Binary File Format: B9

The envelope data for each channel can be recorded in a binary data file for use by post-processing software. Every ping cycle, one record is stored with header information and raw data for each frequency channel. Each record is variable in length with a current maximum possible number of 6772 bytes, and can be compressed using a Huffman compression algorithm. The storage device for these files should have sufficient disk space free to store the vast amounts of data generated, especially when working in shallow water where the faster ping rate results in a larger volume of data being generated.

The binary data files are recorded using the following basic structural format:

File Type Id Preamble	(40 bytes)
Record Preamble 1	(10 bytes)
Ping Record 1	(variable number of bytes, compressed if Huffman)
Record Preamble21	(10 bytes)
Ping Record 2	(variable number of bytes, compressed if Huffman)
Record Preamble31	(10 bytes)
Ping Record 3	(variable number of bytes, compressed if Huffman)
.	
.	
.	
Record Preamble N	(10 bytes)
Ping Record N	(variable number of bytes, compressed if Huffman)

The recording program will write data records to one file for up to 20000 pings, then the current file will be closed and a new one will be opened for subsequent data recording.

File Type Id Preamble

The first 40 bytes of the file are used for a file type identification preamble for the playback software to use to determine if the file is in the valid format supported by the version of software being used.

Example:

KEB D409-03167 V1.00 Huffman
(pad unused character locations with spaces)

where, KEB identifies the file as a KEL Binary file,
D409-03167 identifies the part number of the program used to record/convert the data,
V1.00 identifies the version of the program used to record/convert the data.
Huffman indicates that the data is in a compressed format (not present for uncompressed files)

After the File Type Id Preamble, the actual data records are stored as they are received. As soon as a record is received, it is recorded to the disk file. Records are recorded to the file in the same order as they were received (time stamps must be in sequential order). Multiple types of records can be stored in the binary file; ie Envelope data records, serial port sensor data records, configuration records, etc (only Envelope records are actually implemented at this time). The original data record format is shown in Table 3-2. The data can be stored in this format, or the user can enable data compression. When compression is enabled, each data record as shown in Table 3-2 has a Huffman compression algorithm applied to it. The result of the compression is stored in the file. The playback application runs the matching decompression algorithm to access the data records.

Record Preamble

Each data record is preceded by a Record Preamble that provides quick access, particularly for compressed records, to useful info about the record. This data is used by the PostSurvey application for faster analysis of the data statistics. See the following description about the Data Records for some of the field definitions.

FIELD DESCRIPTION	DATA TYPE	BYTE COUNT
Record Type Code	BYTE	1
File offset to start of record after the record preamble	long	4
Record Size expressed in bytes	long	4
Event mark code	BYTE	1
Byte Total		10

Ping Record: Record Type B9: Variable Length Dual Channel Envelope

FIELD DESCRIPTION	DATA FORMAT / RANGE	BYTE COUNT	BYTE OFFSET	WORD/ BYTE COUNT
Record Identification Information				
Record Id	B9h	1	0000h	Word 0: Byte 0
Record Length	data dependent	2	0001h	Word 0: Byte 1 Word 1: Byte 0
Record Number	0 to 65536	2	0003h	Word 1: Byte 1 Word 2: Byte 0
# of Channel Records	1-2	1	0005h	Word 2: Byte 1
Reserved Bytes	0	2	0006h	Word 3: Byte 0 Word 3: Byte 1
	Byte Count: Section Total	8		
Sounder Parameters Shared for Each Channel				
Date @ Start of Ping: day	1 to 31	1	0008h	Word 0: Byte 0
Date @ Start of Ping: month	1 to 12	1	0009h	Word 0: Byte 1
Date @ Start of Ping: year	1966 to 2096	2	000Ah	Word 1: Byte 0 Word 1: Byte 1
Time @ Start of Ping: hours	0 to 23	1	000Ch	Word 2: Byte 0
Time @ Start of Ping: minutes	0 to 59	1	000Dh	Word 2: Byte 1
Time @ Start of Ping: seconds	0 to 59	1	000Eh	Word 3: Byte 0
Time @ Start of Ping: milliseconds	0 to 999	2	000Fh	Word 3: Byte 1 Word 4: Byte 0
Working Units Flag	0 = metres 1 = feet 2 = fathoms	1	00011h	Word 4: Byte 1
Speed of sound	1300 to 1700 m/s 4265 to 5577 ft/s 710 to 929 fm/s	2	0012h	Word 5: Byte 0 Word 5: Byte 1
Start depth	0 to 10000	2	0014h	Word 6: Byte 0 Word 6: Byte 1

FIELD DESCRIPTION	DATA FORMAT / RANGE	BYTE COUNT	BYTE OFFSET	WORD/ BYTE COUNT
End depth	10 to 12000	2	0016h	Word 7: Byte 0 Word 7: Byte 1
Minimum Depth Limit	0 to 11000	2	0018h	Word 8: Byte 0 Word 8: Byte 1
Maximum Depth Limit	20 to 12000	2	001Ah	Word 9: Byte 0 Word 9: Byte 1
Primary Channel	0 = HF, 1 = LF	1	001Ch	Word 10: Byte 0
Pinger Mode	0 = off, 1 = 1/8th second sweep 2 = 1/4th second sweep 3 = 1/2th second sweep 4 = 1 second sweep 5 = 2 second sweep 6 = 4 second sweep	1	001Dh	Word 10: Byte 1
Mux Enable	0 = off 1 = HF 2 = LF 3 = Both	1	001Eh	Word 11: Byte 0
Mux Transducer Number	0 (no multiplexer) 1 to 8	1	001Fh	Word 11: Byte 1
Reserved Bytes	0	8	0020h	Word 12: Byte 0 Word 12: Byte 1 Word 13: Byte 0 Word 13: Byte 1 Word 14: Byte 0 Word 14: Byte 1 Word 15: Byte 0 Word 15: Byte 1
	Byte Count: Section Total	32		
Sensor Data Parameters Shared for Each Channel				
Heave (expressed in cm, $^1/_{100}$ ft, $^1/_{100}$ fm)	data dependent	2	0028h	Word 0: Byte 0 Word 0: Byte 1
Roll Angle [radians]	data dependent	4	002Ah	Word 1: Byte 0 Word 1: Byte 1 Word 2: Byte 0 Word 2: Byte 1
Pitch Angle [radians]	data dependent	4	002Eh	Word 3: Byte 0 Word 3: Byte 1 Word 4: Byte 0 Word 4: Byte 1
Heading Angle [radians]	data dependent	4	0032h	Word 5: Byte 0 Word 5: Byte 1 Word 6: Byte 0 Word 6: Byte 1
Roll, Pitch & Heading Latency	max. 9999 ms	2	0036h	Word 7: Byte 0 Word 7: Byte 1
Roll, Pitch & Heading Quality	0 = invalid 1 = okay	1	0038h	Word 8: Byte 0

FIELD DESCRIPTION	DATA FORMAT / RANGE	BYTE COUNT	BYTE OFFSET	WORD/ BYTE COUNT
Position Format - Lat/Long or X/Y	0 = Latitude/Longitude 1 = X/Y (from Hypack)	1	0039h	Word 8: Byte 1
Latitude (expressed in degrees) or Y (from Hypack)	data dependent	8	003Ah	Word 9: Byte 0 Word 9: Byte 1 Word 10: Byte 0 Word 10: Byte 1 Word 11: Byte 0 Word 11: Byte 1 Word 12: Byte 0 Word 12: Byte 1
Longitude (expressed in degrees) or X (from Hypack)	data dependent	8	0042h	Word 13: Byte 0 Word 13: Byte 1 Word 14: Byte 0 Word 14: Byte 1 Word 15: Byte 0 Word 15: Byte 1 Word 16: Byte 0 Word 16: Byte 1
Position Latency	max. 9999ms	2	004Ah	Word 17: Byte 0 Word 17: Byte 1
Boat Speed (from Hypack)	tba	4	004Ch	Word 18: Byte 0 Word 18: Byte 1 Word 19: Byte 0 Word 19: Byte 1
Boat Heading (from Hypack)	tba	4	0050h	Word 20: Byte 0 Word 20: Byte 1 Word 21: Byte 0 Word 21: Byte 1
Reserved Bytes	0	20	0054h	Word 22: Byte 0 Word 22: Byte 1 Word 23: Byte 0 Word 23: Byte 1 Word 24: Byte 0 Word 24: Byte 1 Word 25: Byte 0 Word 25: Byte 1 Word 26: Byte 0 Word 26: Byte 1 Word 27: Byte 0 Word 27: Byte 1 Word 28: Byte 0 Word 28: Byte 1 Word 29: Byte 0 Word 29: Byte 1 Word 30: Byte 0 Word 30: Byte 1 Word 31: Byte 0 Word 31: Byte 1
	Byte Count: Section Total	64		
High Frequency Channel Parameters				

FIELD DESCRIPTION	DATA FORMAT / RANGE	BYTE COUNT	BYTE OFFSET	WORD/ BYTE COUNT
HF SPM Frequency Code	0 to 31 (see Table 3-3)	1	0068h	Word 0: Byte 0
Number of HF Data Samples	0 - 65535 possible (currently fixed at 1600)	2	0069h	Word 0: Byte 1 Word 1: Byte 0
Sample Data Type	00h indicates 8-bit unsigned data 01h indicates 16-bit unsigned data	1	006Bh	Word 1: Byte 1
TxBlank (expressed in dm, $^{1}/_{10}$ ft, $^{1}/_{10}$ fm)	0 to 3000 [dm] 0 to 9843 [$^{1}/_{10}$ ft] 0 to 1640 [$^{1}/_{10}$ fm]	2	006Ch	Word 2: Byte 0 Word 2: Byte 1
Draft (expressed in cm, $^{1}/_{100}$ ft, or $^{1}/_{100}$ fm)	0 to 10000 [cm] 0 to 32808 [$^{1}/_{100}$ ft] 0 to 5468 [$^{1}/_{100}$ fm]	2	006Eh	Word 3: Byte 0 Word 3: Byte 1
Transmit power level	frequency specific	1	0070h	Word 4: Byte 0
Analog Rx gain code	0 to 255	1	0071h	Word 4: Byte 1
Pulse length code	frequency specific	1	0072h	Word 5: Byte 0
Filter type code	frequency specific	1	0073h	Word 5: Byte 1
Processing Gain	0 to 8	1	0074h	Word 6: Byte 0
Sensitivity	0 = Off 1 - 100	1	0075h	Word 6: Byte 1
Signal Type Option	0 = CW 1 = chirp	1	0076h	Word 7: Byte 0
Envelope Detection Option	0 = square law detection 1= amplitude detection	1	0077h	Word 7: Byte 1
Filter Bandwidth Option	0 = normal bandwidth 1 = wide bandwidth	1	0078h	Word 8: Byte 0
Depth Okay Flag	0 = 1 =	1	0079h	Word 8: Byte 1
Digitized Depth (expressed in metres, feet, or fathoms)	0.00 to 12000.	4	007Ah	Word 9: Byte 0 Word 9: Byte 1 Word 10: Byte 0 Word 10: Byte 1
Echo Strength (expressed in decibels)	-128 to 0	1	007Eh	Word 11: Byte 0
Reserved Bytes	0	9	007Fh	Word 11: Byte 1 Word 12: Byte 0 Word 12: Byte 1 Word 13: Byte 0 Word 13: Byte 1 Word 14: Byte 0 Word 14: Byte 1 Word 15: Byte 0 Word 15: Byte 1
	Byte Count: Section Total	32		
High Frequency Signal Data				
Signal Data	0 to 32767	variable*	0088h	
	Byte Count: Section Total	3200		

FIELD DESCRIPTION	DATA FORMAT / RANGE	BYTE COUNT	BYTE OFFSET	WORD/ BYTE COUNT
Low Frequency Channel Parameters				
LF SPM Frequency Code	0 to 31 (see Table 3-3)	1	0D08h	Word 0: Byte 0
Number of LF Data Samples	0 - 65535 possible (currently fixed at 1600)	2	0D09h	Word 0: Byte 1 Word 1: Byte 0
Sample Data Type	00h indicates 8-bit unsigned data 01h indicates 16-bit unsigned data	1	0D0Bh	Word 1: Byte 1
TxBlank (expressed in dm, $^{1}/_{10}$ ft, $^{1}/_{10}$ fm)	0 to 3000 [dm] 0 to 9843 [$^{1}/_{10}$ ft] 0 to 1640 [$^{1}/_{10}$ fm]	2	0D0Ch	Word 2: Byte 0 Word 2: Byte 1
Draft (expressed in cm, $^{1}/_{100}$ ft, or $^{1}/_{100}$ fm)	0 to 10000 [cm] 0 to 32808 [$^{1}/_{100}$ ft] 0 to 5468 [$^{1}/_{100}$ fm]	2	0D0Eh	Word 3: Byte 0 Word 3: Byte 1
Transmit power level	frequency specific	1	0D10h	Word 4: Byte 0
Analog Rx gain code	0 to 255	1	0D11h	Word 4: Byte 1
Pulse length code	frequency specific	1	0D12h	Word 5: Byte 0
Filter type code	frequency specific	1	0D13h	Word 5: Byte 1
Processing Gain	0 to 8	1	0D14h	Word 6: Byte 0
Sensitivity	0 = Off 1 - 100	1	0D15h	Word 6: Byte 1
Signal Type Option	0 = CW 1 = chirp	1	0D16h	Word 7: Byte 0
Envelope Detection Option	0 = square law detection 1= amplitude detection	1	0D17h	Word 7: Byte 1
Filter Bandwidth Option	0 = normal bandwidth 1 = wide bandwidth	1	0D18h	Word 8: Byte 0
Depth Okay Flag	0 = 1 =	1	0D19h	Word 8: Byte 1
Digitized Depth (expressed in metres, feet, or fathoms)	0.00 to 12000.	4	0D1Ah	Word 9: Byte 0 Word 9: Byte 1 Word 10: Byte 0 Word 10: Byte 1
Echo Strength (expressed in decibels)	-128 to 0	1	0D1Eh	Word 11: Byte 0
Reserved Bytes	0	9	0D1Fh	Word 11: Byte 1 Word 12: Byte 0 Word 12: Byte 1 Word 13: Byte 0 Word 13: Byte 1 Word 14: Byte 0 Word 14: Byte 1 Word 15: Byte 0 Word 15: Byte 1
	Byte Count: Section Total	32		
Low Frequency Signal Data				
Signal Data	0 to 32767	variable*	0D28h	

FIELD DESCRIPTION	DATA FORMAT / RANGE	BYTE COUNT	BYTE OFFSET	WORD/ BYTE COUNT
	Byte Count: Section Total	3200		
Event Mark Condition				
Event Mark Code	0 to 6	1	19A8h	Word 0: Byte 0
Number of Event Mark Data Bytes	0 to 130	1	19A9h	Word 0: Byte 1
Event Mark Number	0 to 65536	2	19AAh	Word 1: Byte 0 Word 1: Byte 1
Event Mark Annotation String	data dependent	variable (max = 200)	19ACh	variable Words 2 to 200
	Byte Count: Section Total	204		
	Byte Count Structure Total	6772	1A10	

* Although the channel data definition allows for variable number of data samples, currently the number is fixed to 1600 words (3200 bytes) which is the value used to determine byte count totals and data offsets.

SPM Frequency Code Definitions

The SPM Frequency code is the frequency identification code number read from the actual SPM hardware. For the HF channel, the raw 8-bit hex code is used. For the LF channel, the 8-bit hex code is bit-wise "or'ed" with 080h (MSB set to one); this enables the Echo Control and Post Survey applications to distinguish which channel has been recorded when an echosounder is only using one channel for data acquisition. The echosounder only sends the envelope data for the active channel and the Echo Control program only records the one channel; this saves on data transfer times and disk space requirements for the data recording

SPM Frequency	HF Code (raw code)		LF Code (raw code | 80h)	
	Binary	Hexadecimal	Binary	Hexadecimal
3.5	00001000	08	10001000	88h
12	00001001	09	10001001	89
15	00010010	12	10010010	92
24	00000010	02	10000010	82
26	00001111	0F	10001111	8F
28	00000011	03	10000011	83
30	00000111	07	10000111	87
33	00001011	0B	10001011	8B
38	00001010	0A	10001010	8A
41	00001100	0C	10001100	8C
50	00000001	01	10000001	81
100	00010001	11	10010001	91
150	00010000	10	10010000	90
200	00000000	00	10000000	80
208	00001101	0D	10001101	8D
210	00000110	06	10000110	86

Event Mark Code Definitions

Event marks can be initiated from a number of sources; the Event Mark code indicates the source of the event mark as described in Table 3-4. Serial Port and Hypack initiated event marks often have variable-length annotation strings recorded as well.

Code #	Code Source
0	No Fix
1	Front Panel
2	Serial Port (320M printer uses internal and external annotation)
3	Remote
4	Internal Timebase
5	Serial Port (320M uses external annotation only)
6	SCSI Control Application
7	Hypack