.19	0.31
10	0.92	0.94	0.08	0.06	0.06	0.06	0.06	0.31	0.55
20	1.64	1.67	0.08	0.06	0.06	0.06	0.06	0.56	1.04
50	3.81	4.46	0.09	0.08	0.08	0.08	0.08	1.31	2.49
100	8.47	9.40	0.15	0.15	0.15	0.15	0.15	2.56	4.92
150	6.68	7.70	0.21	0.21	0.21	0.21	0.21	2.00	3.73
200	9.34	10.89	0.28	0.28	0.28	0.28	0.28	2.70	5.05

RS485 half-duplex interface at 115,200 baud (#hdpause = 50ms)

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.17	0.18	0.07	0.06	0.06	0.06	0.06	0.07	0.09
2	0.20	0.21	0.07	0.06	0.06	0.06	0.06	0.09	0.11
5	0.31	0.33	0.07	0.06	0.06	0.06	0.06	0.13	0.19
10	0.50	0.51	0.07	0.06	0.06	0.06	0.06	0.19	0.31
20	0.86	0.88	0.07	0.06	0.06	0.06	0.06	0.32	0.56
50	1.97	2.31	0.08	0.08	0.08	0.08	0.08	0.72	1.31
100	4.35	4.82	0.15	0.15	0.15	0.15	0.15	1.38	2.56
150	3.47	3.99	0.21	0.21	0.21	0.21	0.21	1.13	2.00
200	4.84	5.62	0.28	0.28	0.28	0.28	0.28	1.51	2.69

RS485 half-duplex interface at 230,400 baud (#hdpause = 50ms)

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.12	0.12	0.06	0.06	0.06	0.06	0.06	0.07	0.07
2	0.13	0.13	0.06	0.06	0.06	0.06	0.06	0.07	0.08
5	0.19	0.19	0.06	0.06	0.06	0.06	0.06	0.09	0.12
10	0.28	0.29	0.06	0.06	0.06	0.06	0.06	0.13	0.19
20	0.47	0.48	0.06	0.06	0.06	0.06	0.06	0.20	0.32
50	1.05	1.21	0.08	0.08	0.08	0.08	0.08	0.42	0.72
100	2.27	2.50	0.15	0.15	0.15	0.15	0.15	0.79	1.38
150	1.87	2.12	0.21	0.21	0.21	0.21	0.21	0.70	1.13
200	2.59	2.98	0.28	0.28	0.28	0.28	0.28	0.92	1.51

RS485 half-duplex interface at 460,800 baud (#hdpause = 50ms)

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.09	0.09	0.06	0.06	0.06	0.06	0.06	0.06	0.07
2	0.10	0.10	0.06	0.06	0.06	0.06	0.06	0.07	0.07
5	0.14	0.14	0.06	0.06	0.06	0.06	0.06	0.09	0.10
10	0.20	0.20	0.06	0.06	0.06	0.06	0.06	0.12	0.14
20	0.32	0.33	0.06	0.06	0.06	0.06	0.06	0.19	0.21
50	0.72	0.79	0.08	0.08	0.08	0.08	0.08	0.40	0.45
100	1.48	1.60	0.15	0.15	0.15	0.15	0.15	0.75	0.84
150	1.25	1.38	0.21	0.21	0.21	0.21	0.21	0.66	0.73
200	1.71	1.91	0.28	0.28	0.28	0.28	0.28	0.88	0.97

RS485 half-duplex interface at 921,600 baud (#hdpause = 50ms)

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.08	0.08	0.06	0.06	0.06	0.06	0.06	0.06	0.06
2	0.09	0.09	0.06	0.06	0.06	0.06	0.06	0.07	0.07
5	0.12	0.12	0.06	0.06	0.06	0.06	0.06	0.09	0.10
10	0.17	0.18	0.06	0.06	0.06	0.06	0.06	0.12	0.13
20	0.28	0.29	0.06	0.06	0.06	0.06	0.06	0.19	0.21
50	0.63	0.67	0.08	0.08	0.08	0.08	0.08	0.40	0.45
100	1.25	1.31	0.15	0.15	0.15	0.15	0.15	0.75	0.84
150	1.06	1.12	0.21	0.21	0.21	0.21	0.21	0.66	0.73
200	1.43	1.54	0.28	0.28	0.28	0.28	0.28	0.88	0.97

USB interface at 38,400 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.34	0.36	0.05	0.01	0.01	0.02	0.01	0.06	0.10
2	0.44	0.46	0.05	0.01	0.01	0.02	0.01	0.09	0.17
5	0.77	0.79	0.05	0.01	0.01	0.02	0.01	0.21	0.39
10	1.30	1.32	0.05	0.02	0.02	0.02	0.02	0.39	0.74
20	2.38	2.40	0.05	0.03	0.03	0.03	0.03	0.76	1.46
50	5.60	5.67	0.08	0.08	0.08	0.08	0.08	1.86	3.63
100	11.17	11.84	0.15	0.15	0.15	0.15	0.15	3.70	7.23
150	8.83	9.57	0.21	0.21	0.21	0.21	0.21	2.82	5.42
200	12.64	14.00	0.28	0.28	0.28	0.28	0.28	3.83	7.37

USB interface at 57,600 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.23	0.24	0.04	0.01	0.01	0.01	0.01	0.04	0.07
2	0.30	0.31	0.04	0.01	0.01	0.01	0.01	0.07	0.11
5	0.52	0.53	0.04	0.01	0.01	0.01	0.01	0.14	0.26
10	0.87	0.89	0.04	0.02	0.02	0.02	0.02	0.27	0.50
20	1.59	1.61	0.04	0.03	0.03	0.03	0.03	0.52	0.99
50	3.76	3.81	0.08	0.08	0.08	0.08	0.08	1.26	2.44
100	7.49	7.92	0.15	0.15	0.15	0.15	0.15	2.51	4.87
150	5.92	6.43	0.21	0.21	0.21	0.21	0.21	1.95	3.68
200	8.47	9.42	0.28	0.28	0.28	0.28	0.28	2.65	5.00

USB interface at 115,200 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.12	0.13	0.02	0.01	0.01	0.01	0.01	0.02	0.04
2	0.15	0.16	0.02	0.01	0.01	0.01	0.01	0.04	0.06
5	0.26	0.27	0.02	0.01	0.01	0.01	0.01	0.08	0.14
10	0.45	0.46	0.02	0.02	0.02	0.02	0.02	0.14	0.26
20	0.81	0.82	0.03	0.03	0.03	0.03	0.03	0.27	0.51
50	1.92	1.94	0.08	0.08	0.08	0.08	0.08	0.67	1.26
100	3.81	4.03	0.15	0.15	0.15	0.15	0.15	1.33	2.52
150	3.09	3.33	0.21	0.21	0.21	0.21	0.21	1.08	1.95
200	4.38	4.83	0.28	0.28	0.28	0.28	0.28	1.46	2.64

USB interface at 230,400 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.06	0.07	0.01	0.01	0.01	0.01	0.01	0.02	0.02
2	0.08	0.08	0.01	0.01	0.01	0.01	0.01	0.02	0.03
5	0.14	0.14	0.01	0.01	0.01	0.01	0.01	0.04	0.07
10	0.24	0.24	0.02	0.02	0.02	0.02	0.02	0.08	0.14
20	0.42	0.43	0.03	0.03	0.03	0.03	0.03	0.15	0.27
50	1.00	1.02	0.08	0.08	0.08	0.08	0.08	0.37	0.67
100	1.98	2.10	0.15	0.15	0.15	0.15	0.15	0.74	1.32
150	1.67	1.82	0.21	0.21	0.21	0.21	0.21	0.64	1.08
200	2.35	2.54	0.28	0.28	0.28	0.28	0.28	0.87	1.46

USB interface at 460,800 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.04	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.02	0.02
5	0.09	0.09	0.01	0.01	0.01	0.01	0.01	0.04	0.05
10	0.15	0.15	0.02	0.02	0.02	0.02	0.02	0.08	0.09
20	0.28	0.28	0.03	0.03	0.03	0.03	0.03	0.14	0.16
50	0.67	0.67	0.08	0.08	0.08	0.08	0.08	0.35	0.40
100	1.32	1.37	0.15	0.15	0.15	0.15	0.15	0.70	0.79
150	1.11	1.18	0.21	0.21	0.21	0.21	0.21	0.61	0.68
200	1.56	1.68	0.28	0.28	0.28	0.28	0.28	0.83	0.92

USB interface at 921,600 baud

Range (m)	Echogram txt 10bit	Echogram txt 12bit	Altimeter NMEA	Altimeter Simple	DESO	Alt Dual	Sonarmiter	Echogram bin 8bit Auto sampling *	Echogram bin 10bit Auto sampling *
1	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2	0.04	0.04	0.01	0.01	0.01	0.01	0.01	0.02	0.02
5	0.07	0.07	0.01	0.01	0.01	0.01	0.01	0.04	0.04
10	0.13	0.13	0.02	0.02	0.02	0.02	0.02	0.07	0.08
20	0.24	0.24	0.03	0.03	0.03	0.03	0.03	0.14	0.16
50	0.58	0.59	0.08	0.08	0.08	0.08	0.08	0.35	0.40
100	1.14	1.17	0.15	0.15	0.15	0.15	0.15	0.70	0.79
150	0.96	0.99	0.21	0.21	0.21	0.21	0.21	0.61	0.68
200	1.33	1.39	0.28	0.28	0.28	0.28	0.28	0.83	0.91

* Auto Sampling Rate by Range

The internal ADC sampling rate is automatically selected based on the configured range setting:

Range	Auto Sampling Rate
1 m – 20 m	100 kS/s
50 m	100 kS/s
100 m	50 kS/s
150 m – 200 m	25 kS/s

Note: If the user selects manual sampling via #samplfreq, it must match a valid rate for the given range. Incorrect settings may cause buffer overrun errors.

Appendix 3: Tilt Sensor Orientation

The tilt sensor measures the device's orientation relative to the horizontal plane. It provides pitch and roll angles in degrees, which are essential for:

- Compensating distance measurements on inclined surfaces
- Monitoring installation alignment and stability
- Validating data quality in dynamic environments (e.g., vessels)

Axis Definitions

Pitch (X-axis tilt):

- Rotation forward/backward
- Positive: Nose-up tilt
- Negative: Nose-down tilt

Roll (Y-axis tilt):

- Rotation left/right
- Positive: Right-side down
- Negative: Left-side down

Measurement Range

- Pitch: -90° to $+90^{\circ}$
- Roll: -90° to $+90^{\circ}$

Note: Proper sensor orientation is critical. The device must be installed according to manufacturer alignment guidelines for accurate tilt readings

