SONAVISION

ECHO

INSTALLATION MANUAL

Part Number: 5253-31-0003

TECHNICAL SUPPORT

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Sonavision Limited warrants that its products are free from defects at the time of delivery and subject to the conditions listed below, undertakes to repair, or at its option replace, any product found to be defective in material or workmanship within one year after delivery, whichever is less, to the original purchaser by Sonavision Limited or its authorised representative.

CONDITIONS

1   Sonavision Limited must be immediately notified of any suspected defect and if advised by Sonavision Limited, the equipment subject to defect shall be returned to Sonavision Limited, freight prepaid.

2   This warranty does not cover defects which are caused as a result of improper usage, repair, maintenance, alteration or installation unless such activities have been undertaken by Sonavision Limited or its authorised representative.

3   On completion of any warranty work, Sonavision Limited will return the equipment, freight prepaid.

4   Sonavision Limited retains the sole right to accept or reject any warranty claim.

GENERAL WARNINGS

1   Lethal voltages are exposed within the surface control unit when the top cover is removed.

2   The surface control unit should always be disconnected from the mains supply before removing or operating any of the access panels.

3   The surface unit should be earthed at all times via the mains earth or the chassis stud at the rear of the control unit.

4   Both surface and subsea units contain electrostatically sensitive devices (ESSD).

RELATED INFORMATION

Description	Part Number
Centaur/Echo operation manual	5253-32-0001
Echo troubleshooting manual	5253-33-0001
Echo transducer change manual	5253-35-0001
Technical sales brochure	-

1   Introduction

The Echo Altimeter is a highly accurate echo sounder with a resolution of 1mm. There are 3 depth rated version 300m, 1000m, 3000m and 6000m. Two frequencies of operation are available, 200 kHz (Red transducer) and 500 KHz (Blue transducer). The frequency can be changed at any time by swapping the transducer and setting a single switch.

The device is power by 12 – 48 Volts d.c. and communicates over RS232 or RS485. In addition a user-selectable analogue output is available.

2   Functionally of the Echo

Note: All settings of the Echo are changed using Sonavision software supporting the Echo

2.1   Communication

The Echo supports RS232 and RS485 on the following baud rates

4800
9600
19200
38400
115200

When powered up the Echo resorts to an RS232 / RS485 auto detection mode for 5 seconds. If no connection is established using the SV Protocol within this 5 second window the Echo will revert to a pre-programmed mode of output. This output will be 1 of the selectable modes of output as described in the "Data Output" section of the manual.

The factory default baud rate is 9600 this is changeable by the user.

2.2   Data Output

There are three methods of accessing the information acquired by the Echo altimeter

2.2.1   Data on request via the SV protocol

Reading are requested and received by a system communicating with the SV protocol

2.2.2   Streamed output

The Echo can be configured to stream data on either RS232 or RS485 at a user specified repetition rate up to a maximum of 20 outputs per second. A list and format of the current strings are specified in the appendix section of this manual.

2.2.3 Analogue voltage output

An analogue output representing the Echo's reading is always available to the user via a pin on the connector. The voltage range is selectable between 2 configurable voltage ranges. The factory default configurations are calibrated as 0 – 5 volts and 0 – 10 volts. The user can select either the 0 – 5 voltage range or 0 – 10 voltage range. These voltage ranges are also user configurable.

Note: The range selection determines what the maximum voltage output represents.

e.g.　Max Range = 30 meters　　analogue voltage range = 0 – 5 volts

0 V = 0 meters or greater than 30 meters
2.5 V = 15 meters
5 V = 30 meters

2.3　Range Selection

The Echo allows a maximum range to be set by the user, this range is from the Echo's transducer to the object (one way). Any echo's received beyond this range are ignored.

If it is known that the Echo is working no more than a certain distance from a target then it is recommended to set the maximum range to slightly more than this distance. This will focus and optimize the echo's AGC, analogue output and ping rate to the working distance.

2.4　Automatic Gain Control (AGC)

If enabled AGC will adjust the gain of the receiver in an appropriate fashion so that long range echoes are boosted increasing range capabilities and short range echoes are attenuated allowing accurate short range use.

2.5　Filtering Data

The data outputted from the device can be filtered using 1 of 5 filtering methods. Each method has 24 intensities meaning that 120 unique algorithms for smoothing data are available.

Filter Method	Description
Mean	Add n number of samples and divide by n
Median	Order n samples in a sequential fashion and return the middle value.
Median 1	Order n samples in a sequential fashion and return the mean of the middle and 2 adjacent samples. (Average of 3 center values).
Median 2	Order n samples in a sequential fashion and return the mean of the middle and 4 adjacent samples. (Average of 5 center values).
Median 3	Order n samples in a sequential fashion and return the mean of the middle and 6 adjacent samples. (Average of 7 center values).

n can take any integer value between 8 and 31

2.5.1 Effects of Increasing Samples

Increasing the number of samples in the filtering method will delay the output data by the number of samples in the filtering method. If the Mean of 8 filtering method is applied then the output will be delayed by 8 samples. The effect can be seen below, with the green line the filtered version of the raw data.


| Mean of 8 | Mean of 31 |
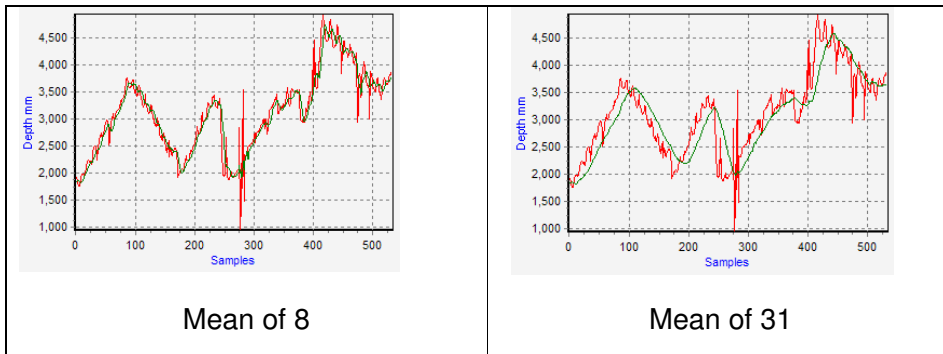
2.5.2 Choosing a Filtering Method

The choice of algorithm and the intensity to which it is used is based upon the environment and desired output. The Mean algorithm will smooth out any variations but not remove extremes so data may contain spikes that are error readings.

The Median type algorithms will very likely exclude any extremes and output only true measurements. Taking the mean of the center sample as Median 1 does effectively smoothes the true measurements. The further the sample is from the center the more likely it could be an incorrect reading. So using Median 3 on 8 samples of data is much more prone to errors than Median 1 on 8 samples. Increasing the number of samples will improve this but introduce delay.

2.5.3 Filtering Examples
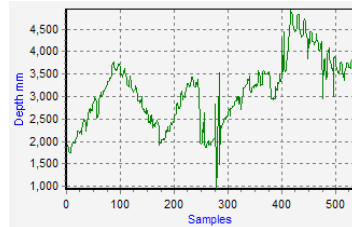
Unfiltered Data

	8 Samples	16 Samples	31 Samples
mean			
Median			
Median 1			
Median 2			

Median 3
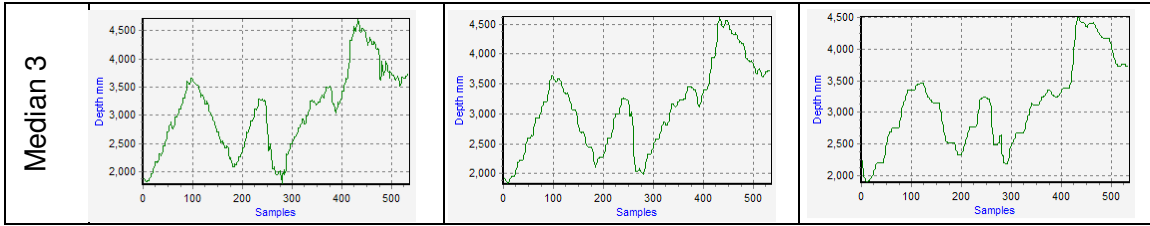
2.6   Changing Frequency

The electronics inside the Echo support 200 kHz and 500 kHz. In order to change the operating frequency of the Echo the transducer must be changed to one that is designed to operate on the required frequency. Refer to the "Echo transducer change" manual (part number 5253-35-0001) for details on how to do this.

2.7   Updating Firmware

The Echo has been equipped with a boot loader allowing the user to update the firmware version. Reloading the firmware will not result in loss of settings.

3   Appendix A

3.1   String Output

3.1.1 Sonavision
Example: #SV,1000<CR><LF>
Format: #SV,d<CR><LF>

d is the depth in mm from the transducer's face to the object (one way).
The length of d varies from 1 to 10 characters and there are no leading 0's.
d has the range 0 to 4294967296.

Depth reading examples:
0	displayed when an echo is lost
1001	1.001 m
12543	12.543 m
100000	100.000 m

3.1.2 Sonavision Time
Example: #SV,5738<CR><LF>
Format: #SV,t<CR><LF>

t is the time in 125 nano second units for the ultrasound to travel from the transducer's face to the object (one way).
The length of t varies from 1 to 10 characters and there are no leading 0's.
t has the range 0 to 4294967296.
With a speed of sound of 1500m/s, 125 ns equates to 0.1875 mm of sound travel. This is the highest resolution this string can provide.

Formula to convert to depth:

Depth = t × 0.000000125 × Speed of sound

Example:
t = 9000, Speed of sound = 1500 m/s
9000 × 0.000000125 × 1500 = 1.6875 m

Depth reading examples - speed of sound assumed to be 1500 m/s:
0	displayed when an echo is lost
8734	1.6376 m
386496	72.4680 m

3.1.3 UK94
Example: <STX>U00000000+00000003F<CR><LF>
Format: <STX>Upppppppp+tttttDDDD<CR><LF>

p is the pressure and is always a fixed length of 8.
t is the temperature and is always a fixed length of 5.

p and t will always be 0 as these sensors are not fitted to the echo.

D is the depth in hexadecimal. It is a 16 bit number with a range of 0x0000 to 0x0FFF, representing 0 to 30 m. The 4 hexadecimal ASCII character are capital letters.

The highest resolution this string can provide is 7.32 mm.

Formula to convert to depth:
In the formula D is assumed to be the decimal representation of the hexadecimal D
$$depth = (30 \div 4095) \times D$$

Depth reading examples:
0000	displayed when an echo is lost
00AF	1.28 m
05B7	10.71 m

3.1.4 Mesotech

Example: +00023<CR><LF>
Format: +ddddd<CR><LF>

d is the time, in 11.3932 microsecond units, for the ultrasound to travel from the transducer and back (both ways).
d always has 5 digits and the + sign is always present.

With a speed of sound of 1500m/s 11.3932 µs equates to 8.5449 mm of sound travel. This is the highest resolution this string can provide.

Formula to convert to depth:

$$Depth = (ddddd \times 11.3932 \times \text{Speed of sound}) \div 2000000$$

Example:
ddddd = 00365, Speed of sound = 1500 m/s

$(00365 \times 11.3932 \times 1500) \div 2000000 = 3.1188885$ m

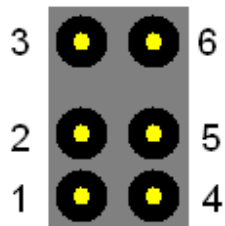Depth reading examples - speed of sound assumed to be 1500 m/s:
00000	displayed when an echo is lost
00100	0.85 m
96845	827.53m

4   Appendix B

4.1   Connector Pin out

Pin	Function
1	Analogue out (referenced to pin 5)
2	+12 to +48 (typ +24) Volts Power
3	RS232 Ground
4	RS232 RX (data in) / RS485 -
5	0 Volts Power
6	RS232 TX (data out) / RS485 +

```
3  ●  ●  6

2  ●  ●  5

1  ●  ●  4
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View from pin side of
connector

5 Appendix C

5.1 Specification

Supply voltage   12 – 50 VDC,
Max power consumption   6 W
Typical current consumption   215 mA @ 24 VDC

Communications   RS232 / RS485, 8-N-1 serial format
Output mode   Free running, interrogated, multidrop

Analogue Output   0 to a maximum of 10 volts d.c
Analogue resolution   0.024% of range
*Analogue accuracy   0.24% of range

Digital resolution   0.1875 mm
*Digital accuracy   ±15 mm

Storage temperature range   -20 ℃ to + 70 ℃
Operating temperature range   -10 ℃ to + 40 ℃

Length   130 mm
Diameter   79 mm
Weight (Acetal in water)   400 g
Connector   LPBH6M
Mating connector   LPIL6F

Housing material	Depth ratings
Acetal	300 m
Stainless steel	1000 m
Titanium	3000 m
Titanium (Grade 5)	6000 m

Frequency	200 KHz	500 KHz
Range minimum	0.4 m	0. 3 m
Range Maximum	100 m	50 m
Beam width conical	10°	6°

*Dependent on sea bed conditions