TECHNICAL SPECIFICATION

ECHOTRAC ETHERNET INTERFACE
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Revision History

Version	Date	Author	Remarks
0.1	2002	S. Apsey	Initial version – draft
0.2	11-04-2003	S. Apsey	Added draft and index to acoustic packet (See introduction)
0.3	20-08-2004	P. Oostenrijk	1. Conversion to document template. - Expanded Sampling frequency list - Renamed 'MK3' to 'Echotrac' in table headers - NAP packet header example contained '1' iso 'N' - Added USP packet structure - Added "E" type parameter packet - Added basic UDP/IP structure overview - Updated parameter list
0.4	15-10-2004	P. Oostenrijk	Minor corrections to Parameter overview list. Updated to reflect third channel support. Added special parameter Ids to parameter list.
0.5	04-15-2005	P. Oostenrijk	Updated the PulseWidth values for version 3.04
0.6	03-03-2006	P. Oostenrijk	As of 3.06 some parameter Ids were added/changed: Added Heave correction (74) Added Standby bit (75) Added UDP port (76) Added Packetsize (77) Changed Defset from 77 to 178 Changed ChartOnOff from 81 to 129 Changed Print parameters from 85 to 186 Changed User settings from 86 to 187
0.7	04-18-2006	P. Oostenrijk	Added chapter with important basic information for using the Echotrac Ethernet Interface.
0.8	05-30-2006	P. Oostenrijk	As of 3.22 some parameters values have changed. Also comments have been updated. - Range minimum 10 meter, 30 feet - Chartspeed comment: cm/min,ft/min, 15➔20 - Silt TVG Range default 9 feet, 3 meters - Outputstrings Deso-DDV (Depth,Draft,Soundvelocity) for Deso version - Channel 2 and 3 comments updated - Pulsewidth increased to 256 - Min. Channel 2 frequency 8 kHz ➔ 3 kHz.
0.9	09-26-2006	P. Oostenrijk	As of 3.27 some maximum and default parameter values have changed for the CVM which contains a Dual channel board configured as High-Low. - Channel 2 frequency defaults to 24 kHz - Channel 2 pulse width defaults to 10 - Range Updated the entire document with minor changes. Added chapter 6 with more details and scenarios about the Using the Ethernet Interface. Added Appendices with version overview for parameters.
1.0	12-14-2006	P. Oostenrijk	Parameter 78 (Mode) values are 1 and 2
1.1	01-11-2007	P. Oostenrijk	Updated page 24, parameter list overview.
1.2	01-12-2007	P. Oostenrijk	Updated page 24, Added 3.28 column.

Revision History

Version	Date	Author	Remarks
1.3	05-22-2007	P. Oostenrijk	Updated page 23, Added 3.29 column. Rearranged order of packet structures. Added Baudrate 38400 and MinGateWidth 50% Mode is only supported on Echotrac CV2/CV3. Default Outputstring for COM1 is Echotrac DBT, except for CV100. Default baudrate for COM2 is 9600.
1.4	06-05-2007	P. Oostenrijk	Spelling mistakes
1.5	08-07-2007	P. Oostenrijk	Chartspeed range is 0-15 for all Echotracs.
1.6	11-13-2007	P. Oostenrijk	Added Channel type parameters 17,18 and 19. Added S-packet and overview of differences in Appendix C. The default Baudrate for COM1 has been changed from 9600 to 19200. Section 6.7 Annotation packets. Replaced “A” with “N” and added comment to set Navigation Data field to 1. Consolidated table in Appendix B. Updated 5.1 Header Structure Added chapter 5.7 Settings Packet Added chapter 5.8 Extra ID Packet
1.7	03-28-2008	P. Oostenrijk	Updated Parameter Overview with Power values.
1.8	05-28-2008	P. Oostenrijk	Added parameter Missed Returns Replaced meters/100 with ‘centimeters’ Replaced meters/10 with ‘decimeters’ Replaced feet/10 with ‘tenths of feet’ Replaced KHz/10 with ‘hectohertz’
1.9	07-23-2008	P. Oostenrijk	Blanking reduced: 64000 dm & 64000 tenths of a foot
2.0	02-09-2012	R. Zheng	Added Appendix D: Packets and parameter set implemented in HTII

Approved

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R. Byrd	President		
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CONTENTS

1 INTRODUCTION

The Echotrac Ethernet Interface is designed to satisfy the need for exporting raw analog data in digital form for (post) processing on third party products and also provides an interface for Echotrac control.

The changes made to the initial Ethernet interface are restricted to the Accoustic Data Packet by including the Draft and Index. This will allow the data acquisition system to always have current draft and index value for the data in the packet.

The Depth value in the Accoustic Data Packet is adjusted with the draft and index correction but the acoustic data will need to be shifted depending on what draft and index are. For draft the data needs to be shifted down and for index the data needs to be shifted up. It is possible to have the Depth value corrected or uncorrected with Heave.

1.1 Purpose

The purpose of this document is to describe in detail the structure of the Echotrac Ethernet Interface to allow developers to create custom interfaces for their application. Furthermore this document is used to collect all the technical specifications/design requirements for future reference.

1.2 Scope

The content of this document is focused on the technical specifications. Information about Design requirements for applications are currently omitted but will be added at a later time. Therefore, this document is intended for the software and test engineers and those people who will be providing the support. All parties are expected to comprehend the contents of this document.

1.3 Glossary

ADP	Acoustic Data Packet
EID	Extra ID Packet
NAP	Navigation/Annotation Packet
OHSI	Odom Hydrographic Systems Incorporated
PP	Parameter Packet
USP	User Settings Packet (or User Special Packet)

1.4 References

[1] Title: TCP/IP Illustrated, Volume 1 “The Protocols”
Author(s): W. Richard Stevens
Report no: -
Version: ISBN 0-201-63346-9
Date: © 1994

2 PRODUCT DESCRIPTION

2.1 Product perspective

There are four basic types of packets: Acoustic, Navigation/Annotation, Parameter and User packets.

The Acoustic packet contains the raw signal data accompanied by extra fields such as draft, index, scale sampling frequency and a few others.

There is one packet structure that is used for Navigation and Annotation. Basically the packet allows 100 characters to be sent to or from the Echotrac. A designated field distinguishes the packet type between Navigation and Annotation. Navigation data is typically GPS data and Annotation is everything else.

The Parameter packet structure is used to send and receive parameter settings. This packet type is used to update the Echotrac with new settings. If the Echotrac makes any changes to its parameters, this packet is used to inform the application about the change. This packet structure is also used to report errors.

There is a generic User packet structure that is used for sending and receiving specific types of data. For example, to send port settings to the Echotrac or request its version numbers. This packet structure is referred to as USP, which stands for: User Settings Packet or User Special Packet.

2.2 Product Functions

The Ethernet interface is not provided as a module at this time and therefore this section is not used for describing the module's functions.

2.3 Product Interfaces

The Ethernet interface is not provided as a module at this time and therefore this section is not used for describing the module's interface(s).

2.4 Assumptions and Dependencies

The design requirements for applications are not explained at this time and the assumption is made that the software engineer has the experience and knowledge about network programming. Specifically UDP/IP.
Please see the references for more information.
Initially the Ethernet Interface was designed to uniquely identify the Echotrac that transmitted the packets using for example "#MK3" or "#ECV", etc. This is currently not available and all Echotracs use "#MK3" in the header.

2.5 Apportioning of Requirements

There is the requirement to provide the Ethernet Interface as a module that third parties can use with their applications to communicate with the Echotracs. The implementation of this requirement is scheduled for the future. Furthermore, there are also future plans to make the Ethernet Interface on the Echotracs more generic and flexible.
At this time the functionality supported by the interface is determined by the firmware version. In the future, the interface will be defined by a version.

3 ETHERNET PORT GENERAL INFORMATION

This chapter describes the general characteristics that should be known about the Ethernet Interface.

The Echotrac ETHERNET port runs at 10 Mbps and outputs 16 or 8 bit samples of the acoustic data.

We use the following convention for data types used in this document :

ASCII : For ASCII 8 bits characters or strings
uw8 : For unsigned char (8 bits)
uw16 : For non signed 16 bits word
w16 : For signed 16 bits word
uw32 : For non signed 32 bits word
w32 : For signed 32 bits word
floatI3E : For standard 32 bits float
double : For standard 64 bits double

Full scale is 5VDC on all data.
Data is encoded using the Big-Endian convention

The following abbreviations are used in this document to refer to certain Ethernet packet structures:
- ADP stands for Acoustic Data Packet
- NAP stands for Navigation and Annotation Packet
- PP stands for Parameter Packet
- USP stands for User Settings Packet (or User Special packet)
- EID stands for Extra ID information packet

Each ADP, NAP, PP, USP and EID structure contains a Header structure that is followed by a ping number, which uniquely identifies each packet transmitted across a network.

Each packet or -sub structure that is described in a separate table contains a column called Validity. This column is used to explain or show one or more examples of valid data. It is important to realize that the example may be slightly different depending on its use. A different table may show more examples.

For example, each packet structure described in a table shows the header as a text string of 8 characters, such as: “#MK3,1,M”. The ADP for the MK3 uses each piece of this header. At this time the Echotrac CV also uses “#MK3”, but in the future the Echotrac CV will actually have a slightly different header, ie. “#ECV,1,M”.
The character “1” indicates that the packet contains data belonging to the channel 1 or respectively the High Frequency channel. This character can be “2” for channel 2 or respectively the Low Frequency Channel.
The character “M” indicates that the data is in meters and an “F” indicates feet.
For the NAP packet, the units character “M” or “F” is not used at this time and can therefore be any character.

In short, when a sub-structure such as the Header structure is used in an ADP, NAP or PP structure, be sure to check the Header table for examples and do not rely on the single example in the ADP, NAP or PP structure.

When controlling the Echotrac through the Ethernet port, each of these packet structures must be encapsulated in an Ethernet packet. The Network protocol used is UDP/IP. The basic structure is shown and the internal detail of the structure is explained later. Using UDP/IP means that the packets are broadcasted across a network and not directed using an IP address. An IP address is used in the protocol header structures to allow filtering/detection of packets on the network.

4 BASIC STRUCTURE OF ETHERNET PACKET

The figure below shows the basic building blocks or header structures for a UDP/IP Ethernet packet.

Ethernet Header	(14 bytes)
IP Header	(20 bytes)
UDP Header	(8 bytes)
Data area (Example: either an Annotation or Parameter packet)	(18 – 1472 bytes)

Detailed structure of a complete Ethernet Packet

	Ethernet Header															
Bit Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	DESTINATION MAC ADDRESS															
2	DESTINATION MAC ADDRESS															
3	DESTINATION MAC ADDRESS															
4	SOURCE MAC ADDRESS															
5	SOURCE MAC ADDRESS															
6	SOURCE MAC ADDRESS															
7	ETHERNET TYPE															

	IP Header															
Bit Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	TYPE of SERVICE								IP version							
2	TOTAL LENGTH of IP PACKET (Headers+Content)															
3	IDENTIFICATION															
4	FRAGMENT OFFSET														FLAGS	
5	PROTOCOL								TIME TO LIVE							
6	HEADER CHECKSUM															
7	SOURCE IP LOW															
8	SOURCE IP HIGH															
9	DESTINATION IP LOW															
10	DESTINATION IP HIGH															

	UDP Header															
Bit Word	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	UDP SOURCE PORT															
2	UDP DESTINATION PORT															
3	UDP PACKET LENGTH															
4	UDP CHECKSUM															

5 ECHOTRAC PACKET STRUCTURES

5.1 Header Structure

The header structure is part of every packet structure and described in detail in this section.

Header					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY**	**SIZE (Bytes)**	**COMMENT**
Start	*ASCII*	N.A	"#"	1	Header start character
Sensor [1]	*ASCII*	N.A	"MK3"	3	Sensor type (CV1,CV2,CV3,CVM,MK3)
Separator	*ASCII*	N.A	","	1	Separator character
Channel type [2]	*ASCII*	N.A	"1" "2" "3" "P" "N" "U" "V" "E" [3] "S" "I" "?"	1	Type of channel in packet 1 : Channel 1 Data 2 : Channel 2 Data 3 : Channel 3 Data Side Scan P : Parameter update N : Navigation/Annotation packet U: User Settings Packet V: User Special Packet E: Error packet [3] S: Settings packet I: Identity Packet ?: Ping packet (See USP packet "U")
Separator	*ASCII*	N.A	","	1	Separator character
Units	*ASCII*	N.A	"M" "F"	1	M for meters F for feet
Total				**8**	

Sidenotes

[1] Sensor field:
Depending on which type of target is being used, the sensor field is used to identify the target.
For the Echotrac MK3, the sensor field is "MK3". This is currently used for all Echotracs.
For other Echotrac Models, unique sensor fields are currently not supported.

[2] Channel type field:
Be sure that the correct channel type is used in the packet structure that you are using. An incorrect channel type will result in the packet being rejected by the target (Echotrac MK3 or CV)

[3] Error packet:
A Parameter packet with a channel type of "E" indicates that there was an error with a parameter and parameter value returned in the packet.

5.2 Acoustic Data Packet

Echotrac Acoustic Data Packet					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**SIZE (Bytes)**	**COMMENT**
Header [1]	*Header*	N.A	"#MK3,1,M"	8	Header of a MK3 frame. See description
Ping_Number	*uw32*	N.A	$0 \leq < 2^{32}$	4	Recurrence number
Acoustic_Data	*Uw16*	N.A.	0 for bathymetry 1 for Side Scan Port 2 for Side Scan Stbd.	2	Either bathymetry or Side Scan data
Time	*Uw32*	ms		4	Time from unit power up in milliseconds
Depth	*uw32*	Centimeters or tenths of feet	0-1200000 centimeters 0-360000 tenths of feet	4	Water Depth. In meters units are centimeter in feet units are tenths of feet
Draft	*Uw16*	Centimeters or tenths of feet	0-1500 centimeters 0-500 tenths of feet	2	Draft. The acoustic data needs to be shifted down by this amount.
Index	*Uw16*	Centimeters or tenths of feet	0-1500 centimeters 0-500 tenths of feet	2	Index. The acoustic data needs to be shifted up by this amount.
Gate Hi	*uw32*	Centimeters or tenths of feet	0-1200000 centimeters 0-360000 tenths of feet	4	Upper limit of Digitizer tracking gate
Gate Low	*Uw32*	Centimeters or tenths of feet	0-1200000 centimeters 0-360000 tenths of feet	4	Lower limit of Digitizer tracking gate
Scale Width	*Uw16*	Meters or feet	5,10,20,40,80,100,200,400,800,1600 meters. 15,30,60,120,240,300,600,1200,2400,4800 ft.	2	Scale width for the acoustic data.
End of scale	*Uw16*	Meters or feet	5-12000 meters 15-36000 feet	2	End of scale for the acoustic data.
Heave, Pitch, Roll	*Attitudes_Sample*	N.A		8	Heave, Pitch and roll data is available
Nb_Samples	*uw16*	N.A		2	Number of samples in packet (Normally 1600 for meters and 1590 for feet)
Sample_Resolution	*Uw16*		1 for 8 bit data 2 for 16 bit data	2	Resolution of acoustic data
Sampling_Frequency	*uw32*	Hertz	(Normally 240Khz for 5 meter scale width 120Khz for 10 meter scale width 60Khz for 20 meter scale width 30Khz for 40 meter scale width 15Khz for 80 meter scale width) 12Khz for 100 meter scale width) 6Khz for 200 meter scale width) 3Khz for 400 meter scale width) 1.5Khz for 800 meter scale width) 0.75Khz for 1600 meter scale width)	4	sampling frequency
Acoustic Samples	Uw8 or uw16	N.A		Sample_Resolution * Nb_Samples	Acoustic data
Total				**54 + Nb_Samples *Sample_Resolution**	

[1] See Header structure for more details.

[2] **IMPORTANT**: Check the Echotrac parameter overview for the Validity values for each Echotrac Model.

5.3 Navigation / Annotation packet

Echotrac Navigation/Annotation Packet					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**SIZE (Bytes)**	**COMMENT**
Header [1]	*Header*	N.A	"#MK3,N,M"	8	Header of a MK3 frame. See description
Ping_Number	*uw32*	N.A	$0 \leq < 2^{32}$	4	Recurrence number
Time	*Uw32*	ms		4	Time from unit power up in milliseconds
Navigation_Data	*uw16*	N.A	0 for Navigation Data 1 for Annotation Data	2	Identifier of whether packet contain a string to GPS information or annotation information
Data	*ASCII*	N.A		100	Any string that is sent through the Echotrac MKIII is echoed through the Ethernet port in this packet. Annotation data that is sent through the serial port is also echoed through the Ethernet port through this packet.
Total				**118**	

[1] See Header structure for more details.

[2] **IMPORTANT**: Check the Echotrac parameter overview for the Validity values for each Echotrac Model.

5.4 Parameter Packet

Echotrac Parameter Packet					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**SIZE (Bytes)**	**COMMENT**
Header [1]	*Header*	N.A	"#MK3,P,M"	8	Header of a MK3 frame. See description
Ping_Number	*uw32*	N.A	$0 \leq < 2^{32}$	4	Recurrence number
Parameter	*uw16*	N.A.		2	Parameter that is changing. (see table)
Parameter_Value	*uw32*	N.A.		4	Parameter value that is changing. (see table)
Total				**18**	

[1] See Header structure for more details.

[2] **IMPORTANT**: Check the Echotrac parameter overview for the Validity values for each Echotrac Model.

See Appendix A for an example of a parameter packet in detail on a byte level.

5.5 Attitudes Sample Structure

The Attitudes structure contains the heave, pitch and roll information.

Attitudes_Sample					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY**	**SIZE (Bytes)**	**COMMENT**
Validity Field	*uw16*	N.A	0,1,2	2	Bit field validity flag: 0 then no sensor data included 1 sensor data is included but sensor not settled 2 sensor data is included and sensor settled
Pitch	*w16*	0.01Deg	-180≤ ≤180 Degrees	2	VRU pitch
Roll	*w16*	0.01Deg	-180≤ ≤180 Degrees	2	VRU roll
Heave	*w16*	0.01m		2	Ship heave
Total				**8**	

5.6 User Settings / User Special Packet / Ping Packet

Echotrac User Settings Packet					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**SIZE (Bytes)**	**COMMENT**
Header [1]	*Header*	N.A	"#MK3,U,M"	8	Header of a MK3 frame. See description
Ping_Number	*uw32*	N.A	$0 \leq < 2^{32}$	4	Recurrence number
Field1	*uw32*	N.A.		4	
Field2	*uw32*	N.A.		4	
Field3	*uw32*	N.A.		4	
Field4	*uw32*	N.A.		4	
Field5	*uw32*	N.A.		4	
Field6	*uw32*	N.A.		4	
Total				**36**	

[1] See Header structure for more details.

[2] **IMPORTANT**: Check the Echotrac parameter overview for the Validity values for each Echotrac Model.

Example of field usage:

CHANNEL TYPE	**"U"**	**Example**	
Field1	Default_ip	192.168.200.200	= 0xC0A8C8C8
Field2	Default _port	1600	= 0x00000640
Field3	Data_ip	192.168.1.32	= 0xC0A80120
Field4	Data_port	1600	= 0x00000640
Field5	Control_ip	192.168.1.32	= 0xC0A80120
Field6	Control_port	1601	= 0x00000641

"V"	**Example**
software version	2.21 = 0x00000221
DSP version channel 1/3	1.21 = 0x00000121 [1]
DSP version channel 2	1.21 = 0x00000121 [1]
XDCR version channel 1/3	1.21 = 0x00000079 [2]
XDCR version channel 2	1.21 = 0x00000079 [2]
N/A	

Notes:
1 Version numbers for DSPs are stored as decimal numbers.
2 Version numbers for the XDCR are in hexadecimal values.
3 If an Echotrac has a dual channel board, then it will be channel 1 and 3.

Using the Ping packet

To send a Ping packet, use the "?" character to fill the Channel Type field. The fields Field1 through Field6 are filled with zero. Broadcast the packet onto the network on port 1501. Any sounders on the network with firmware 4.x will respond with an EID packet on port 1501.

5.7 Settings Packet

This packet is only available from firmware 3.31 and higher.

Echotrac Settings Packet					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**SIZE (Bytes)**	**COMMENT**
Header [1]	*Header*	N.A	"#MK3,S,M"	8	Header of a MK3 frame. See description
Settings Data	*Settings record*	N.A		(NOP x 12) Number of parameters x 12	NOP dependent on Echotrac model.
Total				**8 + nop x 12**	

[1] See Header structure for more details.

[2] **IMPORTANT**: Check the Echotrac parameter overview for the Validity values for each Echotrac Model.

Echotrac Settings Record					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**SIZE (Bytes)**	**COMMENT**
Parameter ID	*uw16*	N.A	$0 \leq < 2^{16}$	2	Recurrence number
Minimum value	*uw16*	N.A.	$0 \leq < 2^{16}$	2	Parameter that is changing. (see table)
Default value	*uw16*	N.A.	$0 \leq < 2^{16}$	2	Parameter value that is changing. (see table)
Maximum value	*uw16*	N.A.	$0 \leq < 2^{16}$	2	
Before decimal	*byte*	N.A.	$0 \leq < 2^{8}$	1	
After decimal	*byte*	N.A.	$0 \leq < 2^{8}$	1	
Current value	*uw16*	N.A.	$0 \leq < 2^{8}$	2	
Total				**12**	

When requesting all parameters (command 187, value 255), the Echotrac will acknowledge the command and then respond by sending the S-packet with all the supported parameters and their minimum, maximum, current and default value. A parameter ID of 255 is an unsupported parameter.
Note, each Echotrac model supports a different set of parameters and commands.
See Appendix C Echotrac Interface Differences Overview for more details.

5.8 Extra ID Packet

This packet is only available from firmware 3.31 and higher.

Echotrac ID Packet (EID)								
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**Segment**	**Start Row**	**Offset**	**SIZE (Bytes)**	**COMMENT**
Header [1]	*Header*	N.A	"#MK3,I,M"	1		0	8	Header of a MK3 frame. See description
Ping_Number	*uw32*	N.A		1		8	4	
Model_ID	*uw16*	N.A.	0 = Echotrac MK3 1 = Echotrac CV100 2 = Echotrac CV200 3 = Echotrac CV300 4 = Echotrac CVM	1		12	2	
Model	*char*	N.A.		1		14	20	Model name as ASCII
Reserved1	*uw32*	N.A.		1		34	4	Reserved for serial #
Reserved2	*char*	N.A.		2	6-8	38	48	Reserved for company
Reserved3	*char*	N.A.		3	9	86	204	
Default_IP	*uw32*	N.A.		3		290	4	
Default_Port	*uw16*	N.A.		3		294	2	
Data_IP	*uw32*	N.A.		3		296	4	
Data_Port	*uw16*	N.A.		3		300	2	
Control_IP	*uw32*	N.A.		3		302	4	
Control_Port	*uw16*	N.A.		3		306	2	
Unique_Port	*uw16*	N.A.		3		308	2	
Number_of_records	*uw16*	N.A.		4	23	310	2	NoR
Record_size	*uw16*	N.A.		4		312	2	Rs
Data	*EID rec.*	N.A.		4		314	NoR x Rs	(ie. 8 records x 32 bytes)
Total							**38 + 48 + 224 + 4 +(Nor x Rs) = 570**	

[1] See Header structure for more details.

[2] **IMPORTANT**: Check the Echotrac parameter overview for the Validity values for each Echotrac Model.

The EID packet is designed to have four segments:

1. Packet Header and Echotrac information
2. Reserved space
3. Communication data
4. Echotrac configuration records

Note: The location of fields is related to debugging. Most debugging or hexadecimal viewers display data in 4 columns of 4 bytes each. Therefore, each row displays 16 bytes.

Each segment is designed to start at a logical 16-Byte boundary. The only exception is the first segment because Ethernet Protocol headers prefix segment 1 and would require inserting reserved bytes or padding to make segment 1 align to a 16-Byte boundary.

Segment 1:
Taking the size of 42 bytes for the Ethernet protocol headers into consideration, the first segment of the EID packet ends at row 5 (5 x 16 = 80 bytes).

Segment 2:
By design this segment was intended to start at the 128-byte boundary (128 – 86 for segment 1 = 48 bytes.)

Segment 3:
By design this segment reserves 224 bytes (14 rows x 16 Bytes). This would be enough for future use to allow storage of 7 fields containing 32 characters of text. However, there was a need to store 20 bytes of Communication data, reducing the reserved space to 204 bytes.

Segment 4:
By design this segment holds the configuration information of the Echotrac. The first two fields define how many records there are to follow and the record size, followed by the records.

EID Record					
FIELD NAME	**TYPE**	**UNIT**	**VALIDITY** [2]	**SIZE (Bytes)**	**COMMENT**
hwid	*uw16*	N.A	$0 \leq < 2^{16}$	2	Hardware ID
hwlabel	*char*	N.A.		26	Hardware label
swversion	*uw16*	N.A	$0 \leq < 2^{16}$	2	Software version
reserved	*uw16*	N.A	$0 \leq < 2^{16}$	2	
Total				**32**	

The software versions are stored in hexadecimal format.
Example: 1.21 = 0x0079

5.8.1 Using the EID packet

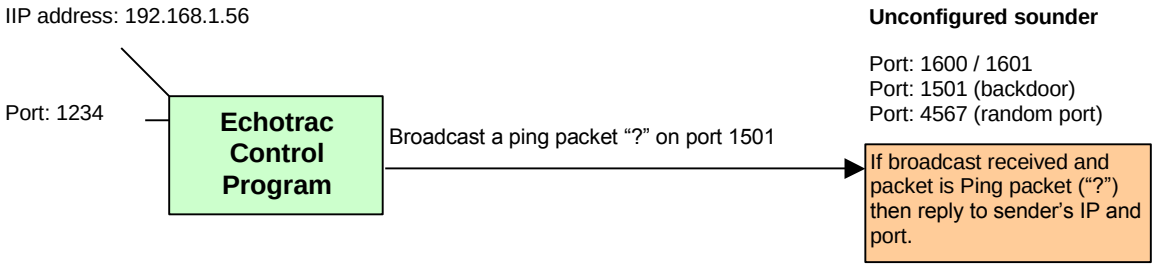
This section describes how to use the EID packet and the different scenarios that can occur.
A sounder can be in one of three states:

1. Configured. (the sounder has been given a specific port number to use, ie 1750.)
2. Unconfigured. (the sounder uses the default port numbers 1600 (data) and 1601 (control))
3. Conflicting. (one or more sounders have the same port numbers as another sounder.)

When two or more sounders are connecting to the network in an unconfigured (default state) or conflicting state, then they will reconfigure themselves to use unique port numbers. This is the random port number generated each time the sounder is powered on.

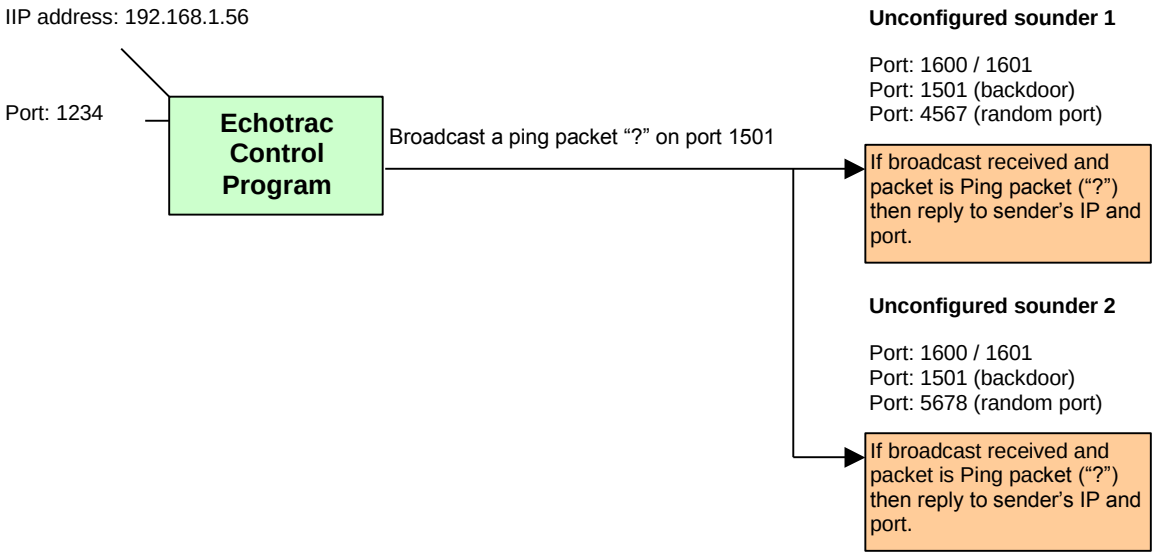
5.8.1.1 Scenario 1

This scenario shows a sounder in an unconfigured (default) state with a generated random port number of 4567. When this sounder joins the network first, it will announce itself on the network. Because there is no conflict with any other sounders, it will use port 1600 by default as it is the only sounder on the network.



5.8.1.2 Scenario 2

This scenario shows two unconfigured sounders with generated random port numbers: 4567 and 5678.
First sounder 1 joins the network and announces itself on the network. When sounder 2 joins and shares the network with sounder 1, it will also announce itself on the network and sounder 1 will detect the conflict. Sounder 1 will then use port 4567 and send a message to sounder 2 about the conflict. Sounder 2 will then use port 5678. Both sounders are now configured with unique, unconflicting port numbers.



6 USING THE ETHERNET INTERFACE

This section explains some basic but important points to remember when using the Ethernet Interface to communicate with the Echotrac sounders. Always make sure that the Echotrac Control Program version provided by Odom Hydrographic System, Inc. matches an Echotrac's firmware. This is the firmware on the Communication board for every Echotrac. An Echotrac may also have a Front Panel, Printer or Dual channel board in which case this firmware must match also. Failure to use matching versions may result in communication or operational problems.
Before upgrading any Echotrac, check the current versions and read the Upgrade manual for instructions. Partial upgrading of an Echotrac (using incompatible firmware versions for the Communication board, DSP and XDCR) can cause the Echotrac to not operate properly.

6.1 Acknowledgement

Every command sent to the Echotrac through the Ethernet interface is echoed back as an acknowledgement. If the application wants to put the Echotrac in Standby, then a parameter packet must be sent with the parameter ID 160 for standby and the parameter value of 255 to put the Echotrac in standby. The Echotrac will then acknowledge the receipt of the command by sending a parameter packet back with the same parameter ID and value. The application can now verify that the Echotrac received the command that was sent. If the application does not receive the acknowledge within a certain time, then it should take the appropriate action. For example, send the command again or ask the user whether to try again, skip this command or stop communicating due to a communication problem. Read 6.4 for more details on sending commands.

6.2 Automatic Changes

An Echotrac is able to make the decision to change a parameter setting if a certain condition occurs. In this situation it will transmit this change automatically. This is also considered an acknowledgement because it informs the Echotrac Control Program of a change whereby the Echotrac Control Program remains synchronized with the Echotrac's settings. The Echotrac Control Program does not acknowledge the receipt of an automatic change.

Examples are:
1. When the Gain and Transmit Power are set to automatic and the depth or maximum depth is changed. Then the Echotrac will change the Transmit power automatically.
2. When the Scale change is set to automatic and the tracked bottom reaches the preset margins of the scale, then the Echotrac will automatically adjust the scale and transmit the changes to the Echotrac Control Program.
3. When a user changes a parameter on an Echotrac MK3, then this change is automatically transmitted to the Echotrac Control Program. In this situation it is no possible to distinguish between the Echotrac or the User that initiated the change.

Note: The Echotrac does not report 'automatic' changes on the serial port, but only on the network port. If changes are sent to the Echotrac on the serial port, then the Echotrac will acknowledge receiving that command by echoing it back on the serial port.

6.3 Stand-by / Stand-by bit

Every Echotrac sounder goes into stand-by upon power-up. This is a factory default setting and is controlled by the Stand-by bit. In this mode the Echotrac is basically dedicated to listen and process network and/or serial communication. To start the Echotrac the Stand-by OFF command must be sent. It is possible to disable the Stand-by bit factory setting, but this is not recommended.

There are certain conditions when the Stand-by bit needs to be disabled. For example a vessel with a poor power system can fluctuate too much and cause the Echotrac to briefly loose power. When this happens the Echotrac is basically powered off and on again causing the Echotrac to wait in Stand-by until instructed to start sounding.

6.4 Sending commands

There are two ways to send commands to an Echotrac. For the serial commands see the user manual for instructions. For the network interface there are some important points to remember.

1. Put the Echotrac in Stand-by before trying to communicate with the Echotrac. This will speed up the communication process and ensure that the Echotrac is dedicated to communicating.

   For example if there is a list of parameter changes that need to be sent, put the Echotrac in Stand-by, wait for the acknowledge and then send each command one by one. After the acknowledgement for the Stand-by command has been received you can send all the commands in sequence and then handle the acknowledgments as the Echotrac sends them.

   Or, after the Standby acknowledgement has been received, send a command and wait for acknowledgement before sending the next command.

2. When the Echotrac is running and every now and then you have only one or two parameters to change, then there is no need to put the Echotrac in Stand-by. As soon as a parameter change is sent to the Echotrac it will acknowledge receiving that command but may not process the new parameter setting until the start of the next sounding cycle.

3. Always make sure that the control program knows the current state of the Echotrac. If the Echotrac is configured to use Feet, then do not send any parameter values in Meters. Therefore, instruct the Echotrac to change the units to Meters first before sending any other parameter settings.

   If the Echotrac is running in Feet and parameter settings are sent using values in Meters, then it is possible that the Echotrac will not operate correctly. When the Echotrac is powered off and back on again, the Echotrac does a parameter settings check. If there is a problem the Echotrac will report a message on the serial port that it has reset itself to factory default settings.

   There is a special command that instructs the Echotrac to send all of its current settings to the control program. The alternative is to manually request each parameter setting.

4. Every Echotrac is configured to use port 1600 for outputting data and 1601 for communicating with a control program. The NAP and ADP datagrams are transmitted on the data port. The PP and USP datagrams are used on the control port. These ports are always available. If there are two or more Echotracs, then they must each have their own unique data and control port. They cannot be 1600 or 1601.

   For example: Echotrac A uses 1856 and 1857, while Echotrac B uses 2112 and 2113. If in this situation the default ports are used then the Echotrac will automatically change its current ports to the factory default ports. The acknowledge will be transmitted on the default control port. To reset the Echotrac to the correct ports again, the Echotrac must receive a Factory Reset command on port 1601. The alternative is to remove its internal battery that stores the current parameter settings.

   If you use the Echotrac Control Program and do not select the correct port configuration file, but use the default port settings of 1600 and 1601, then the Echotrac will communicate using the factory default ports. You must then instruct the Echotrac to perform a Factory reset again to use the correct ports.

5. You can use the USP datagram to request firmware versions or instruct the Echotrac which UDP ports and IP address to use. After the control program has established communication it is possible to change the current port numbers to something different. For example if an Echotrac is using ports 2112 and 2113, then use port 2113 to send a USP datagram with new port numbers to use. The Echotrac will use them immediately.

Note: The Echotrac uses UDP/IP and therefore the IP address is not really necessary but since it is part of the Ethernet packet header it may help when network packets are captured for analysing/debugging purposes.

6. When a control program is unable to communicate with an Echotrac, make sure you use the factory default ports 1600 and 1601. This may solve the communication problem when Echotracs were configured to share a network by using unique port numbers such as 1856/1857 and 2112/2113.

7. Because some Echotracs do not have a displays or printer, then you can use the Version utility to ask an Echotrac which firmware versions it has.

6.5 Using USP packets

This section tries to explain how to use the User Settings/User Special Packet structure using a step by step guide of how the Echotrac Control Program (ECP) communicates with the Echotrac.

1. The ECP sends a parameter packet with the Standby command 160 and value 255 to put the Echotrac in Standby. The Echotrac transmits the parameter packet back to acknowledge that it was received.

2. When the ECP receives the acknowledge, a communication connection with the Echotrac is confirmed.

3. The ECP sends a USP packet with channel type “U” that contains the IP numbers and port numbers that the Echotrac needs to know to fill the fields of the Ethernet structures. The Echotrac will transmit the USP packet back to the ECP to confirm it received the packet.

4. The ECP sends a USP packet with the channel type “V” with blank fields. The Echotrac fills the fields and transmits the USP packet back to the ECP.

5. The ECP and Echotrac are now initialised with port numbers and version numbers.

6. The ECP can now use parameter packets to request parameters settings from the Echotrac or set them. This procedure is called synchronizing. Both ECP and Echotrac will then have the same parameter settings.

   It is also possible to send one parameter packet to request all parameters to be sent back to the ECP. This is done by sending a parameter packet with command ID 187 and value 255. The Echotrac will then send all parameters.

7. When both the ECP and Echotrac are synchronized, the command to exit standby can be sent by sending a parameter packet with the Standby command 160 and value 0. The Echotrac will acknowledge the receipt by sending the parameter packet back to the ECP.

8. The Echotrac will now start sounding and (depending on the settings) can output ADP packets containing the digitised raw acoustic signal data on the data port. It will also output the digitised depth with parameter packets on the control port to the ECP.

6.6 Mark and Serial Mark

The Echotrac supports two types of Marks. The command Mark (224) instructs the Echotrac that you want a fixmark and expect the Echotrac to handle it completely. The Echotrac will draw a vertical line and also generate annotation that is printed alongside the vertical line. When the command Serial Mark (225) is used, then you are instructing the Echotrac to only draw a vertical line. This is equivalent to a sending CTRL-F to the Echotrac through the serial port. If you want annotation, then you need to send a separate NAP packet with text. Make sure that you have a little bit of time, ie. 50 ms, between sending the parameter packet and annotation packet. See also section 6.7.

6.7 Annotation packets

When you want to send text the Echotrac you use the NAP packet. Set the channel type to “N”, set the Navigation Data field to 1 and put up to 100 characters of text in the packet. The Echotrac will output a copy of the annotation packet on the data port for other applications. Make sure that the Echotrac is configured to accept external annotation by setting the Annotate command.

6.8 Depth packets

The Echotrac will output digitised Raw Acoustic Data on the data port using the ADP packets. The digitised depth is included in these ADP packets, but is also output using the parameter packet structure on the control port. The parameter packet will have a parameter ID to identify the channel and the value contains the depth. These packets are output once a second.

6.9 Error packets

The parameter packet structure can also be used to inform the ECP about errors. For example: if the depth on channel 1 has been zero for a few pings, then the Echotrac will use the parameter structure and replace the channel type with “E” to indicate an error. The parameter ID field contains the identifier for channel 1 depth (ie. 189) and the parameter value indicates the number of times the Echotrac detected a zero depth.

6.10 Changing Units

It is important to realize that the Echotrac works in either Meters or Feet. There are parameters that depend on which units are used. The first thing the Echotrac Control Program wants to know is what the units are because only then can it verify that all the unit-dependent parameter values are within a valid range. Also, before trying to configure an Echotrac, always inform the Echotrac which units to use. You only need to do this one time before sending any other parameters. When you send a parameter packet with the Unit parameter ID, the Echotrac will respond by sending an acknowledge followed by a list of parameter packets.

6.11 Recovering from problems

6.11.1 Collisions

If you are experiencing problems, make sure that you are not flooding the network or the Echotrac with information. If you send packets to the Echotrac too quickly after one another, then it is possible that they are not received. The Echotrac may be trying to send an acknowledge back at the same time you are trying to send a packet. This is a collision on the network. That is why when there is a lot of communicating to be performed, that it is best to put the Echotrac in Standby, which puts the Echotrac in listening mode. The Echotrac will not be outputting any data packets which could cause collisions on the network.

6.11.2 Communication

The control port is used to communicate with the Echotrac. When the Echotrac Control Program (ECP) sends packets to the Echotrac, the Echotrac will acknowledge their receipt by echoing the packets back. If the ECP does not receive an acknowledge from the Echotrac within a certain time, the ECP can send it again. After so-many tries the user is informed of the communication problem. The user can decide to skip trying to send the command or decide to terminate the communication session.

6.11.3 Back-door control port

If you are unable to communicate with the Echotrac, then try to use control port 1601. This port is always available for communication. You can try to request the version numbers or send a standby command. When you receive a response, you know that communication is possible. This situation can arise when an Echotrac has been assigned different port numbers. For example, if one Echotrac is configured to use ports 1856 for data and 1857 for control and another Echotrac is configured to use ports 2112 for data and 2113 for control, then the application must also use these ports otherwise communication is not possible. However, you can use 1601 to

recover from this problem. You can then assign new port numbers to the Echotrac.

This recover procedure is supported by the ECP. Start the ECP and by default the control port 1601 is used. Once communication has been established, load the configuration file that contains the ports 1856 and 1857 that you want to assign to the Echotrac. As soon as the file is loaded, it is sent to the Echotrac. The Echotrac will continue to use 1601 until it is powered off. When the Echotrac is turned on again, it will use the new port numbers.

6.11.4 Factory settings

If you want to have the Echotrac back to factory default settings, you can always send a parameter packet with the command ID for DEFSET to port 1601. The next time the Echotrac is powered on, it will use the factory default settings.

6.11.5 Using Parameter IDs

When sending parameters, make sure that you only send parameter packets with parameter IDs that are supported. Check the parameter overview table for parameter ID numbers.
If you use parameter IDs that are labelled “unused” or not supported by the firmware version the Echotrac has, then you may experience operating problems and will have to instruct the Echotrac to use the Factory Default settings or remove the internal battery to reset the Echotrac back to Factory Default settings.

One symptom is that you will not receive the correct version numbers or loose network communication.
If the latter occurs, you can try to communicate with the Echotrac through the serial port and instruct it to use the Factory Default settings.

6.11.6 Wrong depth

Sometimes it is possible that the Echotrac is tracking the transmit pulse from the transducer. In that case add some blanking to instruct the Echotrac to ignore the first part below the transducer. A blanking of 1 meter should be sufficient.

7 PARAMETER OVERVIEW

Echotrac parameter list			
Parameter	**Index**	**Valid Parameter Value (default)**	**Comments**
Range	0	10-12000 for Meters (45) 30-36000 for Feet (150)	Maximum operating depth Range of sounder.
Velocity	1	1370-1700 in Meters (1500) 4500-5600 in Feet (5000)	Sound Velocity
End of Scale	2	5-12000 in Meters (20) 15-36000 in Feet (60)	End of scale of data.
Scale Width	3	5,10,**20**,40,80,100,200,400,800,1600 meters. 15,30,**60**,120,240,300,600,1200,2400,4800 feet.	Scale width of data.
Draft channel 1	4	0-1500 centimeters. (0) 0-500 tenths of feet. (0)	Draft of transducer. High Frequency
Draft channel 3	5	0-1500 centimeters. (0) 0-500 tenths of feet. (0)	Draft of transducer Second High Frequency Only for CV3
Draft channel 2	6	0-1500 centimeters. (0) 0-500 tenths of feet. (0)	Draft of transducer. Low Frequency
Index channel 1	7	0-1500 centimeters. (0) 0-500 tenths of feet. (0)	Index error of transducer. (Opposite of Draft) High Frequency
Index channel 3	8	0-1500 centimeters. (0) 0-500 tenths of feet. (0)	Index error of transducer. (Opposite of Draft) Second High Frequency Only for CV3
Index channel 2	9	0-1500 centimeters. (0) 0-500 tenths of feet. (0)	Index error of transducer. (Opposite of Draft) Low Frequency
Bar Depth	10	0-40 meters. (0) 0-130 feet. (0)	Center of digitizer gate when performing a bar check
Gate Width	11	1-5 meters. (1) 1-12 feet. (1)	Width of digitizer gate when performing a bar check.
Blanking	12	0-64000 decimeters (0) 0-64000 tenths of feet (0)	Blanking level to digitizer. Digitizer will not track anything above this depth
Min. Depth	13	0-30 meters (0) 0-100 feet (0)	Minimum depth alarm. Sounder will sound alarm if depth is shallower than this depth.
Aux. Line	14	0-1500 centimeters (0) 0-500 tenths of feet (0)	Auxiliary line that can be printed on the printer for dredge depth, draft line etc.
Chart speed	15	0-15 cm/min or inch/min (0)	Plotting speed of data. When set to 0 one column of data is plotted for every ping. 1-15 is an index for manual plotting speed.
Silt TVG Range	16	0 - 75 feet, 0 – 250 decimeters (0)	Range to which the Subottom TVG amplification is used for.
Channel 1 Type	17	0-Envelope 1-Half Wave AC 2-Full Wave AC	Supported from firmware 3.31 and higher. In older version this parameter is not supported.
Channel 3 Type	18	0-Envelope 1-Half Wave AC 2-Full Wave AC	Supported from firmware 3.31 and higher. In older version this parameter is not supported.
Channel 2 Type	19	0-Envelope 1-Half Wave AC 2-Full Wave AC	Supported from firmware 3.31 and higher. In older version this parameter is not supported.
Not Used	20		
Not Used	21		
Units	22	0 meters (0) 1 feet	Operating units of sounder
Com1	23	0-Echotrac SBT string 1-Echotrac DBT string (1) 2-NMEA DBS string 3-Deso 25 String 4-Raw Depth and Heave string 5-NO-COE (New Orleans Core Of Engineers) 6-DESO-DDV+C 7-DESO-DDV+NOC	Function of serial port 1 Note: CV100's default is (0): Echotrac SBT Depth-Draft-Soundvelocity + Chartspeed control Depth-Draft-Soundvelocity + No Chartspeed control
Com2	24	0-Remote Display off (0)	Function of serial port 2

Echotrac parameter list			
Parameter	**Index**	**Valid Parameter Value (default)**	**Comments**
		1-Remote Display on	
Com3	25	0-No GPS input (0) 1-Reading GPS	Function of serial port 3
Com4	26	0-Heave turned off (0) 1-Accepting Heave data	Function of serial port 4
Com 1 Baud	27	0 for 4800 1 for 9600 2 for 19200 (2) 3 for 38400	Baud Rate of serial port 1
Com 2 Baud	28	0 for 4800 1 for 9600 (1) 2 for 19200 3 for 38400	Baud Rate of serial port 1
Com 3 Baud	29	0 for 4800 1 for 9600 (1) 2 for 19200 3 for 38400	Baud Rate of serial port 1
Com 4 Baud	30	0 for 4800 1 for 9600 (1) 2 for 19200 3 for 38400	Baud Rate of serial port 1)
Phasing	31	0-Auto10% 1-Auto20% (1) 2-Auto30% 3-Manual	Scale changing mode.
Alarm	32	0-alarm off (0) 1-alarm on	No depth alarm.
Trigger	33	0-internal (0) 1-external ttl	Sounder is controlled internally or externally by a ttl pulse.
Simulator	34	0-Off (0) 1-On	Depth simulator.
Language	35	0-English (0) 1-German 2-Spanish	Menu language
Channel 1	36	0-channel 1 off 1-channel 1 is set to bathymetry data (1) 2-channel 1 is set to side scan port data 3-channel 1 is set to side scan stbd data	Which channels are turned on. High frequency channel
Channel 2	37	0-channel 2 off (0) 1-channel 2 is set to bathymetry data	Which channels are turned on. Low frequency channel
Channel 3	38	0-channel 3 off (0) 1-channel 3 is set to bathymetry data 2-channel 3 is set to side scan port data 3-channel 3 is set to side scan stbd data	Which channels are turned on. Second High frequency channel
Ping Rate	39	0-20 (0 = Auto)	When set to 0 sounder pings at the highest rate for that depth. When set from 1-20 sounder will sound up to a maximum to that ping rate/sec as long as the water depth allows it.
Digitizer Line	40	0 – Off (0) 1- 10 (On)	Plots a line above the raw bottom indicating where the digitizer has detected the depth.
Channel 1 PW	41	1-256 (20)	High frequency channel pulse width in cycles
Channel 3 PW	42	1-256 (20)	High 2 frequency channel pulse width in cycles
Channel 2 PW	43	1-256 (10)	Low frequency channel pulse width in cycles
Fix Mark Width	44	Not used	
Plot Gate	45	0 – Off (0) 1- On	Plot the limits of the digitizer tracking gate.
Annotate	46	0-Off (0) 1-W/O gaps 2-With gaps	Plots annotation information on the chart. If set to 1 the annotation is plotted over the acoustic data. If set to 2 Acoustic data is paused while annotation is plotted.
Channel 1 frequency	47	120-10000 hectohertz (2000 = 200.0)	High frequency Channel operating frequency
Channel 3 frequency	48	120-10000 hectohertz (2000 = 200.0)	High 2 frequency Channel operating frequency
Channel 2 frequency	49	30 - 2000 hectohertz (240 = 24.0)	Low frequency Channel operating frequency
Light Shade	50	Not used	

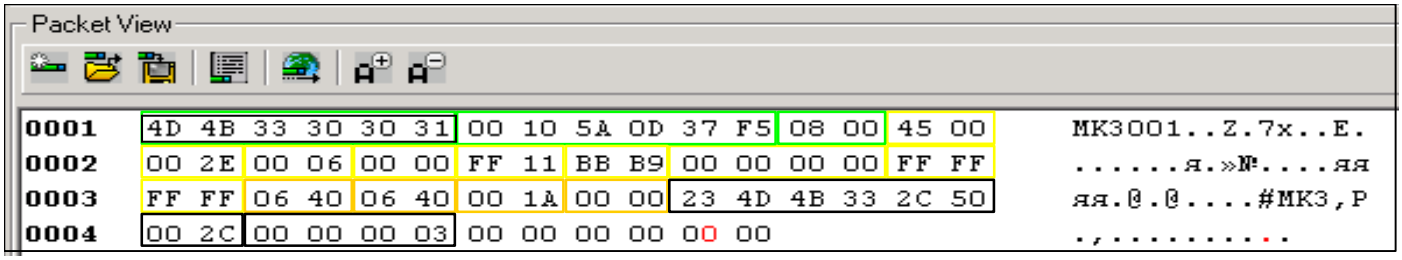
Echotrac parameter list			
Parameter	**Index**	**Valid Parameter Value (default)**	**Comments**
Brightness	51	Not used	Brightness of LCD backlight
Channel 1 Gain	52	0-256 (255) 256=auto	Gain of high frequency channel receiver
Channel 3 Gain	53	0-256 (255) 256=auto	Gain of high 2 frequency channel receiver
Channel 2 Gain	54	0-256 (255) 256 = auto	Gain of low frequency channel receiver
Channel 1 TX Power	55	0-12 (6)	TX power of high frequency channel transmitter Firmware prior to 4.xx uses 0 for auto power control. As of firmware 4.xx bit 8 indicates auto power on/off. Example: 0x106 means auto on, power level set to 6.
Channel 3 TX Power	56	0-12 (6)	TX power of high 2 frequency channel transmitter Firmware prior to 4.xx uses 0 for auto power control. As of firmware 4.xx bit 8 indicates auto power on/off. Example: 0x106 means auto on, power level set to 6.
Channel 2 TX Power	57	0-12 (6)	TX power of low frequency channel transmitter Firmware prior to 4.xx uses 0 for auto power control. As of firmware 4.xx bit 8 indicates auto power on/off. Example: 0x106 means auto on, power level set to 6.
Digital Algorithm	58	0 – Off (1) 1- 10 On	When set to off no tracking gate is maintained.
LF Bandwidth	59	Not used	
Channel 1 Gain Curve	60	0-10Log 1-20Log (1) 2-30Log 3-40Log 4-No TVG curve only manual gain	TVG curve of high frequency channel receiver.
Channel 3 Gain Curve	61	0-10Log 1-20Log (1) 2-30Log 3-40Log 4-No TVG curve only manual gain	TVG curve of high 2 frequency channel receiver.
Channel 2 Gain Curve	62	0-10Log 1-20Log (1) 2-30Log 3-40Log 4-No TVG curve only manual gain	TVG curve of low frequency channel receiver.
Channel 1 Gain Ref.	63	0-.25 meter (0) 1-.5 meter 2-1 meter 3-2 meter 4-4 meter	Step interval of TVG curve is applied to high frequency channel receiver.
Channel 3 Gain Ref.	64	0-.25 meter (0) 1-.5 meter 2-1 meter 3-2 meter 4-4 meter	Step interval of TVG curve is applied to high 2 frequency channel receiver.
Channel 2 Gain Ref.	65	0-.25 meter (0) 1-.5 meter 2-1 meter 3-2 meter 4-4 meter	Step interval of TVG curve is applied to low frequency channel receiver.
Media	66	0 - Paper (0) 1 - Film	Type of chart paper used.
Scale grid	67	0-fine grid 1-coarse grid (1) 2-extra fine	Frequency of chart lines. Currently Deso only.
Threshold	68	0 - None 1 - 10% 2 - 25% (2) 3 - 50% 4 - 75%	Percentage of the maximum signal level where the digitizer detects the bottom.
Min. gate width	69	0 - 10% (0) 1 - 20% 2 - 30% 3 - 50%	Percentage of maximum water depth that the minimum gate width is reduced to when the digitizer is locked onto the bottom.
Grey Shades	70	0 - OFF 1- ON (1)	Determines whether the data printed on the chart is printed in grey shades or black and white.

Echotrac parameter list				
Parameter	**Index**	**Valid Parameter Value (default)**		**Comments**
Skip alarms	71	0-10	(1)	The sounder will buffer the last good return and output that value for Skip alarms number of times while there is an error condition.
Silt TVG	72	0 - 20	(0)	Value in db/meter that the low frequency signal is amplified after the high frequency channel is bottom is determined. Used for better detection on the hard bottom.
Preamp gain	73	0 - 20	(0)	Gain setting for the optional preamp board.
Heave Correction	74	0 - OFF 1- ON	(1)	Applies heave correction to the chart
Standby Bit	75	0 - OFF 1- ON	(1)	If set, then upon power up the Echotrac will go to Standby first.
UDP Port	76	0-4096	(1600)	The Echotrac uses this port for Data, port+1 is for Control. Port 1600 and 1601 are default and always active.
Packet size	77	0-16	(16)	Sets the number of raw data bits to mask and put into the Ethernet packets. Use 8 or 16 only. Bits 9-16 will result in 16 bit data, 0-8 will result in 8 bit data.
Mode	78	1-Echotrac Mode 2-Subbottom Mode	(1)	Normal packet size of 1590/1600 samples Extra large packet size (3190/3200) samples. Supported on CV2/CV3 only.
Missed Returns	79	1 – 50	(3)	Number of bad returns to accept before increasing the gate to find the return again.
SPECIAL PARAMETERS				
ChartOnOff	129	0 = Off, 1 = On		
Default Settings	178	N/a		
Print Parameters	186	N/a		
User Settings request	187	0-78		Pid for version 3.6 (version 2.21 and earlier use 71)
Standby	160	00 = Off 255 = On		
Mark	224	N/a		
Serial Mark	225	N/a		

IMPORTANT
This is a standard list of parameters. Each Echotrac Model may not support all of these parameters/commands. A full detailed list for each Echotrac is currently only available upon request.

Appendix A. Example Parameter packet in detail

Example of an Ethernet Packet with Green = Ethernet header (14 bytes), Yellow = IP header (20 bytes), Orange = UDP header (8 bytes) (same colours as used in the basic structure overview. Following the UDP header structure is the data area containing the Parameter packet structure.



0001	4D 4B 33 30 30 31			00 10 5A 0D 37 F5				08 00		45 00	
	ETH: destination MAC			ETH: source MAC				ETH: type		IP: version	
0002	00 2E	00 06	00 00	FF 11	BB B9	00 00 00 00				FF FF	
	IP: length	IP: id	IP: flags	IP:TTL+UDP	IP: CHKS	IP: Source IP				IP: Dest.IP	
0003	FF FF	06 40	06 40	00 1A	00 00	23	4D	4B	33	2C	50
	IP: Dest. IP	UDP: src	UPD: dest.	UDP: length	UDP: CHKS	#	M	K	3	,	P
0004	00 2C	00 00 00 03		00 00	00 00	00 00					
	Parameter	Parameter value		Padding	Padding	Padding					

Overview of packet contents:

Description	Bytes	Value
ETH: MAC destination address	6	MK3001
ETH: MAC source address	6	0x00105A0D37F5
ETH: type	2	0800
Total Ethernet Header	14	
IP version	nibble	4
IP header length	nibble	5
IP service	1	0x00
IP length	2	36 bytes (0x002E)
IP identification	2	6
IP flags	2	0x00
IP Time to Live	1	255
IP protocol	1	0x1A (17 UDP)
IP header checksum	2	0xBBB9
IP source IP	4	Reserved
IP destination IP	4	Reserved
Total IP Header	20	
UPD source port	2	0x0640 (1600)
UPD destination port	2	0x0640 (1600)
UDP length	2	26 bytes (0x001A)
UDP checksum	2	Not used
Total UDP Header	8	
DATA Header	6	#MK3,P
DATA Parameter packet: Parameter identifier	2	44 (0x002C)
DATA Parameter packet: Parameter value	4	3
Packet Padding	6	0x0000-0000-0000

Appendix B. Parameter List Version History

This appendix shows the history of parameters and in which firmware version they are available. For example, the parameter Heave Correction was added in firmware version 3.06 and the Stand-by bit in firmware version 3.10.

Echotrac Parameter List Version Overview																	
Parameter																	
Units Dependent Parameters	**3.01**	**3.04 - 3.05**	**3.06 - 3.09**	**3.10**	**3.20**	**3.22**	**3.25 – 3.28**	**3.29 – 3.30**	**4.01 – 4.02**								
Range	0	√	√	√	√	√	√	√	√								
Velocity	1	√	√	√	√	√	√	√	√								
End of Scale	2	√	√	√	√	√	√	√	√								
Scale Width	3	√	√	√	√	√	√	√	√								
Draft channel 1	4	√	√	√	√	√	√	√	√								
Draft channel 3 [#1]	5	√	√	√	√	√	√	√	√								
Draft channel 2	6	√	√	√	√	√	√	√	√								
Index channel 1	7	√	√	√	√	√	√	√	√								
Index channel 3 [#1]	8	√	√	√	√	√	√	√	√								
Index channel 2	9	√	√	√	√	√	√	√	√								
Bar Depth	10	√	√	√	√	√	√	√	√								
Gate Width	11	√	√	√	√	√	√	√	√								
Blanking	12	√	√	√	√	√	√	√	√								
Min. Depth	13	√	√	√	√	√	√	√	√								
Aux. Line	14	√	√	√	√	√	√	√	√								
Chart speed	15	√	√	√	√	√	√	√	√								
Silt TVG Range	16	√	√	√	√	√	√	√	√								
Channel 1 Type	17								√								
Channel 3 Type	18								√								
Channel 2 Type	19								√								
Not Used	20	√	√	√	√	√	√	√	√								
Not Used	21	√	√	√	√	√	√	√	√								
Units **In**dependent Parameters																	
Units	22	√	√	√	√	√	√	√	√								
Com1	23	√	√	√	√	√	√	√	√								
Com2	24	√	√	√	√	√	√	√	√								
Com3	25	√	√	√	√	√	√	√	√								
Com4	26	√	√	√	√	√	√	√	√								
Com 1 Baud	27	√	√	√	√	√	√	√	√								
Com 2 Baud	28	√	√	√	√	√	√	√	√								
Com 3 Baud	29	√	√	√	√	√	√	√	√								
Com 4 Baud	30	√	√	√	√	√	√	√	√								
Phasing	31	√	√	√	√	√	√	√	√								
Alarm	32	√	√	√	√	√	√	√	√								
Trigger	33	√	√	√	√	√	√	√	√								
Simulator	34	√	√	√	√	√	√	√	√								
Language	35	√	√	√	√	√	√	√	√								
Channel 1	36	√	√	√	√	√	√	√	√								
Channel 2	37	√	√	√	√	√	√	√	√								
Channel 3 [#1]	38	√	√	√	√	√	√	√	√								
Ping Rate	39	√	√	√	√	√	√	√	√								
Digitizer Line	40	√	√	√	√	√	√	√	√								
Channel 1 PW	41	√	√	√	√	√	√	√	√								
Channel 3 PW [#1]	42	√	√	√	√	√	√	√	√								
Channel 2 PW	43	√	√	√	√	√	√	√	√								
Fix Mark Width	44	√	√	√	√	√	√	√	√								
Plot Gate	45	√	√	√	√	√	√	√	√								
Annotate	46	√	√	√	√	√	√	√	√								
Channel 1 frequency	47	√	√	√	√	√	√	√	√								
Channel 3 frequency [#1]	48	√	√	√	√	√	√	√	√								
Channel 2 frequency	49	√	√	√	√	√	√	√	√								
Light Shade	50	√	√	√	√	√	√	√	√								
Brightness	51	√	√	√	√	√	√	√	√								
Channel 1 Gain	52	√	√	√	√	√	√	√	√								
Channel 3 Gain [#1]	53	√	√	√	√	√	√	√	√								

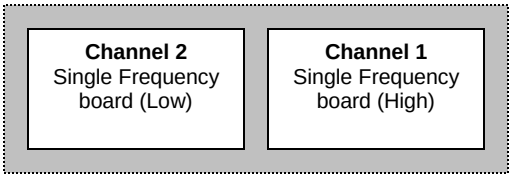
Echotrac Parameter List Version Overview																	
Parameter																	
Units Dependent Parameters	**3.01**	**3.04 - 3.05**	**3.06 - 3.09**	**3.10**	**3.20**	**3.22**	**3.25 – 3.28**	**3.29 – 3.30**	**4.01 – 4.02**								
Channel 2 Gain	54	√	√	√	√	√	√	√	√								
Channel 1 TX Power	55	√	√	√	√	√	√	√	√								
Channel 3 TX Power [#1]	56	√	√	√	√	√	√	√	√								
Channel 2 TX Power	57	√	√	√	√	√	√	√	√								
Digital Algorithm	58	√	√	√	√	√	√	√	√								
LF Bandwidth	59	√	√	√	√	√	√	√	√								
Channel 1 Gain Curve	60	√	√	√	√	√	√	√	√								
Channel 3 Gain Curve [#1]	61	√	√	√	√	√	√	√	√								
Channel 2 Gain Curve	62	√	√	√	√	√	√	√	√								
Channel 1 Gain Ref.	63	√	√	√	√	√	√	√	√								
Channel 3 Gain Ref. [#1]	64	√	√	√	√	√	√	√	√								
Channel 2 Gain Ref.	65	√	√	√	√	√	√	√	√								
Media	66	√	√	√	√	√	√	√	√								
Scale grid	67	√	√	√	√	√	√	√	√								
Threshold	68	√	√	√	√	√	√	√	√								
Min. gate width	69	√	√	√	√	√	√	√ [#3]	√ [#3]								
Grey Shades	70	√	√	√	√	√	√	√	√								
Skip alarms	71	√	√	√	√	√	√	√	√								
Silt TVG	72	√	√	√	√	√	√	√	√								
Preamp gain	73	√	√	√	√	√	√	√	√								
Heave Correction	**74**		√	√	√	√	√	√	√								
Standby Bit	**75**			√	√	√	√	√	√								
UDP Port	**76**				√	√	√	√	√								
Packet size	**77**				√	√	√	√	√								
Mode	**78**						√	√	√								
MissedReturns	**79**							√	√								
SPECIAL PARAMETERS																	
ChartOnOff	129	√	√	√	√	√	√	√	√								
Default Settings	77	√	178	178	178	178	178	178	178								
Print Parameters	85	√	186	186	186	186	186	186	186								
User Settings request	86	√	187	187	187	187	187	187	187								
Channel 1 Depth [#2]	88	√	189	189	189	189	189	189	189								
Channel 3 Depth [#2]	89	√	190	190	190	190	190	190	190								
Channel 2 Depth [#2]	90	√	191	191	191	191	191	191	191								
Standby	160	√	√	√	√	√	√	√	√								
Mark	224	√	√	√	√	√	√	√	√								
Serial Mark	225	√	√	√	√	√	√	√	√								

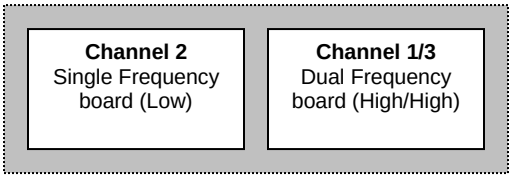
[#1]: **IMPORTANT**: Check the Echotrac parameter overview for the Validity values for each Echotrac Model.

[#2]: The special parameters Channel 1/2/3 Depth are output by the Echotrac as Parameter packets on port the Control port (1601 by default) to inform the Echotrac Control Program of the Digitized Depth.

[#3]: Parameter overview list.

1. All channel 3 parameters are only supported by the Dual Channel board. See figure below. In the Echotrac CV2 and MK3, there are two single frequency boards, High on the right-hand side and Low on the left-hand side. The Echotrac CV3 has a Dual channel board on the right-hand side usually configured as two High frequency channels and named channel 1 and channel 3. On the left-hand side is usually a Low or Very Low Frequency Board as channel 2.





Appendix C. Echotrac Interface Differences Overview

An Echotrac supports a certain set of parameters and a certain set of commands. Even though they may seem to be the same thing, commands may not have a minimum, maximum or default value. The parameters can be categorized into two groups: Unit dependent where a parameter has a set of values in Feet and a set of values in Meters. The second group is not Unit dependent.

Parameters
As shown in Appendix B: Parameter List Version History, firmware revisions introduced new parameters. It is therefore important to realize that not only per firmware revision an Echotrac may support a different set of parameters, but also per model the set of parameters change. For example, a CV200 is a two-channel Echotrac CV and does not support a third channel.
Also, per model the supported parameter values may be different. For example a CVM has a different maximum range than the MK3.

Commands
Each Echotrac model may support different commands. For example, a CVM does not support a remote printer and therefore, PrintParameters, Chart Feed, Chart On and Chart Off should not be supported in an Echotrac Control Program.

Appendix D. Packet and parameter set implemented in HTII

HTII implemented a subset of the packets and parameters. Some parameters have different maximum, minimum and default values.

1 **Acoustic Data Packet**
The header structure of the Acoustic Data Packet is the same as MK III's. The acoustic data packet is sent out during each sounding cycle.

2 **Parameter Packet**
The following parameters are sent when a specific control function is called.

Parameter Name	Parameter Index	Function
Stand by	160	Initialization of communition
Time	176	Setting time hh:mm:ss
Date	177	Setting date yy:mm:dd
Chart on/off	129	Turn on/off chart
Mark	224	Mark the chart

Table-1

The following parameters are sent during the initialization of communication; they are also sent when there's a change in the parameter settings either in HTII or Echart.

Parameter Name	Parameter Index	Default		Range	
		Meter	Feet	Meter	Feet
Range	0	45	150	[10,600]	[30,1800]
Velocity	1	1500	5000	[1370,1700]	[4500,5600]
End of Scale	2	20	60	[10,595]	[30,1785]
Scale Width	3	20	60	[10,80]	[30,240]
Draft	4	0	0	[0,1500]	[0,500]
Index	7	0	0	[0,1500]	[0,500]
Bar Depth	10	0	0	[0,4000]	[0,1300]
Blanking	12	0	0	[0,6000]	[0,18000]
Min. Depth	13	0	0	[0,30]	[0,100]
Chart Speed	15	0		[0,15]	
Units	22	0		[0,1]	
Com1 Baud	27	1		[0,2]	
Com2 Baud	28	1		[0,2]	
Phasing	31	0		[0,1]	
Alarm	32	0		[0,1]	
Simulator	34	0		[0,1]	
Channel1	36	1		[0,3]	
Pulse Width	41	1		[0,2]	
Annotate	46	0		[0,1]	
Frequency	47	7		[0,10]	
Gain Curve	60	1		[0,4]	

Table-2

The Depth is sent during each sounding cycle

Parameter Name	Parameter Index
Depth	189

Table-3

The Gain is sent whenever the Gain Knob is in control

Parameter Name	Parameter Index
Gain	52

Table-4

The Power is sent whenever the reading changes

Parameter Name	Parameter Index
Power	55

Table-5

3 **Annotation Packet**
Two types of annotation packets are transmitted: the Navigation (GPS) Packet and the Annotation Packet. Whenever a GPS data is received through the serial port, it's packed and sent out as a Navigation Packet. When the Mark Button is pressed or an Annotation Packet is received through the network, HTII responds by sending out an Annotation Packet.

4 **Settings Packet**
The default setting of the parameters as in Table-2 is sent out during the initialization of the connection. They are also sent out when the unit is changed.

5 **EID Packet**
The EID Packet is sent out during the initialization of the connection.