ELAC Nautik

Data Exchange Format (XSE)

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Technical Description

Version 1.8.28
Revsion m

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Table of Contents

1 Applicable Documents

No.	Document No.	Title	Date	Revision / Version
-	-	-	-	-

2 Abbreviations

Abbreviation	Description
DGPS	Differential GPS
GGA	The GGA message of a GPS receiver contains detailed GPS position information and is the most frequently used data message.
GLL	The GLL message of a GPS receiver contains the geographic position as latitude and longitude.
GPS	Global Positioning System
HDG	Heading from Navigation Frame (Frame Id: 1, Group Id: 11)
HRP	Heave Roll Pitch
HSO	HydroStar Online
I/O	Input/Output
LAN	Local Area Network
LSB	Least Significant Bit
MB	Multi Beam
MBES	Multi Beam Echo Sounder
N	Geographic North
NMEA	National Marine Electronics Association
N/A	Not Applicable
RTK	Real-Time Kinematic
SB	SeaBeam
Slant/Range Data	MBES data that is defined by two angles and the two way travel time. The direction of the beam axis is described by the projection on two orthogonal geo-vertical planes. The slant/range co-ordinate system differs from a classical spherical co-ordinate system.
SRL	Swath Reference Line. Imaginary line passing through the projector or transducer. For Cartesian data the SRL (not the ship axis) defines the horizontal co-ordinate system for the lateral distance and the along distance. For slant/range data, the SRL defines the geo-vertical planes onto which the beam axis is projected to measure the across-ship and along ship angle.
SRV	Swath Reference Vector. Geo-horizontal Vector perpendicular to SRL, pointing “more forward then backward”.
SSV	Surface Sound Velocity. Value online to derive observables as beam angles.
SVP	Sound Velocity Profile. SVP data is used to calculate the ray path through the water column.
TH	Technical Handbook
VMEbus	Versa Module Eurocard bus
VRU	Vertical Reference Unit
WGS	World Geodetic System

Abbreviation	Description
XSE	Data Format from L-3 Communications ELAC Nautik

3 Format Description

3.1 Introduction

3.1.1 Overview

This document defines the format for exchanging information between the HydroStar software package and other software packages. The format description is not limited to a file format, although in the near future the main purpose is to introduce a more general file format than the older native ELAC file format.
The HydroStar software can be seen as a server application that provides other software (clients) with specialized services like navigation information, multi beam or sidescan data or even status information. Data concerning ship's geometry, sound velocity and tide information can be inserted in the server application or requested from the server. Experiences in client/server data exchange communication have been collected. The client/server communication is discussed in an extra section of this document.
A section, listing and answering frequently asked questions, can be found in an extra section at the end of this documentation.

3.1.2 Document History

The following table summarizes the changes made to this document.

Table 1: Document History

Revision	Version	Date	Changes	Created	Appr.
	0.8	May 1998	only Navigation Group and Single Beam Groups specified and implemented		
	0.9	August 1998	second version of draft		
	0.9.1	November 1998	SeaBeam frame added		
-	1.0	November 1998	tide groups changed; pressure group to sound velocity frame added; first sample files released	SD	ZI
	1.1	Dezember 1998	control frame specified; section about client/server communication added		
	1.2	January 1999	minor corrections; navigation frame extended; action group in control frame extended		
	1.3	April 1999	minor correction regarding multi beam frame; Table 14 states document version with last changes and HydroStar version which implements the features; section "About the Format" updated;		
a	1.4	May 14, 1999	groups of SeaBeam frame updated/extended	SD	ZI
	1.4.1	July, 1999	groups of SeaBeam frame finalized (team members: John Spitzak, Frank Ritters, Carsten Ziegenbein)		

Revision	Version	Date	Changes	Created	Appr.
	1.4.2	August, 1999	groups of product frame released (extended and finalized based on requirements from SeaBeam 2120 project) (team members: John Spitzak, Paul Cohen, Carsten Ziegenbein)		
	1.5	October, 1999	Client/Server Communication section reviewed and put under version control		
	1.6	November, 1999	group of SeaBeam frame changed/adjusted (team members: John Spitzak, Carsten Ziegenbein), FAQ section added		
	1.6.8	August, 2000	SeaBeam adjustments and minor corrections; synchronized to HydroStar Software Version 3.0.x		
	1.6.9	October, 2000	Adjustments and minor additions made during SeaBeam Integration meeting October 4-10, 2000 (team members: John Spitzak, Steve Zarenko, Carsten Ziegenbein)		
b	1.7	January, 2001	Identity group in control frame added; requesting a new connection now needs to identify the client using the appropriate identity number, version number and sensor name in the identity group	HN	CZ
	1.7.1	March, 2001	Updated to HydroStar Software 3.2 beta; Third party software using the network access to HydroStar Software needs to log in with identity group included in control frame (obsolete log in procedure will be supported in version 3.2 for compatibility purposes)		
	1.7.2	Mai, 2001	Updated to cover Geomar project requirements; signals group in side scan frame added		
	1.8.0	July, 2001	Synchronized with Cesme project and HydroStar Software version 3.2.2		
	1.8.1	September, 2001	Updated to cover Geomar III project requirements; signals group in side scan frame corrected and ping type group in side scan frame added		
	1.8.2	December, 2001	Complex Signal Group added to side scan frame; Heading group in Navigation frame implemented		
	1.8.3	March, 2002	ShipFrame, general group, weighted group added to side scan frame		
	1.8.4	July, 2002	SeaBeam Frame: Description Beams Group extend, MotionReferenceUnitGroup Sidescan Frame: Complex Signal Group Units added ShipFrame new groups: NavigationAndMotion Group, Transducer Group added, Sensors Group expand and implemented Not supported since June 2002: Parameter Group		

Revision	Version	Date	Changes	Created	Appr.
c	1.8.5	July, 2003	Navigation Frame: GPS Information added Ship Frame: Add Parameters Sidescan Frame: Description of Weighting Group corrected Added timing requirements. Correct MessageFrame Add Transducer Extended Group (Ship Frame) Control Frame: New ID Numbers in Identity Group (QINSy, PDS 2000, SeaBeam 3000, SeaBeam RawData) added SeaBeam Frame: SeaBeam3000 Groups added	WE	HN
d	1.8.6	March, 2004	Multibeam Frame: Azimuth added SeaBeam Frame: Raw Data, Sweep Segments, Collect corrected Seabeam Frame: Spacing Mode, Collect Raw Data, Raw Data Heave Roll Pitch Azimuth added	RI	RO
e	1.8.7	November, 2004	Added Digital I/O Frame	RA	HN
f	1.8.8	September, 2006	Seabeam Frame: FishPacDVLBinaryDataPD4PD5, FishPacDVLBinaryDataPD5 added Multibeam Frame: PropertiesGroup, GatesGroup corrected; Start/Stop in Pitch Group are double now	RA	RO
g	1.8.9	January, 2007	SeabeamFrame: FishPacRawDataLogSettings, FishPacRawDataLogMode	RA	RO
	1.8.10	April, 2007	Work on Geodetic Frame		
	1.8.11	September, 2007	SeabeamFrame: FishPacSaturationDetectionSettings		
i	1.8.12	December, 2007	SeabeamFrame: AliveGroup	RA	WE
	1.8.13	March, 2008	Work on SeaBeamFrame: FishPacSaturationDetectionSettingsGroup: Corrected Byte Number of Channels Reported NC from 2 to 4, as it is an ulong (no change in systems)		
k	1.8.14	April, 2008	Message Frame Group IDs corrected	RA	WE
	1.8.15	December 2008	Backscatter Group	RK	
	1.8.16	February, 2009	SeaBeamFrame Collected Group Obsolet SeaBeamFrame SidescanGroup define orientation	WE	
	1.8.17	March, 2009	Add XML Configuration Group to SeaBeam Frame	RI	
	1.8.18	April 2009	Add SB3100 Settings Group to SeaBeam Frame Added new id ShipFrame Sensors Group Added new ids to Identity Group of Control Frame	RI	

Revision	Version	Date	Changes	Created	Appr.
	1.8.19	June 2009	Add new Ids to SeaBeamFrame Transmitter Test Result Group	RI	
	1.8.20	July 2009	Added New Group to Multibeam and Seabeam Frame: Normalized Amplitude Extended description of the Gates Group within the Seabeam Frame	RI	
	1.8.21	July 2009	Added new types no. 4 and 5 in the Properties Group of the Multi Beam Frame; Editorial Changes	CZ	
L	1.8.22	August 2009	Added New Group to Seabeam Frame: Extended Properties Amplitude	RA	WE
	1.8.23	September 2009	Added External Trigger item to SB3100 Settings Group	RI	
	1.8.23	September 2009	Added 2 new quality indicators	RA	
	1.8.24	September 2009	Added new group to Seabeam Frame: SB3100 Boot Status	RI	
	1.8.25	October 2009	Added new group to Seabeam Frame: SB31000 Online Bite Status Group	RI	
	1.8.25	October 2009	Added new group to Seabeam Frame: Versatile Message Group	RI	
	1.8.26	October 2009	Corrected layout of SB31000 Online Bite Status Group. Renamed Versatile Message Group to System Message Group and improved documentation for this group.	RI	
	1.8.27	2010-09-09	Added depth validity to Sound Velocity Frame's Surface group	UN	
m	1.8.28	2011-01-26	Rename of Pitch Group in the Multibeam Frame in Forward Beam Angle Group	RA	WE

3.1.3 About the XSE Format

The byte order is most significant byte (MSB) first and least significant byte (LSB) last. This is big endian or UNIX byte order style. The floating point format of the XSE data is IEEE FP standard (754). The items in the frames and groups are byte aligned.

Table 2: Format Ranges (float and double are IEEE)

Format	Bytes	Range		N/A or NaN
char	1	-127	+127	-128 (0x80)
uchar	1	0x00	254 (0xFE)	255 (0xFF)
short	2	-32767	32767	-32768 (0x8000)
ushort	2	0x0000	65534 (0xFFFE)	65535 (0xFFFF)
long	4	-2147483647	2147483647	-2147483648 (0x80000000)
ulong	4	0x00000000	4294967294 (0xFFFFFFFE)	4294967295 (0xFFFFFFFF)

Format	Bytes	Range		N/A or NaN
float	4	-3.402823466e+38	3.402823466e+38	0xFFFFFFFF
double	8	-1.797693134862 3158e+308	1.797693134862 3158e+308	0xFFFFFFFFFFFFFF FF

Table 3: Distance Ranges

Format	Bytes	Range		Resolution
short	2	-32.767 m	32.767 m	1 mm
ushort	2	0.0 m	65.534 m	1 mm
long	4	-2147.5 km	2147.5 km	1 mm
ulong	4	0.0 km	4295 km	1 mm
float	4			6 digits; 0.1 rad = 40 cm
double	8			15 digits; 0.0001 rad = 5 mm

Table 4: Angle Ranges

Format	Bytes	Range		Resolution
short	2	- 360.437 deg	360.437 deg	0.011 deg
ushort	2	0.0 deg	393.204 deg	0.006 deg
long	4	- 365.072 deg	365.072 deg	1.7e-7 deg
ulong	4	0.0 deg	360.777 deg	8.4e-8 deg
float	4			6 digits
double	8			15 digits

Definition:

2 x Pi rad = 360 degree
1 rad = 180/ Pi degree

3.2 Items

As described in the following two sections the structure is given by the frames and group definition. However there are often sequences of items common to all frames and groups. To make the format description easier to read we introduce a number of predefined items that will be referenced in the frame and group description.

Table 5: Start and End Marker Item

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	0x24485346		start of frame, $HSF
End	4	ulong	0x23485346		end of frame, #HSF
Start	4	ulong	0x24485347		start of group, $HSG
End	4	ulong	0x23485347		end of group, #HSG

Table 6: Boolean Item

Item	Bytes	Format	Value	Units	Description
Boolean	1	uchar	1 or 0	N/A	true or false

Table 7: String Item

Item	Bytes	Format	Value	Units	Description
Length	4	ulong	N	N/A	Text length
Text	N	char		chars	Text

Table 8: Point Item

Item	Bytes	Format	Value	Units	Description
X	8	double		m/radian	East/Longitude
Y	8	double		m/radian	North/Latitude
Z	8	double		m	Height/Ellipsoidal Height

Table 9: Geodetic Point Item

Item	Bytes	Format	Value	Units	Description
N	4	ulong	N	N/A	Description length
Description	N	char		chars	Geodetic Description
X	8	double		m ll radian	East ll Longitude
Y	8	double		m ll radian	North ll Latitude
Z	8	double		m	Height/Ellipsoidal Height

Supported Geodetic Descriptions:
Description = “WGS84”
Datum: *WGE World Geodetic System 1984*; Elliposoid: *WE: WGS84*;
Projection: *Geodetic* (X: radian longitude (E+), Y: radian latitude (N+) Z: m (height+))

Table 10: Time Item

Item	Bytes	Format	Value	Units	Description
Seconds	4	ulong	N/A	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong	N/A	μs	micro seconds of seconds

3.3 Frames

3.3.1 Overview

Each data frame is made up of several groups. Each frame header contains timing and status information that are common to all contained groups. The groups contained in a frame are frame-specific. A frame must contain a specific group only once. The exceptions are documented along with the group description.
The Frame Id specifies the frame. Table 12 shows the frame and there frame-specific groups.

Table 11: Basic Frame

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Frame Start
Byte Count	4	ulong	N/A	bytes	between Byte Count & Frame End
Id	4	ulong	N/A	N/A	see Table 12
Source	4	ulong	N/A	N/A	id (e.g. sensor id)

Item	Bytes	Format	Value	Units	Description
Seconds	4	ulong	N/A	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong	N/A	µs	micro seconds of seconds
…	…	…	…	…	frame specific groups
End	4	ulong	#HSF	N/A	Frame End

Table 12: Valid Frames (Examples)

Name	Id	Description
Navigation	1	Navigation, ship's motion and attitude information
Sound Velocity	2	Sound velocity profile and surface sound velocity
Tide	3	Tide
Ship	4	Ship parameter information
Side scan	5	Side scan
Multi beam	6	Multi beam
Single beam	7	Single beam
Control	8	Establishing connections and control HydroStar Software
Bathymetry	9	3D Bathymetry data from multi beam or single beam sensors
Product	10	Product (HydroStar Application) and Project information
Native	11	Framed data without knowing the true format
Geodetic	12	Ellipsoidal information, Datum information, Translation and Projections
SeaBeam	13	Handle SeaBeam 2100 multi beam sonar
Message	14	Id and/or text messages
<Reserved>	15	<Reserved>
<Reserved>	16	<Reserved>
Digital I/O	17	Handle Digital I/O

3.3.2 Control Frame

A specialized frame is the Control Frame. When data exchange is done on-line by using LAN or serial ports, the Control Frame serves as the base frame to exchange control data between HydroStar Software and one or more software programs.

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Frame Start
Byte Count	4	ulong	N/A	Bytes	between Byte Count & Frame End
Id	4	ulong	8	N/A	see Table 12
Source	4	ulong	N/A	N/A	id (e.g. sensor id)
Seconds	4	ulong	N/A	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong	N/A	µs	micro seconds of seconds
Transaction	4	ulong	N/A	N/A	Transaction number
Address	4	ulong	N/A	N/A	Sender IP address
…	…	…	…	…	frame specific groups
End	4	ulong	#HSF	N/A	Frame End

3.4 Groups

3.4.1 Overview

The groups are wrapped in a frame structure which contains common timing and status information, valid to all groups in the frame, followed by the groups themselves. The order that the groups appear in a frame at the output will be arbitrary (e.g. group 5 do not need to appear after group 4). The items in the frames and groups are byte aligned!

Table 13: Basic Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Group Start
Byte Count	4	ulong	N/A	Bytes	between Byte Count & Group End
Id	4	ulong	N/A	N/A	see Table 14
…	…	…	…	…	Group specific data
End	4	ulong	#HSG	N/A	Group End

Table 14 summarized all available frames with corresponding groups. The column labeled “Frame” states the name and the corresponding frame id. The Column labeled “Group” shows all group names with corresponding group ids which belong to the frame. The column labeled “Reference” gives the associated table number. The Version column labeled “Version” indicates the latest program version of HydroStar Software and the latest document version of the XSE documentation which incorporates relevant changes of the given item. No version number implies.

Table 14: Valid Groups

Frame		Group		Reference	Version	
Name	Id	Name	Id		HydroStar	Document
Navigation Motion Attitude	1	General	1	Table 15		
		Point	2	Table 16	2.8.1	0.8
		Accuracy	3	Table 17	3.4.0	1.8.5
		Motion Ground Truth	4	Table 18	2.8.1	0.9
		Motion Trough Water	5	Table 19	2.8.1	
		Current Track Steering Properties	6	Table 20		1.2
		Heave Roll Pitch	7	Table 21	3.1.7	1.4.1
		Heave	8	Table 22		1.4.1
		Roll	9	Table 23		1.4.1
		Pitch	10	Table 24		1.4.1
		Heading	11	Table 25	3.3.2	1.4.1
		Speed	12	Table 26	3.4.0	1.4.1
		GPS Altitude Group	13	Table 27	3.4.0	1.8.5
Sound Velocity	2	General	1	Table 28		0.9
		Depth	2	Table 29	2.8.2	0.9
		Velocity	3	Table 30	2.8.2	0.9
		Conductivity	4	Table 31	2.8.2	0.9
		Salinity	5	Table 32	2.8.2	0.9
		Temperature	6	Table 33	2.8.2	0.9
		Pressure	7	Table 34	2.8.2	1.0

Frame		Group		Reference	Version	
Name	Id	Name	Id		HydroStar	Document
		Surface	8	Table 35		0.9.1
		Point	9	Table 36		1.4
Tide	3	General	1	Table 37		0.9
		Point	2	Table 38	3.4.0	0.9
		Time	3	Table 39	3.4.0	1.0
		Tide	4	Table 40	3.4.0	1.0
Ship	4	General	1	Table 41	3.3.2	0.9
		Time	2	Table 42		
		Draft	3	Table 43		
		Sensors	4	Table 44	3.3.4	1.8.4
		Motion	5	Table 45		
		Geometry	6	Table 46		
		Description	7	Table 47		
		Parameter (Not supported since June 2002)	8	Table 48	2.8.2.	0.9
		NavigationAndMotion	9	Table 49	3.3.4	1.8.4
		Transducer	10	Table 50	3.3.4	1.8.4
		Transducer Extended	11	Table 51	3.4.0	1.8.5
Side Scan	5	General	1	Table 52	3.1.9	1.7.1
		Amplitude vs. Traveltime	2	Table 53	3.2.2	0.9
		Phase vs. Traveltime	3	Table 54		0.9
		Amplitude vs. lateral	4	Table 55	3.1.9	1.7.1
		Phase vs. lateral	5	Table 56		1.7.2
		Signal	6	Table 57	3.2.2	0.9
		Ping Type	7	Table 58	3.3.1	1.8.1
		Complex Signal	8	Table 59	3.3.2	1.8.2
		Weighting	9	Table 60	3.3.3	1.8.3
Multi Beam	6	General	1	Table 61	3.1.9	1.7.1
		Beam	2	Table 62		
		Travel time	3	Table 63	2.8.1	0.9
		Quality	4	Table 64	2.8.1	0.9
		Amplitude	5	Table 65	2.8.1	0.9
		Delay	6	Table 66	2.8.1	0.9
		Lateral	7	Table 67	3.1.7	0.9.1
		Along	8	Table 68	3.1.7	0.9.1
		Depth	9	Table 69	3.1.7	0.9.1
		Angle	10	Table 70	2.8.1	0.9
		Heave	11	Table 71	2.8.1	0.9
		Roll	12	Table 72	2.8.1	0.9
		Forward Beam Angle (formerly Pitch)	13	Table 73	2.8.1	0.9
		Gates	14	Table 74	2.1.7	1.8.8
		Noise (signal to noise ratio)	15	Table 75	3.1.7	0.9.1
		Echo length	16	Table 76	3.1.7	0.9.1
		Hits	17	Table 77	3.1.7	0.9.1
		Heave Receive	18	Table 78	3.4.0	1.8.5
		Azimuth	19	Table 79		
		Properties	20	Table 80		1.8.8
		Normalized Amplitude	21	Table 81		1.8.20
Single Beam	7	General	1	Table 82		0.8
Control	8	General	1	Table 83		
		Change	2	Table 84		

Frame		Group		Reference	Version	
Name	Id	Name	Id		HydroStar	Document
		Add	3	Table 85		
		Delete	4	Table 86		
		Action	5	Table 87	2.8.1	1.1
		Continuous	6	Table 88	2.8.1	1.1
		Request	7	Table 89		1.1
		Connection	8	Table 90	2.8.1	1.1
		Reply	9	Table 91		1.1
		Identity	10	Table 92	3.0.14	1.7
		Record File Name	11	Table 93		
		Sonar Multibeam Settings	12	Table 94		
		Sonar SB1000 Power	13	Table 95		
Bathymetry	9	General	1	Table 96		
		Points	2	Table 97		
		SwathBounderies	3	Table 98		
Product	10	General	1	Table 99		
		ExchangeServer	2	Table 100		
		ProjectProperties	3	Table 101		
		Sources	4	Table 102		
Native	11	Collectable	1	Table 103		
		Raw	2	Table 104		
		ELAC	3	Table 105		
		UNB	4	Table 106		
Geodetic	12	General	1	Table 107		
		Ellipsoid	2	Table 108		
		Datum	3	Table 109		
		Projection	4	Table 110		
		System	5	Table 112		
		Alias	6	Table 113		
SeaBeam	13	Properties	1	Table 114	3.1.7	1.4
		HeaveRollPitch	2	Table 115	3.1.7	1.4
		Setup	3	Table 116	3.1.7	1.4
		MotionReferenceUnit	4	Table 117	3.1.7	1.4
		Settings	5	Table 118	3.1.7	1.4
		Beams	6	Table 119	3.1.7	1.4
		Gates	7	Table 120	3.1.7	1.4
		Slice	8	Table 121	3.1.7	1.4
		Signal	9	Table 122	3.1.7	1.4
		Sidescan	10	Table 123	3.1.7	1.4
		Shutdown	11	Table 124	3.1.7	1.4
		Ping	12	Table 125	3.1.7	1.4
		Calibrate	13	Table 126	3.1.7	1.4
		Collect	14	Table 127	3.1.7	1.4
		Surface	15	Table 128	3.1.7	1.4
		Hydrophone	16	Table 129	3.1.7	1.4
		Projector	17	Table 130	3.1.7	1.4
		Bias	18	Table 131	3.1.7	1.4
		Acknowledge	19	Table 132	3.1.7	1.4
		Warning	20	Table 133	3.1.7	1.6.9
		Message	21	Table 134	3.1.7	1.6.9
		Error	22	Table 135	3.1.7	1.6.9
		Transmit	23	Table 136	3.1.7	1.4.1
		Transmitter	24	Table 137	3.1.7	1.4.1
		Amplifier	25	Table 138	3.1.7	1.4.1

Frame		Group		Reference	Version	
Name	Id	Name	Id		HydroStar	Document
		Update	26	Table 139	3.1.7	1.4.1
		Firmware	27	Table 140	3.1.7	1.4.1
		Generate	28	Table 141	3.1.7	1.4.1
		TimeVaryingGain	29	Table 142	3.1.7	1.4.1
		Process	30	Table 143	3.1.7	1.4.1
		Processor	31	Table 144	3.1.7	1.4.1
		Receive	32	Table 145	3.1.7	1.4.1
		Receiver	33	Table 146	3.1.7	1.4.1
		Calibration	34	Table 147	3.1.7	1.4.1
		Echo	35	Table 148	3.1.7	1.4.1
		Protocol	36	Table 149	3.1.7	1.4.1
		SelectSignal	37	Table 150	3.1.7	1.6
		TransducerAdvance	38	Table 151	3.4.1	1.8.4
		Seabeam 3000 Ping	39	Table 152	3.5.0	1.8.5
		Sweep Segments	40	Table 153	3.5.0	1.8.5
		Shut Down Amplifiers	41	Table 154	3.5.0	1.8.5
		SB3000 Settings	42	Table 155	3.5.0	1.8.5
		Enable / Disable Power Amplifiers	43	Table 156	3.5.0	1.8.5
		Power Amplifier Monitoring	44	Table 157	3.5.0	1.8.5
		Transmitter Tests	45	Table 158	3.5.0	1.8.5
		Reset Transmitter	46	Table 159	3.5.0	1.8.5
		Power Amplifier Monitoring Data	47	Table 160	3.5.0	1.8.5
		Transmitter Test Result	48	Table 161	3.5.0	1.8.5
		Raw Data	49	Table 162	3.5.0	1.8.5
		Spacing Mode	50	Table 163	3.5.0	1.8.6
		Raw Data Collect	51	Table 164	3.5.0	1.8.6
		Raw Data Heave Roll Pitch Azimuth	52	Table 165	3.5.0	1.8.6
		FishPacRawDataLogMode	70	Table 166		
		FishPacRawData LogSettings	71	Table 167		
		FishPacDVLBinaryDataPD4PD5	72	Table 168	3.5.4	1.8.8
		FishPacDVLBinaryDataPD5	73	Table 169	3.5.4	1.8.8
		FishPacSaturationDetectionSettings	74	Table 170	3.5.5	1.8.11
		Alive	75	Table 171	3.5.5	1.8.12
		Backscatter	76	Table 172		
		XML Configuration	77	Table 173		1.8.17
		SB3100 Settings	78	Table 174		1.8.18
		Normalized Amplitude	79	Table 175		1.8.20
		Extended Properties	80	Table 176		
		SB3100 Boot Satus	81	Table 177		1.8.24
		SB3100 Online Bite Status	82	Table 178		1.8.25
		System Message	83	Table 179		1.8.25
Message	14	Error	1	Table 180	3.2.2	1.4.1
		Warning	2	Table 181	3.2.2	1.4.1
		Info	3	Table 182	3.2.2	1.4.1
		Debug	4	Table 183		1.8.5
		Exception	5	Table 184		1.8.5

Frame		Group		Reference	Version	
Name	Id	Name	Id		HydroStar	Document
		Annotation	6	Table 185		1.8.5
<Reserved>	15					
<Reserved>	16					
Digital I/O	17	Board Description	1	Table 186	3.5.0	1.8.7
		Error	2	Table 187	3.5.0	1.8.7
		Counters	3	Table 188	3.5.0	1.8.7
		Clear Counters	4	Table 189	3.5.0	1.8.7
		Digital Inputs	5	Table 190	3.5.0	1.8.7
		Digital Outputs	6	Table 191	3.5.0	1.8.7

3.4.2 Navigation Groups

Table 15: General Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
End	4	ulong	#HSG	N/A	End Group

Table 16: Point Group *(see Table 9: Geodetic Point Item)*

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	32+N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Point Group
N	4	ulong	Geodetic Point Item	N/A	Description length
Description	N	char		chars	Geodetic Description
X	8	double		m ll rad	East ll Longitude
Y	8	double		m ll rad	North ll Latitude
Z	8	double		m	Height ll Ellipsoidal Height
End	4	ulong	#HSG	N/A	End Group

Table 17: Accuracy Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	19	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Accuracy Group
QualityIndicator	2	short	0: FixOrInvalid 1: SPS 2:Differential SPS 3: PPS 4: RTK 5: FloatRTK 6: Estimated 7: Manual 8: Simulator 9:USBL Sensor 10:HighQulity GPSData 11:LowQuality GPSData		GPS QualityIndicator Fix not available or invalid; GPS SPS Mode, fix valid; Differential GPS SPS Mode, fix valid; GPS PPS Mode, fix valid; Real Time Kinematic System used in RTK mode with fixed integers; Float RTK. Satellite system used in RTK Mode, floating integers; Estimated (dead reckoning) Mode; Manual Input Mode; Simulator Mode **USBL Sensor:** Extra GPS Sensor **HighQulityGPSData:** The gps data have a high quality, but there are no additional information about the quality, the following attributes can be ignored. **LowQualityGPSData:** The gps data have a low quality, but there are no additional information about the quality, the following attributes can be ignored.
Satellites	1	uchar			Number of Satellites
HorizontalDilution	4	float			Horizontal Dilution of precision
DifferentialAge	4	float		s	Age of Differential GPS data (Time in seconds since last SC104 Type 1 or 9 update, null field when DGPS is not used
DifferentialReferenceStation	4	ulong			Differential Reference Station
End	4	ulong	#HSG	N/A	End Group

Table 18: Motion Ground Truth Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	20	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Motion Ground Truth Group
Speed	8	double		m/s	Speed made good
Course	8	double		rad	Course made good (0..2*π)
End	4	ulong	#HSG	N/A	End Group

Table 19: Motion Through Water Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	20	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	Motion Through Water Group
Speed	8	double		m/s	Speed
Course	8	double		rad	Heading (0..2*π)
End	4	ulong	#HSG	N/A	End Group

Table 20: Current Track Steering Properties Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	60	bytes	between Byte Count & Group End
Id	4	ulong	6	N/A	Current Track Properties Group
Offset Track	8	double		m	
Offset SOL	8	double		m	
Offset EOL	8	double		m	
Distance SOL	8	double		m	Distance to Start Of Line
Azimuth SOL	8	double		rad	Azimuth to Start Of Line
Distance EOL	8	double		m	Distance to End Of Line
Azimuth EOL	8	double		rad	Azimuth to End Of Line
End	4	ulong	#HSG	N/A	End Group

Table 21: HeaveRollPitch Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	28	bytes	between Byte Count & Group End
Id	4	ulong	7	N/A	HeaveRollPitch Group
Heave	8	double		m	Heave
Roll	8	double		rad	Roll (starboard down = positive) Heave (ship up = positive) Pitch (bow up = positive)
Pitch	8	double		rad	Pitch
End	4	ulong	#HSG	N/A	End Group

Table 22: Heave Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Heave Group
Heave	8	double		m	Heave (ship up = positive)
End	4	ulong	#HSG	N/A	End Group

Table 23: Roll Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Roll Group
Roll	8	double		radian	Roll (starboard down = positive)
End	4	ulong	#HSG	N/A	End Group

Table 24: Pitch Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	10	N/A	Pitch Group
Pitch	8	double		radian	Pitch
End	4	ulong	#HSG	N/A	End Group

Table 25: Heading Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	11	N/A	Heading Ground Truth Group
Course	8	double		radian	Heading (0..2*π)
End	4	ulong	#HSG	N/A	End Group

Table 26: Speed Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	12	N/A	Speed Group
Speed	8	double		m/s	Speed through water (Log)
End	4	ulong	#HSG	N/A	End Group

Table 27: GPS Altitude Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	13	N/A	GPS Altitude Group
MeanSeaLevel	4	float		m	Altitude re: mean-sea-level (geoid)
GeoidalSeparation	4	float		m	The difference between the WGS-84 earth ellipsoid surface and mean-sea-level (geoid) surface, "-" = mean-sea-level surface below WGS-84 ellipsoid surface
End	4	ulong	#HSG	N/A	End Group

3.4.3 Sound Velocity Groups

Table 28: General Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
Length	4	ulong	String Item	N/A	Text length
Text	N	char		chars	Description
State	4	ulong	1: measured 2: calculated 3: mean	bits	
End	4	ulong	#HSG	N/A	End Group

Table 29: Depth Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Depth Group
N	4	ulong		N/A	Number of values
Depth	8*N	double		meter	Depth values
End	4	ulong	#HSG	N/A	End Group

Table 30: Velocity Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Velocity Group
N	4	ulong		N/A	Number of values
Velocity	8*N	double		m/s	Velocity values
End	4	ulong	#HSG	N/A	End Group

Table 31: Conductivity Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Conductivity Group
N	4	ulong		N/A	Number of values
Conductivity	8*N	double		mmho/cm	Conductivity values
End	4	ulong	#HSG	N/A	End Group

Table 32: Salinity Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	Salinity Group
N	4	ulong		N/A	Number of depth values
Salinity	8*N	double		o/oo	Salinity values
End	4	ulong	#HSG	N/A	End Group

Table 33: Temperature Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	6	N/A	Temperature Group
N	4	ulong		N/A	Number of values
Temperature	8*N	double		deg Celsius	Temperature values
End	4	ulong	#HSG	N/A	End Group

Table 34: Pressure Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	
Id	4	ulong	7	N/A	Pressure Group
N	4	ulong		N/A	Number of values
Pressure	8*N	double		bar	Pressure values
End	4	ulong	#HSG	N/A	End Group

Table 35: Surface Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	21	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Surface Group
Velocity	8	double		m/s	Surface sound velocity
Depth	8	double		m	
Validity of depth	1	char		N/A	0: depth is invalid any other value: depth is valid
End	4	ulong	#HSG	N/A	End Group

Table 36: Point Group (not implemented) *(see Table 9: Geodetic Point Item)*

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	32+N	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Point Group
N	4	ulong	Geodetic Point Item	N/A	Description length
Description	N	char		chars	Geodetic Description
X	8	double		m ll rad	East ll Longitude
Y	8	double		m ll rad	North ll Latitude
Z	8	double		m	Height/Ellipsoidal Height
End	4	ulong	#HSG	N/A	End Group

3.4.4 Tide Groups

Table 37: General Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+N	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
Length	4	ulong	N	N/A	Text length
Text	N	char		chars	Description
End	4	ulong	#HSG	N/A	End Group

Table 38: Point Group *(see Table 9: Geodetic Point Item)*

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	32+N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Point Group
N	4	ulong	Geodetic Point Item	N/A	Description length
Description	N	char		chars	Geodetic Description
X	8	double		m ll rad	East ll Longitude
Y	8	double		m ll rad	North ll Latitude
Z	8	double		m	Height/Ellipsoidal Height
End	4	ulong	#HSG	N/A	End Group

Table 39: Time Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+4*N	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Time Group
N	4	ulong		N/A	Number of values
Time	4*N	ulong		s	UTC time values (seconds since 00:00 01.01.1901)
End	4	ulong	#HSG	N/A	End Group

Table 40: Tide Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Tide Group
N	4	ulong		N/A	Number of values
Tide	8*N	double		m	Tide values
End	4	ulong	#HSG	N/A	End Group

3.4.5 Ship Groups

Table 41: General Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	56+N	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
N	4	ulong		chars	Length of ship name
Name	N	char		N/A	Ship name
Length	8	double		m	total length
Beam	8	double		m	total width
Draft	8	double		m	maximum draft
Height	8	double		m	maximum height
Displacement	8	double		cubic m	
Weight	8	double		kg	
End	4	ulong	#HSG	N/A	End Group

Table 42: Time Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+4*N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Time Group
N	4	ulong		N/A	Number of values
Time	4*N	ulong		UTC Time	Time where draft is valid
End	4	ulong	#HSG	N/A	End Group

Table 43: Draft Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Draft Group
N	4	ulong		N/A	Number of values
Draft	8*N	double		meter	Draft values
End	4	ulong	#HSG	N/A	End Group

Table 44: Sensors Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+12*N	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Sensors Group
N	4	ulong		N/A	Number of values
Sensor Ids	4*N	ulong		ids	Sensors id values
Sensor Type	4*N	ulong	1000: 2000: 2001: 3000: 3100: 4000: 8000: 8001: 9000: 9001:	SB1000 SB2100 SB2100 V-shaped SB3000 SB3100 SingleBeam EdgeTech Sidescan FishPac Surfacesound velocity sensor	
Frequency	4*N	ulong		Hz	Operating frequency (if the sensor is a sonar)
End	4	ulong	#HSG	N/A	End Group

Table 45: Motion Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	Motion Group
End	4	ulong	#HSG	N/A	End Group

Table 46: Geometry Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	6	N/A	Geometry Group
End	4	ulong	#HSG	N/A	End Group

Table 47: Description Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	7	N/A	Description Group
End	4	ulong	#HSG	N/A	End Group

Table 48: Parameter Group (Not supported since June 2002)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	76	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Parameter Group
Roll	4	float		rad	HRP sensor roll offset
Pitch	4	float		rad	HRP sensor pitch offset
Heading	4	float		rad	heading sensor offset
Delay	4	float		s	navigation time delay
PTrans. x	4	float		m	port transducer x position
PTrans. y	4	float		m	port transducer y position
PTrans. z	4	float		m	port transducer z position
STrans. x	4	float		m	starboard transducer x position
STrans y	4	float		m	starboard transducer y position
STrans z	4	float		m	starboard transducer z position
PTrans. Error	4	float		rad	port transducer rotation in roll direction
STrans. Error	4	float		rad	starboard transducer rotation in roll direction
Navigation x	4	float		m	navigation antenna x position
Navigation y	4	float		m	navigation antenna y position
Navigation z	4	float		m	navigation antenna z position
HRP x	4	float		m	HRP sensor x position
HRP y	4	float		m	HRP sensor y position
HRP z	4	float		m	HRP sensor z position
End	4	ulong	#HSG	N/A	End Group

Table 49: NavigationAndMotion Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	92	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Parameter Group
Roll	8	double		rad	HRP sensor roll offset
Pitch	8	double		rad	HRP sensor pitch offset
Heave	8	double		m	HRP sensor heave offset
Gyro	8	double		rad	Gyro sensor offset
Delay	8	double		s	navigation time delay
Navigation x	8	double		m	navigation antenna x position
Navigation y	8	double		m	navigation antenna y position
Navigation z	8	double		m	navigation antenna z position
HRP x	8	double		m	HRP sensor x position
HRP y	8	double		m	HRP sensor y position
HRP z	8	double		m	HRP sensor z position
End	4	ulong	#HSG	N/A	End Group

Table 50: Transducer Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+N*90	bytes	between Byte Count & Group End
Id	4		ulong	10	N/A	Transducer Group
Number N	4		ulong			Number of Transducers
SensorID	4	90 *N	ulong			Sensor Ids (SensorsGroup)
Frequency	4		ulong		Hz	Frequency
Transducer	1		uchar	0: Hydrophone 1: Projector 2: Transducer		Kind of Transducer
Side	1		uchar	0: undefined 1: port 2: starboard 3: midship 4: SystemDefined		Transducer Side
MountingRoll	8		Double		rad	array mounting angle (Roll)
MountingPitch	8		Double		rad	array mounting angle (Pitch)
MountingAzimuth	8		Double		rad	array mounting angle (Azimuth)
X	8		Double		m	across track offset (transducer center)
Y	8		Double		m	along track offset (transducer center)
Z	8		Double		m	vertical offset (transducer center)
Roll Bias	8		Double		rad	roll bias value which should be used in beam forming (port up positive)
Pitch Bias	8		Double		rad	pitch bias value applied to beam forming (bow up positive)
Azimuth Bias	8		Double		rad	compass bias value applied to beam forming (projector axis clockwise with respect to compass positive)
Distance	8		Double		m	Horizontal distance between the innermost transducer elements of the transducer arrays to the center ship line in a V-shaped ship configuration
End	4		ulong	#HSG	N/A	End Group

Table 51: Transducer Extended Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+N*51	bytes	between Byte Count & Group End
Id	4	ulong	11	N/A	Transducer Group
Number N	4	ulong			Transducers Number
Mounting Roll	1*N	uchar	0 Auto 1 Manual 2 Fixed		0 Auto Mode 1 User Input Mode 2 System Parameter Mode
Mounting Pitch	1*N	Uchar	0 Auto 1 Manual 2 Fixed		0 Auto Mode 1 User Input Mode 2 System Parameter Mode
Mounting Azimuth	1*N	Uchar	0 Auto 1 Manual 2 Fixed		0 Auto Mode 1 User Input Mode 2 System Parameter Mode
	48*N	uchar			unused
End	4	ulong	#HSG	N/A	End Group

3.4.6 Side Scan Groups

Table 52: General Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	28	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
Ping	4	ulong			Ping number
Frequency	4	float		kHz	Operating frequency
Pulse	4	float		s	Transmit pulse length
Power	4	float		dB	Transmit power
Bandwidth	4	float		kHz	Band width of receiver filter
Sample	4	float		s	Sample interval
End	4	ulong	#HSG	N/A	End Group

Table 53: Amplitude vs. Traveltime Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+2*N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	AmplitudeTraveltime Group
Interval	4	ulong		us	Sample interval
Offset	4	ulong			Time offset
N	4	ulong		N/A	Number of values
Amplitude	2*N	short		N/A	Amplitude in dB (rel. weighting factor from Weighting Group) Sample 0 is on starboard side. Sample N is in port side.
End	4	ulong	#HSG	N/A	End Group

Table 54: Phase vs. Traveltime Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+2*N	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	PhaseTraveltime Group
Interval	4	ulong		us	Sample interval
Offset	4	ulong		us	Time offset
N	4	ulong		N/A	Number of values
Phase	2*N	short		radian	Phase
End	4	ulong	#HSG	N/A	End Group

Table 55: Amplitude vs. Lateral Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+2*N	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	AmplitudeLateral Group
Size	4	ulong		mm	Bin size
Offset	4	ulong		mm	Lateral offset
N	4	ulong		N/A	Number of values
Amplitude	2*N	short		dB	Amplitude
End	4	ulong	#HSG	N/A	End Group

Table 56: Phase vs. Lateral Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+2*N	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	PhaseLateral Group
Size	4	ulong		mm	Bin size
Offset	4	ulong		mm	Lateral offset
N	4	ulong		N/A	Number of values
Phase	2*N	short		rad	Phase
End	4	ulong	#HSG	N/A	End Group

Table 57: Signal Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	32+N*2	bytes	between Byte Count & Group End
Id	4	ulong	6	N/A	Signal Group
Number	4	ulong		N/A	Ping number
Channel	4	ulong		N/A	Channel id
Offset	8	double		N/A	Start offset
Interval	8	double		N/A	Bin size/sample interval
N	4	ulong		N/A	Number of Samples
Sample	2*N	short		N/A	Amplitude in dB (rel. weighting factor from Weighting Group)
End	4	ulong	#HSG	N/A	End Group

Table 58: Ping Type Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	40+N	bytes	between Byte Count & Group End
Id	4	ulong	7	N/A	Ping Type Group
Frequency Mode	4	ulong	0 1	constant linear sweep	Pulse type
Start Frequency	8	double		Hz	Start frequency
End Frequency	8	double		Hz	End frequency
Duration	8	double		ms	Transmit pulse duration
Manufacturer Code	4	ulong	1 2	EdgeTech ELAC	Manufacturer code
Pulse Id	4	long			Pulse identifier (proprietary)
Name	4+N	string			Pulse name (proprietary)
End	4	ulong	#HSG	N/A	End Group

Table 59: Complex Signal Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	40+N	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Complex Signal Group
Number	4	ulong		N/A	Ping number
Channel	4	ulong		N/A	Channel id
Offset	8	double		us	Start offset
Interval	8	double		us	Bin size/sample interval
N	4	ulong		N/A	Number of Samples
Sample	4*N	short		N/A	Signal data, (1 short real, 1 short imaginary) N times
End	4	ulong	#HSG	N/A	End Group

Table 60: Weighting Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Weighting Group
FactorLeft	2	short			weighting factor for block floating point expansion -- defined as 2^(-N)
SamplesLeft	4	ulong			
FactorRight	2	short			weighting factor for block floating point expansion -- defined as 2^(-N)
SamplesRight	4	ulong			
End	4	ulong	#HSG	N/A	End Group

3.4.7 Multi Beam Groups

Table 61: General Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	32	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
Ping	4	ulong			Ping number
Frequency	4	float		Hz	Transducer frequency
Pulse	4	float		s	Transmit pulse length
Power	4	float		dB	Transmit power
Bandwidth	4	float		Hz	Band width of receiver filter
Sample	4	float		s	Sample interval
Swath	4	float		rad	
End	4	ulong	#HSG	N/A	End Group

Table 62: Beam Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+2*N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Beam Group
N	4	ulong		N/A	Number of values
Beam	2*N	ushort			Beam number
End	4	ulong	#HSG	N/A	End Group

Table 63: Traveltime Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Traveltime Group
N	4	ulong		N/A	Number of values
Traveltime	8*N	double		s	Traveltime (two ways)
End	4	ulong	#HSG	N/A	End Group

Table 64: Quality Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+N	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Quality Group
N	4	ulong		N/A	Number of values
Quality	N	uchar		N/A	
End	4	ulong	#HSG	N/A	End Group

Table 65: Amplitude Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+2*N	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	Amplitude Group
N	4	ulong		N/A	Number of values
Amplitude	2*N	ushort		0.1 dB	Average of amplitudes
End	4	ulong	#HSG	N/A	End Group

Table 66: Delay Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	6	N/A	Delay Group
N	4	ulong		N/A	Number of values
Delay	8*N	double		s	Time offset of the beam relative to frame time
End	4	ulong	#HSG	N/A	End Group

Table 67: Lateral Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	7	N/A	Lateral Group
N	4	ulong		N/A	Number of values
Lateral	8*N	double		m	Lateral distance (negative starboard, positive port)
End	4	ulong	#HSG	N/A	End Group

Table 68: Along Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Along Group
N	4	ulong		N/A	Number of values
Along	8*N	double		m	Along distance (negative stern, positive bow)
End	4	ulong	#HSG	N/A	End Group

Table 69: Depth Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Depth Group
N	4	ulong		N/A	Number of values
Depth	8*N	double		m	Depth below transducer
End	4	ulong	#HSG	N/A	End Group

Table 70: Angle Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	10	N/A	Angle Group
N	4	ulong		N/A	Number of values
Angle	8*N	double		rad	Beam angle (negative starboard, positive port) >>Launch Angle
End	4	ulong	#HSG	N/A	End Group

Table 71: Heave Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	11	N/A	Heave Group
N	4	ulong		N/A	Number of values
Heave	8*N	double		m	Ship up = positive heave at time of transmit
End	4	ulong	#HSG	N/A	End Group

Table 72: Roll Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	12	N/A	Roll Group
N	4	ulong		N/A	Number of values
Roll	8*N	double		rad	Roll (starboard down = positive) roll at time of transmit
End	4	ulong	#HSG	N/A	End Group

Table 73: Forward Beam Angle Group (formerly Pitch Group)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	13	N/A	Forward Beam Angle Group (formerly Pitch Group)
N	4	ulong		N/A	Number of values
Pitch	8*N	double		rad	(bow up = positive)
End	4	ulong	#HSG	N/A	End Group

Table 74: Gates Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+24*N	bytes	between Byte Count & Group End
Id	4		ulong	14	N/A	Gates Group
N	4		ulong		N/A	Number of values
Angle	8	24*N	double		rad	direction of beam
Start	8		double		s	Start gate
Stop	8		double		s	Stop gate
End	4		ulong	#HSG	N/A	End Group

Table 75: Noise Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+4*N	bytes	between Byte Count & Group End
Id	4	ulong	15	N/A	Noise Group
N	4	ulong		N/A	Number of values
Noise	4*N	float		dB	Signal to noise ratio
End	4	ulong	#HSG	N/A	End Group

Table 76: Length Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+4*N	bytes	between Byte Count & Group End
Id	4	ulong	16	N/A	Length Group
N	4	ulong		N/A	Number of values
Length	4*N	float		s	Echo length
End	4	ulong	#HSG	N/A	End Group

Table 77: Hits Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+4*N	bytes	between Byte Count & Group End
Id	4	ulong	17	N/A	Hits Group
N	4	ulong		N/A	Number of values
Hits	4*N	ulong			Hits
End	4	ulong	#HSG	N/A	End Group

Table 78: Heave Receive Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	18	N/A	Heave Receive Group
N	4	ulong		N/A	Number of values
Heave	8*N	double		m	Ship up = positive heave at time of receive
End	4	ulong	#HSG	N/A	End Group

Table 79 Fehler! Verweisquelle konnte nicht gefunden werden.**: Azimuth Group**

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count & Group End
Id	4	ulong	19	N/A	Azimuth Group
N	4	ulong		N/A	Number of values
Azimuth	8*N	double		rad	Azimuth angle of transmitrted swath
End	4	ulong	#HSG	N/A	End Group

Fehler! Verweisquelle konnte nicht gefunden werden.Fehler! Verweisquelle konnte nicht gefunden werden.Fehler! Verweisquelle konnte nicht gefunden werden.Fehler! Verweisquelle konnte nicht gefunden werden.**Table 80: Properties Group**

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+10*N+40	Bytes	between Byte Count & Group End
Id	4		ulong	20	N/A	Properties Group
Count N	4		ulong			Number of values
Type	2	10* N	ushort	0 1 2 3 4 5	N/A	0: SSV applied for Rx beamforming 1: Azimuth of transmitted swath 2: Across-ship beam width of MBES 3: Along-ship beam width of MBES 4: User gain (i.e. system base gain @ 10 m water depth minus a system base gain offset) 5: Absolute transmission source level vertically below the projector array (i.e. vertically in relation to the ship, not vertically in space).
Value	8		double		Depending on type: 0: m/s 1: rad 2: rad 3: rad 4: dB 5: dB	Value
Reserved	40		Byte	0	N/A	Reserved
End	4		ulong	#HSG	N/A	End Group

Table 81: Normalized Amplitude Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	20 +2N + (4 or 4N)	bytes	between Byte Count & Group End
Id	4	ulong	21	N/A	Normalized Amplitude Group
N	4	ulong		N/A	Number of Beams
Flags	4	ulong	0x00000001 Multi Frequency	bitmask	Multi-Frequency-Flag 0: one frequency is written. 1: one frequency for each beam is written.
Along track Beam width	4	Float		rad	Along track beam width for center beam
Across track Beam width	4	Float		rad	Across track beam width for center beam
Normalized Amplitude	2*N	short		0.1 dB	Normalized Amplitude of Bottom Echo per Beam. All System Gain Values (Receiver Gain, Source Level, etc.) have been removed from this value. System independent losses are not part of the normalization! (Beam Order is the same as in the Angle Group (Id 10))
Frequency	4 or 4*N	Float		Hz	System Frequency (Number of Values depends on Multi-Frequency-Flag, see above)
End	4	ulong	#HSG	N/A	End Group

3.4.8 Single Beam Groups

Table 82: General Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	44	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
Frequency	4	ulong		kHz	30/200 kHz transducer
Quality	4	ulong		N/A	0/1 invalid/valid
Traveltime	8	double	N/A	s	not used (NaN)
Sound	8	double		m/s	used sound velocity
Depth	8	double		m	calculated depth
Amplitude	8	double	N/A	dB	not used (NaN)
End	4	ulong	#HSG	N/A	End Group

3.4.9 Control Groups

Table 83: General Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
End	4	ulong	#HSG	N/A	End Group

Table 84: Change Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Change Group
End	4	ulong	#HSG	N/A	End Group

Table 85: Add Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Add Group
End	4	ulong	#HSG	N/A	End Group

Table 86: Delete Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Delete Group
End	4	ulong	#HSG	N/A	End Group

Table 87: Action Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	Action Group
Action	4	ulong	start actions: 0x01: record 0x02: playback 0x04: simulate 0x08: online stop actions: 0x11: record 0x12: playback 0x14: simulate 0x18: standby	bit	start and/or stop one of the following actions: storage record or play, simulate, sensor standby or online
End	4	ulong	#HSG	N/A	End Group

Table 88: Continuous Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+4*N	bytes	between Byte Count & Group End
Id	4	Ulong	6	N/A	Continues Group
Frame	4	ulong			Requested frame id
Mode	4	ulong	1 2	enable disable	Enable/disable
N	4	ulong			Number of groups
Group	4	ulong			Requested group id
End	4	ulong	#HSG	N/A	End Group

Table 89: Request Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	7	N/A	Request Group
Frame	4	ulong			Requested frame id
N	4	ulong			Number of groups
Group	4	ulong			Requested group id
End	4	ulong	#HSG	N/A	End Group

Table 90: Connection Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	10	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Connection Group
Port	2	short			Port number
Command	4	ulong	1: open 2: close	bit	Open or close connection
End	4	ulong	#HSG	N/A	End Group

Table 91: Reply Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Reply Group
Transaction	4	ulong			transaction number to which this reply corresponds
Status	4	ulong	1: error 2: accepted 3: unavailable 4: processing	bit	error, accepted request or command, requested data unavailable, processing request or command
End	4	ulong	#HSG	N/A	End Group

Table 92: Identity Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+N	bytes	between Byte Count & Group End
Id	4	ulong	10	N/A	Identity Group
Server	4	ulong	0..99: HydroStar Software 90:HS Nav WCI 100: SeaBeam 2100 101: Isis2000 102: Hysweep 103: ISS2000 104: SMS 105: Helmsman1 106: Helmsman2 107: NaviBat 108: NAVICOURSE 109: HydroStar NDS 110: QINSy 111: PDS2000 112: SeaBeam 3000 113: SeaBeam RawData 114: GeomarSidescan 116: SeaBeam 3020 120: FishPac 122: SeaBeam 3012 123: SeaBeam 3100	number	Identity number of sensor (client or server)
Version	4	ulong		number	version of client or server software
Name	4+N	string			name of client or server software
End	4	ulong	#HSG	N/A	End Group

Table 93: Record File Name Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+N	bytes	between Byte Count & Group End
Id	4	ulong	11	N/A	Identity Group
Filename	4+n	String			Filename by recording
End	4	ulong	#HSG	N/A	End Group

Table 94: Sonar Multibeam Settings Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong		bytes	between Byte Count & Group End
Id	4	ulong	12	N/A	Identity Group
Sensor Id	4	ulong		ids	See ShipFrame Sensor Group
Frequency		float		kHz	
Power Mode		uchar	Auto Manual		
Power		short	0, -3, … -18	db	
Pulse Mode		uchar	Auto Manual		
Pulse Length		float	≥ 0.0	ms	SB1000: 0.15 0.3 1 3
Bandwidth Mode		uchar	Auto Manual		
Bandwidth		float		kHz	SB1000: 1 kHz 3.3 kHz 12 kHz
Swath Width Mode		uchar	Auto Manual		
Swath Width		float		Rad	SB1000 in Degree: 15, 41, 63, 86, 108, 131, 153
Gain Mode		uchar	Auto Manual		
Gain		double		dB	
Gates Mode		uchar	Auto Manual		
Center Depth		float		m	Gates
Width		float		m	Gates
Sidescan		uchar	On Off		
Pixel Mode		uchar	Auto Manual		Sidescan
Pixel Size		float			Sidescan
	50				Unused
End	4	ulong	#HSG	N/A	End Group

Table 95: Sonar SB1000 Power Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	5	bytes	between Byte Count & Group End
Id	4	ulong	13	N/A	Identity Group
Sensor Id	4	ulong		ids	See ShipFrame Sensor Group
Remote Mode	1	uchar	0: Off 1: On		Remote Power Off Remote Power ON
End	4	ulong	#HSG	N/A	End Group

3.4.10 Bathymetry Groups

Table 96: General Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
End	4	ulong	#HSG	N/A	End Group

Table 97: Points Group (not implemented) *(see Table 9: Geodetic Point Item)*

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N1+24*N2	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Points Group
Description	4+N1	string			Geodetic Description
Entries	4	ulong			Number of point items
Points	24*N2	point			Point items
End	4	ulong	#HSG	N/A	End Group

Table 98: SwathBounderies (not implemented) *(see Table 9: Geodetic Point Item)*

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+N1+N2+N3	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	SwathBounderies Group
N1	4	ulong	Geodetic Point Item	N/A	Valid Outermost Starboard Position
Description	N1	char		chars	
X	8	double		m/rad	
Y	8	double		m/rad	
Z	8	double		m	
N2	4	ulong	Geodetic Point Item	N/A	Valid Innermost Position
Description	N2	char		chars	
X	8	double		m/rad	
Y	8	double		m/rad	
Z	8	double		m	
N3	4	ulong	Geodetic Point Item	N/A	Valid Outermost Port Position
Description	N3	char		chars	
X	8	double		m/rad	
Y	8	double		m/rad	
Z	8	double		m	
End	4	ulong	#HSG	N/A	End Group

3.4.11 Product Groups

Table 99: Application Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24+N1+N2+N3 +N4+N5	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
Product	4+N1	string			Product Name
Vendor	4+N2	string			Vendor Name
Copyright	4+N3	string			Copyright text
Version	4+N4	string			Version text
System	4+N5	string			Operating system
End	4	ulong	#HSG	N/A	End Group

Table 100: ExchangeServer Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	18+N1+N2	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	ExchangeServer Group
Machine	4+N1	string			IP Machine Name
Address	4+N2	string			IP Machine Address
Port	2	ushort			IP Port
Version	4	ulong			XSE Server Version
End	4	ulong	#HSG	N/A	End Group

Table 101: ProjectProperties Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	9	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	ProjectProperties Group
Playback	1	boolean			true: Playback on
Recording	1	boolean			true: Recording
On-line	1	boolean			true: On-line (Pinging)
Simulation	1	boolean			true: Simulating
Surveying	1	boolean			true: Surveying
End	4	ulong	#HSG	N/A	End Group

Table 102: Source Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+N1*(12+N 2+N3)	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Source Group
N1	4	ulong			Number of sources
Id	4	ulong			Source Id
Version	4+N2	string			Source Version (e.g. version of sensor software)
Name	4+N3	string			Source Name
End	4	ulong	#HSG	N/A	End Group

3.4.12 Native Groups

Table 103: Collectable Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4+N	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	Collectable Group
Data	N	uchar			Collectable data
End	4	ulong	#HSG	N/A	End Group

Table 104: Raw Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Raw Group
Sensor	4	ulong			Sensor Id
N	4	ulong			Length of raw data
Data	N	uchar			Raw data
End	4	ulong	#HSG	N/A	End Group

Table 105: ELAC Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4+N	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	ELAC Group
Data	N	uchar			ELAC data
End	4	ulong	#HSG	N/A	End Group

Table 106: UNB Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4+N	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	UNB Group
Data	N	uchar			UNB data
End	4	ulong	#HSG	N/A	End Group

3.4.13 Geodetic Groups

Table 107: General Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	General Group
End	4	ulong	#HSG	N/A	End Group

Table 108: Ellipsoid Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	28+N1+N2	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Ellipsoid Group
Code	4+N1	string			
Name	4+N2	string			
Major	8	double			Semi-major axis
Inverse Flattening	8	double			Inverse Flattening
End	4	ulong	#HSG	N/A	End Group

Table 109: Datum Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Datum Group
Code	4+N1	string			
Name	4+N2	string			
RefCode	4+N3	string			Code of Reference Ellipsoid defined in Table 108
Translation		point		m	Translation
Rotation		point		rad	Rotation Angles
Scale				ppm	Scale
End	4	ulong	#HSG	N/A	End Group

Table 110: Projection Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Projection Group
Type	1	uchar		N/A	Projection Type (see Table 111)
Count	4	ulong	N	N/A	Number of Projection Parameters
Parameters	8*N	double		N/A	List of projection parameters (see Table 111)
End	4	ulong	#HSG	N/A	End Group

Table 111: Projection Group Parameters

Type	Projection	Number of Parameters	Parameter	Unit
1	UTM	4	North/South Indicator (north: 1.0, south: -1.0)	N/A
			Reference Meridian	
			Scale	
			False Northing	
			False Easting	

Table 112: System Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	4	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	System Group
End	4	ulong	#HSG	N/A	End Group

Table 113: Alias Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N1+N2	bytes	between Byte Count & Group End
Id	4	ulong	6	N/A	Alias Group
Name	4+N1	string			
Alias	4+N2	string			
End	4	ulong	#HSG	N/A	End Group

3.4.14 SeaBeam Groups (Only for Internal Communication)

Table 114: Properties Group (Send with each Beams Group)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	52	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	Properties Group
Ping	4	ulong		number	Ping number
Gain	4	float		dB	Currently applied user gain (i.e. system base gain @ 10 m water depth minus a system base gain offset)
Pulse	4	float		s	Currently applied pulse width
Power	4	float		dB	Currently applied transmit power level
Sidescan	4	float		meter	Currently applied physical size of each pixel in side scan data (across direction)
Swath	4	float		radian	Currently applied swath width
Interval	4	float		s	Time interval between slices (computed by the sonar based on pulse width)
Depth Mode	4	ulong	1 2 3	shallow intermediat e deep	
Beam Mode	4	ulong	1 0	focused normal	Focused beam mode
Sound	4	float		m/s	Surface sound velocity
Frequency	4	float		kHz	Frequency of sonar system
Bandwidth	4	float		kHz	Receiver bandwidth
End	4	ulong	#HSG	N/A	End Group

Table 115: HeaveRollPitch Group (at sending time)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	28	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	HeaveRollPitch Group
Heave	8	double		meter	sensor heave
Roll	8	double		radian	sensor roll
Pitch	8	double		radian	sensor pitch
End	4	ulong	#HSG	N/A	End Group

Table 116: Setup Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	28	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Setup Group
Frequency	4	float		kHz	Frequency of sonar
ShallowToIntermediate	4	ulong		us	the range at which the sonar should switch from deep (1-degree) to shallow (4-degree) beam forming
IntermediateToShallow	4	ulong		us	the range at which the sonar should switch from deep (1-degree) to shallow (4-degree) beam forming
IntermediateToDeep	4	ulong		us	the range at which the sonar should switch from shallow (4-degree) to deep (1-degree) beam forming
DeepToIntermediate	4	ulong		us	the range at which the sonar should switch from shallow (4-degree) to deep (1-degree) beam forming
Synchronizer	4	ulong		list entry number	tells the sonar what sort of external synchronizer it should use from a list of available devices (including “none”
End	4	ulong	#HSG	N/A	End Group

Table 117: MotionReferenceUnit Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	MotionReferenceUnit Group
Source	4	ulong	0: none 1: TSS1	list entry number	tell the MRU reader to read data from one of the devices it is familiar with
X	4	float		m	across track offset
Y	4	float		m	along track offset
Z	4	float		m	vertical offset
Latency	4	float		s	device latency
End	4	ulong	#HSG	N/A	End Group

Table 118: Settings Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	64	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	Settings Group
Gain mode	4	ulong	2 3	auto manual	auto makes the sonar set the ping gain based on previous range measurement
Gain	4	float		dB	ping gain if gain mode is manual
Pulse mode	4	ulong	2 3	auto manual	auto makes the sonar set the pulse width based on previous range measurement
Pulse	4	float	≥ 0	S	pulse width if pulse mode is manual
Power mode	4	ulong	1 2 3	no trans-mission auto manual	no transmission (only SB3100 series); auto makes the sonar set the power level based on previous range measurement
Power	4	float	≤ 0.0	dB	transmit power level if power mode is manual
Sidescan mode	4	ulong	2 3	auto manual	in auto the sonar will compute a sidescan pixel size which corresponds to the swath width
Sidescan size	4	float		m	physical size of each pixel in sidescan data (across direction)
Swath mode	4	ulong	2 3	auto manual	
Swath width	4	float		radians	full swath width
Gates mode	4	ulong	2 3	auto manual	auto makes the sonar set the gates on previous range measurements
Gate Center	4	ulong		us	center depth (manual gate mode)
Gate Width	4	ulong		us	(manual gate mode)
Gate Slope	4	float		radians	angle of manual gates with port up positive
FocusedBeam	4	ulong	0 1 2	off on auto	
End	4	ulong	#HSG	N/A	End Group

Table 119: Beams Group (The beams are corrected by roll and pitch)

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	24+40*N	bytes	between Byte Count & Group End
Id	4		ulong	6	N/A	Beams Group
Across	8		double		radians	across-ship beam width of MBES
Along	8		double		radians	along-ship beam width of MBES
Count N	4		ulong			number of beams
Number	4	40*N	ulong		number	beam number (Starboard: Beam 0, Port Beam N-1)
Flag	4		ulong	0xFF00 0x8000 0xC000 0x00FF 0x0001 0x0002 0x0004 0x0008	bit masked BDI WMT bit masked good fair bad invalid	Algorithm: beam direction index (BDI) weighted mean time (WMT) Quality: good fair bad none, invalid
Range	4		Ulong		us	travel time
Vertical	4		float		radians	launch angle
Forward	4		float		radians	Bearing angle
Heave	4		float		m	Heave at receiving time
Amplitude	4		float		dB	
Signal	4		float		dB	Signal to noise ratio
Length	4		ulong		pixel	Echo length
Hits	4		ulong		counter	Number of signals above threshold
End	4		ulong	#HSG	N/A	End Group

Table 120: Gates Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	12+12*N	bytes	between Byte Count & Group End
Id	4		ulong	7	N/A	Gates Group
Mode	4		ulong			Bit masked: 0x0FFFF. Gates Mode 0x00002: auto 0x00003: manual 0xF0000. Gates Spacing 0x10000: interpolated gates to beamangles 0x00000: 151 gateangles equiangle with 1 degree spacing
Count N	4		ulong			Number of gates
Angle	4	12*N	float		radians	Beam angle
Start	4		ulong		us	Range, travel time
Stop	4		ulong		us	Range, travel time
End	4		ulong	#HSG	N/A	End Group

Table 121: Slice Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+4*H	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Raw Group
Slice	4	ulong			slice number
Roll	4	float			roll valid for each slice
HydrophonesH	4	ulong			number of hydrophones
Raw	4*H	ulong			sampled hydrophone data
End	4	ulong	#HSG	N/A	End Group

Table 122: Signal Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+4*N	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Center Group
Beam	4	ulong			beam number
Count N	4	ulong			number of samples
Signal	4*N	float		dB	amplitude data
End	4	ulong	#HSG	N/A	End Group

Table 123: Sidescan Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+2*4*N	bytes	between Byte Count & Group End
Id	4		ulong	10	N/A	Sidescan Group
Count N	4		ulong			number of pixels
Amplitude	4	8*N	float		dB	amplitude
Across	4		float		m	distance across track (negative starboard, positive port)
End	4		ulong	#HSG	N/A	End Group

Table 124: Shutdown Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	11	N/A	Shutdown Group
State	4	ulong	1	trigger	causes sonar to shut down gracefully
End	4	ulong	#HSG	N/A	End Group

Table 125: Ping Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	12	N/A	Ping Group
State	4	ulong	1/0	on/off	causes sonar cycle to ping
End	4	ulong	#HSG	N/A	End Group

Table 126: Calibrate Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	13	N/A	Calibrate Group
State	4	ulong	1	trigger	calibrate receiver on next ping
End	4	ulong	#HSG	N/A	End Group

Table 127: Collect Group (obsolete, used only for old SB2100 and SB3000 systems)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	14	N/A	Collect Group
State	4	ulong	0 1	off on	collect raw hydrophone data and send it to UI
End	4	ulong	#HSG	N/A	End Group

Table 128: Surface Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	15	N/A	Surface Group
Velocity	4	float		m/s	Surface sound velocity
End	4	ulong	#HSG	N/A	End Group

Table 129: Hydrophone Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	40	bytes	between Byte Count & Group End
Id	4	ulong	16	N/A	Hydrophone Group
Number	4	ulong			number of hydrophones in the hydrophone array
Spacing	4	float		m	spacing between hydrophone elements
Mounting	4	float	Starbd: < 0 Port: > 0	rad	array mounting angle
Distance	4	float		m	horizontal distance between the innermost transducer elements of the transducer arrays to the center ship line in a V-shaped ship configuration
Sound	4	float		m/s	used to compute shading coefficients
Baffle	4	float		m	
X	4	float		m	across track offset
Y	4	float		m	along track offset
Z	4	float		m	vertical offset
End	4	ulong	#HSG	N/A	End Group

Table 130: Projector Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16	bytes	between Byte Count & Group End
Id	4	ulong	17	N/A	Projector Group
X	4	float		m	across track offset
Y	4	float		m	along track offset
Z	4	float		m	vertical offset
End	4	ulong	#HSG	N/A	End Group

Table 131: Bias Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16	bytes	between Byte Count & Group End
Id	4	ulong	18	N/A	Bias Group
Roll Bias	4	float		radian	roll bias value which should be used in beam forming (port up positive)
Pitch Bias	4	float		radian	pitch bias value applied to beam forming (bow up positive)
Azimuth Bias	4	float		radian	compass bias value applied to beam forming (projector axis clockwise with respect to compass positive)
End	4	ulong	#HSG	N/A	End Group

Table 132: Acknowledge Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	19	N/A	Acknowledge Group
Group	4	ulong			Group to acknowledge
State	4	ulong	0x00000001 0x00000002 0x00000004 0x10000001 0x10000002 0x10000004		accepted accepted and processed accepted but pending rejected rejected unknown group rejected incorrect values
End	4	ulong	#HSG	N/A	End Group

Table 133: Warning Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	20	N/A	Warning Group
Warning	4	ulong			Warning Id
Text	4+N	string			Warning text
End	4	ulong	#HSG	N/A	End Group

Table 134: Message Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	21	N/A	Message Group
Message	4	ulong			Message Id
Text	4+N	string			Message text
End	4	ulong	#HSG	N/A	End Group

Table 135: Error Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	22	N/A	Error Group
Error	4	ulong			Error Id
Text	4+N	string			Error text
End	4	ulong	#HSG	N/A	End Group

Table 136: Transmit Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	23	N/A	Transmit Group
State	4	ulong	1/0	on/off	collect transmitter/amplifier data and send it to UI
End	4	ulong	#HSG	N/A	End Group

Table 137: Transmitter Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	16+24*N	bytes	between Byte Count & Group End
Id	4		ulong	24	N/A	Transmitter Group
Result	4		ulong	0 1 2	fail pass working	
Progress	4		float	0.0 – 100.0	percentage	
Amplifiers N	4		ulong		number	number of amplifiers
Voltage	4	24*N	float		Volt	
Current	4		float		Ampere	
Phase	4		float		radian	
Impedance	4		float		Ohm	
Power	4		float		Watt	
State	4		ulong	0 1 2	fail pass working	
End	4		ulong	#HSG	N/A	End Group

Table 138: Amplifier Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+4*N	bytes	between Byte Count & Group End
Id	4	ulong	25	N/A	Amplifier Group
Amplifiers N	4	ulong			number of amplifiers
Switch	4 4*N	ulong	1/0	on/off	switch the amplifier on or off
End	4	ulong	#HSG	N/A	End Group

Table 139: Update Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N+S	bytes	between Byte Count & Group End
Id	4	ulong	26	N/A	Update Group
Length N	4	ulong	string item	N/A	File name length
Text	1 N	char		chars	File name
Size S	4	ulong		chars	File size
Data	1 S	char		chars	File content
End	4	ulong	#HSG	N/A	End Group

Table 140: Firmware Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+N	bytes	between Byte Count & Group End
Id	4	ulong	27	N/A	Firmware Group
Status	4	ulong	1 2 3	dead alive working	
Length N	4	ulong	string item	N/A	Version length
Text	1 N	char		chars	Version text
Progress	4	float	0.0 - 100.0	percentage	percentage of update complete
End	4	ulong	#HSG	N/A	End Group

Table 141: Generate Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16	bytes	between Byte Count & Group End
Id	4	ulong	28	N/A	Generate Group
Switch	4	ulong	0: Off 1: On (Int) 2: On (Ext)		1: Internel EDG 2: Externel EDG
TravelTime	4	ulong		us	two-way travel time
Hydrophone	4	ulong		number	hydrophone number
End	4	ulong	#HSG	N/A	End Group

Table 142: TimeVaryingGain Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	29	N/A	TimeVaryingGain Group
Gain mode	4	ulong	1 2	varying flat	use TVG function use manual gain
Gain	4	float		dB	manual gain if gain mode is flat
End	4	ulong	#HSG	N/A	End Group

Table 143: Process Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	30	N/A	Process Group
Trigger	4	ulong	1	trigger	start DSP test
End	4	ulong	#HSG	N/A	End Group

Table 144: Processor Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	31	N/A	Processor Group
Result	4	ulong	0 1 3	fail pass working	
Progress	4	float	0.0 - 100.0	percentage	
End	4	ulong	#HSG	N/A	End Group

Table 145: Receive Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	32	N/A	Receive Group
Trigger	4	ulong	1	trigger	start receiver test
End	4	ulong	#HSG	N/A	End Group

Table 146: Receiver Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16	bytes	between Byte Count & Group End
Id	4	ulong	33	N/A	Receiver Group
Result	4	ulong	0 1 3	fail pass working	
Noise	4	float		dB	ambient noise level
Progress	4	float	0.0 - 100.0	percentage	
End	4	ulong	#HSG	N/A	End Group

Table 147: Calibration Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+4*N	bytes	between Byte Count & Group End
Id	4	ulong	34	N/A	Calibration Group
Result	4	ulong	0 1 3	fail pass working	
Progress	4	float	0.0 - 100.0	percentage	
Projectors N	4	ulong			number of projectors
Coefficients	4 | 4*N	float			shading coefficients
End	4	ulong	#HSG	N/A	End Group

Table 148: Echo Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	44+N	bytes	between Byte Count & Group End
Id	4	ulong	35	N/A	Echo Group
Package	4	ulong			package number
Created	*8*	*double*	*N/A*	*s*	*Creation time*
Send	*8*	*double*	*N/A*	*s*	*Send time*
Received	*8*	*double*	*N/A*	*s*	*Receive time*
Processed	*8*	*double*	*N/A*	*s*	*Process time*
Length N	4	ulong			length of data
Data	1 | N	char			data
End	4	ulong	#HSG	N/A	End Group

Table 149: Protocol Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	36	N/A	Protocol Group
Trigger	4	ulong	1	test groups	test groups in this frame, do not interpret the groups
End	4	ulong	#HSG	N/A	End Group

Table 150: SelectSignal Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	37	N/A	SelectSignal Group
Mode	4	ulong	1001 1002 1003	off center all	no beam signal signal from center beam beam signal of all beams
End	4	ulong	#HSG	N/A	End Group

Table 151: TransducerAdvance Group (not implemented)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	54	bytes	between Byte Count & Group End
Id	4	ulong	38	N/A	Hydrophone Group
Transducer	1	uchar	0: Hydrophone 1: Projector		Kind of Transducer
Frequency	4	ulong		Hz	Frequency
Side	1	uchar	0: undefined 1: port 2: starboard 3: midship		Transducer Side
Number	4	ulong			number of transducer in the transducer array
Spacing	4	float		m	spacing between transducer elements
MountingRoll	4	float		rad	array mounting angle
MountingPitch	4	float		rad	array mounting angle
MountingAzimuth	4	float		rad	array mounting angle
Distance	4	float		m	horizontal distance between the innermost transducer elements of the transducer arrays to the center ship line in a V-shaped ship configuration
Baffle	4	float		m	
X	4	float		m	across track offset (transducer center)
Y	4	float		m	along track offset (transducer center)
Z	4	float		m	vertical offset (transducer center)
Roll Bias	4	float		radian	roll bias value which should be used in beam forming (port up positive)
Pitch Bias	4	float		radian	pitch bias value applied to beam forming (bow up positive)
Azimuth Bias	4	float		radian	compass bias value applied to beam forming (projector axis clockwise with respect to compass positive)
End	4	ulong	#HSG	N/A	End Group

Table 152: Seabeam 3000 Ping Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	13	bytes	between Byte Count & Group End
Id	4	ulong	39	N/A	Seabeam 3000 Ping Group
Width	4	float		radian	Beam width along track
Voltage	4	float		V	High voltage at start of ping
Compensation	1	uchar	0 1	no yes	Attitude compensation applied flag
End	4	ulong	#HSG	N/A	End Group

Table 153: Sweep Segments Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	13+36*S	bytes	between Byte Count & Group End
Id	4		ulong	40	N/A	Sweep Segments Group
Sweep Direction	1		uchar	0 1 2	static to port to starboard	Sweep direction
Azimuth	4		float		radian	Effective azimuth
Segments	4		ulong	S	N/A	Number of segments
Seconds	4	36*S	ulong		s	Seconds since start of ping and end of sweep segment
Micro	4		ulong		μs	Micro seconds of seconds
Extrapolated Azimuth	4		float		radian	Extrapolated azimuth at center of sweep segment
Interpolated Azimuth	4		float		radian	Interpolated azimuth at center of sweep segment
Extrapolated Pitch	4		float		radian	Extrapolated pitch at center of sweep segment
Interpolated Pitch	4		float		radian	Interpolated pitch at center of sweep segment
Extrapolated Roll	4		float		radian	Extrapolated roll at center of sweep segment
Interpolated Roll	4		float		radian	Interpolated roll at center of sweep segment
Stabilized Angle	4		float		radian	Sweep segment stabilized angle
End	4		ulong	#HSG	N/A	End Group

Seconds and Micro fields: There are S sweep segments, each being defined by a start and end time. The end time of any segment is also the start time of the following segment. The start time of the first segment is given in the Properties Group (Id 1). Thus it is possible to compute all segment start and end times using the Properties and Sweep Segments Groups.

Table 154: Shut Down Amplifiers Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	16 +4*A+5*C+4*T	bytes	between Byte Count & Group End
Id	4		ulong	41	N/A	Shut Down Amplifiers Group
Amplifiers	4		ulong	A	N/A	Number of non-disabled power amplifiers shut down during ping
Amplifier Id	4*A		ulong		N/A	Identificators of shut down power amplifiers
Channel Count	4		ulong	C = 0,1,2	N/A	Number of channels that failed digital or analog test
Channel Id	4	5*C	ulong		N/A	Identificator of channel that failed a test
Test	1		uchar	1 2 3	1:failed analog test 2:failed digital test 3:failed analog and digital test	Type of failed test
Temperatures	4		ulong	T	N/A	Number of measured temperatures in cabinet
Temperature	4*T		float		degree C	Measured temperature
End	4		ulong	#HSG	N/A	End Group

Table 155: SB3000 Settings Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12	bytes	between Byte Count & Group End
Id	4	ulong	42	N/A	SB3000 Settings Group
Sweep Direction	1	uchar	0 1 2 3	disabled to port to starboard alternating	Sweep direction
Motion Compensation	1	uchar	0 1	off on	Motion compensation (must be off if sweep disabled)
Yaw Compensation Limit	1	uchar	3, 4, 5, 6, 7, 8, 9, 10	degree	Yaw compensation limit
Spacing Mode	1	uchar	0 1	equi-angle equi-distance	Spacing Mode 'equi-angle' is a *new* word 'equidistance' is *one* word
Equidistance	4	float	> 0.0	m	Equidistance
End	4	ulong	#HSG	N/A	End Group

Table 156: Enable / Disable Power Amplifiers Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+C	bytes	between Byte Count & Group End
Id	4	ulong	43	N/A	Enable / Disable Power Amplifiers Group
Amplifier Count	4	ulong	C = 312, 624	N/A	Amplifier count
Amplifier State	C	uchar	0 1	disabled enabled	Amplifier state
End	4	ulong	#HSG	N/A	End Group

Table 157: Power Amplifier Monitoring Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	9+6*C	bytes	between Byte Count & Group End
Id	4		ulong	44	N/A	Power Amplifier Monitoring Group
State	1		uchar	0 1 2	disabled round robin selected channels	State of power amplifier monitoring
Channel Count	4		ulong	C = 2	N/A	Number of channels that failed digital or analog test
Channel Id	4	6*C	ulong		N/A	Monitored power amplifier (valid only if State equals 2)
Phase	1		uchar	0..255	N/A	Phase
Shading	1		uchar	0..63	N/A	Shading coefficient
End	4		ulong	#HSG	N/A	End Group

Table 158: Transmitter Tests Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	5	bytes	between Byte Count & Group End
Id	4	ulong	45	N/A	Transmitter Tests Group
Test	1	uchar	0 1	automated compre-hensive test selected channels test	Selected transmitter test
End	4	ulong	#HSG	N/A	End Group

Table 159: Reset Transmitter Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	5	bytes	between Byte Count & Group End
Id	4	ulong	46	N/A	Reset Transmitter Group
Reset	1	uchar	1	reset	Reset transmitter
End	4	ulong	#HSG	N/A	End Group

Table 160: Power Amplifier Monitoring Data Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	28+4*D+4*A	bytes	between Byte Count & Group End
Id	4		ulong	47	N/A	Power Amplifier Monitoring Data Group
Ping	4		ulong		N/A	Ping number
First Sample	4		ulong		N/A	Index of first digital sample
Digital Samples	4		ulong	D = 0 - 2097152	N/A	Number of digital samples (must be multiple of 8)
D/A Ratio	4		ulong	> 0: digital samples per analog sample < 0: analog samples per digital sample	N/A	Digital to analog samples ratio
Channel 1 Id	4		ulong		N/A	Channel 1 identifier
Channel 1 Digital “A” Side State	1	D	uchar	0, 1	N/A	Channel 1 digital “A” side state
Channel 1 Digital “B” Side State	1	D	uchar	0, 1	N/A	Channel 1 digital “B” side state
Channel 1 Current	2	2*A	ushort		A	Channel 1 current
Channel 2 Id	4		ulong		N/A	Channel 2 identifier
Channel 2 Digital “A” Side State	1	D	uchar	0, 1	N/A	Channel 2 digital “A” side state
Channel 2 Digital “B” Side State	1	D	uchar	0, 1	N/A	Channel 2 digital “B” side state
Channel 2 Current	2	2*A	ushort		A	Channel 2 current
End	4		ulong	#HSG	N/A	End Group

There are always 8 digital samples per analog sample: D = 8*A; D/A Ratio is always 8.

Alternative packed data structures: (replace content between “D/A Ratio” and “End” fields)
1. bit-packed, data structures together

Channel 1 Id	4		ulong		N/A	Channel 1 identifier
Channel 2 Id	4		ulong		N/A	Channel 2 identifier
Channel 1 Digital "A" Side States	1	D/8	uchar		N/A	8 samples, channel 1 digital "A" side state, LSB 0th sample, MSB 7th sample
Channel 1 Digital "B" Side States	1	D/8	uchar		N/A	8 samples, channel 1 digital "B" side state, LSB 0th sample, MSB 7th sample
Channel 2 Digital "A" Side States	1	D/8	uchar		N/A	8 samples, channel 2 digital "A" side state, LSB 0th sample, MSB 7th sample
Channel 2 Digital "B" Side States	1	D/8	uchar		N/A	8 samples, channel 2 digital "B" side state, LSB 0th sample, MSB 7th sample
Channel 1 Current	2	2*A	ushort		A	Channel 1 current
Channel 2 Current	2	2*A	ushort		A	Channel 2 current

D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
A								A								
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	…
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
A								A								

Time axis →

2. bit-packed, close times together

Channel 1 Id	4		ulong		N/A	Channel 1 identifier
Channel 2 Id	4		ulong		N/A	Channel 2 identifier
Digital States Samples 0, 1	1	D/8	uchar		N/A	Bit 0: Ch 1, "A", smpl. 0/2/4/6 Bit 1: Ch 1, "B", smpl. 0/2/4/6 Bit 2: Ch 2, "A", smpl. 0/2/4/6 Bit 3: Ch 2, "B", smpl. 0/2/4/6 Bit 4: Ch 1, "A", smpl. 1/3/5/7 Bit 5: Ch 1, "B", smpl. 1/3/5/7 Bit 6: Ch 2, "A", smpl. 1/3/5/7 Bit 7: Ch 2, "B", smpl. 1/3/5/7
Digital States Samples 2, 3	1		uchar		N/A	
Digital States Samples 4, 5	1		uchar		N/A	
Digital States Samples 6, 7	1		uchar		N/A	
Channel 1 Current	2		ushort		A	Channel 1 current
Channel 2 Current	2		ushort		A	Channel 2 current

D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
A								A								
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	…
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
A								A								

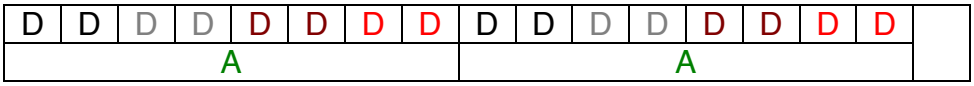

Table 161: Transmitter Test Result Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	14+N	bytes	between Byte Count & Group End
Id	4	ulong	48	N/A	Transmitter Test Result Group
Test Id	1	uchar	0: VME bus acknowledge 1: Register read/write 2: TCB memory 3: Interrupts 4: Accuracy timing crystal 5: Power amplifiers 6: Transmission Voltage 7: Bridge Circuit Voltage 8: Transmission Channel Test 255: Tests completed		Identifier of run test
Result	1	uchar	0: failed 1: passed 2: working 255: no result		Test result
Message Length	4	ulong	N	N/A	Message text length
Message Text	N	char		chars	Message text
Progress	4	float	0.0 - 100.0	percentage	Percentage completed
End	4	ulong	#HSG	N/A	End Group

Table 162: Raw Data Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	38+4*H*S+4*S+8*Type*H*S	bytes	between Byte Count & Group End
Id	4		ulong	49	N/A	Raw Data Group
Ping	4		ulong		N/A	Ping number
Type	1		uchar	0 1	stave data beamformed data	Data type
Transducer	1		uchar		N/A	Transducer identificator
Angle	4		float	Starbd: < 0 Port: > 0	radian	Hydrophone mounting angle
Hydrophones	4		ulong	H	N/A	Number of hydrophones / staves / Number of Beams
First Slice	4		ulong		N/A	First slice index
Transmitted Slices S	4		ulong	S	N/A	Number of currently transmitted slices
All Slices	4		ulong		N/A	Number of all slices
I	2	H*S*4	short		N/A	Hydrophone or stave data, ordered by slice (all hydrophones/staves slice 0, …, all hydrophones/staves slice S-1)
Q	2		short		N/A	
Gain	4	S*4	float		dB	Gain per slice
Bearing	4	Type*H*S*8	float		radian	*Beam*: Bearing
Launch	4		float		radian	*Beam:* Launch
Offset	4		ulong		*µ*s	Time offset of first slice to ping start
Length	4		ulong		*µ*s	Length of each slice
End	4		ulong	#HSG	N/A	End Group

The Properties Group (Id 1) of the corresponding ping must be sent together with the Raw Data Group. This group is used for both stave and beamformed data! The angles *Bearing* and *Launch* are only available if the value of *Type* is set to 1 (i.e. beamformed data).

Table 163: Spacing Mode Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	17	bytes	between Byte Count & Group End
Id	4	ulong	50	N/A	Spacing Mode Group
Spacing Mode	1	uchar	0 1	equi-angle equidistance	Spacing Mode
Equidistance	4	float	0.0 – 100.0	percentage	Equidistance (per cent of center depth)
Equidistance Range Min	4	float	> 0.0	percentage	min. value for Equidistance
Euidistance Range Max	4	float	< 100.0	percentage	max. value for Equidistance
End	4	ulong	#HSG	N/A	End Group

Table 164: Raw Data Collect Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	6	bytes	between Byte Count & Group End
Id	4	ulong	51	N/A	Raw Data Collect Group
Stave	1	uchar	0 1	off on	collect stave data and send it to UI
Beamformed	1	uchar	0 1	off on	collect beamformed data and send it to UI
End	4	ulong	#HSG	N/A	End Group

Table 165: Raw Data Heave Roll Pitch Azimuth Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	24+8*(H+R+P+A)	bytes	between Byte Count & Group End
Id	4		ulong	52	N/A	Raw Data Heave Roll Pitch Azimuth Group
Ping	4		ulong		N/A	Ping number
Heaves H	4		ulong		N/A	Number of heave values
Offset	4	8*H	long		µs	Time offset to ping start
Heave	4		float		m	Heave
Rolls R	4		ulong		N/A	Number of roll values
Offset	4	8*R	long		*Stave*: µs *Beam*: N/A	*Stave*: Time offset to ping start / *Beam*: SliceNumber
Roll	4		float		radian	Roll
Pitches P	4		ulong		N/A	Number of pitch values
Offset	4	8*P	long		*Stave*: µs *Beam*: N/A	*Stave*: Time offset to ping start / *Beam*: SliceNumber
Pitch	4		float		radian	Pitch
Azimuths A	4		ulong		N/A	Number of azimuth values
Offset	4	8*A	long		*Stave*: µs *Beam*: N/A	*Stave*: Time offset to ping start / *Beam*: SliceNumber
Azimuth	4		float		radian	Azimuth
End	4		ulong	#HSG	N/A	End Group

This group is used for both stave and beamformed data! In case of stave *Offset* is a time offset, but in case if beamformed data *Offset* is a slice number.

Table 166: FishPacRawDataLogMode

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24	bytes	between Byte Count & Group End
Id	4	ulong	70	N/A	FishPacRawDataLogMode Group
LoggingActive	1	uchar		N/A	Switch the Logging on or off (Off = 0; On =1)
End	4	ulong	#HSG	N/A	End Group

Table 167: FishPacRawDataLogSettings

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24	bytes	between Byte Count & Group End
Id	4	ulong	71	N/A	FishPacRawDataLogSettings Group
ExtendedDataLoggingActive	1	uchar		N/A	switch the extended Data Logging on of off (Off = 0, On = 1)
RemoteHost Active	1	uchar		N/A	switch the remote host on or off (Off = 0, On = 1)
IP Address Text Length	4	ulong	N	N/A	IP Address text length
IP Address Text	N	char		chars	IP Adress text
Remote Path Text Length	4	ulong	N	N/A	Remote Path text length
Remote Path Text	N	char		chars	Remote Path text
Name Prefix Text Length	4	ulong	N	N/A	Prefix text length
Name Prefix Text	N	char		chars	Prefix text
End	4	ulong	#HSG	N/A	End Group

Table 168: FishPacDVLBinaryDataPD4PD5Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24	bytes	between Byte Count & Group End
Id	4	ulong	72	N/A	FishPacDVLBinaryDataPD4PD5 Group
SystemConfig	1	uchar			Defines the DVL hardware/firmware configuration
XVelocityBtm	2	short		mm/s	contain the velocity of the vessel in relation to the bottom (X: Positive east) (Y: Positive north) (Z: Positive up) (E: Error)
YVelocityBtm	2	short		mm/s	
ZVelocityBtm	2	short		mm/s	
EVelocityBtm	2	short		N/A	
Beam1RngToBtm	2	ushort		cm	contain the vertical range from the ADCP to the bottom as determined bye ach beam. This vertical range does not compensate for the effects of pitch and roll. When a bottom detection is bad, the field is set to zero. (Range=0-65535 cm)
Beam2RngToBtm	2	ushort		cm	
Beam3RngToBtm	2	ushort		cm	
Beam4RngToBtm	2	ushort		cm	
BottomStatus	1			N/A	contain the status of bottom-referenced correlation and echo amplitude data. (zero: all right)
XVelocityLayer	2	short		mm/s	contain the velocity of the vessel in relation to the water-mass reference layer (X: Positive east) (Y: Positive north) (Z: Positive up) (E: Error)
YVelocityLayer	2	short		mm/s	
ZVelocityLayer	2	short		mm/s	
EVelocityLayer	2	short		N/A	
LayerStart	2	ushort		dm	contain the starting boundary(near surface) and the ending boundary(near bottom) of the water-mass reference layer. (Range=0-9999dm)
LayerEnd	2	ushort		dm	
LayerStatus	1	uchar		N/A	contain the status of reference layer depth and correlation data.
TimeOfFirstPing_Hour	1	uchar		hours	contain the time of the first ping of the current ensemble.
TimeOfFirstPing_Minute	1	uchar		minutes	
TimeOfFirstPing_Second	1	uchar		seconds	
TimeOfFirstPing_HundredthSec	1	uchar		hundredth seconds	
BitResults	2	ushort		N/A	contain the results of the ADCP's Built-in Test function (zero: all right)
SpeedOfSound	2	ushort		m/s	contain either manual or calculate speed of sound information (Range=1400-1600 m/s)
Temperature	2	short		C	contain the temperature of the water at the transducer head (Range= -5.00 to +40.00 C)
End	4	ulong	#HSG	N/A	End Group

Table 169: FishPacDVLBinaryDataPD5Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24	bytes	between Byte Count & Group End
Id	4	ulong	73	N/A	FIshPacDVLBinaryDataPD5 Group
Salinity	1	uchar		ppt	contains the salinity value of the water at the transducer head (Range= 0-40 ppt)
Depth	2	short		dm	contains the depth of the transducer below the water surface. (Range= 1-9999 dm)
Pitch	2	short		0.01 degree	contains the ADCP pitch angle (Range= -20.00 to +20.00 degrees)
Roll	2	short		0.01 degree	contains the ADCP heading angle (Range= -20.00 to +20.00 degrees)
Heading	2	ushort		0.01 degree	(Range= 000.00 to 359.99 degrees)
XDistanceMade GoodBtm	4	long		dm	contain the distance made good over the bottom since the time of the first ping after initialisation or <BREAK> (X: Positive East) (Y: Positive North) (Z: Positive Up) (E: Error)
YDistanceMade GoodBtm	4	long		dm	
ZDistanceMade GoodBtm	4	long		dm	
EDistanceMade GoodBtm	4	long		N/A	
XDistanceMade GoodLayer	4	long		dm	contain the distance made good over the water-mass refernce layer since the time of the first ping after initialisation or <BREAK> (X: Positive East) (Y: Positive North) (Z: Positive Up) (E: Error
YDistanceMade GoodLayer	4	long		dm	
ZDistanceMade GoodLayer	4	long		dm	
EDistanceMade GoodLayer	4	long		N/A	
End	4	ulong	#HSG	N/A	End Group

Table 170: FishPacSaturationDetectionSettingsGroup

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	26+NC*4	bytes	between Byte Count & Group End
Id	4		ulong	74	N/A	FishPacSaturationDetectionSettingsGroup
ChannelMask_0_31	4		Ulong		N/A	Bitmask to select/deselect channels for saturation detection channels 0 – 31
ChannelMask_32_63	4		Ulong		N/A	Bitmask to select/deselect channels for saturation detection channels 32 – 63
ChannelMask_64_95	4		Ulong		N/A	Bitmask to select/deselect channels for saturation detection channels 64 – 95
ChannelMask_96_127	4		Ulong		N/A	Bitmask to select/deselect channels for saturation detection channels 96 – 127
SaturationHeadroomThreshold	2		Ushort		N/A	current max value for sample above which the saturation count is incremented
SaturationCountThreshold	2		Ushort		N/A	Current max value for the SaturationCount before a channel is reported saturated for the whole ping
ChannelsReported NC	4		Ulong	0 to 128	N/A	Number of channels for which count and saturation status is reported
SaturationStatus	2	NC*4	Ushort	0/1/2	N/A	Status for each reported channel (**0** not saturated ; **1** saturated (-> count exceeded limit) ; **2** not monitored (masked out in channel mask)
SaturationCount	2	NC*4	ushort	0 to 32767		Saturation Count for each reported channel
End	4		ulong	#HSG	N/A	End Group

Table 171: AliveGroup

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8	bytes	between Byte Count & Group End
Id	4	ulong	75	N/A	Alive Group
Counter	4	ulong		N/A	Alive block counter
End	4	ulong	#HSG	N/A	End Group

Table 172: Backscatter Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24	bytes	between Byte Count & Group End
Id	4	ulong	76	N/A	Backscatter Group
Frequency	4	float		Hz	Frequency
Staves AcrossRX	4	short		N/A	Foot print of staves across rx ?
Stave AlongTX	4	short		N/A	Foot print of stave along tx ?
Beampattern bearing	4	float		rad	Beampattern bearing Angle ?
Beampattern vertical	4	float		rad	Beampattern vertical Angle ?
End	4	ulong	#HSG	N/A	

Table 173: XML Configuration Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12 + N	bytes	between Byte Count & Group End
Id	4	ulong	77	N/A	Alive Group
Encryption	4	ulong	0 : Plain text	N/A	Encryption of XML String
XML String	4+N	string			String containing XML Configuration
End	4	ulong	#HSG	N/A	End Group

Table 174: SB3100 Settings Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	11	bytes	between Byte Count & Group End
Id	4	ulong	78	N/A	SB3100 Settings Group
Ping Mode	1	uchar	0: Multi Ping 1: Single Ping	N/A	Ping Mode
Desired Ping Rate Mode	1	uchar	2: Auto 3: Manual	N/A	Desired Ping Rate Mode
Desired Ping Rate	4	Float	> 0.0	Hz	Desired Ping Rate
External Trigger	1	uchar	0: Off 1: On	N/A	State of External Trigger
End	4	ulong	#HSG	N/A	End Group

Table 175: Normalized Amplitude Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	20 +2N + (4 or 4N)	bytes	between Byte Count & Group End
Id	4	ulong	79	N/A	Normalized Amplitude Group
N	4	ulong		N/A	Number of Beams
Flags	4	ulong	0x00000001 Multi Frequency	bitmask	Multi-Frequency-Flag 0: one frequency is written. 1: one frequency for each beam is written.
Along track Beam width	4	Float		radiant	Along track beam width for center beam
Across track Beam width	4	Float		radiant	Across track beam width for center beam
Normalized Amplitude	2*N	short		0.1 dB	Normalized Amplitude of Bottom Echo per Beam. All Gain Values (Receiver Gain, Source Level, etc.) from the System have been removed from this value. System independent losses are not part of the normalization! (Beam Order is the same as in the Angle Group (id 10))
Frequency	4 or 4*N	Float		Hz	System Frequency (Number of Values depends on Multi-Frequency-Flag, see above)
End	4	ulong	#HSG	N/A	End Group

Table 176: Extended Properties Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+10*N+40	Bytes	between Byte Count & Group End
Id	4		ulong	80	N/A	Properties Group
Count N	4		ulong			Number of values
Type	2	10* N	ushort	0	N/A	0: Absolute transmission source level vertically below the projector array (i.e. vertically in relation to the ship, not vertically in space).
Value	8		double		Depending on type: 0: dB	Value
Reserved	40		Byte	0	N/A	Reserved
End	4		ulong	#HSG	N/A	End Group

Table 177: SB3100 Boot Status Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	5	Bytes	between Byte Count & Group End
Id	4	ulong	81	N/A	SB3100 Boot Status Group
Progress	1	uchar	0..99:Booting Up 100: Booted	Percent	Progress of SB3100 Boot Procedure *A granulation finer than 1% is not need here.*
End	4	ulong	#HSG	N/A	End Group

Table 178: SB3100 Online Bite Status Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+5*N	Bytes	between Byte Count & Group End
Id	4		ulong	82	N/A	SB3100 Online Bite Status Group
Count N	4		ulong			Number of tests
Test Id	4		ulong		N/A	Online BITE test id
Test Status	1	5* N	uchar	0: Failed 1: Passed 2: Not tested	N/A	Status of current test
End	4		ulong	#HSG	N/A	End Group

Table 179: System Message Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	14+N	bytes	between Byte Count & Group End
Id	4	ulong	83	N/A	System Message Group
Message Type	1	uchar	0: Error 1: Warning 2: Info 3: Debug 4: Exception 5: Annotation	N/A	Message type
Acknowledge	1	uchar	Bit 0:: visible Bit 1: audible Bit 2: status line	N/A	User acknowledgement required (*this value is bit-coded !*)
Id Number	4	ulong		N/A	Id depending on Message Type
Text	4+N	String			Message Text
End	4	ulong	#HSG	N/A	End Group

3.4.15 Message Groups

Table 180: Error Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	Error Group
Id Number	4	ulong			Error Id
Text	4+N	string			Error String
End	4	ulong	#HSG	N/A	End Group

Table 181: Warning Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Warning Group
Id Number	4	ulong			Warning Id
Text	4+N	string			Warning String
End	4	ulong	#HSG	N/A	End Group

Table 182: Info Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	3	N/A	Info Group
Id Number	4	ulong			Info Id
Text	4+N	string			Info String
End	4	ulong	#HSG	N/A	End Group

Table 183: Debug Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	4	N/A	Debug Group
Id Number	4	ulong			Debug Id
Text	4+N	string			Debug String
End	4	ulong	#HSG	N/A	End Group

Table 184: Exception Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	5	N/A	Exception Group
Id Number	4	ulong			Exception Id
Text	4+N	string			Exception String
End	4	ulong	#HSG	N/A	End Group

Table 185: Annotation Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	6	N/A	Annotation Group
Id Number	4	ulong			Annotation Id
Text	4+N	string			Annotation String
End	4	ulong	#HSG	N/A	End Group

3.4.16 Digital I/O Board Groups

Table 186: Board Description Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	24+M+N	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	Board Description Group
Manufacturer	4+M	string		N/A	Board manufacturer
Model	4+N	string		N/A	Board model
Counters	4	ulong		N/A	Number of installed counters
Inputs	4	ulong		N/A	Number of installed inputs
Outputs	4	ulong		N/A	Number of installed outputs
End	4	ulong	#HSG	N/A	End Group

Table 187: Error Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	12+N	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Error Group
Code	4	ulong		N/A	Board-dependent error code
Message	4+N	string		N/A	Board-dependent error message (may be empty)
End	4	ulong	#HSG	N/A	End Group

Table 188: Counters Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+8*C	bytes	between Byte Count & Group End
Id	4		ulong	3	N/A	Counters Group
Counters C	4		ulong		N/A	Number of reported counters
Port	4	8*C	ulong		N/A	Reported counter Id
Value	4		ulong		N/A	Reported current value
End	4		ulong	#HSG	N/A	End Group

Table 189: Clear Counters Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+8*C	bytes	between Byte Count & Group End
Id	4		ulong	4	N/A	Clear Counters Group
Counters C	4		ulong		N/A	Number of counters to clear
Port	4	8*C	ulong		N/A	Id of counter to clear
Value	4		ulong		N/A	Reset value of counter to clear
End	4		ulong	#HSG	N/A	End Group

Table 190: Digital Inputs Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+5*P	bytes	between Byte Count & Group End
Id	4		ulong	5	N/A	Digital Inputs Group
Ports P	4		ulong		N/A	Number of reported inputs
Port	4	5*P	ulong		N/A	Reported port Id
Value	1		uchar	0: off 1: on	N/A	Reported current value
End	4		ulong	#HSG	N/A	End Group

Table 191: Digital Outputs Group

Item	Bytes		Format	Value	Units	Description
Start	4		ulong	$HSG	N/A	Start Group
Byte Count	4		ulong	8+5*P	bytes	between Byte Count & Group End
Id	4		ulong	6	N/A	Digital Outputs Group
Ports P	4		ulong		N/A	Number of outputs to set
Port	4	5*P	ulong		N/A	Port Id to set
Value	1		uchar	0: off 1: on	N/A	Value to set
End	4		ulong	#HSG	N/A	End Group

3.5 Examples

3.5.1 Example 1: Navigation and Single Beam Frames

Table 192: Specialized Navigation Frame (WGS84 Position only)
(see Table 9: Geodetic Point Item)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Start Frame
Byte Count	4	ulong	60+5	bytes	between Byte Count & Frame End
Id	4	ulong	1	N/A	Navigation Frame
Source	4	ulong	N/A	N/A	id (e.g. sensor id)
Seconds	4	ulong	N/A	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong	N/A	µs	micro seconds of seconds
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	28+5	bytes	between Byte Count & Group End
Id	4	ulong	2	N/A	Position Group
N	4	ulong	5	N/A	Name length
Description	N	char	WGS84	chars	Geodetic Description
X	8	double		rad	Longitude
Y	8	double		rad	Latitude
Z	8	double		m	Ellipsoidal Height
End	4	ulong	#HSG	N/A	End Group
End	4	ulong	#HSF	N/A	End Frame

Table 193: Single Beam Frame (Echosounder Data)

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Start Frame
Byte Count	4	ulong	72	bytes	between Byte Count & Frame End
Id	4	ulong	7	N/A	Single Beam Frame
Source	4	ulong	N/A	N/A	id (e.g. sensor id)
Seconds	*4*	*ulong*	*N/A*	*s*	*seconds since 00:00 1.1.1901 UTC*
Micro	*4*	*ulong*	*N/A*	*µs*	*micro seconds of seconds*
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	40	bytes	between Byte Count & Group End
Id	4	ulong	1	N/A	
Frequency	4	ulong		kHz	30/200 kHz transducer
Quality	4	ulong		N/A	0/1 invalid/valid
Traveltime	8	double		s	not used (NaN)
Sound	8	double		m/s	used sound velocity
Depth	8	double		m	calculated depth
Amplitude	8	double		dB	not used (NaN)
End	4	ulong	#HSG	N/A	End Group
End	4	ulong	#HSF	N/A	End Frame

4 Client/Server Communication

4.1 Handle Data Connection

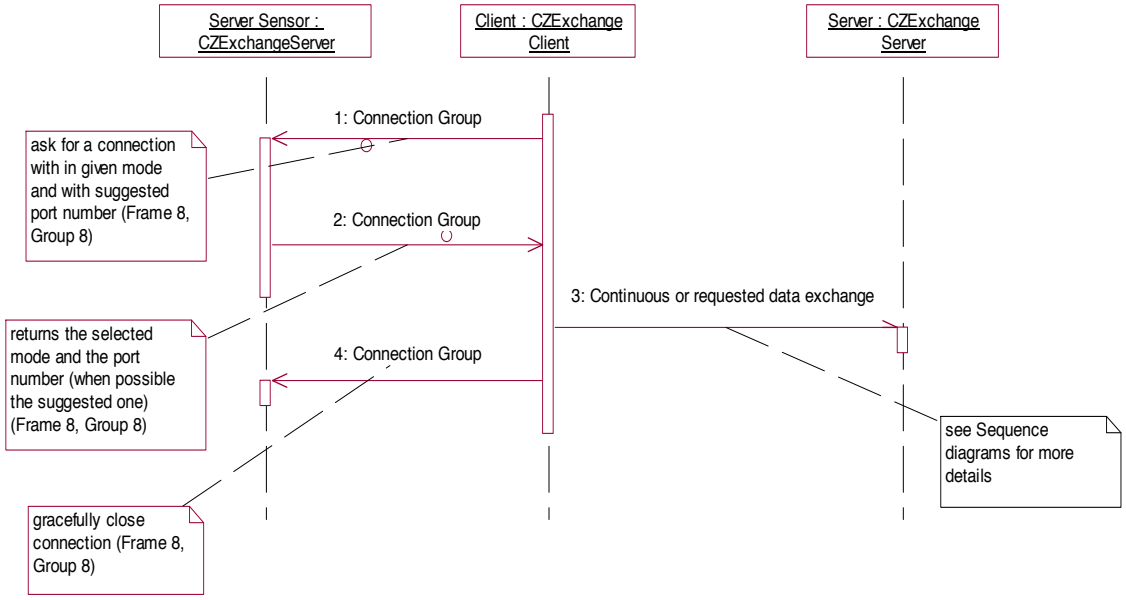

Figure 1: Create and Shutdown Connection to Exchange Server

To establish a new connection you have to send a request connection control command to the exchange server. The services supplied by the exchange server can be reached under port number 3400. As shown in Figure 1, send a control frame containing a Connection Group (frame 8, group 8) and an Identity Group (frame 8, group 10) to the server port 3400. To summarize you send the following bytes to the server with the given port number above:

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Frame Start
Byte Count	4	ulong	74+N	Bytes	between Byte Count & Frame End
Id	4	ulong	8	N/A	see Table 12
Source	4	ulong	N/A	N/A	id (e.g. sensor id)
Seconds	4	ulong	time item	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong		µs	micro seconds of seconds
Transaction	4	ulong	1	N/A	Client transaction number
Address	4	ulong	19.16.84.21	N/A	e.g. sender IP address
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+6	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Connection Group
Port	2	short	1530		Requested port number
Command	4	ulong	1: open	bit	Request to open connection
End	4	ulong	#HSG	N/A	End Group
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	16+N	bytes	between Byte Count & Group End
Id	4	ulong	10	N/A	Identity Group

Item	Bytes	Format	Value	Units	Description
Server	4	ulong	99	number	Identity number of HydroStar client (example)
Version	4	ulong	1	number	version of client
Name	4+N	string	HydroStar Client	string	name of client
End	4	ulong	#HSG	N/A	End Group
End	4	ulong	#HSF	N/A	Frame End

As a reply (sequence 2 in Figure 1) to this request the server answers with:

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Frame Start
Byte Count	4	ulong	70	Bytes	between Byte Count & Frame End
Id	4	ulong	8	N/A	see Table 12
Source	4	ulong	N/A	N/A	id (e.g. sensor id)
Seconds	4	ulong	time item	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong		µs	micro seconds of seconds
Transaction	4	ulong	1234	N/A	Server transaction number
Address	4	ulong	19.16.84.20	N/A	e.g. server IP address
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+6	bytes	between Byte Count & Group End
Id	4	ulong	8	N/A	Reply Group
Port	2	short	3401		Requested port number is not available. Reply with given port number
Command	4	ulong	1: open	bit	Open connection
End	4	ulong	#HSG	N/A	End Group
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+N	bytes	between Byte Count & Group End
Id	4	ulong	9	N/A	Reply Group
Transaction	4	ulong	1		transaction number to which this reply corresponds
Status	4	ulong	2	bit	accepted request (connection group valid)
End	4	ulong	#HSG	N/A	End Group
End	4	ulong	#HSF	N/A	Frame End

We are dealing with a one-shot protocol so we can handle one or more clients connected to the server software. As a result from a one-shot protocol close the connection after the client receives the reply with the port number. The table below uses the port number 3401 as an example. Now the server is ready to open a connection on port 3401. However, a waiting period of 500 ms is required between the reply with the port number and the first use of the connection. Communication in both directions takes place between the server with port number 3401 and the client. (sequence 3 in Figure 1). To shutdown the connection send a control frame with the close connection group to the server (port number 3400). This is represented as sequence 4 in Figure 1.
The connection which was established for future use between the client and server is used to exchange data and control commands in an bi-directional way.

4.2 Continuous Data Exchange

Which frames and groups are used in continuous data exchange is determined by the identity group, which was send within the control frame during the login phase.

4.3 On Request Data Exchange (not implemented)

If the client side is interesting in data on request, a request group within the control frame is send to the server. The server answers this request immediately. The reply group is used when data is not available or the request could not be understand by the server (e.g. asking for undefined frames or groups). Let's assume that the client side is interested in knowing the sound velocity profile, which is currently used for processing. By sending the following byte (sequence 1 in Figure 2) to the server the client asks for the currently used sound velocity profile:

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Frame Start
Byte Count	4	ulong	N/A	Bytes	between Byte Count & Frame End
Id	4	ulong	8	N/A	see Table 12
Source	4	ulong	N/A	N/A	id (e.g. sensor id)
Seconds	4	ulong	N/A	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong	N/A	μs	micro seconds of seconds
Transaction	4	ulong	2	N/A	Transaction number
Address	4	ulong	19.16.84.20	N/A	e.g. server IP address
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+16	bytes	between Byte Count & Group End
Id	4	Ulong	6	N/A	Request Group
Frame	4	ulong	2		frame id
Count	4	ulong	2		Number of groups to enable or disable for continuous data exchange
Group	4	ulong	2		depth group id
Group	4	ulong	3		velocity group id
End	4	ulong	#HSG	N/A	End Group
End	4	ulong	#HSF	N/A	Frame End

To answer the request the server sends the following bytes (sequence 2 in Figure 2) to the client (assuming that a current sound velocity profile is available):

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSF	N/A	Frame Start
Byte Count	4	ulong	N/A	bytes	between Byte Count and Frame End
Id	4	ulong	N/A	N/A	see Table 12
Source	4	ulong	N/A	N/A	id (e.g. sensor id)
Seconds	4	ulong	N/A	s	seconds since 00:00 1.1.1901 UTC
Micro	4	ulong	N/A	μs	micro seconds of seconds
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count and Group End
Id	4	ulong	2	N/A	Depth Group
N	4	ulong	2	N/A	The sound velocity profile holds only two entries (values)
Depth	8	double	0.0	meter	first depth value
Depth	8	double	3.0	meter	second depth value
End	4	ulong	#HSG	N/A	End Group

Item	Bytes	Format	Value	Units	Description
Start	4	ulong	$HSG	N/A	Start Group
Byte Count	4	ulong	8+8*N	bytes	between Byte Count and Group End
Id	4	ulong	3	N/A	Velocity Group
N	4	ulong	2	N/A	Two velocity values follow
Velocity	8	double	1420.0	m/s	First velocity value
Velocity	8	double	1430.0	m/s	Second velocity value
End	4	ulong	#HSG	N/A	End Group
End	4	ulong	#HSF	N/A	Frame End

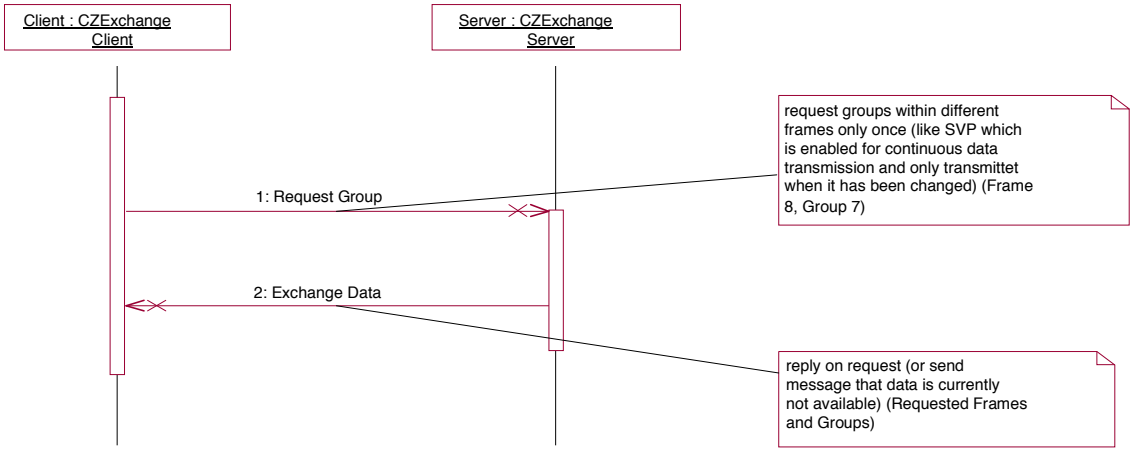

Figure 2: Sequence Diagram

5 Frequently Asked Questions

Q: The Navigation Group indicates that storage could be northing/easting, or latitude/longitude. It does not say, however, how the 2 modes are differentiated.

A: The Point Group contains values for X, Y, Z and a geodetic description (a so-called Geodetic Point Item). If the geodetic description is WGS84, then the X, Y should be handled as longitude, latitude. Z is in this case a geodetic height.

Q: The heading seems to be stored in the Navigation Group, but our data files do not have the Heading Group within the Navigation Group. Can you tell me where we can get reliable heading information?

A: There is more than one place where heading information can be stored. One place is the Heading Group, a second one in the Navigation Frame is the Motion Through Water Group. Which group is used depends on the configuration of HydroStar, e.g. which sensors are connected to the HydroStar software.

Q: Heave/roll/pitch seems to be stored in both the Navigation and Multibeam groups. Why?

A: The heave, roll and pitch values stored in the Multibeam Group, are sampled/read by the multibeam sensor and than send to the HydroStar software. These values should be used when processing the multibeam data. The heave/roll/pitch stored in the Navigation Frame is read over the network or a serial line direct from the motion (HRP) sensor. The update rate of the two sources differs in normal operation. Whereas the update rate of the multibeam depends on the water depth, the update rate of the motion sensor should be constant in normal operation.

Q: The Navigation Group can contain a HeaveRollPitch Group, as well as separate Heave, Roll and Pitch Groups. Not all of these groups are present in our data files. Can you tell us which groups are always present and should be used?

A: Which groups are present depends on the configuration in which the HydroStar software is running. If there is a motion sensor which measures heave/roll/pitch at the same time (e.g. TSS DMS05) the HeaveRollPitch Group is used. If the motion sensor measures only heave, then the Heave Group is used.

Q: How are the offset conventions in the XSE protocol?

A: The convention is the positive right hand rule (See Figure 3).

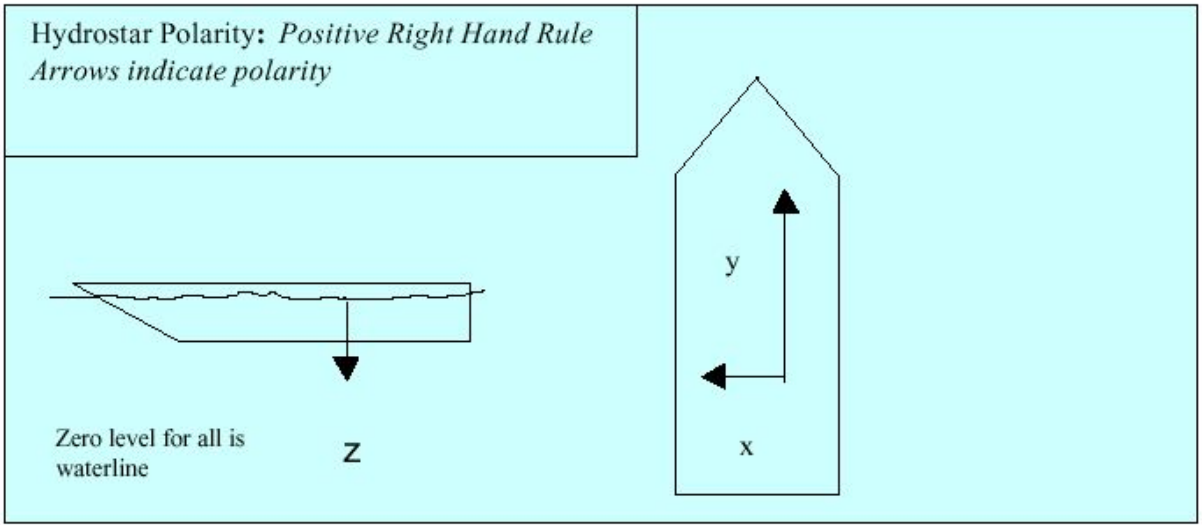

Figure 3: Elac Sign Convention

Q: In the Multibeam Group, data can be stored as raw slant range (angle / travel time), as well as computed (across/along/depth). In the data files that we have, I only see the slant range data. Can you tell me what data is always present? If we are going to use slant range, can you tell me what sound velocity should I use to compute the initial set of across/along/depth?

A: For sure the travel time is always present, because this is a value which is measured by the multibeam sonar. The across/along/depth is calculated using a sound velocity profile the user has to select in post-processing. The sound velocity profile which was used during the data recording will be (but is probably not in your sample file) inserted at the beginning of the file or when the sound velocity profile will change (due to user interaction or using a tow fish).

Q: In the Side Scan Group, data can be stored as raw amplitudes (amplitude vs. time) or corrected amplitudes (amplitude vs. distance). However, the documentation does not go into specific details about the values. For example, what does "Time Offset" mean? How are port and starboard values stored? The data files that we have store side scan data in the corrected mode, but the "Bin size" and "Lateral Offset" are zero, meaning we can't decode the range of imagery. I think a more thorough explanation of the values within the group is necessary. We also need to know how many of the 16 bits for each side scan amplitude is actually used to store data.

A: Up to now, the amplitude vs. lateral distance in the Side Scan Frame is implemented (and the General Group). The “Bin size” means the grid size in lateral direction. If there is a gap between the port and starboard side (e.g. the side scan data of the innermost beams are omitted) the “Lateral Offset” holds this gap in direction of the lateral distance.

Q: Why does the server immediately close the port that has been negotiated during setup?

A: It may take some time for the server to setup, start and initialize the connection. The connection must not be used within 500 ms after negotiation of the port.

Q: Should the length and value of the string fields (i.e. "Name" field in the identity group) include the zero termination character which normally part of C-type strings?

A: No. The string item is defined on page 5/57 (Table 7) and the text doesn't include the zero termination character.

Q: When should we send the "Ships Groups". By this I mean the Ship General Group, the Ship Sensors Group, the Ship NavigationAndMotion Group and the Ships Transducer Group. May we send them immediately after receiving the port number or should we send them after the Continuous Group?

A: Send the Ship and Soundvelocity Frames on the data connection after the Continuous Group and when the operator changes these values.

Q: Our software is interfaced with the HRP sensor and is capable of determining Roll/Pitch/Heave at any moment in time. However, the following groups do not make sense to me: "Multibeam-Roll", "Multibeam-Pitch" and "Multibeam-Heave".

A: The values Roll, Pitch and Heave group are stored by the SeaBeam 1000, 2100 or 3000. The accuracy between measurement and timestamp correlation is higher.

Q: If we want the HydroStar software to output both data from the Multibeam Group and the Sidescan Group on the same socket, do we need to send 2 Continuous Groups (as defined in figure 85 of the 1.8.5 beta documentation) or is it possible to combine the two types of data in one group?

A: HydroStar sends all information (frames) on one socket. If you want, you can open two sockets, one socket for multibeam data and another for the sidescan data. If you don't send the Continuous Group, then HydroStar sends all existent groups (i.e. Sidescan Frame groups 1, 2 and 9). If you don't need all groups, you send the Continuous Group to control this. Send one Continuous Group per frame.

Q: Which groups are sent by HydroStar Online?

A: Which groups exist, depends of the kind of sensors which are connected to HydroStar Online. You can choose with the Continuous Group a set of the existent groups.

Q: Are the multibeam angles roll-corrected?

A: Yes, but without the roll offset from the motion sensor.

Q: What is the time relation of multibeam data to the time in the frame header, what is the info contained in the Delay Group?

A: The time of the multibeam frame header plus the delay value is the transmit time of the beam.

Q: Our software receives the multibeam and sidescan data of the Seabeam 1000 via the XSE interface. Which frames needs HydroStar Online from our software?

A: HydroStar Online needs the Navigation Frame (groups 2 and 4), the Sound Velocity Frame (groups 1, 2 and 3, the surface sound velocity value is important) and the Ship Frame.

Q. What does the *N mean in the group descriptions for the byte size?

A: Every attribute, where the factor N is inside of the byte-size means that this attribute is N times inside of the group. Attributes which are listed together with a factor N inside of the byte size, should be interpreted as a block.