

# Echologger Dual Frequency Echosounder User Manual

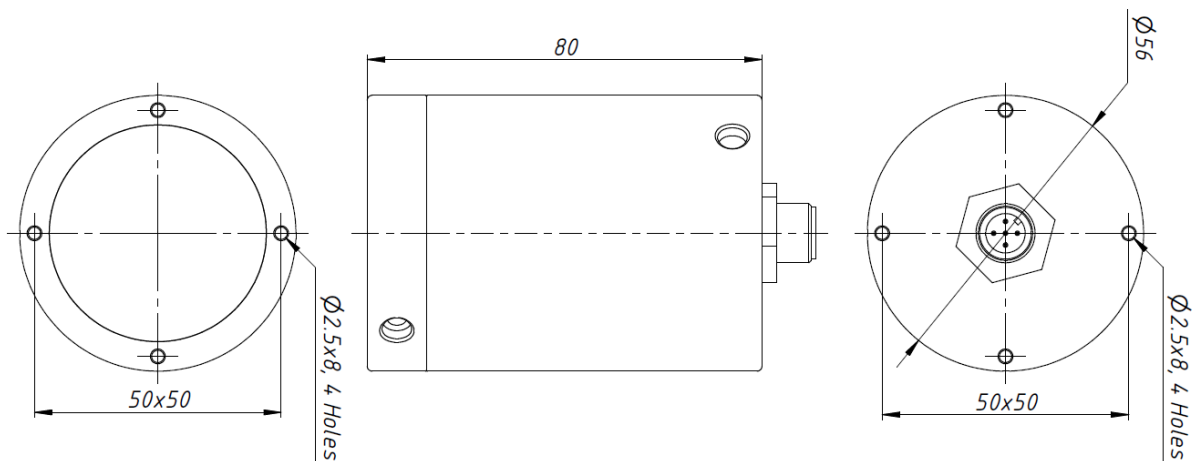
## EU D24 / ECT D24S / ECS D24S

---

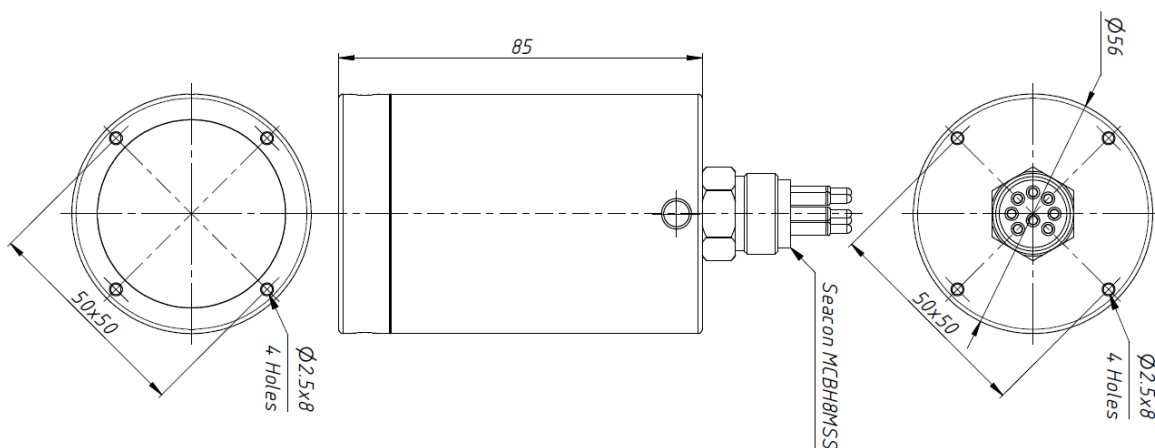
### 1. Specification

#### 1.1 Dimensions

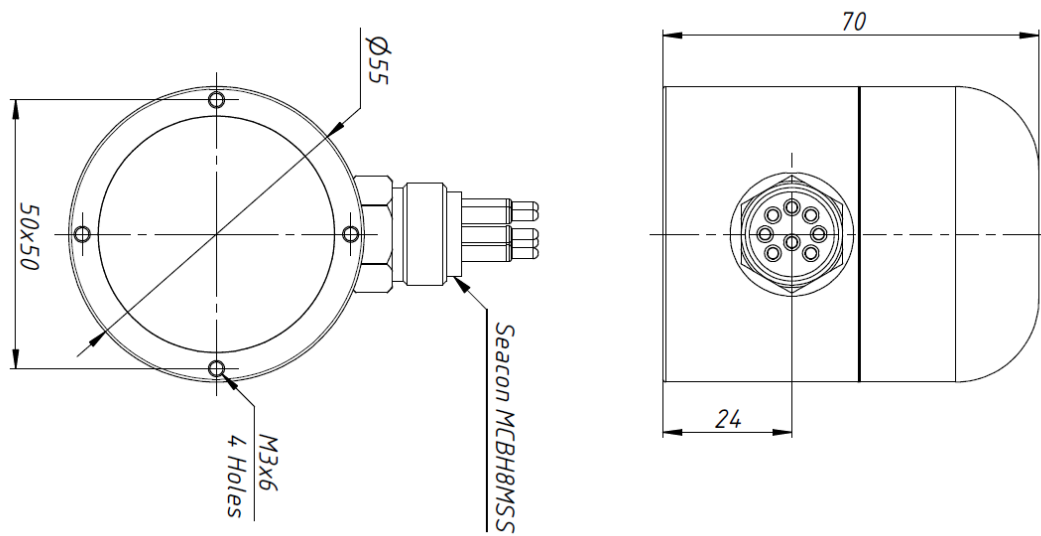
##### (1) EU D24



(2) ECT D24S / ECT D24U (S: serial interface (RS232/485), U : USB interface)



(3) ECS D24S / ECS D24U (S: serial interface (RS232/485), U : USB interface)



(4) EGT D24 (DB9 connector)



## 1.2 Specification (Electrical, Acoustic, physical)

### (1) EU D24 / ECT D24U / ECS D24U – USB interface

Acoustic Frequency	200 kHz / 450 KHz
Beam width	10° / 5° Conical (-3dB)
Transmit Pulse Width	10µsec ~ 200µsec
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	0.15 m ~ 200 m (200kHz)
	0.15 m ~ 100 m (450kHz)
Repetition (Ping) Rate	100 Hz max
Sampling Rate (Profiling mode)	Max 100kHz; adjustable, or auto mode (default)
Water Column Resolution	Appx. 7.5 mm @100kHz 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) - ECT D24U & ECS D24U
Analog Output Interface	1.25V, 2.5V, 5V, 10V max (S/W selectable)
	Distance or Envelope
Digital Output Interface	USB 2.0
Communication Speed	4800 ~ 921600, 3M baud (115200 baud default)
Data Output Format	Profile 12bit/10bit resolution ASCII Text
	Profile 12bit resolution Binary
	Profile 8bit resolution Binary (12bit compressed to 8bit)
	Altitude NMEA0183
	Altitude Simple
Configuration and Data reading	Echologger Control Program or any Terminal program
Connector	EU D24 - LTW 12-05PMMS-SH8003 & 5m USB 2.0 Cable
	ECS D24U / ECT D24U - SEACON MCBH8MSS
Power supply	USB Powered, 2W max
Operation Temperature	-10°C +50°C
Operating Depth	Standard 1m, 100m, (up to 6000m)
Housing	EU D24 - Acetal (1m) IP68
	ECS D24U - Aluminium (100m, 1000m)
	ECT D24U – Acetal (100m), Aluminium (1000m)
Dimensions (100m rate)	EU D24: D56 mm x L80 mm (without connector)
	ECS D24U: D55 mm x L70 mm (without connector)
	ECT D24U: D56 mm x L85 mm (without connector)
Weight (100m rate)	EU D24: 240g
	ECS D24U: 320g (100m, 1000m versions)
	ECT D24U: 280g (100m version)
Other features	Compatible with many Geo-related commercail softwares (Hypack, HydroPro, Echoview etc.) GPS integrated data

## (2) ECT D24S/ ECS D24S (Serial interface)

Acoustic Frequency	200 kHz / 450 KHz
Beam width	10° / 5° Conical (-3dB)
Transmit Pulse Width	10μsec ~ 200μsec
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	0.15 m ~ 200 m (200kHz), 0.15 m ~ 100 m (450kHz)
Repetition (Ping) Rate	100Hz max
Sampling Rate	Max 100kHz; adjustable, or auto mode (default)
Water Column Resolution	Appx. 7.5 mm @100kHz 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	RS-232, RS-485 (selectable by select pin)
Communication Speed	4800 ~ 921600 baud (115200 baud default)
Data Output Format	Profile 12bit resolution ASCII Text
	Profile 10bit resolution ASCII Text
	Profile 12bit resolution Binary
	Profile 8bit resolution Binary (12bit compressed to 8bit)
	Altitude NMEA0183/ Altitude Simple
Multi node Internetworking(RS485 only)	Up to 32 units
Configuration and Data reading	Echologger Control Program or any Terminal program
Connector	ECT D24S: SEACON MCBH8MSS
	ECS D24S: SEACON MCBH8MSS
	EGT D24: Cable Gland
Power supply	10 ~ 75 VDC, 2W max, Internally isolated
Operation Temperature	-10°C +50°C
Operating Depth	1m, 100m, 1000m, 6000m
Housing	ECT D24S: Acetal (100m), Aluminum (1000m, 6000m)
	ECS D24S: Aluminum (100m, 1000m, 6000m)
	EGT D24: Acetal (1m) IP68
Dimensions	ECT D24S: D56 mm x L85 mm (without connector)
	ECS D24S: D55 mm x L70 mm (without connector)
	EGT D24: D56 mm x L80 mm (without cable gland)
Weight	ECT D24S: 280g (100m version)
	ECS D24S: 320g (100m, 1000m versions)
	EGT D24: 240g (without cable)
Other features	Compatible with many Geo-related commercail softwares (Hypack, HydroPro, Echoview etc.)
	GPS integrated data
	Multi-node networking

## 2. Connection

### (1) EU D24

Connect the device to a PC via USB port (Plug and pay)

Just in case a PC needs a driver to recognize the USB device, it can be downloaded on the link below.  
USB driver for ftdi

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

For Windows7

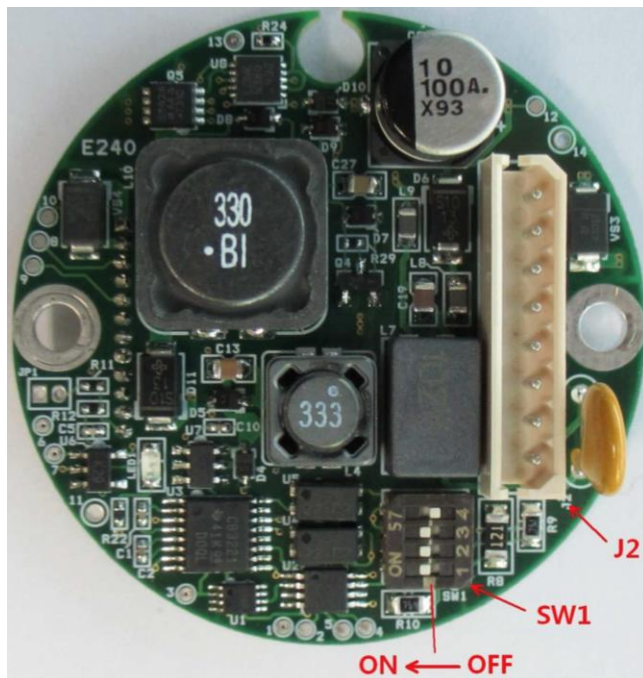
<http://www.ftdichip.com/Drivers/CDM/CDM%202.08.24%20WHQL%20Certified.zip>





## (2) ECT D24S / ECS D24S

Connect a power supply (10~75VDC) to the device, then the device to a PC via a 'RS232/RS485 to USB' converter



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

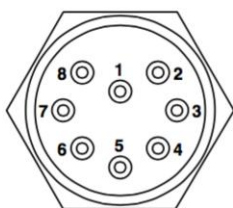
Signal Lines (3, 4, 5, 6, 7, 8) Galvanically Isolated from Power Lines (1, 2).

\* At SW1.4 and J2.6 perform the same

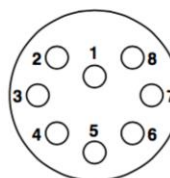
For RS-485 mode both should be in the RS-485 mode: SW1.4 = OFF and J2.6 = Not Connected (left floating).

- 8pin connection

Micro WET-CON Bulkhead Connector Male Plug  
Seacon MCBH8MSS



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

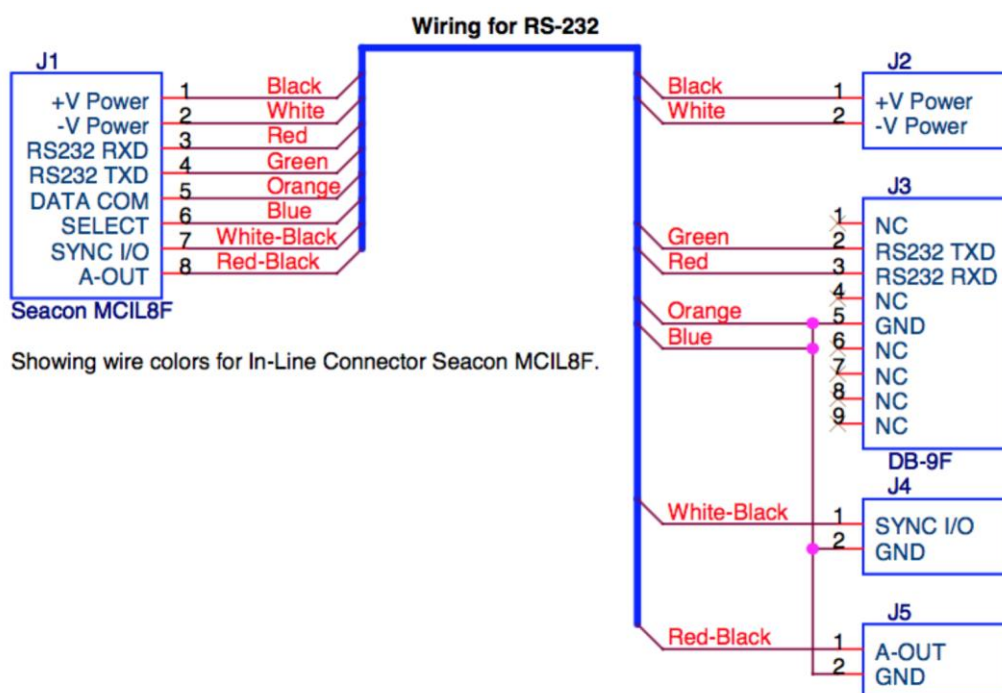


E-D24S Bulkhead Connector pinout:

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

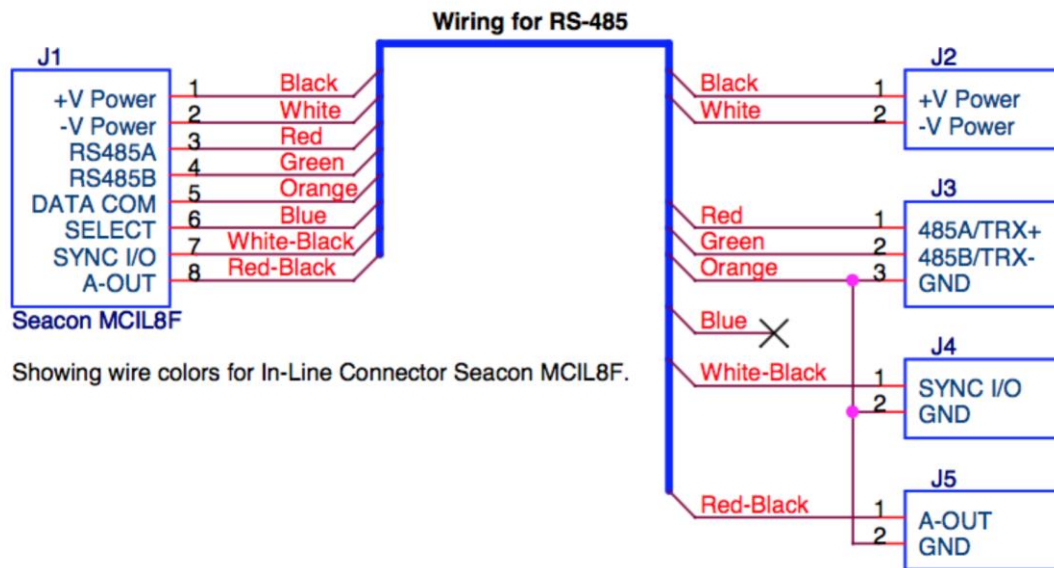
Signal Lines (3, 4, 5, 6, 7, 8) Galvanically Isolated from Power Lines (1, 2).

- RS232

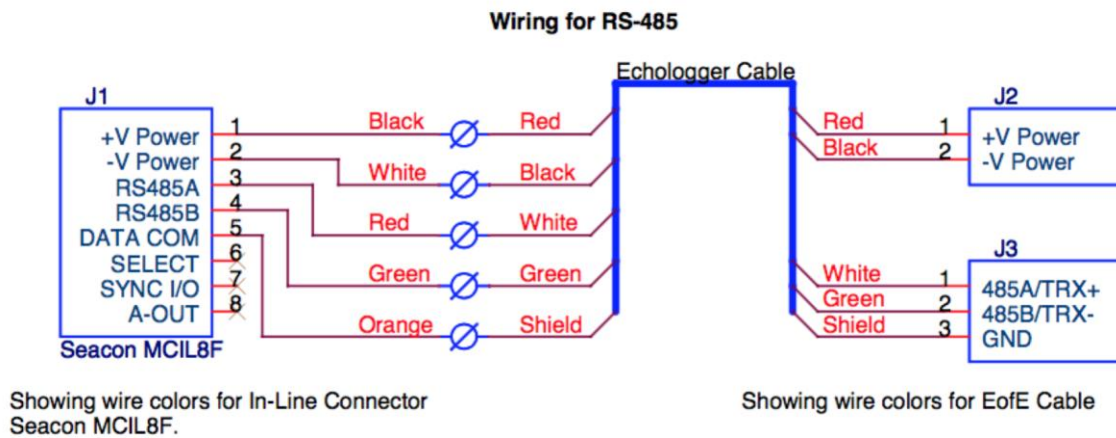




- RS485

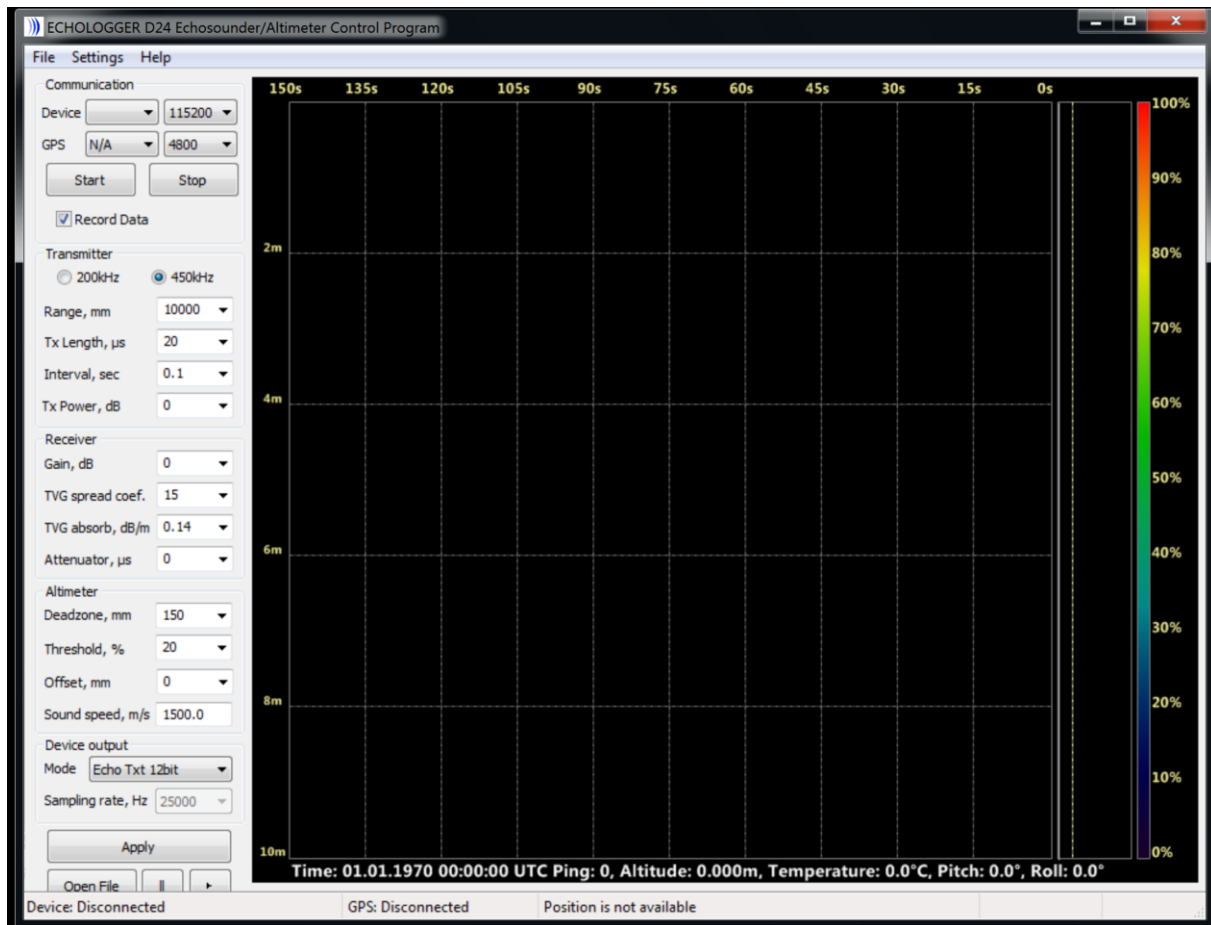


- Extended Echologger Cable & Seacon-8pin\_RS485

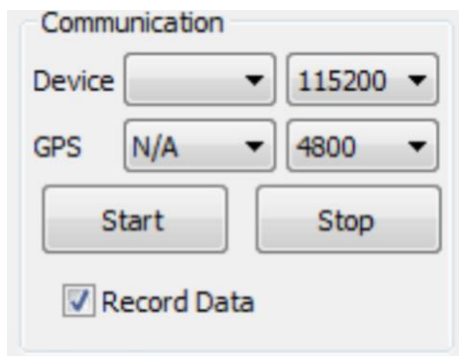


### 3. GUI software program

(1) Run an up-to-date control software 'Echologger D24 Control Program' (Ver 1.5)

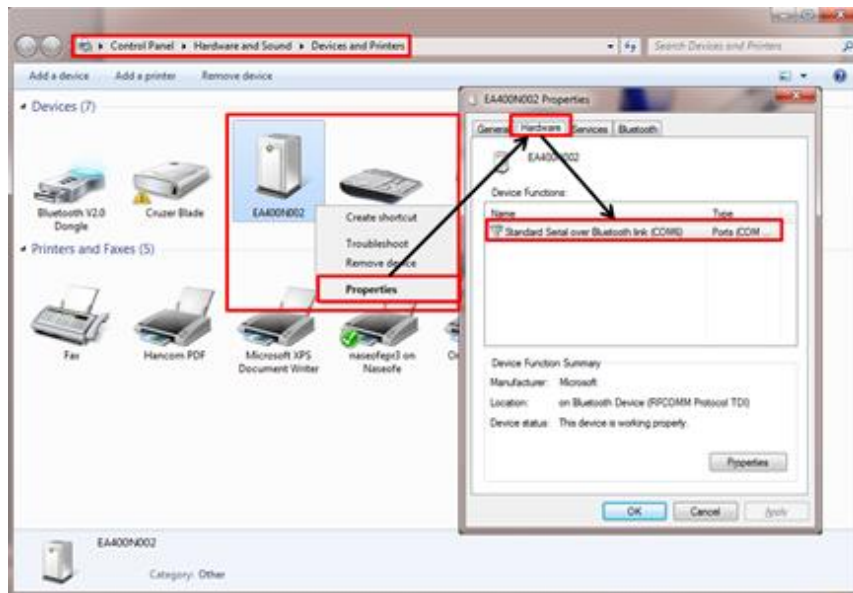


(2) Communication setup

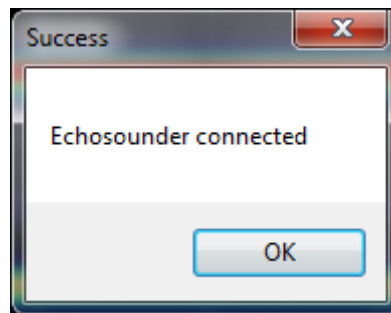


Select a correct serial port for the device and for a GPS if applicable. Select proper communication speeds for both devices. If GPS is not available in the system – select N/A. After all communication parameters are set, press “Start” button to start communication.

\* For a correct port number- Go to Control Panel > Hardware and Sound > Devices and Printers.  
(Windows 7)



When device is successfully recognized GUI show “Echosounder connected” popup.



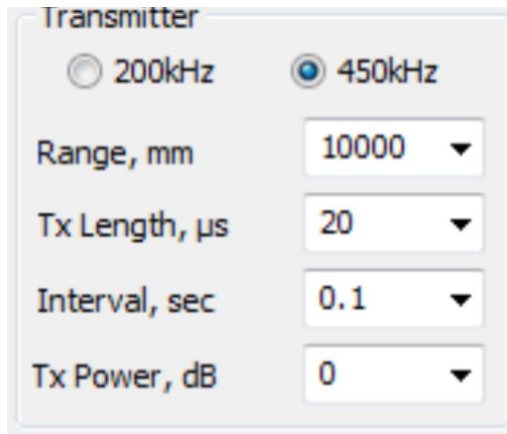
Device starts to work immediately. Tick the box “Record data” to generate a file and save the measurement. New files are generated every time when the box is ticked/unticked.

If a device not properly connected nor recognized by the system, and error will popup.



If “Stop” button is selected, the device is disconnected from the GUI program.

## (2) Transmitter setup



The Transmitter setup window contains the following controls:

- Frequency selection: Two radio buttons for 200kHz and 450kHz. The 450kHz button is selected.
- Range, mm: A dropdown menu showing 10000.
- Tx Length,  $\mu$ s: A dropdown menu showing 20.
- Interval, sec: A dropdown menu showing 0.1.
- Tx Power, dB: A dropdown menu showing 0.

Device supports two working frequencies (200kHz or 450 kHz, not simultaneously)

Range, mm : Range in millimeter

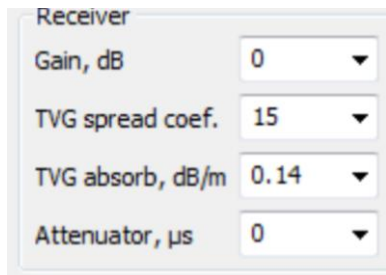
Tx Length,  $\mu$ s : Transmitting pulse length in microsecond..Max. 200  $\mu$ s

The Tx pulse length (or pulse duration) of the transmitted signal is to ensure that the device transmits sufficient energy for the reception of the signal. The energy delivered to a target is the product of two parameters; the output power and the duration of transmitting signals.

Interval, sec : Transmitting pulses interval (repetition rate) in seconds

Tx Power, dB : Transmitted pulse power in dB, 0dB (max power), -48dB (minimum power)

## (3) Receiver setup



The Receiver setup window contains the following controls:

- Gain, dB: A dropdown menu showing 0.
- TVG spread coef.: A dropdown menu showing 15.
- TVG absorb, dB/m: A dropdown menu showing 0.14.
- Attenuator,  $\mu$ s: A dropdown menu showing 0.

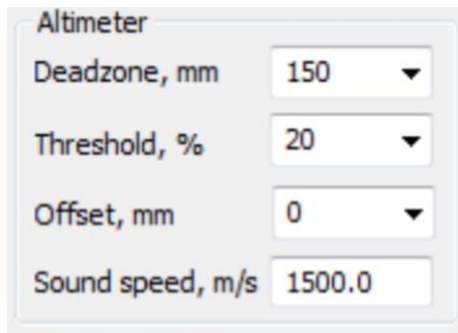
Gain, dB : Receiver gain in dB

TVG spread coef : Spreading coefficient of transmission losses for time variable gain (TVG). This t is a part of TVG formula:  $TVG(R) = K * \log(R/R_0) + R * ATL$

TVG absorb, dB/m : Absorption coefficient of transmission losses for TVG This is a part of TVG formula:  $TVG(R) = K * \log(R/R_0) + R * ATL$ .

Attenuator,  $\mu$ s : Initial time interval to attenuate -20dB analog input

#### (4) Altimeter setup



The Altimeter setup window contains the following settings:

Parameter	Value
Deadzone, mm	150
Threshold, %	20
Offset, mm	0
Sound speed, m/s	1500.0

Deadzone, mm : Set initial dead zone in millimeter

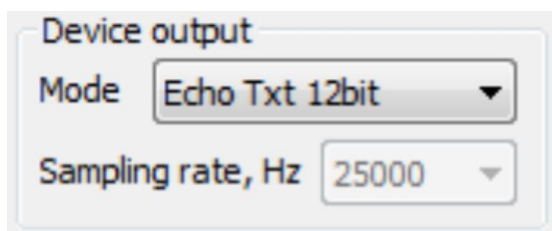
Transducer rings (reverberates) for some time after transmission of signal. The dead zone or ring down zone is an area where detection of the reflected signal is not clear due to the ringing.

Threshold, % : Receiver signal detection threshold in percent of full scale.

Offset, mm : Device position offset in milimeter

Sound speed, m/s : Speed of sound in the medium used for calculation of distance

#### (5) Device output setup



The Device output setup window contains the following settings:

Parameter	Value
Mode	Echo Txt 12bit
Sampling rate, Hz	25000

Altimeter NMEA mode : NMEA 0183 format

Echo sounder text output mode 10 bit mode / Echo sounder text output mode 12 bit mode

: Full backscatter data in text(ascii) format containing full internal ADC resolution data. They are up 6 times slower than binary format and obviously take more space in memory

Echo sounder binary output 12 bit mode

: Full backscatter data in binary format, containing full internal ADC resolution data

Echo sounder binary output 8bit companded mode

: Contain 12 bit data compressed into 8 bit. Takes half a space than 12 bit data but has some error (max. 3.125%)

Refer to output formats documentation for additional information.

Sampling rate, Hz : Inform on sampling rate related to bin sizes. Not changeable



## (6) Apply / Playback

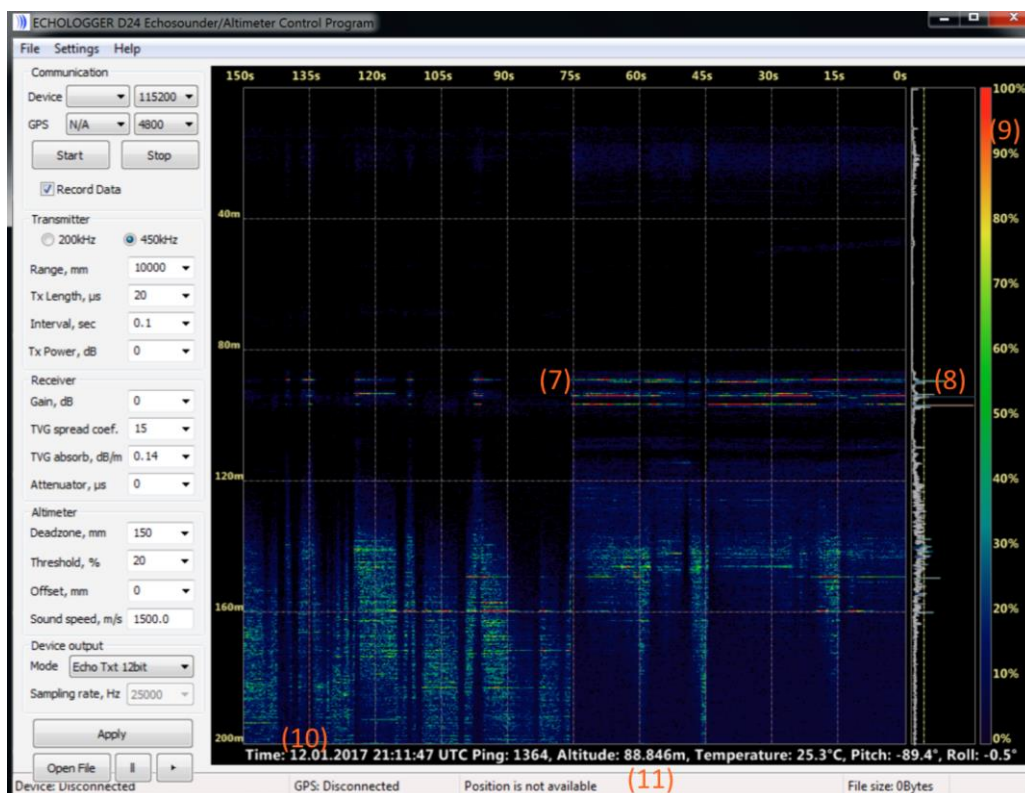


Apply : Should be pressed in order to send selected parameters to the device. Otherwise, the selections are not in effect yet

Open file : Select a file to playback. It supports all formats listed in device output setup



: pause and re-play



## (7) Backscattering Echo Viewer

This screen shows full backscatter data for latest 10seconds – 5 minutes history of output signal. Range(Y axis) can be changed by scrolling the mouse. Time(X Axis) can be changed by Shift + scrolling the mouse

Viewer area can be extended to full-window by clicking Ctrl + Left Mouse button. Screenshot can be taken by clicking Right Mouse button. Picture files from screenshot are saved to the preset Working folder

(8) Current ping echogram

This area show backscattering echogram for the latest ping

(9) Echo signal color palette

(10) Additional information from the device

This line shows current time from device in UTC, current ping number, measured altitude(distance), temperature and tilt information

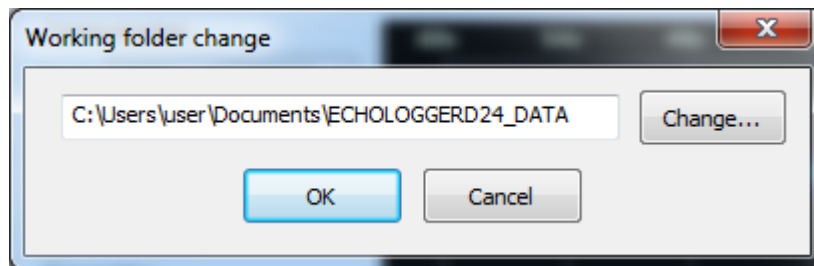
(11) GUI status line

This line shows GUI status, i.e., current connection, device ID, latest GPS position and file size recorded

(12) Working folder

Working folder is where all data and screenshot are to be saved

Go to “settings” → ”Working folder” in the Menu to change the folder



**\* Sampling Rate**

The sampling rate is relevant only for the Echosounder mode. GUI will automatically set a maximum Sampling rate depending on the Range:

- 1 ~ 50m : 100kHz
- 60 ~ 100m : 50kHz
- 120 ~ 200m : 25kHz

On the command line (Without GUI )

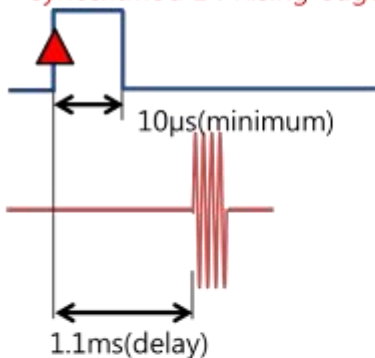
“**#samplfreq**” - Command for set an internal ADC sampling frequency. This setting is only for Echosounder modes. It has fixed values at 100000, 50000, 25000, 12500, 6250 Hz. If 0 (default) is selected, the sampling frequency is automatically set depending on #range value, it is determined by internal memory availability. If user set improper value for a certain range, device may send a warning message “Buffer overrun” during working cycle and can reset continuously until proper value or 0 is set

#### 4. Synchronization

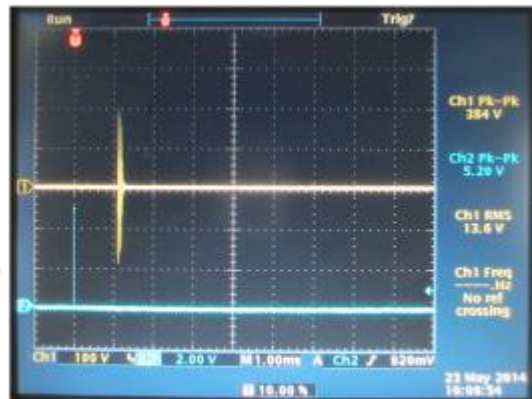
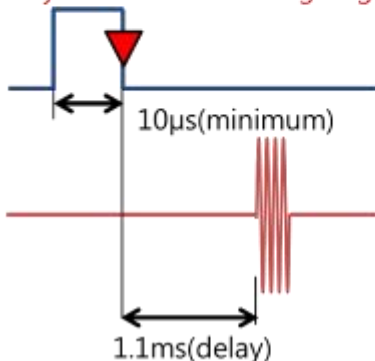
Change the parameters for synchronization is only available from a terminal program

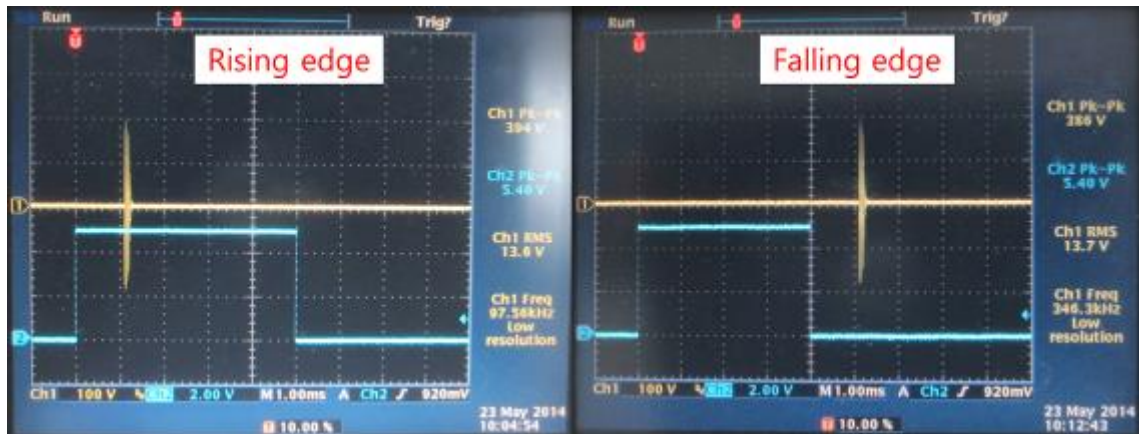
- (1) Start a terminal program and set a correct port information (Com No. and baud rate)
- (2) Switch on Echosounder by supplying power. After initialization, the device will start work and send data strings
- (3) Press "space bar" to stop sending data, not it is ready to control
- (4) Type "#info" and find out device ID
- (5) Command "#syncextern" to select internal sync mode (0), or external sync mode (1)  
: At internal sync mode "#syncextern = 0" (default setting), device will transmit sync pulses (Duration~1ms, Amplitude~4.5V)
- (6) Command "#syncoutpol" to set polarity of transmit pulse  
: "0" : inverting pulse or "1" (default setting) : positive pulse
- (7) Command "#syncextmod" to define triggering edge for external sync mode  
: "0" : Falling or "1" ; Rising(default setting)

#syncextmod 1 : Rising edge synchronization



#syncextmod 0 : Falling edge synchronization





(8) After selecting all parameters, enter "#go" to start

## 5. Echologger D24 Data Output Formats

(1) Echosounder text output (#output 2 or #output 4)

This mode includes NMEA messages. When #OutputMode = 2, data sample values are 10 bit (0~1023). When #OutputMode = 4, data sample values are 12 bit (0~4095).

Output parameter	Description
#DeviceID D24USB001 Type USB	Device ID number and device type
#TimeWork 343589.814	Working Time in seconds
#Ping 48727	Internal Ping Number
#Altitude 0.4964	Altitude measurement
#Temperature 28.05	Temperature measurement in centigrade
#NSamples 400	Number of echo signal samples in the current record
#Resolution,mm 7.500	Resolution in millimeters (distance between each sample of echo amplitude)
#Sampling_Frequency,Hz 100000	Sampling frequency
#SoundSpeed,mps 1500.00	Current speed of sound, mps
#Tx_Frequency,Hz 447000	Transmitting frequency, Hz
#Range,m 3.0	Range in meters
#Interval,sec 0.100	Interval between pulses, seconds
#Threshold,% 10	Threshold in % of Full Scale
#Offset,m 0.000	Offset, mm
#Deadzone,m 0.200	Deadzone, m
#PulseLength,uks 50	Tx pulse length, $\mu$ s
#TxPower,dB -6.000	Transmitter power, dB
#TVG_Gain -6.000	Receiver Gain, dB
#TVG_Slope 1.000	Parameter not using
#TVG_Mode 1	TVG mode
#OutputMode 4	Output mode
#Pitch, deg 1.200	Output, $\pm 90^\circ$ x-axis inclination from tilt sensor

#Roll, deg 0.600	Output, $\pm 90^\circ$ y-axis inclination from tilt sensor
##DataStart	Data start point
0	First echo sample (Value 10bit 0~1023 or 12 bit 0~4095 depend of #OutputMode)
0	
0	
0	
9	
22	
34	
37	
38	
32	
26	
18	
10	
5	
3	
7	
6	
11	
14	
19	
24	
21	
24	
24	
23	
26	
2	
...	
##DataEnd	End of data
\$SDZDA,022303.81,16,09,2016,00,00*40	NMEA ZDA message
\$SDBT,1.629,f,0.496,M,0.238,F*08	NMEA DBT message
\$SDXDR,A,1.2,D,PTCH,A,0.6,D,ROLL*4E	NMEA XDR message for tilt
\$SDMTW,28.0,C*0E	NMEA MTW message
\$SDXDR,A,63.98,P,EMA*2B	NMEA XDR message for Echo Max. Amplitude



(2) NMEA output (#output 3)

Refer to NMEA 0183 specification

Message	Meaning	Description	Format example
\$SDDBT	Depth below transducer	Water depth referenced to the transducer's position. Depth value expressed in feet, meters and fathoms.	\$xxDBT,FEET,f, METRES,M, FATHOMS,F*hh<0D><0A>
\$SDDPT	Water Depth	Water depth relative to the transducer, the depth offset of the transducer, and maximum depth that the sounder can detect a sea-bed (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<0D><0A>
\$SDMTW	Mean Temperature of Water	Water temperature in degrees centigrade.	\$xxMTW,TEMPERATURE,C*hh<0D><0A>
\$SDZDA	Time and Date	UTC, day, month, year, and local time zone.	\$xxZDA,hhmmss.ss,dd,mm,yyyy,hh,mm*hh<0D><0A>
\$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<0D><0A> > \$xxXDR,A,X.XX,P,EMA*hh<0D><0A>

### (3) Echo sounder binary output (#output 100 or #output 101)

There are 2 echo sounder output data formats: 12 bit format and 8 bit companded format.

Common structure:

HEADER
DATAGRAM

Datagram header:

Field Size	Description	Data type	Comments	Value
8	magic	char[]	Magic value	"ECHOLOGG"
2	packetid	char[]	Packet ID	"EC" or "GP"
4	length	uint32	Packet length include header	42-26760

Echosounder datagram format:

Field Size	Description	Data type	Comments	Value
4	time	uint32	time as seconds elapsed since midnight, January 1, 1970	0-ULONG_MAX
4	timems	uint32	ms fractional time portion	0-999
4	pingnum	uint32	Ping number	0-ULONG_MAX
4	altitude	float	Measured altitude	0-200
4	temperature	float	Water temperature	-10 - +50
4	pitch*	float	Tilt data X	-90 - +90°
4	roll*	float	Tilt data Y	-90 - +90°
4	dataformat	int32	Data format of echo sounder samples	0 – 12bit, 1 – 8bit companded
4	samplesnum	int32	Number of echo sounder samples	144-30000
144-13340	samples	uint16[]	Samples	0-4095 or 0-255

\* when tilt information is available

A GPS datagram format (only for GUI output). Record after each echo sounder datagram

Field Size	Description	Data type	Comments	Value
4	latitude	float	Latitude	-90 - +90°
4	longitude	float	Longitude	-180 - +180°
4	time	uint32	GPS fix time as seconds elapsed since midnight, January 1, 1970	0-ULONG_MAX
4	PDOP	float	Position (3D) dilution of precision	0-100
4	datavalid	int32	Validity of GPS data	0 - not valid, 1 - valid

Expanded table for 8bit compressed values:

```
uint16_t uncompand8to12[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) Simple altimeter output (#output 1).

Output only a current measured altitude in meters.

Format: VALUE\_IN\_METERS<CR><LF>

Example:

```
0.1235
0.1234
0.1233
0.1234
```

## Appendix 1. Echosounder D24 commands description

### Basic settings

Command	Description	Values	Unit
#help, #info, ?	Show info screen	N/A	N/A
#default	Set default settings	N/A	N/A
#reset	Reset device	N/A	N/A
#descript	Set device's description	1-31 text characters	text
#setfreqlow, #setfl	Set low working frequency	N/A	N/A
#setfreqhigh, #setfh	Set high working frequency	N/A	N/A
#echo	Set terminal "echo" input mode	0/1	N/A
#go	Start device	N/A	N/A
#range	Set working range	1000-200000	mm
#interval	Set ping interval	0.01~10	seconds
#threshold	Set threshold	10~80	% of FS
#offset	Set offset	±1000	mm
#deadzone	Set dead zone	0~1000	mm
#txlength	Set TX pulse length	10~200	μseconds
#sound	Set speed of sound	1000~2000	m/s
#output	Set output mode	1/2/3/4/100/101	N/A
#gain	Set gain	±60	dB
#tvemode	Set TVG mode	0~4	N/A
#tvgabs	Set TVG absorb coefficient	0~2	N/A
#pingonce	One-shot ping	0/1	N/A
#time	Set/Get current UTC time	0~4294967295	seconds
#speed, #baudrate	UART speed	2400~3000000	baud
#syncextern	Set external synchronization	0/1	N/A
#syncextmode, #syncextmod	Set ext. pulse polarity	0/1	N/A
#syncoutpol	Set out pulse polarity	0/1	N/A
#nmeadbtt	NMEA DBT message enable	0/1	N/A
#nmeamtw	NMEA MTW message enable	0/1	N/A
#nmeaxdr	NMEA XDR message enable	0/1	N/A
#nmeaema	NMEA EMA message enable	0/1	N/A
#nmeazda	NMEA ZDA message enable	0/1	N/A

#### #help, #info, ?

Command shows information about device and list of commands available for user

#### #default

Command set all setting to default state.

#### #reset

Command do reset the device and start work. Can be used after user has changed a serial port speed

#### #descript

Command for set a device's description string. May contained up to 31 symbols. This text shows on #info screen and available on empty #descript command

#### #setfreqlow, #setfl

Command for set a low transmitting frequency. It has no parameters

#### #setfreqhigh, #setfh

Command for set a high transmitting frequency

**#echo**

Command for set an “echo” mode for a command output. All characters entered will be echoed back

**#go**

Start working cycle

**#range**

Set a device’s working range. Only fixed ranges are available: 1, 1.5, 2, 3, 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 150, 200 meters. This setting is in mm. (1m – 1000mm)

**#interval**

Command for set interval between transmitting pulses. It can be any value from interval of 10 milliseconds to 10 seconds. This setting is in seconds

**#threshold**

Command for set an internal threshold in percent of full scale for distance measurement

**#offset**

Command for internal offset in mm. User can compensate device’s installation offset

**#deadzone**

Command for set a dead zone, the range which is not use for distance measurement. Recommended minimum value for 450kHz – 150mm, for 200kHz – 200mm

**#txlength**

Command for set a transmitting pulse length in microseconds. Any value from 10us to 200us can be set. Actual pulse contains whole number of periods of the working frequency

**#sound**

Command for set a speed of sound at the area. This parameter affects a TVG and a distance calculation.

**#output**

Command for set a output mode. Valid values are **1** – simple altimeter mode, **2** – 10-bit text echo sounder mode, **3** – NMEA mode, **4** – 12-bit text echo sounder mode. **100** – 12-bit binary output, **101** – 8-bit binary output (12-bit companded to 8-bit) this increased data throughput but add some (max. 3.125%) error to echo signal

**#gain**

Command for set a receiver’s gain for currently active frequency. Any value from -60dB to +60dB can be set

**#tvgmode**

Command for set a TVG (Time Variable Gain) mode. 1 – gain +  $K \cdot \log(R)$  +  $TL \cdot R$ , 2 – gain +  $K \cdot \log(R)$ , 3 – gain, 4 – gain +  $TL \cdot R$

**#tvgabs**

Command for set a absorption coefficient for current working frequency. Any values from a 0 to 2dB/m can be set

**#pingonce**

When this value is set to 1 - device make only one measurement cycle by #go command. If set to 0 – device will works continuously after #go command (default).

**#time**

Command for set the time counter as seconds since 1970/01/01 00:00 UTC. Clear upon reset. User must set it before send #go command for proper time output

**#speed, #baudrate**

Command for set UART the connection speed. Have values 2400/4800/9600/19200/38400/57600/115200/230400/460800/921600/3000000bps  
Setting of the 3000000bps use only with USB connection

**#syncextern**

Command for set an external synchronization mode



### #syncextmode, #syncextmod

If 0 – external synchronization is on falling edge, if 1 – external synchronization is on rising edge

### #syncoutpol

Command for set an out pulse polarity. 0 – negative pulse polarity, 1 –positive pulse polarity.

### Extended settings

Command	Description	Values	Unit
#txpower	Set transmit power level	0~(-40)	dB
#gainfl	Set gain for low frequency	±60	dB
#gainfh	Set gain for high frequency	±60	dB
#tvgsprcoef	Set spreading law coefficient.	10~40	N/A
#tvgabslow	Set TL value	0~2	dB/m
#tvgabshigh	Set TL value	0~2	dB/m
#attn	Set attenuator on time	0~300000	μseconds

### #txpower

Command for set a transmitter's output power. Any value from 0 to -40dB can be set. By set this parameter user can reduce transmitter's power for getting proper echo values in the near zone

### #gainfl

Command for set a receiver's gain for low frequency. Any value from -60dB to +60dB can be set

### #gainfh

Command for set a receiver's gain for high frequency. Any value from -60dB to +60dB can be set

### #tvgsprcoef

Command for set a spreading law transmission losses **K** coefficient in TVG equation  $K \cdot \log(R)$ . Any value from 10 to 40 can be set

### #tvgabslow

Command for set an absorption transmission losses coefficient for low frequency. Any value from 0 to 2dB/m can be set

### #tvgabshigh

Command for set an absorption transmission losses coefficient for high frequency. Any value from 0 to 2dB/m can be set

### #attn

Command for set a turn on time for input signal attenuator (fixed at -20dB). If value> 0 this attenuator enable for preset time right after transmitting pulse.

### Output settings

Command	Description	Values	Items
#samplfreq	Set output sampling frequency	6250~100000	Hz
#medianflt	Set median filter value	3~21	N/A
#moveavgflt	Set SMA filter	2~12	N/A
#nmeerate	Set NMEA output rate	0~1	seconds
#nmeadpzero	Set NMEA DPT/DBT zero value output	0/1	N/A
#nmeadptoff	Set NMEA DPT offset	±50	meters

### #samplfreq

Command for set an internal ADC sampling frequency. This setting is only for echo sounder modes. It has fixed values at 100000, 50000, 25000, 12500, 6250 Hz. If set to 0 (default) – sampling frequency is automatically set depend on #range value, it determined by internal memory availability. If user set improper value for a certain range, device may send "Buffer overrun" message during working cycle and can reset continuously until proper value or 0 set again

### #medianflt

Command for set a median filter odd window value. This filter applied first for the calculated distance value. If this value is < 3 filter disabled

### #moveavgflt

Command for set a simple moving average (SMA) filter window. This filter is applied after median filter. If this value is < 2 filter disabled

### #nmearate

Command for set a NMEA output rate. This is minimum interval between NMEA messages bundle. Main interval is determined by #interval value. For example if #interval = 0.2 seconds and #nmearate = 0.5 seconds final NMEA output interval will be 0.6 seconds

### #nmeadpzero

Command for configure a SDDPT/SDDBT output. If 0 and distance is not detected NMEA SDDPT/SDDBT messages show no distance values. If 1 and distance is not detected NMEA SDDPT/SDDBT messages show 0.0 distance values

### #nmeadptoff

Command for set a NMEA DPT offset. This offset affect only \$SDDPT message. Positive offset mean DPT show distance to surface, negative – distance to keel. Value is in meters

## Analog Output

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

### #anlgmode

Command for set a device's analog output mode (if available). 0 – for distance output, 1 – for envelope output (80μs sampling rate)

### #anlgrate

Command for set a device's analog output voltage per meter rate. This value can be set from 0.005V/m to 10V/m

### #anlgmax

Command for set a maximum output voltage. Only 10V/5V/2.5V/1.25V can be set. Because of 12 bit DAC resolution, when #anlgmode = 1, 5V output is 11 bit resolution, 2.5V – 10 bit, 1.25V – 9 bit

## Multinode interface commands

Command	Description	Values	Items
#mniface	Enable multi-node interface	0/1	N/A
#mnid	Set multi-node network id	1~240	N/A
#mnsync	Set multi-node synchronization	0/1/2	N/A

### #mniface

Command for enable a multi-node interface mode. 0 – disable multi-node interface, 1 – enable multi-node interface

### #mnid

Command for set a node id in multimode network

### #mnsync

Command for set a multimode synchronization mode. It can be internal, external or by special synchronization packet

**#nmeadbtt**

Command for enable a NMEA DBT message in NMEA mode output. 0 – disable message output, 1 – enable message output.

**#nmeadpt**

Command for enable a NMEA DPT message in NMEA mode output. 0 – disable message output, 1 – enable message output.

**#nmeamtw**

Command for enable a NMEA MTW message in NMEA mode output. 0 – disable message output, 1 – enable message output.

**#nmeaxdr**

Command for enable a NMEA XDR message for tilt values in NMEA mode output. 0 – disable message output, 1 – enable message output.

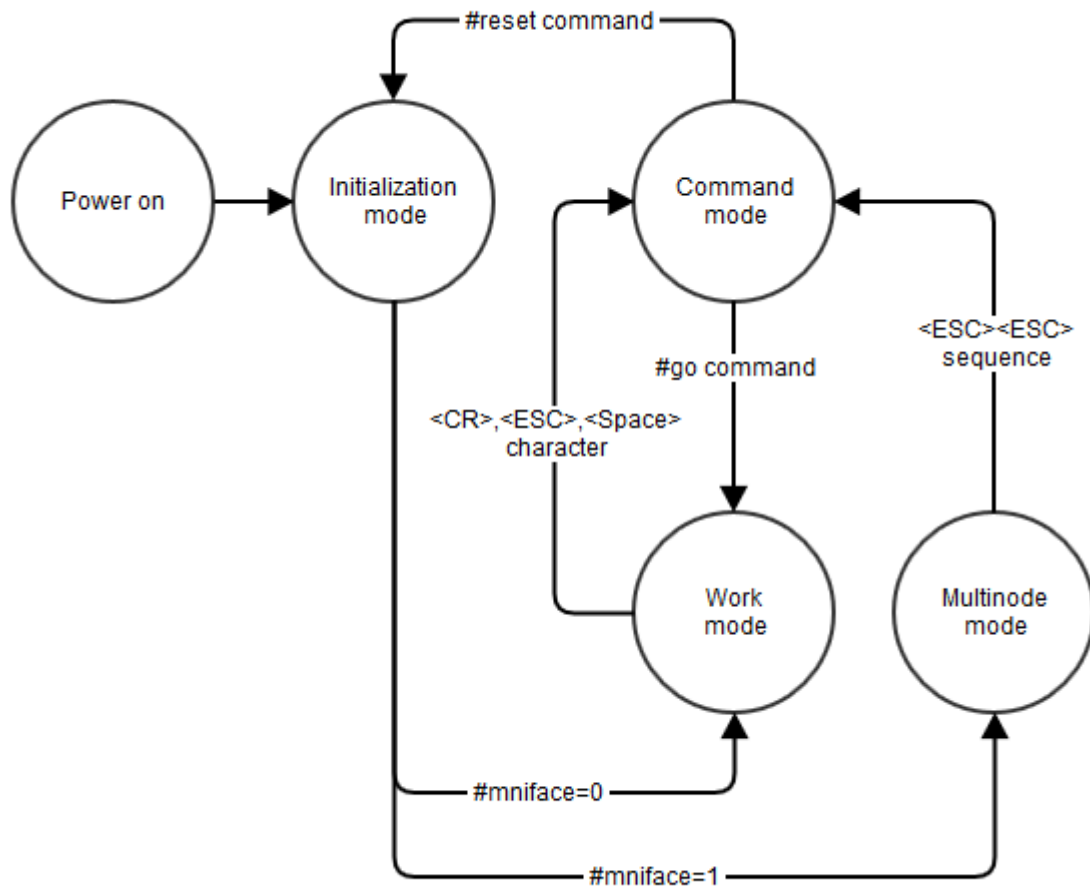
**#nmeaema**

Command for enable a NMEA XDR message for EMA (echo maximum amplitude) value in NMEA mode output. 0 – disable message output, 1 – enable message output.

**#nmeazda**

Command for enable a NMEA ZDA message in NMEA mode output. 0 – disable message output, 1 – enable message output. #time command should be issues for set proper time value before use NMEA ZDA.

## Appendix2. Echosounder D24 Multinode Protocol Description



Multi-node interface should be always enabling by “**#mniface 1**” command after exit multi-node mode and changing parameters. User should properly configure the multimode id by “**#mnid**” command. User should properly configure type of synchronization by “**#mnsync**” command. All setting should be done in command mode.

### (1) Packet description

All multi-byte values (int16, int32, float32) are in LSB first order (Little-Endian)!

Packet contains 3 parts:

Header	Payload data	Footer
--------	--------------	--------

Header structure:

Field Size	Description	Data type	Comments	Value
2	magic	uint8[2]	Magic sentence	"PK"
1	nodeid	uint8	Node ID	0-240
1	channelid	uint8	Channel ID	0-127 for request, 128-255 for response
1	reserved	uint8	Reserved	N/A
1	datalen	uint8	Length of data	0-240

4	time	uint32	Internal time stamp	0-ULONG_MAX
2	crc	uint16	CRC16/CCITT of header	0-65536

“**node id**” can be any value from 1 to 240. If a value is equal to 0 this means a broadcast packet.

“**channel id**” can be 0,1 or 254, 0 – for synchronization packet, 1 – for data request packet, 254 – shutdown packet.

“**time**” can be any value, preferable an internal time in milliseconds.

“**data length**” for synchronizing packet and for data request packet is always equal 0.

Footer structure:

Field Size	Description	Data type	Comments	Value
2	datacrc	uint16	CRC16/CCITT of data	0-65536
2	magic	uint8[2]	Magic sentence	<CR><LF>

In case of “**data length**” equal 0, data crc16 is 0xFFFF;

Maximum total data length of Header + Data + Footer is 256 bytes.



## (2) Synchronization Packet (Single node/All nodes)

When the multimode protocol synchronization is set as “Packet synchronization” this mean the transmitting signal occurred only if the device receive a special synchronization packet. Synchronization packet for single node have channel id 0 and node id is equal to node id which we want to enable transmitting. When we want to transmit a signal by all nodes at once we have to set the channel id to 0 and the node id to 0. There is no response packet for synchronization packet. **Synchronization packet should not have payload data.**

## (3) Shutdown packet (Single node only)

This packet can be send to individual node for shutdown until node will be power cycled.

## (4) Data request Packet

This packet can be send asynchronously not depend of the ping rate. Device returns the last measured distance, temperature, pitch, roll and maximum echo amplitude values in response packet.

## (5) Data response Packet

In Response Packet the channel id has always “1” in MSB!

Response packet structure is similar to request packet structure

Header	Payload data	Footer
--------	--------------	--------

Payload data structure:

Field Size	Description	Data type	Comments	Value
4	altitude	float32	Altitude value, m	0-200
4	temperature	float32	Temperature value, degree	-10 -+50
4	pitch	float32	Pitch, degree	-90 - +90°
4	roll	float32	Roll, degree	-90 - +90°
4	ema	float32	Maximum amplitude of echo, % of Full scale	0-100%