428XL

V5.0

User's Manual

Vol. 2

Ref. No. 0311431

March 9, 2011

Ahead of the Curve℠

To contact SERCEL

Europe

Nantes, France

Sales; Customer Support;
Manufacturing & Repair.
B.P. 30439, 16 rue de Bel Air
44474 Carquefou Cedex
Tel: +33 2 40 30 11 81, **Fax**: +33 2 40 30 19 48
Hot-Line: Land: +33 2 40 30 58 88
Marine: +33 2 40 30 59 59
Navigation: +33 2 40 30 69 87
E-mail: sales.nantes@sercel.com
customersupport.land@sercel.com
customersupport.marine@sercel.com
customersupport.navigation@sercel.com
repair.france@sercel.com
streamer.repair@sercel.com
www.sercel.com

St Gaudens, France

Vibrator Customer Support;
Vibrator Manufacturing & Repair;
Streamer Manufacturing & Repair.
Tel: +33 5 61 89 90 00, **Fax**: +33 5 61 89 90 33
Hot Line: +33 5 61 89 90 91
E-mail: sg_sav@sercel.com
vspsupport@sercel.com

Les Ulis, France

Sales; Customer Support
Tel: +33 1 69 93 83 60, **Fax**: +33 1 69 81 78 09
E-mail: vspsupport@sercel.com
Hot Line: +33 6 15 54 13 96

Brest, France

Sales; Customer Support
Tel: +33 2 98 05 29 05; **Fax**: +33 2 98 05 52 41
E-mail: sales.nantes@sercel.com

Toulon, France

Sales; Customer Support
Tel: +33 4 94 21 69 92; **Fax**: +33 4 94 21 73 44
E-mail: SalesMSBU@sercel.com
SupportMSBU@sercel.com

Toulouse, France

Sales; Customer Support
Tel: +33 5 61 34 80 74; **Fax**:+33 5 61 34 80 66
E-mail: support@metrolog.com
sales@metrolog.com, info@metrolog.com

Alfreton, U. K.

Streamer Manufacturing & Repair;
Customer Support.
Tel: +44 1 773 605 078, **Fax**: +44 1 773 541 778
E-mail: streamer.repair@sercel.com

Liphook, U. K.

Quest Geosolutions Ltd
Tel: +44 1 428 751565, **Fax**: :+44 1428 751566
E-mail: enquiries@qgsl.com

Larbert, U. K. (Sercel England Ltd.)

Customer Support
Tel: +44 1324 556 777, **Fax**: +44 1324 556 222

Trondheim, Norway (Optoplan AS)

Tel: +47 73820500, **Fax**: +47 73820599

Russia

Customer Support; Repair.

Moscow, Russia

Tel: +7 495 644 08 05, **Fax**: +7 495 644 08 04
E-mail: repair.cis@geo-mail.org
support.cis@geo-mail.org

Surgut, Russia

Tel: +7 3462 28 92 50

North America

Houston, USA

Sales; Customer Support;
Manufacturing & Repair;
Tel: +1 281 492 66 88, Fax: +1 281 579 75 05
Hot-Line: +1 281 492 66 88
E-mail:
sales.houston@sercel.com
HOU_Customer.Support@sercel.com
HOU_Training@sercel.com

Calgary

Sales; Customer Support; Manufacturing.
Tel: +1 403 275 3544, **Fax**: +1 403 295 1805
E-mail:
Cal_Customer.Support@sercel.com

Middle East

Dubai, U. A. E.

Sales, Customer Support, Repair.
Tel: +971 4 8832142, **Fax**: +971 4 8832143
Hot Line: +971 50 6451752
E-mail: dubai@sercel.com
repair.dubai@sercel.com

Far East

Beijing, P. R. of China

R & D.
Tel: +86 106 43 76 710, **Fax**: +86 106 43 76 367
E-mail: support.china@geo-mail.com
repair.china@geo-mail.com

Xian, P. R. of China

Manufacturing & Repair.
Tel / Fax: +86 29 8222 9504

Xushui, P. R. of China

Manufacturing & Repair.
Tel:+86 312 8648355, **Fax**:+86 312 8648441

Singapore

Streamer Manufacturing & Repair;
Customer Support.
Tel:+65 64 17 70 00, **Fax**:+65 6 545 1418

In no event shall SERCEL be liable for incidental or consequential damages or related expenses resulting from the use of this product, or arising out of or related to this manual or the information contained in it, even if SERCEL has been advised, or knew or should have known of the possibility of such damages.

The information included in this documentation is believed to be accurate and reliable. However, SERCEL reserves the right to make changes to its products or specifications at any time, without notice, in order to improve design or performance and to supply the best possible product. This documentation does not form in any way a contractual agreement of sales promise on the part of SERCEL.

Software mentioned in this documentation is sold under a precise licence agreement and as such the documentation may cover technical areas for which the user may not have a final licence.

No part of this documentation, or any of the information included herein may be modified or copied in any form or by any means without the prior written consent of SERCEL.

Printed in France.

DSUGPS: US Patent 7,117,094 B2.

Revision history

Date of revision	Chapters or pages affected	Description of revision or reason for change
Dec. 2005		V 1.0 release
Dec. 2006		V 2.0 release
Mar. 2007		Moved "Source Controller Interfacing" to Volume 3.
Apr. 2007	p. 38 Chap. 2 Chap. 6	- DSU3-428 channel sensitivity (452 mV/m/s²). - Added SEGD Rev. 2.1. - Added SPS Rev. 2.1.
Dec. 2007	 p. 25 p. 37 p. 32	V 3.0 - Enhanced Diversity Stack. - VE464 unit type. - Source Line and Point on Aux trace (VSR).
Jan. 2008	p. 23	Added sensor tilt test type.
Feb. 2008	p. 23 p. 40	- Spread First Line and Spread First Number. - Offset value (Trace Header Extension block #7, bytes 29-32).
Mar. 2008	p. 25 p. 162	- Type of Process (1 to 4). - FPS file format.
Sep. 2008	p 37	DSU1-428 Unit Type.
Oct. 2008	p. 147	Updated SPS rev. 2.1 file examples.
Feb. 2009		V4.0
July 2009	p. 38	Sensor sensitivity in Tilt and Gravity tests.
Nov. 2009	p. 27 p. 38	- Extended header, bytes 885-900. - Trace Header Extension #6, bytes 25-28.
Dec. 2009	p. 37	AXCUL-428 Assembly Type
Nov. 2010		Release 5.0.
Feb. 2011	p. 27	Extended header, bytes 885-964.

Table of Contents

Introduction

The documentation coming with the 428XL system consists of the following manuals:

- **Installation Manual** (0311428): provides an introduction to the 428XL system, installation information, a few instructions for the operator to get started, and reference information that will help you select a 428XL configuration tailored to your needs.
- **User's Manual Volume 1** (0311430): describes the parameters displayed on the system's Graphic User Interface and how to use each window.
- **User's Manual Volume 2** (0311431): this manual, containing information on logged data and on interfaces (description of Input/ Output formats, including the SEGD format).
- **User's Manual Volume 3** (0311432): contains reference information (filter charts, theory of tests, technical data, release notes, specifications).
- **Technical Manual** (0311429): contains maintenance and repair information, including operating instructions for using the system's testers.

With a PDF file reader (Adobe Acrobat Reader) on a computer you can view this manual direct from the 428XL CDROM's DOC directory.

Chapter 1 SEGD format (Rev. 1)

This chapter describes the SEGD format for the 428XL and Unite systems. It includes the following sections:

Overview

Revisions

428XL version	Changes
1.0	Initial release
3.0	- Enhanced Diversity Stack. - Source Line and Point on Aux trace. - Additional Unit Types: VE464, DSU1-428 - Offset value (Trace Header Extension block #7, bytes 29-32). - Test record types.
4.0	- Extended header, bytes 885-900. - Trace Header Extension #6, bytes 25-28.
5.0	Extended header, bytes 877 -948.

1

Abbreviations

The abbreviation in the "**fmt**" column gives the format of the value:

- **bcd** BCD
- **bin** unsigned binary
- **±bin** 2's complement signed binary
- **asc** ASCII
- **flt** IEEE single-precision
- **dbl** IEEE double-precision format

Other abbreviations:

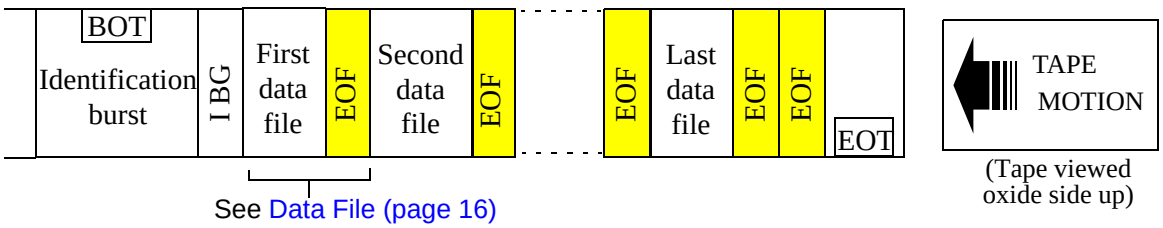
IBG = Inter Block Gap

EOF = End Of File

BOT = Beginning-of-Tape sticker

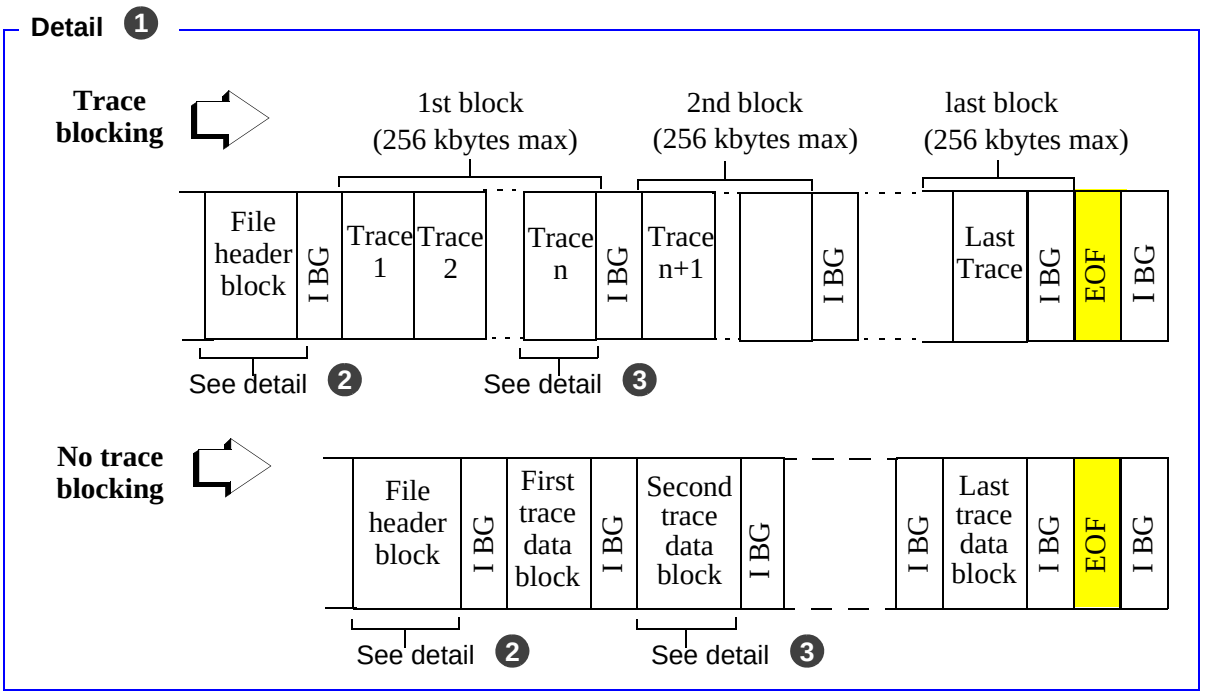
EOT = End-Of-Tape sticker

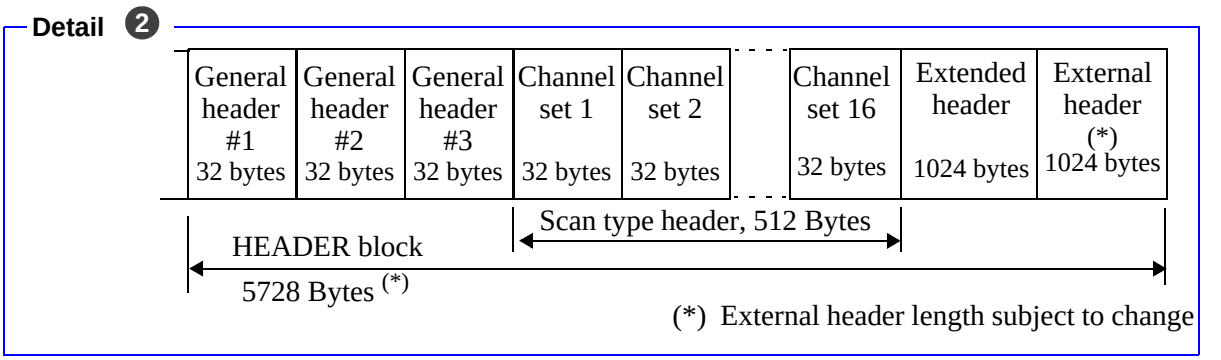
SEGD Rev 1

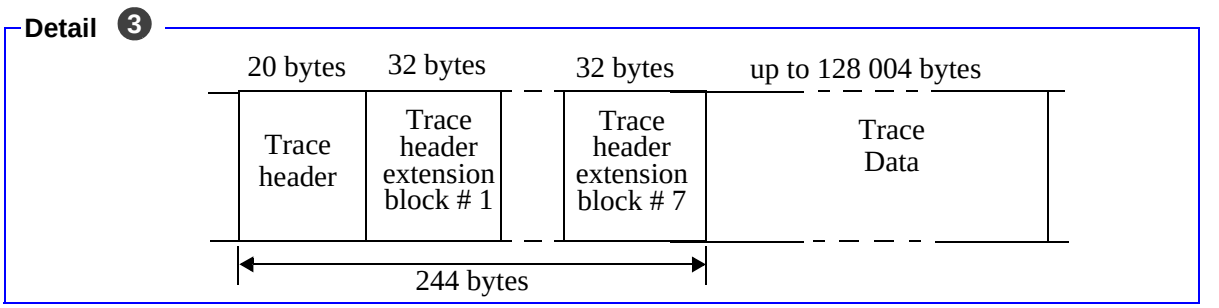


See Data File (page 16)

Data File

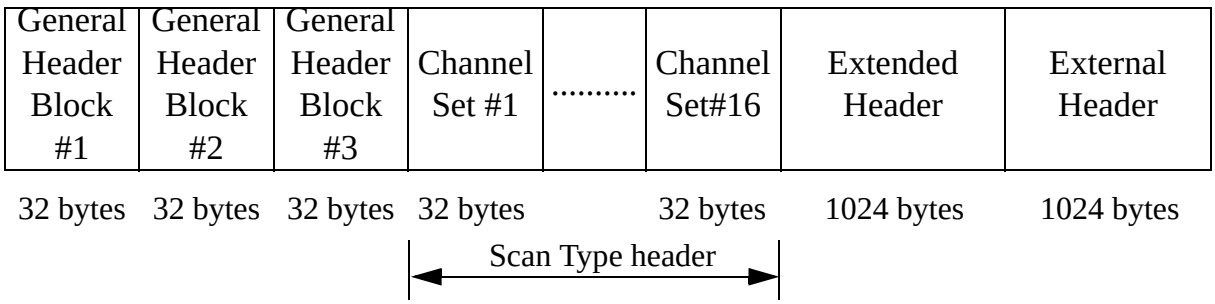

Detail 1
Trace blocking
1st block (256 kbytes max)
2nd block (256 kbytes max)
last block (256 kbytes max)
File header block
I BG
Trace 1
Trace 2
Trace n
Trace n+1
Last Trace
EOF
See detail 2
See detail 3
No trace blocking
File header block
First trace data block
Second trace data block
Last trace data block
See detail 2
See detail 3


Detail 2
General header #1 32 bytes
General header #2 32 bytes
General header #3 32 bytes
Channel set 1 32 bytes
Channel set 2 32 bytes
Channel set 16 32 bytes
Extended header 1024 bytes
External header (*) 1024 bytes
Scan type header, 512 Bytes
HEADER block
5728 Bytes (*)
(*) External header length subject to change


Detail 3
20 bytes
32 bytes
32 bytes
up to 128 004 bytes
Trace header
Trace header extension block # 1
Trace header extension block # 7
Trace Data
244 bytes

File Header block

1



General header block #1

Byte No.	Value	Fmt	Description	Notes
1 - 2	XXXX	bcd	Four-digit File number (0-9999)	If file nb > 9999, set to FFFF and *Extended File Nb* is used.
3 - 4	8058	bcd	Format code (32 IEEE demultiplexed)	
5 -10	X		General constants	5 for 428XL.
11	XX	bcd	Last two digits of Year (0-99)	
12H	2	bcd	Number of additional blocks in general header	
12L-13	XXX	bcd	Julian day, 3 digits (1-366)	
14	XX	bcd	Hour of day (0-23)	
15	XX	bcd	Minute of hour (0-59)	
16	XX	bcd	Second of minute (0-59)	
17	13	bcd	Manufacturer’s code	
18-19	0	bcd	Manufacturer’s serial number	
20-22	XXXXXX		Bytes per scan	000000 non blocked record 100000 blocked record.

Byte No.	Value	Fmt	Description	Notes
23	XX	bcd	Base scan interval: 4 = 0.25 ms 8 = 0.5 ms 10 = 1 ms 20 = 2 ms 40 = 4 ms	
24H	0		Polarity (untested)	
24L-25	0		Not used	
26H	X	bcd	Record type: 8 = normal 2 = test record	
26L-27	FFF		Record length (extended record length used)	
28	01	bcd	Scan type per record	
29	XX	bcd	Number of channel sets per record	16 for land operations.
30	00		Number of sample skew 32 byte extensions	
31	32	bcd	Extended header length	
32	XX	bcd	External header length	The External Header is used to record additional user-supplied information in the header. The two digits (0-99) in this field specify the number of 32-byte fields in the External Header. If more than 99 External Header blocks are used, then this field is set to FF and General Header block #2 (bytes 8-9) indicates the number of External Header blocks.

General Header block # 2

Byte No.	Value	Fmt	Description	Notes
1 - 3	XXXXXX	bin	Expanded file number	0-999999
4 - 5	0		Extended Channel Sets/Scan Types (not used)	
6 - 7	0		Extended header blocks (not used)	
8 - 9	XXXX	bin	External header blocks	Used to specify the number of 32-byte fields in the External Header if greater than 99 (in that case, byte 32 in General Header block #1 is set to FF).
10	0		Not used	
11 - 12	1.0	bin	SEG-D Revision Number	
13 - 14	0		Number of Blocks of General Trailer	
15 - 17	XXXXXX	bin	Extended Record Length (0-128000 ms)	
18	0		Not used	
19	2	bin	General Header Block Number	
20 - 32	0		Not used	

General Header block # 3

Byte No.	Value	Fmt	Description	Notes
1 - 3	XXXXXX		Expanded file number	
4 - 8	XXXXX.XX	bin	Source Line Number (0-99999.99)	Defaults to GUI setup, or updated by navigation system.
9-13	XXXXX.XX	bin	Source Point Number (0-99999.99)	Defaults to GUI setup, or updated by navigation system.
14	XX	bin	Source Point Index (1-9)	
15	0		Phase Control (not recorded)	
16	0		Vibrator Type (not recorded)	
17-18	0		Phase angle (not recorded)	
19	3	bin	General Header Block Number	
20	XX	bin	Source Set Number	Defaults to GUI setup, or updated by navigation system.
21 - 32	0		Not used	

Scan Type Header

<table>
<tr><th>Byte No.</th><th>Value</th><th>Fmt</th><th>Description</th><th>Notes</th></tr>
<tr><td>1</td><td>01</td><td>bcd</td><td>Scan Type Header</td><td></td></tr>
<tr><td>2</td><td>XX</td><td>bcd</td><td>Channel Set Number</td><td></td></tr>
<tr><td>3- 4</td><td>XXXX</td><td>bin</td><td>Channel Set Starting Time</td><td>0 for Auxes.
Refraction Delay for Seis.
Units: 2 ms.</td></tr>
<tr><td>5- 6</td><td>XXXX</td><td>bin</td><td>Channel Set End Time</td><td>Record length for Auxes.
Refraction Delay
+ Record Length for Seis.
Units: 2 ms.</td></tr>
<tr><td>7-8</td><td>XXXX</td><td>±bin</td><td>Descale Multiplier
<table><tr><th rowspan="2">FDU</th><th>1600</th><th>400</th></tr><tr><td>AF6D</td><td>B76D</td></tr></table> mV
<table><tr><th>DSU-428</th><td>AF6D</td></tr></table>
<table><tr><th rowspan="2">DSU-408</th><th>High</th><th>Low</th></tr><tr><td>AF6D</td><td>B76D</td></tr></table> Full scale</td><td>MSB is encoded on byte 8 and LSB on byte 7
Example for AF6D:
byte 8 = AF
byte 7 = 6D</td></tr>
<tr><td>9-10</td><td>XXXX</td><td>bcd</td><td>Number of channels in this channel set</td><td></td></tr>
<tr><td>11H</td><td>X</td><td>bcd</td><td>Channel Type Identification:
1 = Seis
9 = Aux</td><td></td></tr>
<tr><td>11L</td><td>0</td><td></td><td>Not used</td><td></td></tr>
<tr><td>12H</td><td>0</td><td></td><td>Number of subscans exponent</td><td></td></tr>
<tr><td>12L</td><td>3</td><td>bcd</td><td>Channel gain control method
(fixed gain)</td><td></td></tr>
</table>

<table>
<tr><th>Byte No.</th><th>Value</th><th>Fmt</th><th>Description</th><th>Notes</th></tr>
<tr><td>13-14</td><td>XXXX</td><td>bcd</td><td>Alias filter frequency at - 3dB point
<table>
<tr><th></th><th>0.25</th><th>0.5</th><th>1</th><th>2</th><th>4</th></tr>
<tr><td>FDU</td><td>1600</td><td>800</td><td>400</td><td>200</td><td>100</td></tr>
<tr><td>DSU</td><td>1600</td><td>800</td><td>400</td><td>200</td><td>100</td></tr>
</table></td><td></td></tr>
<tr><td>15-16</td><td>XX</td><td>bcd</td><td>Alias filter slope
<table>
<tr><td>FDU</td><td>370</td></tr>
<tr><td>DSU</td><td>370</td></tr>
</table></td><td></td></tr>
<tr><td>17-18</td><td>XX</td><td>bcd</td><td>Low-cut filter frequency
<table>
<tr><td>FDU</td><td>0</td></tr>
<tr><td>DSU</td><td>0</td></tr>
</table></td><td></td></tr>
<tr><td>19-20</td><td>XX</td><td>bcd</td><td>Low-cut filter slope
<table>
<tr><td>FDU</td><td>0</td></tr>
<tr><td>DSU</td><td>0</td></tr>
</table></td><td></td></tr>
<tr><td>21-22</td><td>0</td><td></td><td>First Notch Frequency</td><td></td></tr>
<tr><td>23-24</td><td>0</td><td></td><td>Second Notch Frequency</td><td></td></tr>
<tr><td>25-26</td><td>0</td><td></td><td>Third Notch Frequency</td><td></td></tr>
<tr><td>27-28</td><td>0</td><td></td><td>Extended channel set number</td><td></td></tr>
<tr><td>29H</td><td>0</td><td></td><td>Extended header flag</td><td></td></tr>
<tr><td>29L</td><td>7</td><td>bin</td><td>Trace Header Extensions</td><td></td></tr>
<tr><td>30</td><td>XX</td><td>bin</td><td>Vertical Stack</td><td></td></tr>
<tr><td>31</td><td>XX</td><td>bin</td><td>Streamer cable number</td><td>0 in land operations.</td></tr>
<tr><td>32</td><td>1</td><td>bin</td><td>Array forming (no array forming)</td><td></td></tr>
</table>

Extended Header

Byte No.	Value	Fmt	Description	Notes
1 - 4	XXXX	bin	Acquisition length	1000 to 128000 ms
5-8	XXXX	bin	Sample rate	250, 500, 1000, 2000, 4000 µs
9-12	XXXX	bin	Total number of traces	1 to 100000
13-16	XXXX	bin	Number of Auxes	1 to 100000
17-20	XXXX	bin	Number of Seis traces	1 to 100000
21-24	XXXX	bin	Number of dead Seis traces	1 to 100000
25-28	XXXX	bin	Number of live Seis traces	1 to 100000
29-32	XXXX	bin	Type of source	0 = no source 1 = Impulsive 2 = Vibro
33-36	XXXX	bin	Number of samples in trace	1 to 128000
37-40	XXXX	bin	Shot number	1 to 9999
41-44	XXXX	flt	TB window	0 to 64 seconds
45-48	XXXX	bin	Test record type	0 Normal record. 1 Field (Sensor) noise. 2 Field (Sensor) tilt. 3 Field (Sensor) crosstalk. 4 Instrument noise. 5 Instrument distortion. 6 Instrument gain/phase 7 Instrument crosstalk 8 Instrument common mode 9 Synthetic. 10 Field (Sensor) pulse. 11 Instrument pulse. 12 Field (Sensor) distortion. 13 Instrument gravity. 14 Field (Sensor) leakage 15 Field (Sensor) resistance
49-52	XXXX	bin	Spread first line	1 to 99999
53-56	XXXX	bin	Spread first number	1 to 99999
57-60	XXXX	bin	Spread number	1 to 32

Byte No.	Value	Fmt	Description	Notes
61-64	XXXX	bin	Spread type	1 = Generic 2 = Absolute
65-68	XXXX	bin	Timebreak	0 to 9999 microseconds
69-72	XXXX	bin	Uphole time	Microseconds Updated by navigation system
73-76	XXXX	bin	Blaster id	- MACHA blaster Id number (0 to 15) - or OPSEIS blaster 815 SAR Address (1 to 65535)
77-80	XXXX	bin	Blaster status	**MACHA blaster status**: 2^0 Low battery. 2^1 High voltage ready. 2^2 Fired. 2^3 Fire error. **OPSEIS 815 blaster**: 2^0 Blaster ready for shot. 2^1 Blaster cap open. 2^2 Blaster uphole error. **SHOTPRO blaster status**: 0 No Fire (Radio Status Received but box did not fire). 1 Shot Fired and Status received. All OK. 2 No Status received (Radio Problem). 3 Status Received but no Uphole analog data (Radio problem). 4 Decoder Low Battery warning. 5 Up Hole Geophone resistance not measured or out of tolerance. 6 Cap resistance not measured or out of tolerance. 7 Automatic Uphole Time Pick not successful.
81-84	XXXX	bin	Refraction delay	ms.

Byte No.	Value	Fmt	Description	Notes
85-88	XXXX	±bin	TB to T0 time	Microseconds.
89-92	XXXX	bin	Internal time break	0 = no. 1 = yes.
93-96	XXXX	bin	Prestack within field units	0 = no. 1 = yes.
97-100	XXXX	bin	Noise elimination type	1 Off. 2 Diversity Stack. 3 Historic. 4 Enhanced Diversity Stack.
101-104	XXXX	bin	Low trace percentage	0 to 100%.
105-108	XXXX	bin	Low trace value	0 to 132 dB.
109-112	XXXX	bin	Number of windows (Div.) or Window length (Enhanced Div.)	1 to 64.
113-116	XXXX	bin	Historic editing type or Overlap (Enhanced Div.)	1 = Zeroing. 2 = Clipping.
117-120	XXXX	bin	Noisy trace percentage	0 to 100%.
121-124	XXXX	bin	Historic range	0 to 36 dB.
125-128	XXXX	bin	Historic taper length 2's exponent	0 to 8.
129-132	XXXX	bin	Threshold Hold/Var	1 = Hold. 2 = Var.
133-136	XXXX	bin	Historic threshold Init value	0 to 132 dB.
137-140	XXXX	bin	Historic zeroing length	1 to 500 ms.
141-144	XXXX	bin	Type of process	1 No operation (raw data). 2 Stack. 3 Correlation After stack. 4 Correlation Before stack.
145-272	XXXX	bin	Acquisition type tables	32 values (128 bytes).
273-400	XXXX	bin	Threshold type tables	32 values (128 bytes).
401-404	XXXX	bin	Stacking fold	1 to 32.
405-484	XXXX	asc	Not used	

Byte No.	Value	Fmt	Description	Notes
485-488	XXXX	bin	Record length	100 to 128000 ms.
489-492	XXXX	bin	Autocorrelation peak time	1 to 128000 ms.
493-496	XXXX	bin	Not used	
497-500	XXXX	bin	Correlation Pilot No.	1 to 100000.
501-504	XXXX	bin	Pilot length	1000 to 128000 ms.
505-508	XXXX	bin	Sweep length	1000 to 128000 ms.
509-512	XXXX	bin	Acquisition number	1 to 32.
513-516	XXXX	flt	Max of max, Aux	IEEE format, single precision.
517-520	XXXX	flt	Max of max, Seis	IEEE format, single precision.
521-524	XXXX	bin	Dump stacking fold	1 to 32
525-540	XXXX	asc	Tape label	ASCII text, 16 characters.
541-544	XXXX	bin	Tape number	1 to 9999.
545-560	XXXX	asc	Software version	ASCII text, 16 characters.
561-572	XXXX	asc	Date	ASCII text, 12 characters (dd mmm yyyy).
573-580	XXXX	dbl	Source easting	Defaults to GUI setup, or updated by navigation system.
581-588	XXXX	dbl	Source northing	Defaults to GUI setup, or updated by navigation system.
589-592	XXXX	flt	Source elevation	Defaults to GUI setup, or updated by navigation system.
593-596	XXXX	bin	Slip sweep mode used	0 = No. 1 = Yes.
597-600	XXXX	bin	Files per tape	1 to 9999.
601-604	XXXX	bin	File count	1 to 9999.
605-764	XXXX	asc	Acquisition error description	ASCII text, 160 characters.
765-768	XXXX	bin	Filter type	1 = 0.8 Min. 2 = 0.8 Lin.

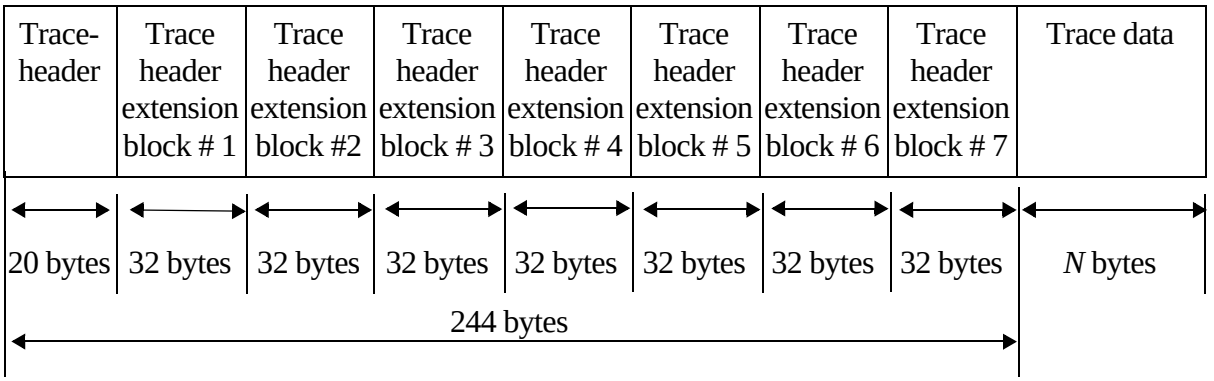
Byte No.	Value	Fmt	Description	Notes
769-772	XXXX	bin	Stack is dumped.	0 = No; 1 = Yes.
773-776	XXXX	bin	Stack sign (current).	0 = No. 1 = Plus. 2 = Minus.
777-780	XXXX	bin	PRM Tilt Correction used.	0 = No; 1 = Yes.
781-844	XXXX	asc	Swath name.	
845-848	XXXX	bin	Operating mode.	bit0 = 1 Standard. bit1 = 1 Microseismic. bit2 = 1 Slip-sweep. bit3 = 1 SQC Dump (VSR). bit4 = 1 Guidance (Navigation).
849-852	XXXX	bin	Reserved.	
853-856	XXXX	bin	No log.	0 = No; 1 = Yes.
857-860	XXXX	bin	Listening time.	100 to 128000 ms.
861-864	XXXX	bin	Type of dump.	0 = Normal dump. 1 = Raw dump. 2 = Extra dump.
865-868	XXXX	bin	Reserved.	
869-872	XXXX	bin	Swath Id.	
873-876	XXXX	bin	Seismic trace offset removal is disabled.	0 = No (i. e. offset is removed) 1 = Yes (Microseismic mode)
877-884	XXXX	bin	GPS time of 1st acquisition Time Break in stack, expressed as the number of microseconds since January 6, 1980 at 0:00 a.m. UTC (signed integer).	Recorded if - “Time Management from GPS” option is selected (in Config window’s Crew setup) - and a GPS receiver is attached to the LCI-428 or 428-Lite box.
885-888	XXXX	bin	Reserved.	
889-892	XXXX	bin	Reserved.	
893-896	XXXX	bin	Reserved.	
897-900	XXXX	bin	Reserved.	
901-908	XXXX	bin	GPS time of 2nd acquisition	(if stacking, otherwise 0).

Byte No.	Value	Fmt	Description	Notes
909-916	XXXX	bin	GPS time of 3rd acquisition	(if stacking, otherwise 0).
917-924	XXXX	bin	GPS time of 4th acquisition	(if stacking, otherwise 0).
925-932	XXXX	bin	GPS time of 5th acquisition	(if stacking, otherwise 0).
933-940	XXXX	bin	GPS time of 6th acquisition	(if stacking, otherwise 0).
941-948	XXXX	bin	GPS time of 7th acquisition	(if stacking, otherwise 0).
949-956	XXXX	bin	GPS time of 8th acquisition	(if stacking, otherwise 0).
957-964	XXXX	bin	GPS time of 9th acquisition	(if stacking, otherwise 0).
965-1024	0		Not used	

External Header

Byte No.	Value	Fmt	Description	Notes
1 - n	XXXX	asc	Concatenation of: - Info from shooting or navigation system, - User info from Config environment setup, - Source comment from operation window.	n = External Header Size parameter from GUI (Configuration window).

Trace Data block



$$N = \left(\frac{\text{acquisition length (ms)}}{\text{sample rate (ms)}} + 1\right) \times 4$$

$$\text{Number of samples per trace} = \left(\frac{\text{acquisition length (ms)}}{\text{sample rate (ms)}} + 1\right)$$

"+1" is there because the first sample is taken at Time Zero.

Trace header

Demultiplexed Trace Header

Byte No.	Value	Fmt	Description	Notes
1-2	XXXX	bcd	Four-digit file number (0-9999)	if file nb > 9999, set to FFFF and *Extended File Num* is used.
3	01	bcd	Scan Type Number	
4	XX	bcd	Channel Set Number	
5-6	XXXX	bcd	Trace Number	
7-9	XXXX	bin	First Timing Word	Refraction delay.
10	7	bin	Trace Header Extension	
11	0		Sample skew	
12	XX	bin	Trace edit 00 No edit applied. 02 Muted or dead prior to acquisition. 03 Edited by acquisition system.	Acquisition error or noise edited. See Reference Information in User's Manual Vol. 3.
13-15	XXXX.XX	bin	Time break window	
16-17	0		Extended channel set number	
18-20	XXXXXX		Extended file number	0-999999.

Trace Header Extensions

Trace Header Extension Block # 1

Byte No.	Value	Fmt	Description	Notes
1-3	XXXXXX	bin	Receiver Line Number	For an **Auxiliary trace** from a DSD(1): set to FFFFFF meaning that the RLN is recorded in the Extended Receiver Line field and includes a fractional part.
4-6	XXXXXX	bin	Receiver Point Number	For an **Auxiliary trace** from a DSD(1): set to FFFFFF meaning that the RPN is recorded in the Extended Receiver Point field and includes a fractional part.
7	XX	bin	Receiver point index	
8-10	XXXXXX	bin	Number of samples per trace	
11-15	0		Extended Receiver Line number	For an **Auxiliary trace** from a DSD(1): XX XX XX . YY stands for the line number of the location where the vibrator generated the sweep (source line information). The XXXXXX portion stands for the integer part of the line number. In compliance with the SEGD standard, the YY portion stands for the fraction (unsigned binary), meaning that 0.5 is encoded as 1×2^{-1} (YY = 0x8000).

(1) If "Post-annotation Logging" (Config window's Crew setup) and "SQC Dump" (Operation) options are enabled (e. g. for vib motion signal recording).

1

Trace Header Extension Block # 1 (continued)

Byte No.	Value	Fmt	Description	Notes
16-20	0		Extended Receiver Point number	For **Auxiliary trace** from DSD(1): XX XX XX . YY stands for the receiver point number of the location where the vibrator generated the sweep (Source Point Number information). The XXXXXX portion stands for the integer part of the point number. The YY portion stands for the fraction (unsigned binary).
21	XX	bin	Sensor SEGD code (not to be mistaken for the "Sensor Type Number" recorded in Trace Header Extension block # 2): 0 : not defined. 1 : Hydrophone. 2 : Geophone, Vertical. 3 : Geophone, Horizontal, In-line. 4 : Geophone, Horizontal, Crossline. 5 : Geophone, Horizontal, other. 6 : Accelerometer, Vertical. 7 : Accelerometer, Horizontal, In-line. 8 : Accelerometer, Horizontal, Crossline. 9 : Accelerometer, Horizontal, other.	
22-32	0		Not used.	

(1) If "Post-annotation Logging" (Config window's Crew setup) and "SQC Dump" (Operation) options are enabled (e. g. for vib motion signal recording).

Trace Header Extension block # 2

Byte No.	Value	Fmt	Description	Notes
1-8	XXXXXXXX	dbl	Receiver point easting	- **Seismic trace**: defaults to GUI setup, or updated by navigation system. - **Auxiliary trace** from DSD(1): vibrator position easting.
9-16	XXXXXXXX	dbl	Receiver point northing	- **Seismic trace**: defaults to GUI setup, or updated by navigation system. - **Auxiliary trace** from DSD(1): vib position northing.
17-20	XXXX	flt	Receiver point elevation	- **Seismic trace**: defaults to GUI setup, or updated by navigation system. - **Auxiliary trace** from DSD(1): vib position elevation.
21	XX	bin	Sensor Type Number (1 to 9)	Each Sensor Type Number (created in the Line main window's Survey setup) is associated with a specific set of sensor test limits. The Sensor Type Number should not be mistaken for the "Sensor SEGD code" recorded in Trace Header Extension block # 1.
22-24	0		Not used	
25-28	XXXX	bin	DSD identification No.	0 unless auxiliary trace from DSD(1)
29-32	XXXX	bin	Extended Trace No.	

(1) If "Post-annotation Logging" (Config window's Crew setup) and "SQC Dump" (Operation) options are enabled (e. g. for vib motion signal recording).

Trace Header Extension block # 3

Byte No.	Value	Fmt	Description	Notes
1-4	XXXX	flt	Resistance low limit	Only for geophones connected to FDU channels.
5-8	XXXX	flt	Resistance high limit	
9-12	XXXX	flt	Resistance value	ohms.
13-16	XXXX	flt	Tilt limit	
17-20	XXXX	flt	Tilt value	% for FDU channels Degrees for DSU channels.
21	X	bin	Resistance error	0 = No. 1 = Yes.
22	X	bin	Tilt error	0 = No. 1 = Yes.
23-32	0		Not used	

Non significant fields are set to FFFFFFFF.

Trace Header Extension block # 4

Byte No.	Value	Fmt	Description	Notes
1-4	XXXX	flt	Capacitance low limit	For hydrophones only.
5-8	XXXX	flt	Capacitance high limit	
9-12	XXXX	flt	Capacitance value	nano farads.
13-16	XXXX	flt	Cut off low limit	For hydrophones only.
17-20	XXXX	flt	Cut off high limits	
21-24	XXXX	flt	Cut off value	Hz.
25	X	bin	Capacitance error	0 = No. 1 = Yes.
26	X	bin	Cut off error	0 = No. 1 = Yes.
27-32	0		Not used	

Non significant fields are set to FFFFFFFF.

Trace Header Extension block # 5

Byte No.	Value	Fmt	Description	Notes
1-4	XXXX	flt	Leakage limit	Only for geophones connected to FDU channels.
5-8	XXXX	flt	Leakage value	kohms.
9-24	0		Not used	
25	X	bin	Leakage error	0 = No. 1 = Yes.
26-32	0		Not used	

Non significant fields are set to FFFFFFFF.

Trace Header Extension block # 6

Byte No.	Value	Fmt	Description	Notes
1	XX	bin	Unit type 0x00 Not identified 0x01 FDU 0x1C DSU 0x20 VE464	See below for details. (digital pilot).
2-4	XXXXXX	bin	Unit serial number	
5	X	bin	Channel number	
6-8		0	Spare	
9	X	bin	Assembly type 0x01 | to | FDU or DSU link 0x10 | 0x24 AXCU 0x42 LSI 0xE0 FDU2S	0x01 to 0x10 = number of FDUs or DSUs in Link.
10-12	XXXXXX	bin	FDU or DSU assembly serial number	
13	X	bin	Location in FDU or DSU assembly	
14-16		0	Spare	
17	XX	bin	Subunit type 0x01 FDU1-408 0x02 FDU3C 0x09 DSU3-408 0x0F FDU2S 0x10 DSU1-408 0x15 FDU-428 0x16 DSU3-428 0x17 QT-428 0x1E DSUGPS 0x21 DSU1-428, short 0x22 DSU3BV-428 0x24 DSU1-428, long	

Byte No.	Value	Fmt	Description	Notes
18	X	bin	Channel type 0 Geophone 1 Hydrophone	
19-20		0	Spare	
21-24	XXXX	flt	Sensor sensitivity	- FDU channels: FFFF FFFF. - DSU3-428 channels: 452 mV/m/s² (142 mV/m/s² for Tilt and Gravity tests). - DSU-408 channels: mV/m/s² . High Full Scale: 408 . Low Full Scale: 204
25-28			Reserved.	
29-32	0		Not used (0)	

Trace Header Extension block # 7

<table>
<tr><th>Byte No.</th><th>Value</th><th>Fmt</th><th>Description</th><th>Notes</th></tr>
<tr><td>1</td><td>XX</td><td>bin</td><td>Control unit type</td><td>0x01 LCI408
0x02 LAUL408
0x03 LAUX408
0x04 LAULS408
0x05 LAUXS408
0x06 LAUL-428

0x16 LRU
0x17 LAUR428

0x30 LAUX-428
0x31 LCI-428</td></tr>
<tr><td>2-4</td><td>XXXXXX</td><td>bin</td><td>Control unit serial number</td><td></td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>5</td><td>X</td><td>bin</td><td>Channel gain scale
<table>
<tr><th colspan="2">FDU</th></tr>
<tr><td>1</td><td>1600 mV RMS</td></tr>
<tr><td>2</td><td>400 mV RMS</td></tr>
</table>
<table>
<tr><th colspan="2">DSU3-428</th><th>DSU-408</th></tr>
<tr><td>1</td><td>5 m/s²</td><td>4 m/s²</td></tr>
<tr><td>2</td><td></td><td>1 m/s²</td></tr>
</table></td><td>(0 dB).
(12 dB).

High Full Scale.
Low Full Scale.</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>6</td><td>X</td><td>bin</td><td>Channel filter
1 0.8FN Minimum Phase
2 0.8FN Linear phase</td><td></td></tr>
<tr><td>7</td><td>X</td><td>bin</td><td>Channel data error: overscaling</td><td></td></tr>
</table>

Byte No.	Value	Fmt	Description	Notes
8	X	bin	Channel edited status 1 dead 2 acquisition/retrieve error 3 noise edition	
9-12	XXXX	flt	Channel sample to mV conversion factor	0 for Auxes (not computed). For details, see Reference Information in User's Manual Vol. 3
13	XX	bin	Number of stacks noisy	
14	XX	bin	Number of stacks low	
15	XX	bin	Channel type id: 1 = Seis 9 = Aux	
16	XX	bin	Channel process 01 Raw data 02 Aux stack 03 Correlation, negative part 04 Correlation, positive part 05 Normal correlation 06 Seis stack	
17-20	XXXX	flt	Trace max value	
21-24	XXXX	bin	Trace max time	microseconds.
25-28	XXXX	bin	Number of interpolations	See Reference Information in User's Manual Vol. 3.
29-32	XXXX	bin	Seismic trace offset value (if offset removal is disabled).	0 if seismic trace offset removal is enabled (i. e. Extended Header bytes 873-876 = 0).

Trace data

Byte No.	Value	Description
1 2 3 4	S, C7 thru C 1 C0, Q-1 thru Q-7 Q-8 thru Q-15 Q-16 thru Q-23	Sample value represented in 32 bit floating point IEEE demultiplexed format

BCD value MSD	8	4	2	1	8	4	2	1	LSD
Binary value MSB	128	64	32	16	8	4	2	1	LSB

First sample	S	C7	C6	C5	C4	C3	C2	C1	1
	C0	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7	2
	Q-8	Q-9	Q-10	Q-11	Q-12	Q-13	Q-14	Q-15	3
	Q-16	Q-17	Q-18	Q-19	Q-20	Q-21	Q-22	Q-23	4
Second sample	S	C7	C6	C5	C4	C3	C2	C1	5
	C0	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7	6
	Q-8	Q-9	Q-10	Q-11	Q-12	Q-13	Q-14	Q-15	7
	Q-16	Q-17	Q-18	Q-19	Q-20	Q-21	Q-22	Q-23	8
Last sample	S	C7	C6	C5	C4	C3	C2	C1	
	C0	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7	
	Q-8	Q-9	Q-10	Q-11	Q-12	Q-13	Q-14	Q-15	
	Q-16	Q-17	Q-18	Q-19	Q-20	Q-21	Q-22	Q-23	Last byte

Note The uphole trace delivered by the Opseis 812 blaster contains fewer samples than seismic traces do.

The samples of the uphole trace are padded with zeroes in order to have the same number of samples as on other traces.

Note IEEE Floating Point Format

BCD value MSD	8	4	2	1	8	4	2	1	LSD
Binary value MSB	128	64	32	16	8	4	2	1	LSB

Single precision value	S	C7	C6	C5	C4	C3	C2	C1
	C0	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7
	Q-8	Q-9	Q-10	Q-11	Q-12	Q-13	Q-14	Q-15
	Q-16	Q-17	Q-18	Q-19	Q-20	Q-21	Q-22	Q-23

Double precision value	S	C10	C9	C8	C7	C6	C5	C4
	C3	C2	C1	C0	Q-1	Q-2	Q-3	Q-4
	Q-5	Q-6	Q-7	Q-8	Q-9	Q-10	Q-11	Q-12
	Q-13	Q-14	Q-15	Q-16	Q-17	Q-18	Q-19	Q-20
	Q-21	Q-22	Q-23	Q-24	Q-25	Q-26	Q-27	Q-28
	Q-29	Q-30	Q-31	Q-32	Q-33	Q-34	Q-35	Q-36
	Q-37	Q-38	Q-39	Q-40	Q-41	Q-42	Q-43	Q-44
	Q-45	Q-46	Q-47	Q-48	Q-49	Q-50	Q-51	Q-52

- Single precision

31	30 23	22 0
s	e	f
s	C7 C0	Q-1 Q-23

value = $(-1)^s$ x 2^{e-127} x 1.f (a 0 value is encoded with e = f = 0).

- Double precision

63	62 52	51 0
s	e	f
s	C11 C0	Q-1 Q-52

value = $(-1)^s$ x 2^{e-1023} x 1.f (a 0 value is encoded with e = f = 0).

Chapter 2 SEG-D format Rev 2.1

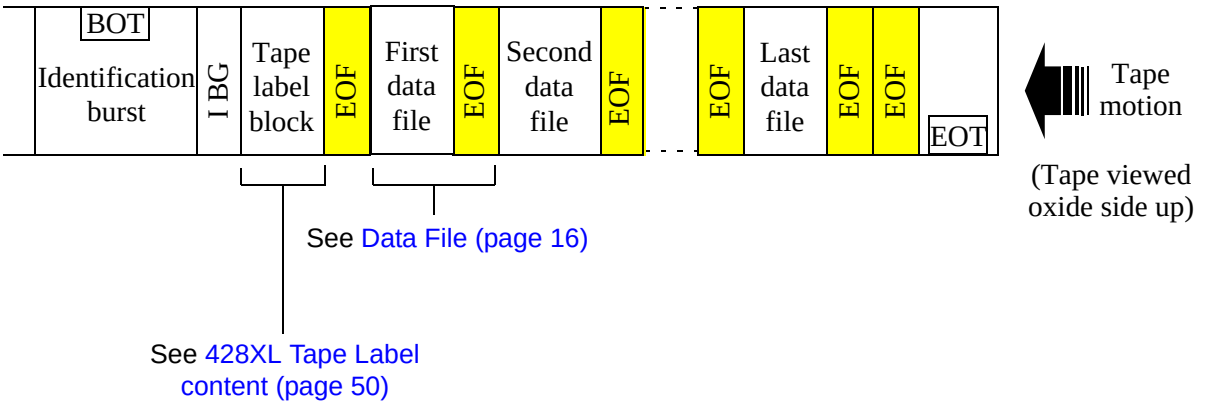
This chapter describes how the SEGD Rev. 2.1 standard is implemented in the 428XL system. It includes the following sections

Changes introduced in Revision 2.1

SEGD standard Revision 2.1 supports “RECORD” (variable-length) and “FIXREC” (fixed-length) storage unit structures. SEGD Rev. 2.1 files from the 428XL system are recorded with the “RECORD” structure.

SEGD standard Revision 2.1 requires a 128-byte label to be recorded at the beginning of each tape. That label is not recorded in the SEGD file.

An EOF is written between the tape label block and the first SEG-D file.



When recording to two tape drives simultaneously, a different tape label is generated for each tape drive.

Table 2-1 SEGD Rev. 2.1 file content

Changes	SEGD Rev 2.1 standard	Content generated by 428XL
Storage Unit Label	See SEGD Rev 2.1 Tape Label (page 45)	See 428XL Tape Label content (page 50)
General Header Block # 2 Bytes 11 and 12	SEG-D Revision Number	2.1
General Header Block # 2 Bytes 21 and 22	Sequence Number	Not used (all 0’s)
Extended Header		Same as SEGD Rev. 1, but with an empty string in the Tape Label field (bytes 525-540).

SEGD Rev 2.1 Tape Label

The first 128 bytes of data on a Rev 2.1 (and Rev 2.0) tape must consist of ASCII characters and will constitute a storage unit label. This label is very similar to the RP-66 storage unit label. The label format is summarized in the table below.

If the tape media supports multiple partitions, SEG-D data may be written to any of the partitions of the tape, each beginning with a Storage Unit Label. Data from one partition can not "run-over" into a subsequent partition, each partition must be capable of being decoded in isolation.

On one tape, it is allowed to mix partitions containing SEG-D data with partitions containing non SEG-D formatted information.

Table 2-2

Field	Description	Bytes	Start - end byte
1	Storage unit sequence number	4	1 - 4
2	SEG-D Revision	5	5 - 9
3	Storage unit structure (fixed or variable)	6	10 - 15
4	Binding edition	4	16 - 19
5	Maximum block size	10	20 - 29
6	API Producer organization code	10	30 - 39
7	Creation date	11	40 - 50
8	Serial number	12	51 - 62
9	Reserved	6	63 - 68
10	Storage set identifier	60	
	- External Label Name	12	69 - 80
	- Recording Entity Name	24	81 - 104
	- User defined	14	105 - 118
	- Max number of shot records per field record	10	119 - 128

Field 1

The Storage Unit Sequence Number is an integer in the range 1 to 9999 that indicates the order in which the current storage unit occurs in the storage set. The first storage unit of a storage set has sequence number 1, the second 2, and so on. This number is represented using the characters 0 to 9, right justified with leading blanks if needed to fill out the field (No leading zeros). The rightmost character is in byte 4 of the label. This field is optional. If not used, it must be blank (filled with blank characters). This implies that this is the only storage unit within the storage set. Separate Storage Sets should be used for different data types.

Field 2

The SEG-D Revision field indicates which revision of SEG-D was used to record the data on this tape. SD2.1 indicates that the data was recorded using SEG-D, Revision 2.1 (SD2.0 in previous revision)- This field is required.

Field 3

Storage Unit Structure is a name indicating the record structure of the storage unit. This name is left justified with trailing blanks if needed to fill out the field. The leftmost character is in byte 10 of the label. For SEG-D, Rev 2.1 and 2.0 tapes, this field must contain "RECORD" or "FIXREC". This field is required.

- "RECORD" -- Records may be of variable length, ranging up to the Blocksize length specified in the maximum Block size field of the storage unit label (if not zero). If the maximum Block size specified is zero, then records may be of any length.
- "FIXREC" -- All records in the storage unit have the same length, namely that specified in the maximum Block size field of the storage unit label. Although all storage units in the same storage set must have a FIXREC structure, the maximum record length may be different in different storage units. When the FIXREC option is used, then the maximum record length field shall not be 0 (zero).

Field 4

Binding edition is the character B in byte 16 of the label followed by a positive integer in the range 1 to 999 (no leading zeros), left justified with trailing blanks if needed to fill out the field. The integer value corresponds to the edition of the Part 3 of the API, RP66 standard used to describe the physical binding of the logical format to the storage unit. This field is required.

Field 5

Maximum Block Size is an integer in the range of 0 to 4,294,967,295 (232-1), indicating the maximum block length for the storage unit, or 0 (zero) if undeclared. This number is represented using the characters 0 to 9, right justified, with leading blanks if necessary to fill out the field (no leading zeros). The rightmost character is byte 29 of the label. A valid value or 0 (zero) must be recorded.

Field 6

Producer organization code is an integer in the range of 0 to 4,294,967,295 (232-1) indicating the organization code of the storage unit producer. This number is represented using the characters 0 to 9, right justified, with leading blanks if necessary to fill out the field (NO leading zeros). The rightmost character is byte 39 of the label. This field may be empty, i.e. may contain all blanks, in which case no storage unit producer is specified (e.g. same as RP-66 V2).

Organization codes are assigned by POSC (API, American Petroleum Institute in previous revision), which maintains the current list of codes. To request a new organization code, contact:

POSC

24 Greenway Plaza

Suite 1000-B

Houston, TX 77046 USA

+1 713 784-1880 telephone

+1 713 784-9219 fax

info@posc.org

Field 7

Creation date is the earliest date that any current information was recorded on the storage unit. The date is represented in the form dd-MMM-yyyy, where yyyy is the year (e.g. 1996), MMM is one of (JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC), and dd is the day of the month in the range 1 to 31. Days 1 to 9 may have one leading blank. The separator is a hyphen (code 4510). This field is required.

Field 8

Serial number is an ID used to distinguish the storage unit from other storage units in an archive of an enterprise. The specification and management of serial numbers is delegated to organizations using this standard. If an external label is used the name/number must be a subset of the serial number or the External Label Name in Field 10, and must occupy the rightmost characters in the serial number (or External Label Name). This field is required.

Field 9

This field is reserved and should be recorded as all blanks (code 3210).

Field 10

The **Storage set identifier** is a descriptive name for the storage set. Every storage unit in the same storage set shall have the same value for the user defined portion of the storage set identifier in its storage unit label. Included in the Storage Set Identifier is the **External Label Name**. The characters in this field are right justified with leading blank characters as required. If the tape does not have a physical label, then this field must be blank. A physical label is optional, but if it exists, then this field is required only if the external label is different from the lower 6 characters of the Serial Number in field 8.

The next field in the Storage set identifier is the **Recording Entity Name**. This must contain the crew number or name, or some other unique identifier which will differentiate the recording entity which recorded this data from any other recording entity within the organization (as included in field 6). The 24 bytes may by any alphanumeric characters. If multiple recording systems are used on a vessel or crew, then data recorded on each system must be clearly distinguished. For example, an ABC Geophysical crew (party 13), on the M/V Gopher, recording data on two Zip 6000 recording systems might have a Recording Entity Name on tapes recording on the first recording system of:

ABC, Gopher, P13, Zip#1

On the second system, the Recording Entity Name might be:

ABC, Gopher, P13, Zip#2

The Recording Entity Name field is required.

USER DEFINED. The next 14 bytes in this field may contain any other user input information. The only restriction is that the data must be in ASCII.

Max Number of shot records per field record. Field Records are data between File Marks (10 bytes).

It is not acceptable to use an ANSI label (or any other label or data) prior to the Storage Unit Label.

An external, physical label is not required.

428XL Tape Label content

Table 2-3 Tape label content

Field	Start - End byte	Description	Content generated by 428XL
1	1 - 4	Storage Unit sequence number	**Tape Number** field from “Records” setup (in Export window).
2	5 - 9	SEG-D revision	"SD2.1"
3	10 - 15	Storage unit structure	"RECORD"
4	16 - 19	Binding edition	"B2 "
5	20 - 29	Maximum block size	" 0"
6	30 - 39	API Producer organization code	**Producer Code** field from “SEGD” setup (in Export window).
7	40 - 50	Creation date	Recording date of first file (i. e. recording date of Tape Label itself).
8	51 - 62	Serial number	**Prefix Serial #** field from “SEGD” setup, plus **Tape Number** field from “Records” setup (in Export window).
9	63 - 68	Reserved	" "
10		Storage set identifier	
	69 - 80	·External label name	**External Label** field from “SEGD” setup (in Export window).
	81 - 104	·Recording entity name	**Crew Name** field (16 characters) from the “Crew” setup in the Config window, plus the device name (8 characters) automatically generated by the Export processing.
	105 - 118	·User defined	**User Defined** field from “SEGD” setup (in Export window).
	119 - 128	·Max number of shots record per field record	1

Chapter 3 Instrument test limit file format

This chapter describes the format of the files containing Instrument test limits. It includes the following sections:

FDU instrument tests

All the files containing the instrument test limits for FDU channels are located in the following directory:

/export/home/e-428/snSol/snFile/instrTest

Below is the `Fdu_Instr_Test_Limit.land.fdu.2ms` file containing the limits for instrument tests with a 2-ms sample rate:

```
Fdu_Instr_Test_Limit : [
# ================

  Distorsion_Limit   : -103 # (dB)
  Com_Mode_Rej_Limit : 100 # (dB)
  Gain_Limit         : 1.0 # (%)
  Phase_Limit        : 20 # (us)
  Noise_Limit_G1600  : 1.0 # (uv)
  Noise_Limit_G400   : 0.25 # (uv)
  Crosstalk_Limit    : 110.00 # (dB)

]
```

The suffix of the file name depends on the Sample Rate (.4ms .2ms .1ms .0.5ms .0.25ms).

For other sample rates, the file structure is the same but limit values may be different, in compliance with 428XL Specifications.

DSU Instrument tests

All the files containing the instrument test limits for DSU channels are located in the following directory:

/export/home/e-428/snSol/snFile/instrTest

Below is the `Dsu_Instr_Test_Limit.land.dsu.2ms` file containing the limits for instrument tests with a 2-ms sample rate:

DSU3-428

```
Dsu_Instr_Test_Limit : [
# ====================

  Distortion_Limit : -60.0 # (dB)
  Gain_Limit       : 2.0 # (%)
  Phase_Limit      : 20 # (us)
  Crosstalk_Limit  : 80.00 # (dB)
  Gravity_Limit    : 2.0 # (%)

]
```

DSU1-428

```
Dsu_Instr_Test_Limit : [
# ====================

  Distortion_Limit : -60.0 # (dB)
  Gain_Limit       : 2.0 # (%)
  Phase_Limit      : 20 # (us)
  Crosstalk_Limit  : 80.00 # (dB)

]
```

For other sample rates, only the suffix of the file name is different (.4ms .2ms .1ms .0.5ms .0.25ms).

Chapter 4 Synthetic File Format

This chapter describes the file format to be used for acquisition of seismic and aux data from a synthetic file in place of seismic receivers. It includes the following sections:

Overview

Using the 428XL synthetic signal file feature, you can generate Seismic and Aux data acquired from a file in place of receivers.

The synthetic signal file feature allows the data on the Seismic traces to be different from the data on the Auxes.

The synthetic signal file feature also allows the data to be different on each acquisition within a VP.

Synthetic Signal File Syntax

File Content

The description of the synthetic signal is an ASCII file containing key symbols that identify the Seismic and Aux data, and distinguish between the data from the different acquisitions within a VP.

The symbol "@" followed by a number ranging from 1 to 32 identifies the data section corresponding to an acquisition within a VP. Unless the symbol "@" is used, all acquisitions within a VP are identical.

Within a data section, the symbol "*" is used as a separator between the data for the seismic traces and the data for the Auxes. The data for the seismic traces must be placed ahead of the data for the Auxes. If the Auxes data are omitted, by default they are the same as for the seismic traces.

Blank rows and rows beginning with the symbol "#" are ignored. Any comment following the symbol "@" and the acquisition number is ignored. Any comment following the symbol "*" is ignored.

The Seismic and Aux data structure consists of a suite of samples. The samples are arranged at the rate of five values per row, preceded by the sequential number of each row's first sample (for better legibility of the file).

Each sample is an integer value ranging from -8388608 (max negative value of the FDU’s converter) to +8388607 (max positive value of the FDU’s converter). The maximum number of samples allowed in a trace is 32000, thus allowing the description of signals up to 32000 times the sample rate in length. If the acquisition length exceeds the synthetic signal length, then the signal restarts with the first sample, which allows you to describe periodic signals with only one period.

File Name

The file containing the description of the synthetic signal should be placed in the directory on the server computer:

/users/e-428/snSol/snFile/synthetic

with the following Permissions: Read, Write and Execute for Owner, Group and World.

To use the file, open the **Line** client window. See The Synthetic setup (page 219) in 428XL User's Manual Vol. 1.

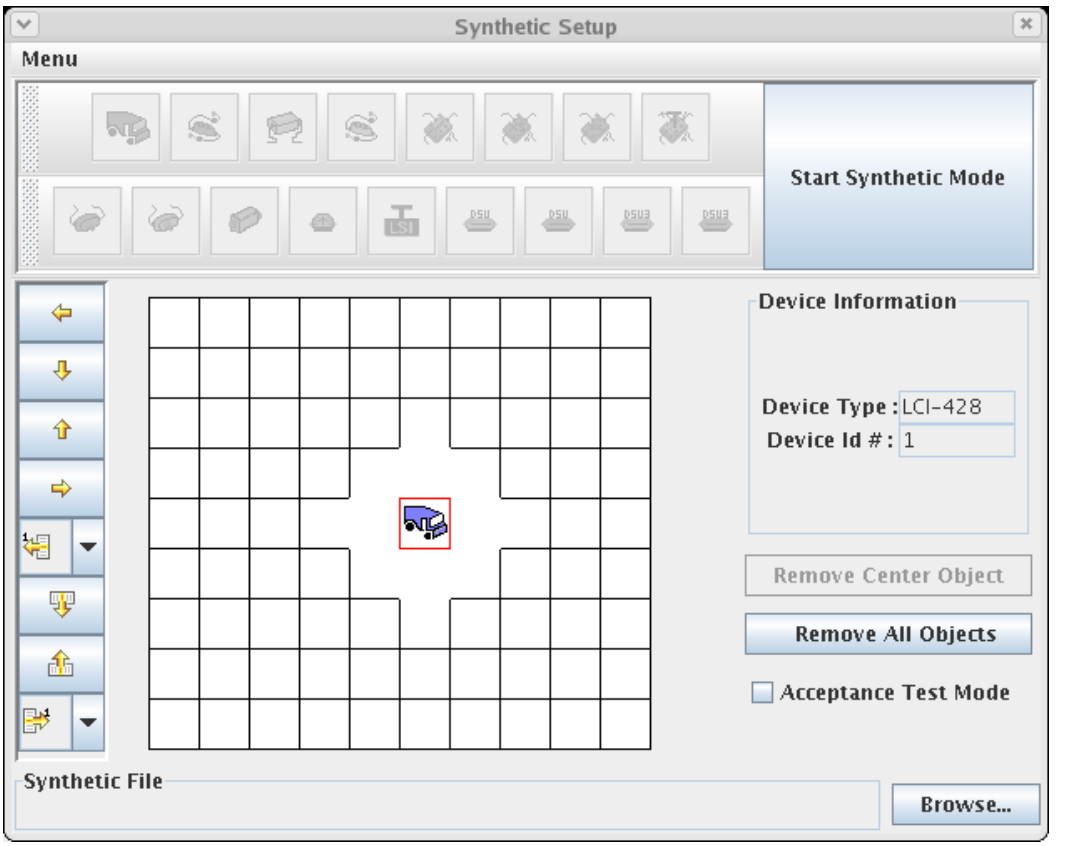


Figure 4-1

Examples

Auxes and Seis traces identical, all acquisitions identical

* full scale 50 Hz sine wave on all traces at 1 ms

```
0          0     2592222     4930699     6786525     7978039
5    8388607     7978039     6786525     4930699     2592222
10         0    -2592222    -4930699    -6786525    -7978039
15  -8388607    -7978039    -6786525    -4930699    -2592222
```

Auxes and Seis traces different, all acquisitions identical

* full scale 10 Hz sine wave on Seis traces at 2 ms

```
0          0     1051371     2086161     3088052     4041242
5    4930699     5742396     6463532     7082735     7590238
10   7978039     8240021     8372054     8372054     8240021
15   7978039     7590238     7082735     6463532     5742396
20   4930699     4041242     3088052     2086161     1051371
25         0    -1051371    -2086161    -3088052    -4041242
30  -4930699    -5742396    -6463532    -7082735    -7590238
35  -7978039    -8240021    -8372054    -8372054    -8240021
40  -7978039    -7590238    -7082735    -6463532    -5742396
45  -4930699    -4041242    -3088052    -2086161    -1051371
```

* half full scale 10 Hz sine wave on Auxes at 2 ms

```
0          0      525685     1043080     1544026     2020621
5    2465350     2871198     3231766     3541367     3795119
10   3989020     4120011     4186027     4186027     4120011
15   3989020     3795119     3541367     3231766     2871198
20   2465350     2020621     1544026     1043080      525685
25         0     -525685    -1043080    -1544026    -2020621
30  -2465350    -2871198    -3231766    -3541367    -3795119
35  -3989020    -4120011    -4186027    -4186027    -4120011
40  -3989020    -3795119    -3541367    -3231766    -2871198
45  -2465350    -2020621    -1544026    -1043080     -525685
```

Auxes and Seis traces identical, acquisitions different

@1

* full scale 10 Hz sine wave on all traces at 2 ms

```
0          0     1051371     2086161     3088052     4041242
5    4930699     5742396     6463532     7082735     7590238
10   7978039     8240021     8372054     8372054     8240021
15   7978039     7590238     7082735     6463532     5742396
20   4930699     4041242     3088052     2086161     1051371
25         0    -1051371    -2086161    -3088052    -4041242
30  -4930699    -5742396    -6463532    -7082735    -7590238
35  -7978039    -8240021    -8372054    -8372054    -8240021
40  -7978039    -7590238    -7082735    -6463532    -5742396
45  -4930699    -4041242    -3088052    -2086161    -1051371
```

@2

* half full scale 10 Hz sine wave on all traces at 2 ms

```
0          0      525685     1043080     1544026     2020621
5    2465350     2871198     3231766     3541367     3795119
10   3989020     4120011     4186027     4186027     4120011
15   3989020     3795119     3541367     3231766     2871198
20   2465350     2020621     1544026     1043080      525685
25         0     -525685    -1043080    -1544026    -2020621
30  -2465350    -2871198    -3231766    -3541367    -3795119
35  -3989020    -4120011    -4186027    -4186027    -4120011
40  -3989020    -3795119    -3541367    -3231766    -2871198
45  -2465350    -2020621    -1544026    -1043080     -525685
```

Auxes and Seis traces different, acquisitions different

@1

* one sample positive full scale pulse on seismic traces

```
0     8388607          0          0          0          0
5           0          0          0          0          0
10          0          0          0          0          0
.
.
31995       0          0          0          0          0
```

* one sample negative half full scale pulse on Auxes

```
0    -4194304          0          0          0          0
5           0          0          0          0          0
10          0          0          0          0          0
.
.
31995       0          0          0          0          0
```

@2

* full scale 50 Hz sine wave on Seis traces at 1 ms

```
0           0    2592222    4930699    6786525    7978039
5     8388607    7978039    6786525    4930699    2592222
10          0   -2592222   -4930699   -6786525   -7978039
15   -8388607   -7978039   -6786525   -4930699   -2592222
```

* half full scale 50 Hz sine wave on Auxes at 1 ms

```
0           0    1296111    2465350    3393263    3989020
5     4194304    3989020    3393263    2465350    1296111
10          0   -1296111   -2465350   -3393263   -3989020
15   -4194304   -3989020   -3393263   -2465350   -1296111
```

Chapter 5 Initial SPS format (Rev. 0)

The Processing Support format contained in this chapter is reproduced by courtesy of Shell Internationale Petroleum Maatschappij B. V., the initiator of this format. This chapter includes the following sections:

Introduction

The purpose of the format is to establish a common standard for the transfer of positioning and geophysical support data from land 3D field crews to seismic processing centres. In principal the format can also be used for land 2D surveys.

With the growth and increased complexity of land 3D surveys there is a need to establish a robust and standard procedure for logging, during acquisition, the positioning and geophysical spread relation data in a way that reduces errors, allows the field crews to quality control the data, and hence detect and correct errors before the data is transferred to the seismic centres.

Currently the quality control is carried out as the first stage in the processing centres. Experience has shown that most errors are only detected when the geophysical and coordinate information are integrated, and that often spread relation errors cannot be corrected, leading to the deletion of otherwise good quality records.

Providing the processing centres with checked disk(s) in a standard format, containing all relevant field data will significantly reduce the time spent by the processing centres on initial quality control and increase the quality of the end product.

Field system

The field crews must have an acquisition management system to generate the SPS format during the survey. Errors will be reduced both during recording and during the generation of the SPS format if automated procedures are introduced at survey set-up and during daily recording. Figure 5-1 shows the main elements of such a system. The Field Database, Topographical computations and 3D recording management are the minimum elements required to support the generation of the SPS format.

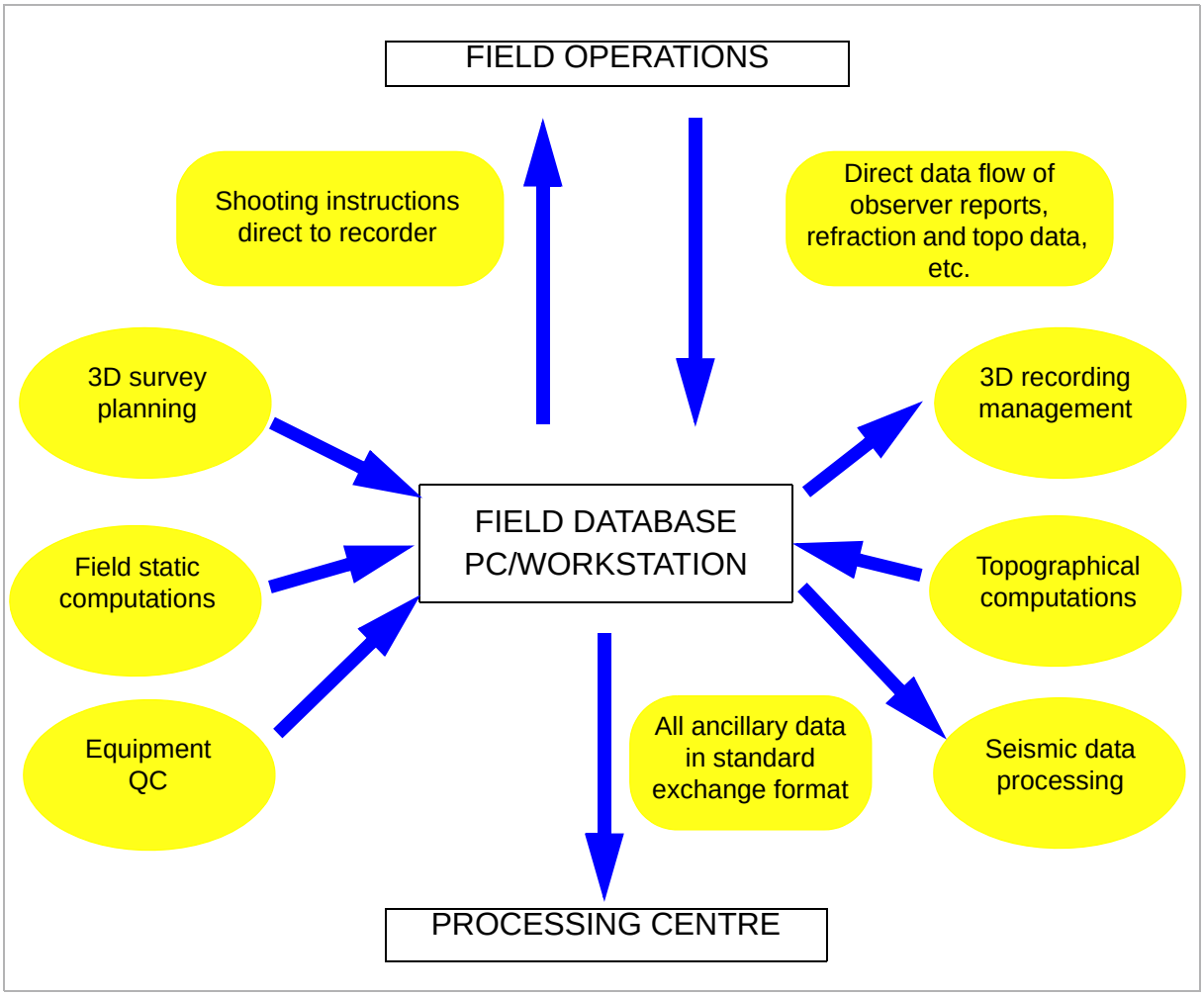


Figure 5-1 Field Acquisition Management System

A direct link to and from seismic recording instrument is strongly recommended.

Figure 5-2 shows the preferred method of data exchange between the system and the seismic recording instrument.

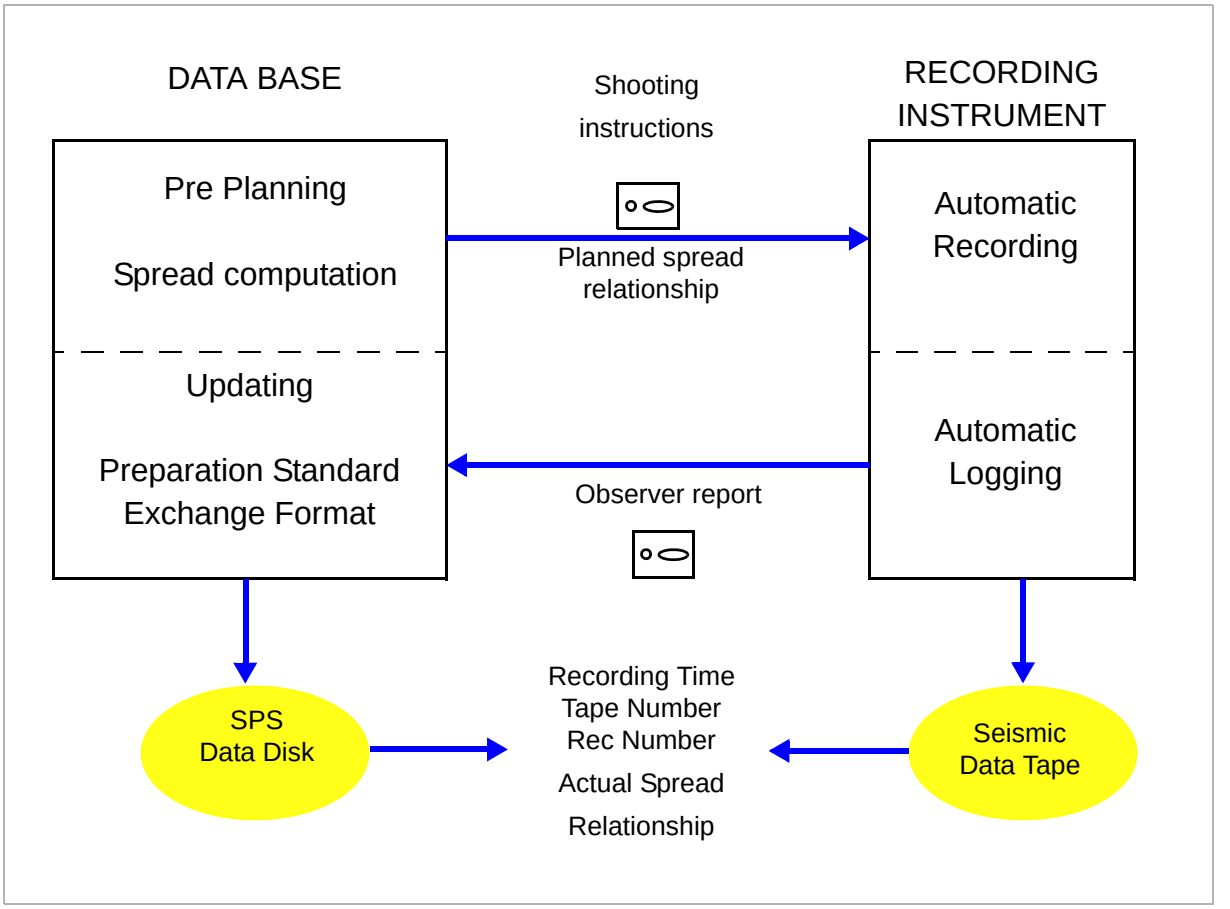


Figure 5-2 Automatic Recording

The key information required to relate the seismic records and the corresponding positioning and geophysical support data is written in the seismic headers and in SPS.

SHELL processing support format for land 3D surveys

General

Coordinates and elevations of geophysical lines may be determined by interpolation between observed break points in the line. The point files contain coordinates and elevations of all geophysical points (observed and interpolated) and of all permanent markers. The shotpoint and relational files are to be sorted chronologically, and the receiver file is to be sorted in ascending sequence of line, point and point index numbers.

In order to avoid ambiguities each physical position in the field (shotpoint or receiver group) must have a unique name.

Data record specification

The data set consists of three files with a block of header records. For magnetic tapes each file is terminated by a record containing “EOF” in col. 1-3.

First file	**Receiver File**: “Point Records” with details of receiver groups or permanent markers.
Second File	**Source File**: “Point Records” with details of shotpoints (power source).
Third File	**Cross-Reference File**: “Relation Record” specifying for each shotpoint its record number and the relation between recording channel numbers and receiver groups.

Data record sorting order

File	Records	Sort fields and sorting order
Receiver	'R'	Line name, Point number, Point index.
Source	'S'	Julian day and Time of recording shotpoint.
Cross-Reference	'X'	Sorted in the same order as the Source File.

Format for land survey data on 9-track tape

Tape specifications and tape layout

Half-inch magnetic tape : IBM compatible, non-label.

Number of tracks : 9.

Number of bytes per inch : 6250 (1600 is a permissible alternative).

Mode : EBCDIC coded.

Record length : 80 bytes.

Block size : 1600 bytes (20 logical records).
Physically separated by inter-record gap.

An "EOF" statement followed by an IBM tape mark shall be written after the end of a file and a tape shall be closed by two IBM tape marks.

In general, a tape may contain one or more files depending on the type of survey. Each file shall start with a number of 'Header Records' followed by 'Data Records' and closed by an EOF statement and an IBM tape mark.

Format for land survey data on floppy disc

Disc specifications and layout

Format: MS DOS compatible ASCII files.

Record length: 80 bytes, followed by carriage return (col 81) and line feed (col 82).

3.5” or 5.25” formatted disc (any size: 360/720 Kbyte or 1.4/1.2 Mbyte). File name to relate to the project, date and sequence. To denote file type extension name must be prefixed with:

‘S’	for shotpoint records	e. g.	PRJX90.S01
‘R’	for receiver records	e. g.	PRJX90.R01
‘X’	for relational records	e. g.	PRJX90.X01

In general, a disc may contain one or more files depending on the type of survey. Each file shall start with a number of ‘Header Records’ followed by ‘Data Records’.

Header record specification

Each file shall start with a number of header records which contain information about, and parameters controlling, all the data records which follow.

The general format for a header record shall be:

	Cols		**Formats**
a.	Record identifier “H”	1	A1
b.	Header record type	2-3	I2
c.	Header record type modifier	4	I1
d.	Parameter description	5-32	7A4
e.	Parameter data	33-80	See below

Header record type H0 to H20 are mandatory for all surveys even if a “N/A” entry is required (”N/A” is not allowed for H18). Header records of types H21 to H25 are mandatory as far as they are applicable to the projection used.

Requirements for projection definition include the following header records:

Transverse Mercator	:	H220, H231, H232, H241, H242
UTM	:	H19, H220.
Stereographic	:	H231, H232, H241, H242.
Oblique Mercator	:	H231, H232, H241, H242, H259 and H256 or H257 or H258.
Lambert Conical	:	H210, H220, H231, H232, H241, H242.

Header record type H26 is a free format statement for any other relevant information.

Formats of parameter data fields for each of the header record types shall be:

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H00	SPS format version num.	33-80	12A4
H01	Description of survey area	33-80	12A4
H02	Date of survey	33-80	12A4
H021	Post-plot date of issue	33-80	12A4
H022	Tape/disk identifier	33-80	12A4
H03	Client	33-80	12A4
H04	Geophysical contractor	33-80	12A4
H05	Positioning contractor	33-80	12A4
H06	Pos. proc. contractor	33-80	12A4
H07	Field computer system(s)	33-80	12A4
H08	Coordinate location	33-80	12A4
H09	Offset to coord. location	33-80	12A4
H10	Clock time w.r.t. GMT	33-80	12A4
H11	Spare	33-80	12A4
H12	Geodetic datum,-spheroid	33-80	3A4, 3A4,F12.3,F12.7
H13	Spare	33-80	12A4
H14	Geodetic datum parameters	33-80	3(F8.3),4F(6.3)
H15	Spare	33-80	12A4
H16	Spare	33-80	12A4
H17	Vertical datum description	33-80	12A4
H18	Projection type	33-80	12A4
H19	Projection zone	33-80	12A4
H20	Description of grid units	33-56	6A4
H201	Factor to metre	33-46	F14.8
H210	Lat. of standard parallel(s)	33-56	2(I3,I2,F6.3, A1)

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H220	Long. of central meridian	33-44	v
H231	Grid origin	33-56	2(I3,I2,F6.3, A1)
H232	Grid coord. at origin	33-56	2(F11.2,A1)
H241	Scale factor	33-44	F12.10
H242	Lat., Long. scale factor	33-56	2(F11.2, A1)
H256	Lat. long. initial line	33-56	4(I3, I2,F6.3, A1)
H257	Circular bearing of H256	33-44	I3, I2, F7.4
H258	Quadrant bearing of H256	33-44	A1, 2I2,F6.3, A1
H259	Angle from skew	33-44	I3, I2,F7.4
H26	Any other relevant information This record can be repeated as required.	5-80	19A4
H30	Project code and description	33-78	3A2,10A4
H31	Line number format	33-80	12A4

Instrument code (I) tables

Header Records: H400-H419: code 1,
H420-H439: code 2...
H560-H579: code 9

Instrument code must be entered in col 33-34, for example: ‘1,’ ‘2,’... ‘9,’

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H400	Type, Model, Polarity	33-80	12A4
H401	Crew name, Comment	33-80	12A4
H402	Sample int. Record Len.	33-80	12A4
H403	Number of channels	33-80	12A4
H404	Tape type, format, density	33-80	12A4
H405	Filter_alias Hz, dB pnt, slope	33-80	12A4
H406	Filter_notch Hz, -3 dB points	33-80	12A4
H407	Filter_low Hz, dB pnt, slope	33-80	12A4
H408	Time delay FTB-SOD app Y/N	33-80	12A4
H409	Multi component recording	33-80	12A4
H410	Aux. channel 1 contents	33-80	12A4
H411	Aux. channel 2 contents	33-80	12A4
H412	Aux. channel 3 contents	33-80	12A4
H413	Aux. channel 4 contents	33-80	12A4
H414	Spare	33-80	12A4
...	...	...	...
H419	Spare	33-80	12A4

Receiver code (Rx) tables

Header Records: H600-H609: code 1,
H610-H619: code 2...
H690-H699: code 10

Receiver code must be entered in cols 33-34. Example of possible codes:

G1..to.G9 for geophones H1..to.H9 for hydrophones

R1..to.R9 for multi comp. and other types

PM = Permanent marker KL = Kill or omit receiver station

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H600	Type, model, polarity	33-80	12A4
H601	Damp coeff, natural freq.	33-80	12A4
H602	Nunits, len(X), width(Y)	33-80	12A4
H603	Units spacing X, Y	33-80	12A4
H604	Spare	33-80	12A4
...	...	...	...
H609	Spare	33-80	12A4

For ‘PM’ and ‘KL’ use H26 records (free format description)

Source code (Sx) tables

Header Records: H700-H719: code 1,
H720-H739: code 2...
H880-H899: code 10

Source code must be entered in cols 33-34. Example of possible codes:

V1..to.V9 for vibroseis E1..to.E9 for explosive

A1..to.A9 for air gun W1..to.W9 for water gun

S1..to.S9 for other types KL = Kill or omit shotpoint

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H700	Type, model, polarity	33-80	12A4
H701	Size, vert. stk fold	33-80	12A4
H702	Nunits, len(X), width(Y)	33-80	12A4
H703	Units spacing X, Y	33-80	12A4

Following records are only required if **source type = Vibroseis V1..V9**

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H704	Control type	33-80	12A4
H705	Correlator, noise supp	33-80	12A4
H706	Sweep type, length	33-80	12A4
H707	Sweep freq start, end	33-80	12A4
H708	Taper, length start, end	33-80	12A4
H709	Spare	33-80	12A4
H710	Spare	33-80	12A4

Following records are only required if **source type = Explosive E1..E9**

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H711	Nom. shot depth, charge len.	33-80	12A4
H712	Nom. soil, drill method	33-80	12A4
H713	Weathering thickness	33-80	12A4
H714	Spare	33-80	12A4
H715	Spare	33-80	12A4

Following records are only required if

source type = air gun A1..A9

or = water gun W1..W9

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H716	P-P bar/m, prim/bubble	33-80	12A4
H717	Air pressure psi	33-80	12A4
H718	No. sub arrays, Nom depth	33-80	12A4
H719	Spare	33-80	12A4

Quality Control check records

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H990	R,S,X file quality control	33-60	2A4,I4,4A4
H991	Coord. status final/prov	33-68	4A4,I4,4A4

Point record specification

This record type contains details at the position of the shotpoint at the time of recording or at the position of a receiver at the time of first shotpoint recorded into the receiver.

Item	Definition of field	Cols	formats	Min.to Max.	Default	Units
1	Record identification	1-1	A1	“R” or “S”	None	-
2	Line name (left adj)	2-17	4A4	Free	None	-
3	Point number (right adj)	18-25	2A4	Free	None	-
4	Point index	26-26	I1	1-9	1	-
5	Point code*	27-28	A2	see below	None	-
6	Static correction	29-32	I4	-999 - 999	Blank	Msec
7	Point Depth	33-36	F4.1	0 - 99.9	None	Metre
8	Seismic datum	37-40	I4	-999 - 9999	None	Metre
9	Uphole time	41-42	I2	0 - 99	Blank	Msec
10	Water depth	43-46	F4.1 #	0 to 99.9/999	Blank	Metre
11	Map grid easting	47-55	F9.1		None	-
12	Map grid northing	56-65	F10.1		None	-
13	Surface Elevation	66-71	F6.1	-999.9 - 9999.9	None	Metre
14	Day of year	72-74	I3	1-999	None	-
15	Time hhmmss	75-80	3I2	000000-235959	None	-

Water depth should be read in as F5.1 to allow for 4 character decimal and integer values.

* Example Point codes:

0 to 9 - SERCEL Process Type.
“PM” - permanent marker, “KL” - kill or omit point
“G1” ..”G9” “H1”..”H9”, “R1”,..”R9” - receiver codes
“V1”..”V9” “E1”..”E9”, “A1”..”A9”, “W1”..”W9”,
“S1”..”S9”.- source codes

Relation record specification

This record type is used to define the relation between the field record number and shotpoint and between recording channels and receiver groups. For each shotpoint there is at least one “Relation Record”. Each of these records specifies a section of consecutively numbered channels and receiver groups. After a numbering gap or a change in line name or repositioning for the receiver groups a new “Relation Record” has to be given. Channel numbers should be in ascending order.

Fields 6, 7 and 8 must be identical to fields 2, 3 and 4 of the corresponding shotpoint record. While the receiver line and point numbers in fields 13, 14 and 15 must be the same as used in the receiver point records.

Item	Definition of field	Cols	formats	Min. to Max.	Default	Units
1	Record identification	1-1	A1	“X”	None	-
2	Field tape number (l adj)	2-7	3A2	Free	None	-
3	Field record number	8-11	I4	0-9999	None	-
4	Field record increment	12-12	I1	1-9	1	-
5	Instrument code	13-13	A1	1-9	1	-
6	Line name (left adj)	14-29	4A4	no default	None	-
7	Point number (right adj)	30-37	2A4	no default	None	-
8	Point index	38-38	I1	1-9	1	-
9	From channel	39-42	I4	1-9999	None	-
10	To channel	43-46	I4	1-9999	None	-
11	Channel increment	47-47	I1	1-9	1	-
12	Line name (left adj)	48-63	4A4	no default	None	-
13	From receiver (right adj)	64-71	2A4	no default	None	-
14	To receiver (right adj)	72-79	2A4	no default	None	-
15	Receiver index	80-80	I1	1-9	1	-

Note Alphanumeric (A) fields are to be left justified and Numeric (I and F) fields are to be right justified unless specified otherwise.

Note See Sercel SPS format with over 10000 traces (page 106).

Header record description

In **bold type** face are the parameter descriptions to be entered, left justified, into position 5-32.

In *italics* are examples of parameters to be entered, left justified, into position 33-80. Positions 33 and 34 must always contain the instrument or receiver or source code.

To enable parsing of free format (12A4) parameter fields the following rule should be used “The parameters entered into positions 33-80 must be separated by a comma and the parameter string must be terminated by a semi colon. Parameter text cannot contain commas ‘,’ or semi colons ‘;’.

Note All units of distance are in metres except the grid coordinates whose units are defined by H20 and can be converted to metres using the conversion factor defined by H201.

H00 **SPS format version num**: The format version number and date of issue.
Example: SPS001,01.10.90;

H01 **Description of survey area**: The name of the country, survey area, survey type (land: L2D/L3D or Transition zone; TZ2D/ TZ3D) and project number.
Example: The Netherlands,Dordrecht,L3D,0090GA;

H02 **Date of survey**: The date of recording first shotpoint of survey and the last date of survey on this file.
Example: 21.05.1990,28.05.1990;

H021 **Post-plot date of issue**: The date when this tape or disc was issued and confirmed checked.
Example: 30.05.90;

H022 **Tape/disk identifier**:
Example: 0090GA0;

H03 **Client**: The client's company name.
Example: NAM;

H04 **Geophysical contractor**: The company name of the main seismic contractor, and the seismic party name.
Example: Prakla Seismos,SON 1;

H05 **Positioning contractor**: The company name of contractor or sub-contractor responsible for the positioning survey/control in the field.
Example: Prakla Seismos,

H06 **Pos. proc. contractor**: The company name of contractor or sub-contractor responsible for the post processing of the positioning data.
Example: Prakla Seismos,SON 1;

H07 **Field computer system(s)**: The acquisition management system name, name of seismic recording instrument, and the method of direct transfer to/from the seismic recording instrument (if no direct transfer enter "***manual entry***").
Examples: CDB,SN368/FLUKE,FDOS discs; or None,SN368, manual entry;

H08 **Coordinate location**: The description of what the coordinates refer to.
Example: centre of source pattern and centre of receiver pattern;

H09 **Offset to coord. location**: The offset from a vessel or vehicle reference position to coordinate location as defined in H08, including method of angular offset used.
Example: 170M,180DEG from vessel gyro heading;

H10 **Clock time w.r.t. GMT**: The number of hours that the local (clock) time is behind or ahead of GMT
Example: +2;or -6; or 0;

H11 **Spare**

H12 **Geodetic datum,-spheroid**: Datum name, spheroid name, semi major axis (a), inverse flattening (1/f) as used for survey.
Example: RD datum Bessel 1841 6377397.155 299.15281

H13 Spare

H14 **Geodetic datum parameters**: Datum transformation parameters to WGS72 (dx,dy,dz,rx,ry,rz,ds) as used for survey.
Example: 595.000 11.300 478.900 0.000 0.000 0.000 0.000

The datum transformation parameters are defined by the following model:

$$\begin{vmatrix} x \\ y \\ z \end{vmatrix}_{(2)} = \begin{vmatrix} dx \\ dy \\ dz \end{vmatrix} + |scale| * \begin{vmatrix} 1 & -rz & +ry \\ +rz & 1 & -rx \\ -ry & +rx & 1 \end{vmatrix} * \begin{vmatrix} x \\ y \\ z \end{vmatrix}_{(1)}$$

where: x,y,z are the geocentric cartesian coordinates in metres, dx, dy, dz are translation parameters in metres, rx, ry, rz are clockwise rotation defined in arcsecs, but converted to radians for use in the formula. Scale is [1+ds(10E-6)], where ds is in parts per million.

For this example (1) is RD datum, (2) is WGS72 datum.

H15 Spare

H16 Spare

H17 **Vertical datum description**: Name, type (i.e. equipotential, LAT or spheroidal), origin (name or lat,long) and undulation of vertical datum with respect to WGS72.
Example: NAP, Equipotential, Amsterdam, 0; or MSL-Syria,Equipotential, 34 degr N, 38 degr E, 23.6 m;

H18 **Projection type**: Type of map projection used
Example: Transverse Mercator;

H19 **Projection zone**: Zone and hemisphere for UTM projections.
Example: Zone 30, North;

H20 **Description of grid units**: Unit of coordinates.
Example: Metres; or International Feet; or Indian Feet; or American Feet;

H201 **Factor to metre**: The multiplication factor to convert grid units to metres. For American Feet the factor is:
Example: 030480061

H210 **Lat. of standard parallel(s)**: Latitude and longitude of standard parallel(s) as required for projection as per H18, in dddmmss.sss N/S. For 2 standard parallels of 5 degr N and 10 degr N:
Example: 0050000.0000100000.000N

H220 **Long. of central meridian**: Longitude of central meridian as required for projection as per H18 above, in dddmmss.sss E/W. For 15 degr 30 minE:
Example: 0153000.000E

H231 **Grid origin**: Latitude and longitude of the grid origin in dddmmss.sss N/S dddmmss.sss E/W. For 5 degr N and 15 deg 10 min and 25 secE:
Example: 0050000.000N0151025.000E

H232 **Grid coord. at origin**: Grid coordinates (Eastings and Northings) at the origin of the projection system. For false Easting of 500000 and false Northing of 0:
Example: 50000000.0E 0.00N

H241 **Scale factor**: Scale factor for defined projection.
Example: 0.9996000000

H242 **Lat.,Long. scale factor**: Latitude and longitude at which the scale factor (H241) is defined.
Example: 0050000.000N 151025.000E

H256 **Lat. Long. initial line**: The two points defining the initial line of projection, as latl, longl, lat2, long2. For 5, degr N, 20 degr E, 10 degr N, 30 degr E.
Example:
0050000.000N0200000.000E0100000.000N0300000.000E

H257 **Circular bearing of H256**: This is the true bearing to the east in the origin of the initial line of projection in dddmmss.ssss (max of 360 degrees).
Example: 1200000.0000

H258 **Quadrant bearing of H256**: Quadrant bearing of the initial line of projection in N/S ddmmss.sss E/W.
Example: S300000.000E

H259 **Angle from skew**: The angle between the skew and the rectified (North oriented) grid, in dddmmsss.sss.
Example: 0883000.0000

H26 **Free format in positions 5-80**: Any other information can be included using header records of this type.

H30 **Project code and description**: A six character code, the survey area name and survey type (see H01).
Example: 0090GA,Dordrecht,L3D;

H31 **Line number format**: Specifies the internal format of the line number field in the data records. The specification shall be:
NAME1(POS1:LEN1),NAME2(POS2:LEN2),NAME3(POS3:LEN3);
Where NAMEn is the name of the sub-identifier, POSn is the first character position within the line number field and LENn is the length of the sub field.
Example: BLOCK(1:4),STRIP(5:4),LINE NUMBER(9:8);
If no sub division of the field is required then enter ‘LINE NUMBER(1:16);’

Seismic instrument header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H400-H419 are to be used to define tables for the first instrument code, and H420-H439 for the second up to H560-H579 for the ninth code. A new table must be defined, with a different code, for each instrument used or if any parameter in the table is changed.

The instrument code must always be in cols. 33-34, for example ‘1,’ to ‘9,’

H400 **Type,Model,Polarity**: The type and model name of seismic recording instrument, the unique model number of the instrument and the polarity defined as SEG or NON SEG. The definition of SEG is “A **compression** shall be recorded as a **negative** number on tape and displayed as a **downward** deflection on monitor records”.
Example: 1,SN368+LXU,12345,SEG;

H401 **Crew name,Comment**: The name of the crew and any other comments.
Example: 1,Prakla SON 1;

H402 **Sample int.,Record Length**: The recording sample rate and the record length on tape.
Example: 1,2MSEC,6SEC;

H403 **Number of channels**: The number of channels per record.
Example: 1,480;

H404 **Tape type, format, density**: The type of tape (9 track or cartridge), recording format of the data on tape and the recording density.
Example: 1,9 track,SEGD,6250;

H405 **Filter_alias Hz,dB pnt,slope**: The anti-alias or high-cut filter setting of the recording instrument or field boxes specified in hertz, the dB level at the frequency value and the filter slope in

dB per octave.
Example: 177HZ,-6DB,72 DB/OCT;

H406 **Filter_notch Hz,-3db points**: The centre frequency of the filter setting of the recording instrument or field boxes specified in hertz and the frequency values at the -3dB points.
Example: 1,NONE;or 1,50,45,55;

H407 **Filter_low Hz,dB pnt,slope**: The low-cut filter setting of the recording instrument or field boxes specified in hertz, the dB level at the frequency value and the filter slope in dB per octave.
Examples: 1,NONE;or 1,8HZ,-3DB,18 DB/OCT;

H408 **Time delay,FTB-SOD app Y/N**: The value of any time delay and if the delay between field time break and start of data has been applied to the seismic data recorded on tape.
Example: 1,0 Msec,not applied;

H409 **Multi component recording**: Describes the components being recorded and their recording order on consecutive channels, allowed values are ‘X’,’Y’,’Z’.
Examples: 1,Z; or 1,Z,X,Y;

H410 **Aux. channel 1 contents**: Describes the contents of an auxiliary channel.
Examples: 1,FTB; or 1,NONE;

H411 Aux. channel 2 contents

H412 Aux. channel 3 contents

H413 Aux. channel 4 contents

H414 Spare

to

H419 Spare

Seismic receiver header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H600-H609 are to be used to define tables for the first receiver code, and H610-H619 for the second up to H690-699 for the tenth code. A new table must be defined, with a different code, for each receiver type used or if any parameter in the tables is changed.

The receiver code must always be in cols. 33-34. Example of possible codes:

G1..to.G9 for geophones H1.. to.H9 for hydrophones

R1..to.R9 for multi comp. and other types

PM = Permanent marker KL = Kill or omit receiver station

H600 **Type,model,polarity**: The type (land geophone, marsh geophone, hydrophone), model name of seismic detector and the polarity defined as SEG or NON SEG. The definition of SEG is "A **compression** shall be recorded as a **negative** number on tape and displayed as a **downward** deflection on monitor records". *Example: G1,SM-4,1234,SEG;*

H601 **Damping coeff,natural freq**
Example: G1,0.68,10Hz;

H602 **Nunits,len(X),width(Y)**: The number of elements in the receiver group, the inline and the cross-line dimension of the receiver group pattern.
Example: G1,12,25M,6M;

H603 **Units spacing X,Y**: The distance between each element of the receiver group, inline (X), and cross-line (Y).
Example: G1,4M,6M;

H604 Spare

to

H609 Spare

Seismic source header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H700-H719 are to be used to define tables for the first source code, and H720-H739 for the second up to H880-899 for the tenth code. A new table must be defined, with a different code, for each source type used if any parameter in the table is changed.

The source code must always be in cols. 33-34. Example of possible codes:

V1..to.V9 for vibroseis E1.. to.E9 for explosive

A1..to.A9 for air gun W1..to.W9 for water gun

S1..to.S9 for other types

KL = Kill or omit receiver shotpoint

H700 **Type,model,polarity**: Source type (explosive, air gun etc.), make or model and the polarity defined as SEG or NON SEG. The definition of SEG is “A **compression** shall be recorded as a **negative** number on tape and displayed as a **downward** deflection on monitor records”.
Examples: E1,EXPLOSIVE, SEISMOGEL 125 gram,SEG; or V1,VIBROSEIS,MERTZ 22,SEG EQU;

H701 **Size,vert. stk fold**: The total charge size, force or air volume of the source pattern, the vertical fold of stack or number of sweeps per VP.
Examples: E1,1000 gram,1; or V1,93 kN,1 SWEEP/VP;

H702 **Nunits,len(X),width(Y)**: The number of elements in the source pattern, the inline and the cross-line dimension of the source pattern.
Examples: E1,6,25M,0M; or V1,4 VIBS,25M,45M;

H703 **Units spacing X,Y**: The distance between each element of the source pattern, inline (X), and cross-line (Y).
Examples: E1,5M,0; or V1,8M,15M;

Following records are only required if source **type= Vibroseis V1..V9**

H704 **Control type**: The type of control used.
Example: V1,GND FORCE PHASE&AMPL LOCK;

H705 **Correlator,noise supp**: The type correlator/stacker, and the type of noise suppression applied before summing.
Example: V1,SERCELCS-2502,NO NOISE SUPP;

H706 **Sweep type,length**: The type and length of the sweep.
Example: V1,LINEAR,30 SECONDS;

H707 **Sweep frequency start,end**: The start and end frequency of the sweep.
Example: V1,5HZ,60HZ;

H708 **Taper,length start,end**: The type of taper and the taper length (start and end).
Example: V1,COSINE,500MSEC,500MSEC;

H709 Spare

H710 Spare

Following records are only required if source **type= Explosive E1..E9**

H711 **Nom. shot depth,charge len.**: The nominal shot depth, and the length of the charge.
Example: E1,15M,1M;

H712 **Nom.soil, drill method**: The nominal type of soil or near surface medium, and the method of drilling (flushing, hand auger, portable drill unit etc.).
Example: E1,CLAY,PORTABLE UNITS;

H713 **Weathering thickness**: The nominal depth to the base of weathered layer.
Example: V1,8-12M;

H714 Spare

H715 Spare

Following records are only required if source

type=air gun A1..A9

water gun W1..W9

H716 **P-P bar/m,prim/bubble**: The Peak-peak output in bar metres, and the primary to bubble ratio measured through a 0-125 Hz filter at a depth of 6 metres.
Example: A1,50,13:1;

H717 **Air pressure psi**: The nominal operating air pressure.
Example: A1,2000PSI;

H718 **No. sub arrays,nom depth**: The number of sub arrays and the nominal towing depth.
Example: A1,3,5.5M;

H719 Spare

Quality Control check records

H990 **R,S,X file quality control**: The date and time of the Q.C. check, and the name of the person who performed the quality control of the file.
Example: 01JUN90,0930,Mr J Smith;

H991 **Coord. status final/prov**: The status of the coordinates contained in the R and S files (final or provisional), the date and time of the status, the name of the surveyor responsible for the coordinate integrity.
Example: Final01jun90,930,Mr J.Jansen;

Point record description

2 **Line name**: Identifier for the shotpoint or receiver line. It can be composed of a block or strip number and a line number. The internal format of this field must be defined in the header.
Example: 89NM0122001

3 **Point number**: Identifier for the shotpoint or receiver group number defined as the centre of the source or receiver array as staked out in the field. The value should be read as a numeric and be right justified.

4 **Point index**: Identifier for the shotpoint or receiver index.

Shotpoint:To be 1 for original shot within the grid cell denoted by fields 2 and 3, and be incremented by 1 for each subsequent shot within the same grid cell.
Exceptions: shots to be vertically stacked (unsummed vibroseis).

Receiver:To be 1 for the original positioning of a receiver group, and be incremented by 1 every time the receiver group is moved or repositioned, even when put back to any previous position.

5 **Point code**: A shotpoint or receiver code which is defined in the header by a table that describes the characteristics of the source or receiver group used at the point.

6 **Static correction**: The shotpoint or receiver static correction defined as a static time shift in Msec. that has been computed in the field to correct any seismic recording for the effects of elevation, weathering thickness, or weathering velocity at the point. The correction should be with reference to the seismic datum as defined by field 8 of this record. If no static was computed leave ‘blank’.

7 **Point Depth**: The depth of the shotpoint source or receiver group. Defined in metres with respect to the surface down to the top of the charge or vertical receiver array. When the surface elevation can vary with time (e. g. a tidal water surface), then for shotpoints the value should be at the time of recording, and for

receivers at the time of recording of the first shotpoint into that receiver. (See figures 3 and 4).

8 **Seismic datum**: Defined in metres as an offset to the datum defined in header record H17. It is +ve when above datum,-ve when below datum or zero when at datum. If the seismic datum is equal to H17, enter zero. (See figures 3 and 4).

9 **Uphole time**: Defined for a shotpoint as the vertical travel time to surface, recorded in msec and is always positive or zero. If no uphole was recorded leave 'blank'. Not defined for receiver leave 'blank', unless a reverse uphole is taken then the shotpoint definition applies.

10 **Water depth**: The measured (or reliably determined) height of water surface above the sea bed or water bottom. In case the water depth varies in time by more than one metre (e. g. tidal areas) then for shotpoints the value should be at the time of recording and for receivers at the time of recording of the first shotpoint into that receiver. The water depth value is always positive. (See figures 3 and 4).

11 **Map grid easting**: The easting for the point, in the coordinate system defined by header record H13.

12 **Map grid northing**: The northing for the point, in the coordinate system defined by header record H13. To accommodate large TM northing values for surveys straddling the equator, this field format has one more digit than UKOOA P1/84.

13 **Surface elevation**: The topographical surface with respect to the vertical datum defined by header record H17. The surface elevation is +ve when above datum, -ve when below datum or zero when at datum. When the surface elevation with respect to the datum can vary with time (e. g. a tidal water surface), then for shotpoints the value should be at the time of recording, and for receivers at the time of recording of the first shotpoint into that receiver. (See Figure 5-3 and Figure 5-4).

14 **Day of year**: The julian day. For shotpoints the value should be the day of recording, and for receivers the day of recording of the first shotpoint into that receiver. When the survey continues into the next year, the day should keep increasing and not be reset to zero (1st January would then be 366 or367).

15 **Time hhmmss**: The time taken from the clock of the master seismic recording instrument. For shotpoints the value should be the time of recording, and for receivers the time of recording of the first shotpoint into that receiver.

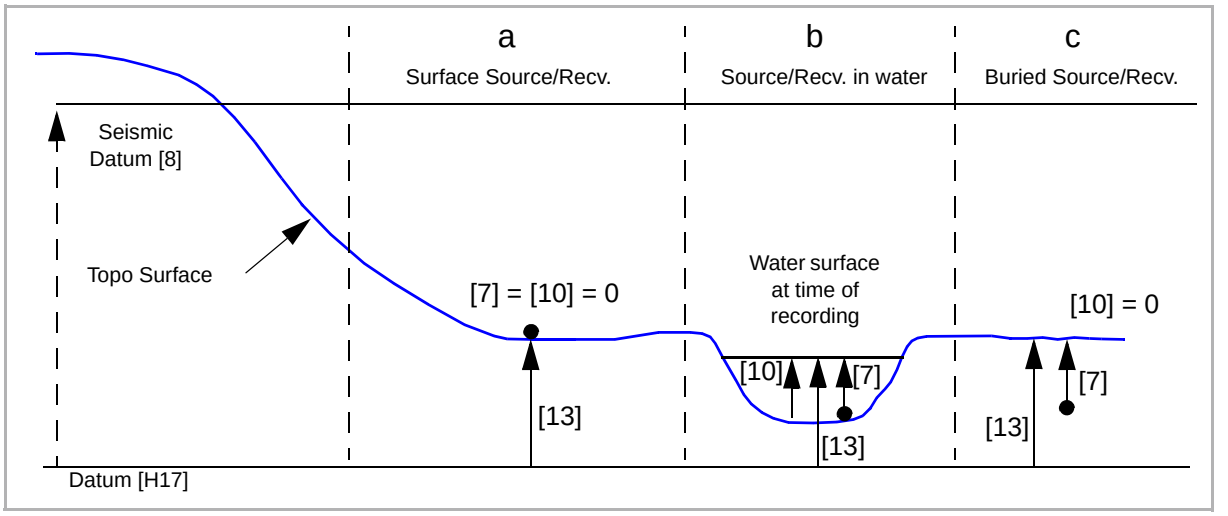


Figure 5-3 Land areas

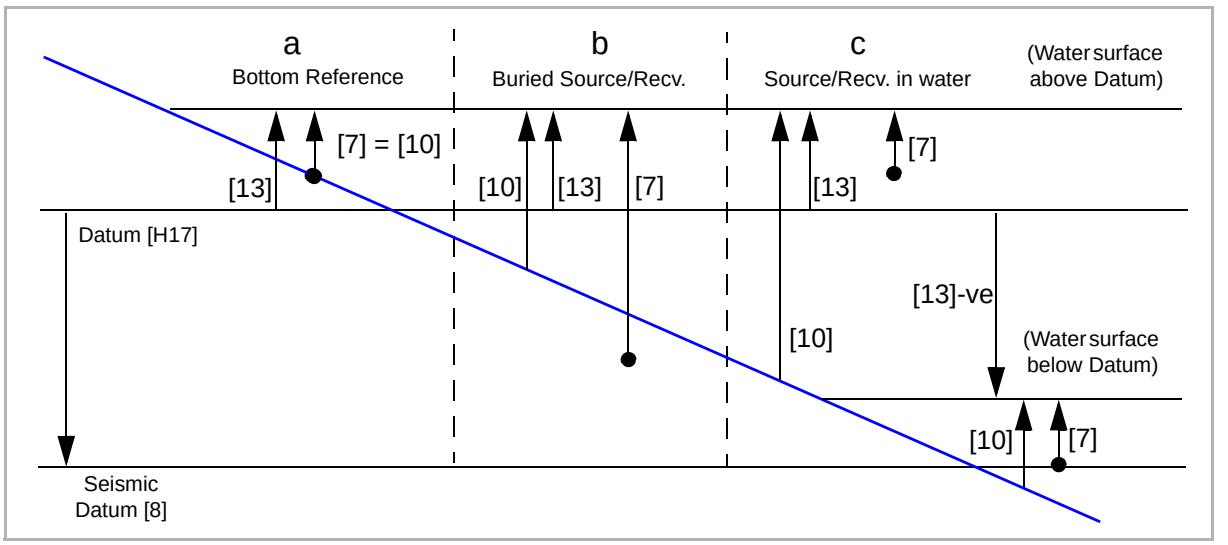


Figure 5-4 Tidal waters

[7] = Point Depth

[10] = Water Depth at time of recording

[13] = Surface Elevation w.r.t. Datum [H17]

[x] = Item number in Point Record

Relation record description

2 **Field tape number**: The identifier of the data carrier (tape) on which the seismic recording of the spread defined by this record is written. To accommodate alphanumeric tape numbers this field is defined as 3A2 and is left-justified in the field.

3 **Field record number**: The number of the seismic recording given by the field instrument used to record the spread defined by this record.

4 **Field record increment**: The increment for the field record numbers, defined to allow several consecutive records which recorded the same shotpoint and spread to be defined by one 'X' record' (eg. unsummed vibroseis records).

5 **Instrument code**: Defined in the header by a table that describes the type, and settings of the instrument used to record the spread defined by this record. See also Sercel SPS format with over 10000 traces (page 106).

6 **Line name**: Identifier for the shotpoint line. Must be identical to field 2 of the corresponding shotpoint record.

7 **Point number**: Identifier for the shotpoint number. Must be identical to field 3 of the corresponding shotpoint record.

8 **Point index**: Identifier for the shotpoint index. Must be identical to field 4 of the corresponding shotpoint record.

9 **From channel**: The seismic channel number as recorded in the seismic trace header corresponding to the data from the receiver group number defined by fields 12 and 13 of this record.

10 **To channel**: The seismic channel number as recorded in the seismic trace header corresponding to the data from the receiver group number defined by fields 12 and 14 of this record.

11 **Channel increment**: This field can be used for multi-component receivers when the three components (Z, X and Y) for one receiver point are recorded on three consecutive seismic

channels. Then one ‘X’ record can define three components using a channel increment of 3. The components and their order are defined by the instrument code.

12 **Line name**: Identifier for the **receiver line** for the range of receivers defined by fields 13 and 14 of this record. The identifier must be identical to field 2 of the receiver point records that correspond to the same receiver line.

13 **From receiver**: Identifier for the **receiver group** number that corresponds to the From channel number defined in field 9. The identifier must be identical to field 3 of the receiver point record that corresponds to the same receiver group.

14 **To receiver**: Identifier for the **receiver group** number that corresponds to the To channel number defined in field 10. The identifier must be identical to field 3 of the receiver point record that corresponds to the same receiver group.

15 **Receiver index**: The receiver index value for the range of receivers defined by fields 12, 13 and 14 of this record. The combination of fields 12, 13, 15 and 12, 14, 15 must correspond to the same range of receivers as defined by records in the receiver point file.

Examples of SPS files

R file

```
H00 SPS format version num.       SPS001,08OCT1990 (SHELL EP 90-2935);
H01 Description of survey area    AREA X, XXX;
H02 Date of survey                start : xx.xx.xx - end : xx.xx.xx;
H021Post-plot date of issue       xx/ x/xx;
H022Tape/disk identifier          AREAC.SPS;
H03 Client                        XXXXXX;
H04 Geophysical contractor        CONTRACTOR A;
H05 Positioning contractor        CONTRACTOR A;
H06 Pos. proc. contractor         CONTRACTOR A;
H07 Field computer system(s)      XXXXX, Manual entry;
H08 Coordinate location           Center of source and of receiver pattern;
H09 Offset from coord. location
H10 Clock time w.r.t GMT
H11 Spare
H12 Geodetic datum,-spheroid      Unknown      CLARKE 1880 6378249.145 293.4649960
H13 Spare
H14 Geodetic datum parameters
H15 Spare
H16 Spare
H17 Vertical datum description    MSL - mean sea level ;
H18 Projection type               UTM;
H19 Projection zone
H20 Description of grid units     METRES
H201Factor to meters                  1.00000000
H210Lat. of standard parallel(s)
H220Long. of central meridian      570000.000E
H231Grid origin                          0.000N 570000.000E
H232Grid coord. at origin           500000.00E       0.00N
H241Scale factor                  0.9995999932
H242Lat., long. scale factor             0.000N 570000.000E
H256Lat., long. initial line
H257Circular bearing of H256
H258Quadrant bearing of H256
H259Angle from skew
H26                               Undefined value is replaced by --- ;
H30 Project code and description  PROJ 1,AREA X,XXX;
H31 Line number format            Line number(1:16);
H400Type,ModelPolarity            1,XXXXX,   007;
H401Crew name,Comment             1,CONA_2503205;
H402Sample int.,Record len.       1,  4.00Msec,  4.00Sec;
H403Number of channels            1,  72;
H404Tape type,format, density     1,9 Tracks,DMX SEG D,6250;
H405Filter_alias Hz,dB pnt,slope  1, 89.0Hz,  0.1Db, 70.0Db/Oct;
H406Filter_notch Hz,-3Db points   1,None;
H407Filter_low Hz,dB pnt,slope    1,  0.0Hz,  0.1Db,  0.0Db/Oct;
H408Time delay FTB-SOD app Y/N    1,0 Msec , Not applied;
H409Multi component recording     1,Z;
H410Aux. channel 1 contents       1,None;
H411Aux. channel 2 contents       1,None;
H412Aux. channel 3 contents       1,None;
H413Aux. channel 4 contents       1,None;
H414Spare                         ;
H415Spare                         ;
H416Spare                         ;
H417Spare                         ;
H418Spare                         ;
H419Spare                         ;
H600Type,model,polarity           G1,G_LAND,SMU10,SEG;
H601Damp coeff,natural freq.      G1,  1.00, 12.00Hz;
H602Nunits,len(X),width(Y)        G1, 18, 10.00M,  1.00M;
H603Unit spacing X,Y              G1,  1.00M,  1.00M;
H604Spare                         ;
H605Spare                         ;
H606Spare                         ;
```

```
H607Spare                          ;
H608Spare                          ;
H609Spare                          ;
H610Type,model,polarity            R2,R,TEST,SEG;
H611Damp coeff,natural freq.       R2,  2.00, 10.00Hz;
H612Nunits,len(X),width(Y)         R2,  9,  9.00M,  0.00M;
H613Unit spacing X,Y               R2,  1.00M,  0.00M;
H614Spare                          ;
H615Spare                          ;
H616Spare                          ;
H617Spare                          ;
H618Spare                          ;
H619Spare                          ;
H26 PM,definition of used codes
H26 PG; geodetic point SA: satellite pt. IN: inertial point NG: levelling
H26 SU: surveyed unit  UH: up hole       WZ: WZ base        FO: old drilling
H26 NO: grid nodes     PC: marked point  BA: bench marks    BM: permanent mark
H26 PM: permanent mark xx: others
H26
H26
H26
H26
H26
H700Type,model,polarity            V1,Vibroseis,M22,SEG;
H701Size,vert. stk fold            V1,  550.00kN,  0Sweep/Vp;
H702Nunits,len(X),width(Y)         V1,  4Vibs,  12.50M,   0.00M;
H703Unit spacing X,Y               V1,  12.50M,   0.00M;
H704Control type                   V1,GROUND;
H705Correlator,noise supp          V1,XXXXXXX,No noise suppressed;
H706Sweep type,length              V1,Linear, 25.00Seconds;
H707Sweep freq start,end           V1,   5Hz,  60Hz;
H708Taper,length start,end         V1,Cosine, 250Sec, 250Sec;
H709Spare                          ;
H710Spare                          ;
H990R,S,X file quality control     24apr91,1740, Party manager;
H991Coord. status final/prov       Final  ,24Apr91,1740, Party manager;
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
H26      1         2         3         4         5         6         7         8
R1228.339        SU      1PM                   332399.8 2527821.8 112.1 48
R5606.146        MP      1PM                   328864.7 2528784.3 109.0 48
RN061            SA      1PM                   331243.8 2527242.3 111.9 38
RN061.014        SA      1PM                   331559.4 2529156.0 113.1 38
RN061.044        SA      1PM                   331243.8 2527242.3 111.9 38
RN061.046        SA      1PM                   331869.6 2529868.8 114.8 38
RN061.055        SA      1PM                   325624.8 2529843.3 107.3 38
RN061.057        SA      1PM                   329870.5 2527395.5 110.9 38
RN061.064        SA      1PM                   328009.0 2526786.0 109.1 38
RN061.132        SA      1PM                   328834.3 2526103.3 106.0 39
RN061.133        SA      1PM                   327808.0 2525931.5 105.3 39
RN061.144        SA      1PM                   326671.4 2529636.0 107.6 39
RN061.145        SA      1PM                   327841.4 2529466.0 111.0 39
RN061.146        SA      1PM                   326231.5 2525979.5 105.7 39
RN061.154        SA      1PM                   332360.3 2529986.0 115.3 39
RN061.156        SA      1PM                   332117.1 2529566.3 113.5 39
RN061.157        SA      1PM                   331827.7 2529046.0 113.6 39
RN061.158        SA      1PM                   331351.5 2528459.0 111.8 39
RN061.159        SA      1PM                   331089.0 2528131.0 112.0 39
RN061.168        SA      1PM                   329568.2 2529906.3 110.8 39
RN061.176        SA      1PM                   325406.3 2527045.5 105.6 39
RN061.177        SA      1PM                   326660.8 2528523.5 108.0 39
RT030.039        SA      1PM                   332000.8 2525398.5 111.3 39
RT030.040        SA      1PM                   330592.7 2526285.8 109.3 39
RT030.041        SA      1PM                   331225.8 2527275.0 111.9 39
RT047.001        SA      1PM                   328949.9 2527403.5 109.1 39
RT138.001        SU      1PM                   332493.7 2526608.0 111.7 44
R91LW1124             2251G1     0.0  10       326260.1 2529068.5 106.8113071245
R91LW1124             2261G1     0.0  10       326300.5 2529039.3 106.8113071245
R91LW1124             2271G1     0.0  10       326341.0 2529009.8 106.9113071245
R91LW1124             2281G1     0.0  10       326381.4 2528980.5 106.9113071245
R91LW1124             2291G1     0.0  10       326421.9 2528951.0 107.0113071245
R91LW1124             2301G1     0.0  10       326462.3 2528921.8 107.0113071245
R91LW1124             2311G1     0.0  10       326502.8 2528892.3 107.1113071245
```

```
R91LW1124          2321G1     0.0  10       326543.2 2528862.8 107.3113071245
R91LW1124          2331G1     0.0  10       326583.5 2528833.5 107.4113071245
R91LW1124          2341G1     0.0  10       326624.1 2528804.4 107.5113071245
R91LW1124          2351G1     0.0  10       326664.6 2528774.8 107.6113071245
R91LW1124          2361G1     0.0  10       326705.0 2528745.3 107.7113071245
R91LW1124          2371G1     0.0  10       326745.4 2528716.0 107.9113071245
R91LW1124          2381G1     0.0  10       326785.9 2528686.5 108.0113071245
R91LW1124          2391G1     0.0  10       326826.3 2528657.3 107.9113071245
R91LW1124          2401G1     0.0  10       326866.8 2528627.8 107.8113071245
R91LW1124          2411G1     0.0  10       326907.3 2528598.3 107.7113071245
R91LW1124          2421G1     0.0  10       326947.7 2528569.0 107.6113071245
R91LW1124          2431G1     0.0  10       326988.2 2528539.5 107.5113071245
R91LW1124          2441G1     0.0  10       327028.6 2528510.3 107.4113071245
R91LW1124          2451G1     0.0  10       327069.0 2528480.8 107.3113071245
R91LW1124          2461G1     0.0  10       327109.5 2528451.5 107.3113071245
R91LW1124          2471G1     0.0  10       327150.0 2528422.0 107.7113071245
R91LW1124          2481G1     0.0  10       327190.4 2528392.8 108.2113071245
R91LW1124          2491G1     0.0  10       327290.9 2528363.3 108.6113071245
R91LW1124          2501G1     0.0  10       327271.3 2528333.8 109.1113071245
R91LW1124          2511G1     0.0  10       327311.8 2528304.5 109.6113071245
R91LW1124          2521G1     0.0  10       327352.3 2528275.0 110.0113071245
R91LW1124          2531G1     0.0  10       327392.7 2528245.8 110.5113071245
R91LW1124          2541G1     0.0  10       327433.2 2528216.3 111.0113071245
```

S file

```
H00 SPS format version num.       SPS001,08OCT1990 (SHELL EP 90-2935);
H01 Description of survey area    AREA X, XXX;
H02 Date of survey                start : xx.xx.xx - end : xx.xx.xx;
H021Post-plot date of issue       xx/ x/xx;
H022Tape/disk identifier          AREAC.SPS;
H03 Client                        XXXXXX;
H04 Geophysical contractor        CONTRACTOR A;
H05 Positioning contractor        CONTRACTOR A;
H06 Pos. proc. contractor         CONTRACTOR A;
H07 Field computer system(s)      None,XXXXX, Manual entry;
H08 Coordinate location           Center of source and of receiver pattern;
H09 Offset from coord. location
H10 Clock time w.r.t GMT
H11 Spare
H12 Geodetic datum,-spheroid      Unknown     CLARKE 1880 6378249.145 293.4649960
H13 Spare
H14 Geodetic datum parameters
H15 Spare
H16 Spare
H17 Vertical datum description    MSL - mean sea level ;
H18 Projection type               UTM;
H19 Projection zone
H20 Description of grid units     METRES
H201Factor to meters                  1.00000000
H210Lat. of standard parallel(s)
H220Long. of central meridian      570000.000E
H231Grid origin                         0.000N 570000.000E
H232Grid coord. at origin           500000.00E       0.00N
H241Scale factor                  0.9995999932
H242Lat., long. scale factor            0.000N 570000.000E
H256Lat., long. initial line
H257Circular bearing of H256
H258Quadrant bearing of H256
H259Angle from skew
H26                               Undefined value is replaced by --- ;
H30 Project code and description  PROJ 1,AREA X,XXX;
H31 Line number format            Line number(1:16);
H400Type,ModelPolarity            1,XXXXX,   007;
H401Crew name,Comment             1,CONA_2503205;
H402Sample int.,Record len.       1,  4.00Msec,  4.00Sec;
H403Number of channels            1,  72;
H404Tape type,format, density     1,9 Tracks,DMX SEG D,6250;
H405Filter_alias Hz,dB pnt,slope  1, 89.0Hz,  0.1Db, 70.0Db/Oct;
H406Filter_notch Hz,-3Db points   1,None;
H407Filter_low Hz,dB pnt,slope    1,  0.0Hz,  0.1Db,  0.0Db/Oct;
H408Time delay FTB-SOD app Y/N    1,0 Msec , Not applied;
H409Multi component recording     1,Z;
H410Aux. channel 1 contents       1,None;
H411Aux. channel 2 contents       1,None;
H412Aux. channel 3 contents       1,None;
H413Aux. channel 4 contents       1,None;
H414Spare                         ;
H415Spare                         ;
H416Spare                         ;
H417Spare                         ;
H418Spare                         ;
H419Spare                         ;
H600Type,model,polarity           G1,G_LAND,SMU10,SEG;
H601Damp coeff,natural freq.      G1,  1.00, 12.00Hz;
H602Nunits,len(X),width(Y)        G1, 18, 10.00M,  1.00M;
H603Unit spacing X,Y              G1,  1.00M,  1.00M;
H604Spare                         ;
H605Spare                         ;
H606Spare                         ;
H607Spare                         ;
H608Spare                         ;
H609Spare                         ;
H610Type,model,polarity           R2,R,TEST,SEG;
H611Damp coeff,natural freq.      R2,  2.00, 10.00Hz;
```

```
H612Nunits,len(X),width(Y)        R2,  9,  9.00M,  0.00M;
H613Unit spacing X,Y              R2,  1.00M,  0.00M;
H614Spare                         ;
H615Spare                         ;
H616Spare                         ;
H617Spare                         ;
H618Spare                         ;
H619Spare                         ;
H26 PM,definition of used codes
H26 PG; geodetic point SA: satellite pt. IN: inertial point NG: levelling
H26 SU: surveyed unit  UH: up hole       WZ: WZ base        FO: old drilling
H26 NO: grid nodes     PC: marked point  BA: bench marks    BM: permanent mark
H26 PM:permanent mark  xx: others
H26
H26
H26
H26
H26
H700Type,model,polarity           V1,Vibroseis,M22,SEG;
H701Size,vert. stk fold           V1,  550.00kN,  0Sweep/Vp;
H702Nunits,len(X),width(Y)        V1,  4Vibs,  12.50M,   0.00M;
H703Unit spacing X,Y              V1,  12.50M,   0.00M;
H704Control type                  V1,GROUND;
H705Correlator,noise supp         V1,XXXXX,No noise suppressed;
H706Sweep type,length             V1,Linear, 25.00Seconds;
H707Sweep freq start,end          V1,   5Hz,  60Hz;
H708Taper,length start,end        V1,Cosine, 250Sec, 250Sec;
H709Spare                         ;
H710Spare                         ;
H990R,S,X file quality control    24apr91,1740, Party manager;
H991Coord. status final/prov      Final  ,24Apr91,1740, Party manager;
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
H26      1         2         3         4         5         6         7         8
S91LW1117            2251V1     0.0  10        326177.3 2529912.5 106.6113071245
S91LW1117            2261V1     0.0  10        326217.8 2528883.3 106.7113071455
S91LW1119            2271V1     0.0  10        326287.6 2528894.3 106.8113071612
S91LW1121            2281V1     0.0  10        326357.5 2528905.3 106.9113072045
S91LW1123            2291V1     0.0  10        326427.3 2528916.5 107.0113072512
S91LW1123            2301V1     0.0  10        326467.8 2528887.0 107.1113073445
S91LW1121            2311V1     0.0  10        326478.8 2528817.3 107.2113073612
S91LW1119            2321V1     0.0  10        326489.9 2528747.3 107.4113074510
S91LW1117            2331V1     0.0  10        326500.9 2528677.5 107.6113074803
S91LW1117            2341V1     0.0  10        326541.4 2528648.0 107.6113075023
S91LW1119            2351V1     0.0  10        326611.3 2528659.3 107.6113075510
S91LW1121            2361V1     0.0  10        326681.1 2528670.3 107.6113080112
S91LW1123            2371V1     0.0  10        326750.9 2528681.3 107.8113080310
S91LW1123            2381V1     0.0  10        326791.4 2528652.0 108.8113080501
S91LW1121            2391V1     0.0  10        326802.4 2528582.0 107.5113081010
S91LW1119            2401V1     0.0  10        326813.5 2528512.3 107.2113081212
S91LW1117            2411V1     0.0  10        327824.6 2528442.5 106.9113081510
S91LW1117            2421V1     0.0  10        326865.0 2528413.0 106.9113081801
S91LW1119            2431V1     0.0  10        326934.8 2528424.0 107.1113082412
S91LW1121            2441V1     0.0  10        327004.7 2528435.0 107.2113082745
S91LW1123            2451V1     0.0  10        327074.5 2528446.3 107.3113083010
S91LW1123            2461V1     0.0  10        327115.0 2528416.8 107.4113083513
S91LW1121            2471V1     0.0  10        327126.0 2528347.0 107.7113083802
S91LW1119            2481V1     0.0  10        327137.1 2528277.0 107.7113083957
S91LW1117            2491V1     0.0  10        327148.2 2528207.3 107.5113084205
S91LW1117            2501V1     0.0  10        327188.6 2528177.8 107.7113085012
S91LW1119            2511V1     0.0  10        327258.5 2528189.0 108.5113085256
S91LW1121            2521V1     0.0  10        327328.3 2528200.0 109.6113085645
S91LW1123            2531V1     0.0  10        327398.1 2528211.0 108.6113091212
S91LW1123            2541V1     0.0  10        327438.6 2528181.8 110.4113091456
S91LW1122            2611V1     0.0  10        327710.0 2527959.8 108.6113091456
S91LW1121            2551V1     0.0  10        327449.7 2528111.8 111.2113091723
S91LW1122            2601V1     0.0  10        327663.7 2527981.0 110.7113091723
S91LW1122            2631V1     0.0  10        327785.0 2527893.0 108.5113091723
S91LW1119            2561V1     0.0  10        327460.7 2528042.0 112.8113093423
S91LW1119            2591V1     0.0  10        327582.1 2527953.8 114.2113093423
S91LW1119            2641V1     0.0  10        327784.3 2527806.8 112.5113093423
S91LW1117            2571V1     0.0  10        327471.8 2527972.8 114.9113094505
S91LW1123            2621V1     0.0  10        327754.1 2527952.5 108.6113101858
```

```
S91LW1117          2641V1     0.0  10       327771.1 2527754.8 109.2113102614
S91LW1117          2651V1     0.0  10       327779.2 2527748.8 110.3113103058
S91LW1119          2551V1     0.0  10       327824.6 2527777.5 107.4113103756
S91LW1117          2661V1     0.0  10       327835.8 2527707.8 108.8113104010
S91LW1119          2661V1     0.0  10       327865.2 2527748.0 108.3113104314
S91LW1119          2671V1     0.0  10       327905.7 2527718.8 108.2113104759
S91LW1121          2681V1     0.0  10       327975.5 2527729.8 108.4113105015
S91LW1123          2691V1     0.0  10       328045.3 2527710.8 108.3113105312
S91LW1123          2701V1     0.0  10       328085.8 2527711.5 108.3113105812
S91LW1121          2711V1     0.0  10       328096.9 2527641.5 108.5113110001
S91LW1119          2721V1     0.0  10       328107.9 2527571.8 108.7114080112
S91LW1117          2731V1     0.0  10       328119.0 2527502.0 108.8114080311
S91LW1117          2741V1     0.0  10       328159.4 2527472.5 108.6114080656
S91LW1119          2751V1     0.0  10       328235.2 2527491.8 108.6114080912
S91LW1121          2761V1     0.0  10       327494.8 2527494.8 108.6114081210
S91LW1123          2771V1     0.0  10       327369.0 2527505.8 108.7114081609
S91LW1123          2781V1     0.0  10       328409.4 2527476.3 108.7114081912
S91LW1121          2791V1     0.0  10       328420.5 2528181.8 108.7114082101
S91LW1119          2801V1     0.0  10       328431.5 2527336.8 108.7114082512
S91LW1117          2811V1     0.0  10       328442.6 2527266.8 108.6114083001
```

X file

```
H00 SPS format version num.       SPS001,08OCT1990 (SHELL EP 90-2935);
H01 Description of survey area    AREA X, XXX;
H02 Date of survey                start : xx.xx.xx - end : xx.xx.xx;
H021Post-plot date of issue       xx/ x/xx;
H022Tape/disk identifier          AREAC.SPS;
H03 Client                        XXXXX;
H04 Geophysical contractor        CONTRACTOR A;
H05 Positioning contractor        CONTRACTOR A;
H06 Pos. proc. contractor         CONTRACTOR A;
H07 Field computer system(s)      None,XXXXX, Manual entry;
H08 Coordinate location           Center of source and of receiver pattern;
H09 Offset from coord. location
H10 Clock time w.r.t GMT
H11 Spare
H12 Geodetic datum,-spheroid      Unknown      CLARKE 1880 6378249.145 293.4649960
H13 Spare
H14 Geodetic datum parameters
H15 Spare
H16 Spare
H17 Vertical datum description    MSL - mean sea level ;
H18 Projection type               UTM;
H19 Projection zone
H20 Description of grid units     METRES
H201Factor to meters                  1.00000000
H210Lat. of standard parallel(s)
H220Long. of central meridian      570000.000E
H231Grid origin                          0.000N 570000.000E
H232Grid coord. at origin           500000.00E       0.00N
H241Scale factor                  0.9995999932
H242Lat., long. scale factor             0.000N 570000.000E
H256Lat., long. initial line
H257Circular bearing of H256
H258Quadrant bearing of H256
H259Angle from skew
H26                               Undefined value is replaced by --- ;
H30 Project code and description  PROJ 1,AREA X,XXX;
H31 Line number format            Line number(1:16);
H400Type,ModelPolarity            1,XXXXX,   007;
H401Crew name,Comment             1,CONA_2503205;
H402Sample int.,Record len.       1,  4.00Msec,  4.00Sec;
H403Number of channels            1,  72;
H404Tape type,format, density     1,9 Tracks,DMX SEG D,6250;
H405Filter_alias Hz,dB pnt,slope  1, 89.0Hz,  0.1Db, 70.0Db/Oct;
H406Filter_notch Hz,-3Db points   1,None;
H407Filter_low Hz,dB pnt,slope    1,  0.0Hz,  0.1Db,  0.0Db/Oct;
H408Time delay FTB-SOD app Y/N    1,0 Msec , Not applied;
H409Multi component recording     1,Z;
H410Aux. channel 1 contents       1,None;
H411Aux. channel 2 contents       1,None;
H412Aux. channel 3 contents       1,None;
H413Aux. channel 4 contents       1,None;
H414Spare                         ;
H415Spare                         ;
H416Spare                         ;
H417Spare                         ;
H418Spare                         ;
H419Spare                         ;
H600Type,model,polarity           G1,G_LAND,SMU10,SEG;
H601Damp coeff,natural freq.      G1,  1.00, 12.00Hz;
H602Nunits,len(X),width(Y)        G1, 18, 10.00M,  1.00M;
H603Unit spacing X,Y              G1,  1.00M,  1.00M;
H604Spare                         ;
H605Spare                         ;
H606Spare                         ;
H607Spare                         ;
H608Spare                         ;
H609Spare                         ;
H610Type,model,polarity           R2,R,TEST,SEG;
```

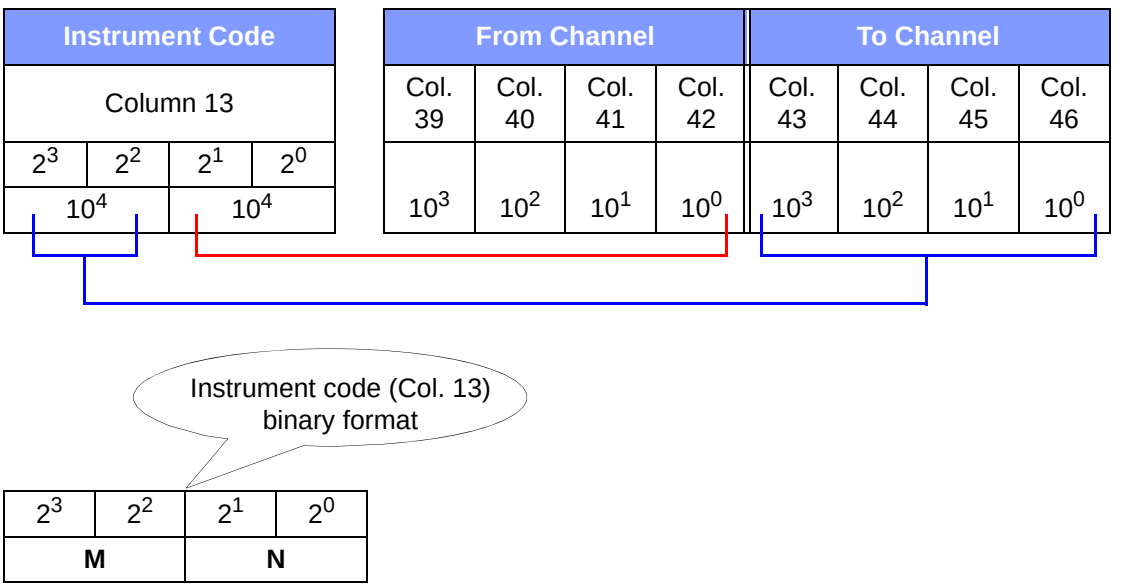
```
H611Damp coeff,natural freq.      R2,  2.00, 10.00Hz;
H612Nunits,len(X),width(Y)        R2,  9,  9.00M,  0.00M;
H613Unit spacing X,Y              R2,  1.00M,  0.00M;
H614Spare                         ;
H615Spare                         ;
H616Spare                         ;
H617Spare                         ;
H618Spare                         ;
H619Spare                         ;
H26 PM,definition of used codes
H26 PG; geodetic point SA: satellite pt. IN: inertial point NG: levelling
H26 SU: surveyed unit  UH: up hole       WZ: WZ base        FO: old drilling
H26 NO: grid nodes     PC: marked point  BA: bench marks    BM: permanent mark
H26 PM: permanent mark xx: others
H26
H26
H26
H26
H26
H700Type,model,polarity           V1,Vibroseis,M22,SEG;
H701Size,vert. stk fold           V1,  550.00kN,  0Sweep/Vp;
H702Nunits,len(X),width(Y)        V1,  4Vibs,  12.50M,   0.00M;
H703Unit spacing X,Y              V1,  12.50M,   0.00M;
H704Control type                  V1,GROUND;
H705Correlator,noise supp         V1,XXXXX,No noise suppressed;
H706Sweep type,length             V1,Linear, 25.00Seconds;
H707Sweep freq start,end          V1,   5Hz,  60Hz;
H708Taper,length start,end        V1,Cosine, 250Sec, 250Sec;
H709Spare                         ;
H710Spare                         ;
H990R,S,X file quality control    24apr91,1740, Party manager;
H991Coord. status final/prov      Final  ,24Apr91,1740, Party manager;
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
H26      1         2         3         4         5         6         7         8
X100      11191LW1117             2251   1   37191LW1124             225      2611
X100      11191LW1117             2251  38   74191LW1132             225      2611
X100      21191LW1117             2261   1   38191LW1124             225      2621
X100      21191LW1117             2261  39   76191LW1132             225      2621
X100      31191LW1119             2271   1   39191LW1124             225      2631
X100      31191LW1119             2271  40   78191LW1132             225      2631
X100      41191LW1121             2281   1   40191LW1124             225      2641
X100      41191LW1121             2281  41   80191LW1132             225      2641
X100      51191LW1123             2291   1   41191LW1124             225      2651
X100      51191LW1123             2291  42   82191LW1132             225      2651
X100      61191LW1123             2301   1   42191LW1124             225      2661
X100      61191LW1123             2301  43   84191LW1132             225      2661
X100      71191LW1121             2311   1   43191LW1124             225      2671
X100      71191LW1121             2311  44   86191LW1132             225      2671
X100      81191LW1119             2321   1   44191LW1124             225      2681
X100      81191LW1119             2321  45   88191LW1132             225      2681
X100      91191LW1117             2331   1   45191LW1124             225      2691
X100      91191LW1117             2331  46   90191LW1132             225      2691
X100     101191LW1117             2341   1   46191LW1124             225      2701
X100     101191LW1117             2341  47   92191LW1132             225      2701
X100     111191LW1119             2351   1   47191LW1124             225      2711
X100     111191LW1119             2351  48   94191LW1132             225      2711
X100     121191LW1121             2361   1   48191LW1124             225      2721
X100     121191LW1121             2361  49   96191LW1132             225      2721
X100     131191LW1123             2371   1   49191LW1124             225      2731
X100     131191LW1123             2371  50   98191LW1132             225      2731
X100     141191LW1123             2381   1   50191LW1124             225      2741
X100     141191LW1123             2381  51  100191LW1132             225      2741
X100     151191LW1121             2391   1   51191LW1124             225      2751
X100     151191LW1121             2391  52  102191LW1132             225      2751
X100     161191LW1119             2401   1   52191LW1124             225      2761
X100     161191LW1119             2401  53  104191LW1132             225      2761
X100     171191LW1117             2411   1   53191LW1124             225      2771
X100     171191LW1117             2411  54  106191LW1132             225      2771
X100     181191LW1117             2421   1   54191LW1124             225      2781
X100     181191LW1117             2421  55  108191LW1132             225      2781
X100     191191LW1119             2431   1   55191LW1124             225      2791
X100     191191LW1119             2431  56  110191LW1132             225      2791
```

```
X100      201191LW1121          2441   1   56191LW1124          225      2801
X100      201191LW1121          2441  57  112191LW1132          225      2801
X100      211191LW1123          2451   1   57191LW1124          225      2811
X100      211191LW1123          2451  58  114191LW1132          225      2811
X100      221191LW1123          2461   1   58191LW1124          225      2821
X100      221191LW1123          2461  59  116191LW1132          225      2821
X100      231191LW1121          2471   1   59191LW1124          225      2831
X100      231191LW1121          2471  60  118191LW1132          225      2831
X100      241191LW1119          2481   1   60191LW1124          225      2841
X100      241191LW1119          2481  61  120191LW1132          225      2841
X100      251191LW1117          2491   1   61191LW1124          225      2851
X100      251191LW1117          2491  62  122191LW1132          225      2851
X100      261191LW1117          2501   1   62191LW1124          225      2861
X100      261191LW1117          2501  63  124191LW1132          225      2861
X100      271191LW1119          2511   1   63191LW1124          225      2871
X100      271191LW1119          2511  64  126191LW1132          225      2871
X100      281191LW1121          2511   1   64191LW1124          225      2881
X100      281191LW1121          2521  65  128191LW1132          225      2881
X101       11191LW1123          2531   1   65191LW1124          225      2891
X101       11191LW1123          2531  66  130191LW1132          225      2891
X101       21191LW1123          2541   1   66191LW1124          225      2901
```

Sercel SPS format with over 10000 traces

Because the "**From channel**" and "**To channel**" fields in an SPS Relation file are limited to 9999, the standard SPS format does not make it possible to depict 10000 or more traces. In SPS Relation files generated by the 428XL, the "**Instrument Code**" field is used to encode a fifth digit (10^4) that allows you to export an SPS-R file with over 10000 active traces.

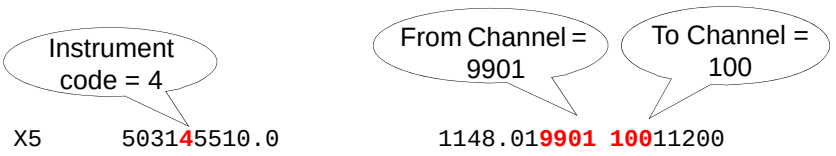
The Instrument Code hexadecimal value (0 to F) in Column No. 13 must be converted to binary format and interpreted as follows:

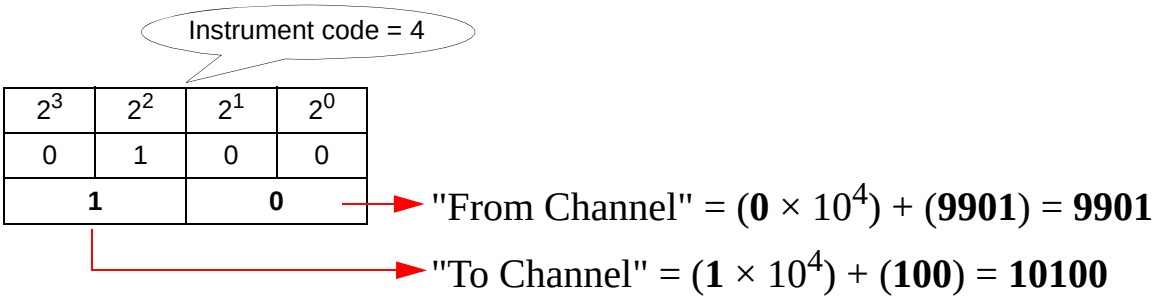


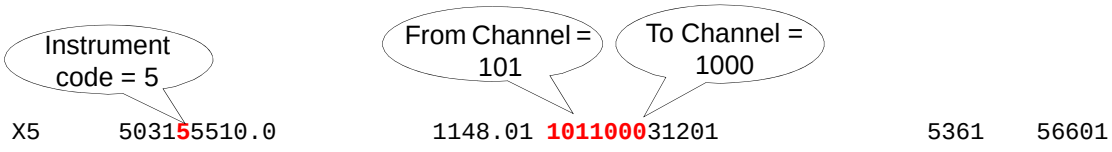
"From Channel" = $(N \times 10^4)$ + (value in columns 39 to 42).

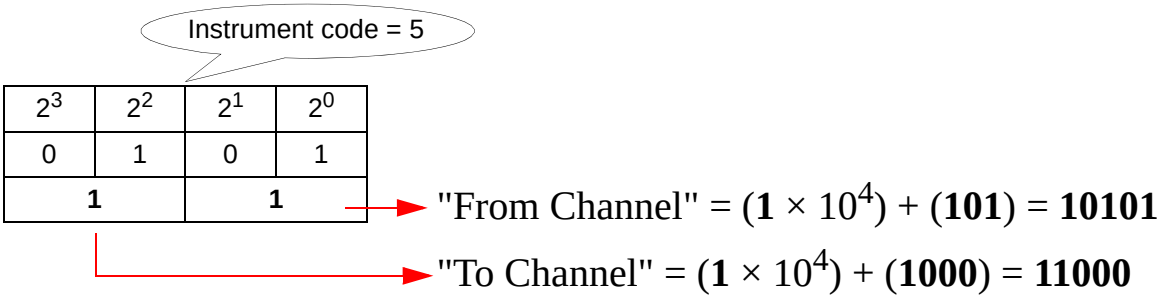
"To Channel" = $(M \times 10^4)$ + (value in columns 43 to 46).

(See the examples on next page).


Instrument code = 4
From Channel = 9901
To Channel = 100
X5 503145510.0 1148.019901 10011200 5411 56101


Instrument code = 4
2^3 2^2 2^1 2^0
0 1 0 0
1 0
"From Channel" = (**0** × 10^4) + (**9901**) = **9901**
"To Channel" = (**1** × 10^4) + (**100**) = **10100**


Instrument code = 5
From Channel = 101
To Channel = 1000
X5 503155510.0 1148.01 1011000 31201 5361 56601


Instrument code = 5
2^3 2^2 2^1 2^0
0 1 0 1
1 1
"From Channel" = (**1** × 10^4) + (**101**) = **10101**
"To Channel" = (**1** × 10^4) + (**1000**) = **11000**

Chapter 6 SPS format Rev. 2.1

The Processing Support format contained in this chapter is reproduced by courtesy of Shell Internationale Petroleum Maatschappij B. V., the initiator of this format. The revisions to this document allow this format to conform to the new SEGD Rev 2.1 SEG Field Tape Standards as revised Jan, 2006. This chapter includes the following sections:

Introduction

The purpose of the format is to establish a common standard for the transfer of positioning and geophysical support data from 3D field crews to seismic processing centers. The format can also be used for other types of seismic surveys.

With the growth and increased complexity of land 3D surveys there was a need to establish a robust and standard procedure for logging, during acquisition, the positioning and geophysical spread relation data in a way that reduces errors, allows the field crews to quality control the data, and hence detect and correct errors before the data was transferred to the seismic processing centers.

Quality control was carried out as the first stage in the processing centers. Experience has shown that most errors are only detected when the geophysical and coordinate information are integrated, and that often spread relation errors could not be corrected, leading to the deletion of otherwise good quality records.

Providing the processing centers with checked data in a standard format, containing all relevant field data significantly reduced the time spent by the processing centers on initial quality control and increased the quality of the end products.

Comments on Revision 2.1

Recently, advances in acquisition technology and improvements in cost efficiencies have greatly increased the volume of data, in terms of channel counts, source/receiver densities, and surface area. This increase in the shear number of elements to account for has led to a situation where both the SEGD and the SPS formats can no longer adequately reflect the positioning and geophysical spread relation data. This was partially addressed in Revision 2.0 of the SEGD format, but was not reflected in an update to the SPS. To this end, this revision (2.1) to the SPS format has been undertaken in conjunction with Revision 2.1 of the SEGD format and has been named accordingly (in the absence of a revision 2.0 of the SPS).

It is the intent of this revision to act as a stop gap measure to meet the immediate needs of the community. To that end, the original text and formats have been left unchanged unless a clear need has been seen to make changes. Modifications to the format itself have been limited to address the pressing needs of current acquisition, and to encompass the likewise limited changes made to the SEGD format in Revisions 2.0 and 2.1. Although it was agreed by the SEG Technical Standards Committee that future SEG standards would use and revisions where possible would be compatible with the EPSG Geodetic Database (now part of OGP) this minor revision will not include this standard. Adoption of the EPSG Geodetic Database compatibility has been left for the next major SEGD/SPS Rev 3 document release.

Summary of Changes to the SPS Format for Rev. 2.1

The following list discusses some of the specific changes of Revision 2.1.

1. Addition of a line sequence number which will allow more than one production line per tape to be recorded as long as a unique combination of field file number and line sequence number are used per storage unit. See pages 119, 131.
2. Point Record Specification table values and descriptions were modified to accommodate updated formats, defaults, justification

and min/max units in keeping with SEGD Revision 2.1. Some header records will be rendered redundant or obsolete with new format, ie; H31 Line number format. See page 119.

3. Relation Record Specification table value and descriptions were modified to accommodate larger field record numbers, value changes on from and to channel items and updating formats, default values, justification and columnar entries in keeping with SEGD Revision 2.1. See page 127.
4. Geodetic datum updated to reflect WGS84 vs WGS72. See page 132.
5. Reference to UKOOA P1/84 updated to UKOOA P1/90. See page 144.
6. Example of SPS Format, R, S, and X files updated to reflect changes to new Revision 2.1 format. See page 147.

Controlling Organization

The SPS rev 2.1 is administered by the SEG Technical Standards Committee. Any questions, corrections or problems encountered in the format should be addressed to:

Society of Exploration Geophysicists

P.O. Box 702740

Tulsa, Ok 74170-2740

Attention: SEG Technical Standards Committee

Phone: (918) 497-5500

Fax: (918) 497-5557

Internet site: www.seg.org

Field system

The field crews must have an acquisition management system to generate the SPS format during the survey. Errors will be reduced both during recording and during the generation of the SPS format if automated procedures are introduced at survey set-up and during daily recording. Figure 6-1 shows the main elements of such a system. The Field Database, Topographical computations and 3D recording management are the minimum elements required to support the generation of the SPS format.

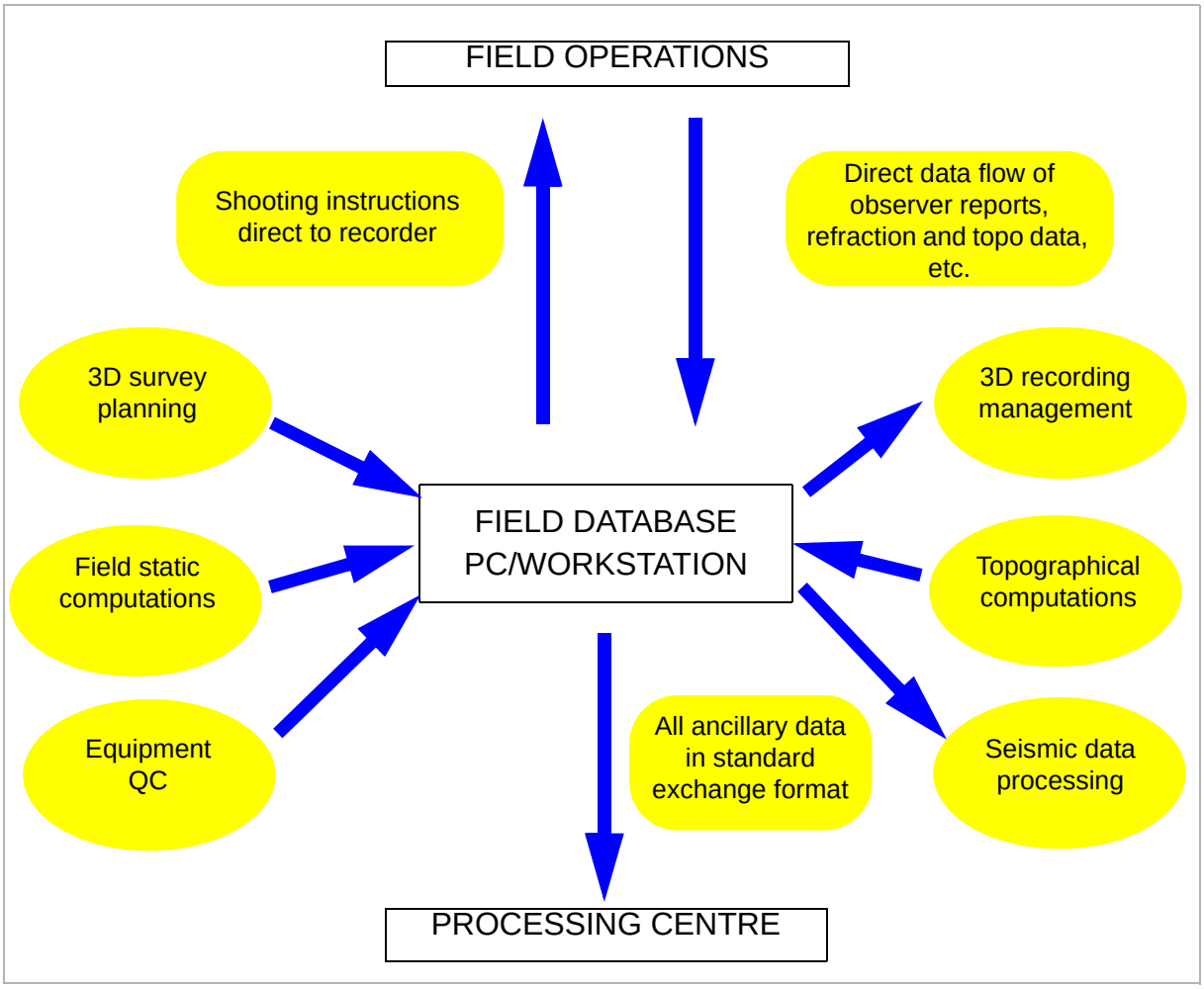


Figure 6-1 Field Acquisition Management System

A direct link to and from seismic recording instrument is strongly recommended. The SN368+LXU, SN388, 408UL, 428XL and SeaRay® have this capability.

Figure 6-2 shows the preferred method of data exchange between the system and the seismic recording instrument.

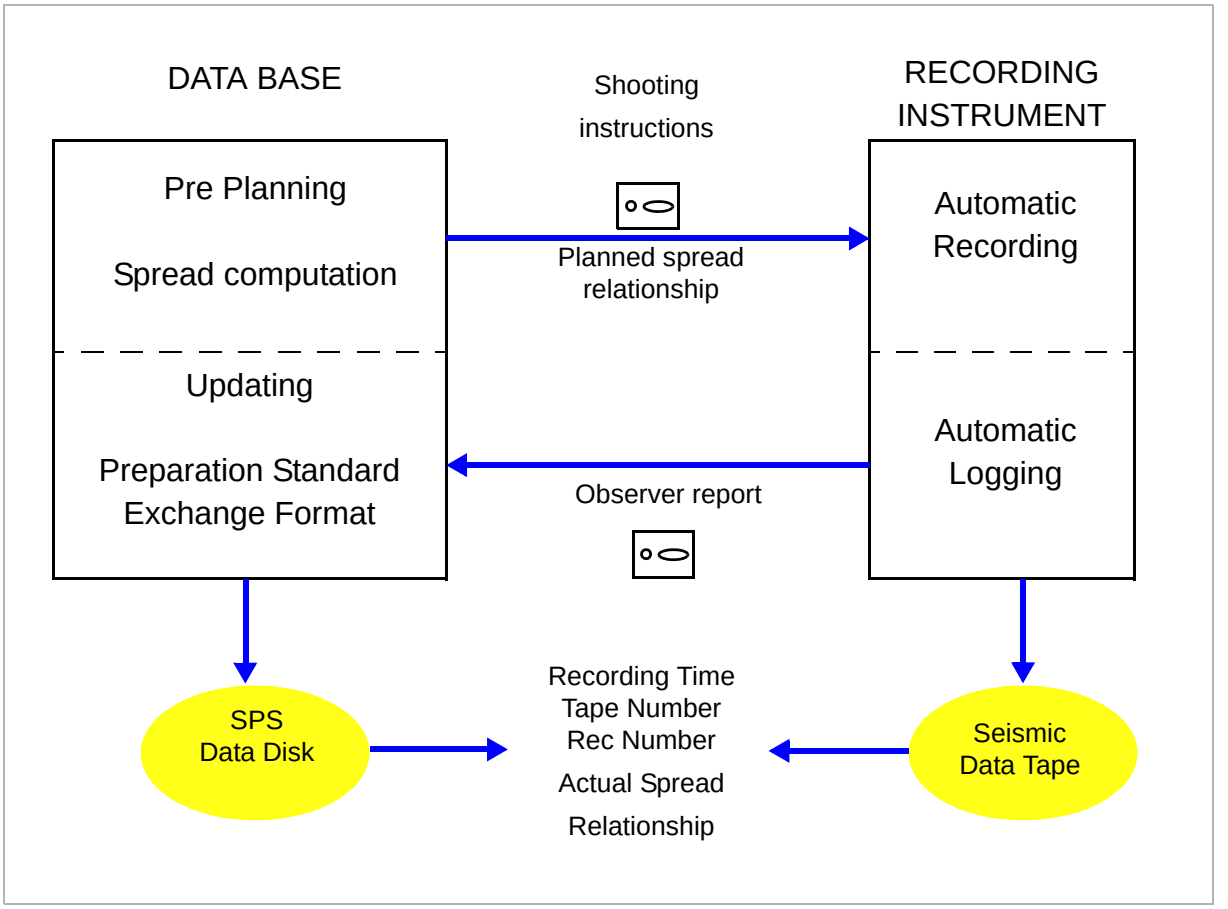


Figure 6-2 Automatic Recording

The key information required to relate the seismic records and the corresponding positioning and geophysical support data is written in the seismic headers and in SPS.

SHELL processing support format for land 3D surveys

General

Coordinates and elevations of geophysical lines may be determined by interpolation between observed break points in the line. The point files contains coordinates and elevations of all geophysical points (observed and interpolated) and of all permanent markers. The shotpoint and relational files are to be sorted chronologically, and the receiver file is to be sorted in ascending sequence of line, point and point index numbers.

In order to avoid ambiguities each physical position in the field (shotpoint or receiver group) must have a unique name.

Data record specification

The data set consists of three files with a block of header records. For magnetic tapes each file is terminated by a record containing “EOF” in col. 1-3.

First file	**Receiver File**: “Point Records” with details of receiver groups or permanent markers.
Second File	**Source File**: “Point Records” with details of shotpoints (power source).
Third File	**Cross-Reference File**: “Relation Record” specifying for each shotpoint its record number and the relation between recording channel numbers and receiver groups.

Data record sorting order

File	Records	Sort fields and sorting order
Receiver	'R'	Line name, Point number, Point index.
Source	'S'	Julian day and Time of recording shotpoint.
Cross-Reference	'X'	Sorted in the same order as the Source File.

Legacy Format for land survey data on 9-track tape

Tape specifications and tape layout

Half-inch magnetic tape : IBM compatible, non-label.

Number of tracks : 9.

Number of bytes per inch : 6250 (1600 is a permissible alternative).

Mode : EBCDIC coded.

Record length : 80 bytes.

Block size : 1600 bytes (20 logical records).
Physically separated by inter-record gap.

An "EOF" statement followed by an IBM tape mark shall be written after the end of a file and a tape shall be closed by two IBM tape marks.

In general, a tape may contain one or more files depending on the type of survey. Each file shall start with a number of 'Header Records' followed by 'Data Records' and closed by an EOF statement and an IBM tape mark.

Legacy Format for land survey data on floppy disc

Disc specifications and layout

Format: MS DOS compatible ASCII files.

Record length: 80 bytes, followed by carriage return (col 81) and line feed (col 82).

3.5” or 5.25” formatted disc (any size: 360/720 Kbyte or 1.4/1.2 Mbyte). File name to relate to the project, date and sequence. To denote file type extension name must be prefixed with:

‘S’	for shotpoint records	e. g.	PRJX90.S01
‘R’	for receiver records	e. g.	PRJX90.R01
‘X’	for relational records	e. g.	PRJX90.X01

In general, a disc may contain one or more files depending on the type of survey. Each file shall start with a number of ‘Header Records’ followed by ‘Data Records’.

Header record specification

Each file shall start with a number of header records which contain information about, and parameters controlling, all the data records which follow.

The general format for a header record shall be:

	Cols		**Formats**
a.	Record identifier “H”	1	A1
b.	Header record type	2-3	I2
c.	Header record type modifier	4	I1
d.	Parameter description	5-32	7A4
e.	Parameter data	33-80	See below

Header record type H0 to H20 are mandatory for all surveys even if a “N/A” entry is required (”N/A” is not allowed for H18). Header records of types H21 to H25 are mandatory as far as they are applicable to the projection used.

Requirements for projection definition include the following header records:

Transverse Mercator	:	H220, H231, H232, H241, H242
UTM	:	H19, H220.
Stereographic	:	H231, H232, H241, H242.
Oblique Mercator	:	H231, H232, H241, H242, H259 and H256 or H257 or H258.
Lambert Conical	:	H210, H220, H231, H232, H241, H242.

Header record type H26 is a free format statement for any other relevant information.

Formats of parameter data fields for each of the header record types shall be:

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H00	SPS format version num.	33-80	12A4
H01	Description of survey area	33-80	12A4
H02	Date of survey	33-80	12A4
H021	Post-plot date of issue	33-80	12A4
H022	Tape/disk identifier	33-80	12A4
H023	Line sequence number	33-80	I5
H03	Client	33-80	12A4
H04	Geophysical contractor	33-80	12A4
H05	Positioning contractor	33-80	12A4
H06	Pos. proc. contractor	33-80	12A4
H07	Field computer system(s)	33-80	12A4
H08	Coordinate location	33-80	12A4
H09	Offset to coord. location	33-80	12A4
H10	Clock time w.r.t. GMT	33-80	12A4
H11	Spare	33-80	12A4
H12	Geodetic datum,-spheroid	33-80	3A4, 3A4,F12.3,F12.7
H13	Spare	33-80	12A4
H14	Geodetic datum parameters	33-80	3(F8.3),4F(6.3)
H15	Spare	33-80	12A4
H16	Spare	33-80	12A4
H17	Vertical datum description	33-80	12A4
H18	Projection type	33-80	12A4
H19	Projection zone	33-80	12A4
H20	Description of grid units	33-56	6A4
H201	Factor to metre	33-46	F14.8
H210	Lat. of standard parallel(s)	33-56	2(I3,I2,F6.3, A1)

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H220	Long. of central meridian	33-44	v
H231	Grid origin	33-56	2(I3,I2,F6.3, A1)
H232	Grid coord. at origin	33-56	2(F11.2,A1)
H241	Scale factor	33-44	F12.10
H242	Lat., Long. scale factor	33-56	2(F11.2, A1)
H256	Lat. long. initial line	33-56	4(I3, I2,F6.3, A1)
H257	Circular bearing of H256	33-44	I3, I2, F7.4
H258	Quadrant bearing of H256	33-44	A1, 2I2,F6.3, A1
H259	Angle from skew	33-44	I3, I2,F7.4
H26	Any other relevant information This record can be repeated as required.	5-80	19A4
H30	Project code and description	33-78	3A2,10A4
H31	Line number format (Obsolete)	33-80	12A4

Instrument code (I) tables

Header Records: H400-H419: code 1,
H420-H439: code 2...
H560-H579: code 9

Instrument code must be entered in col 33-34, for example: ‘1,’ ‘2,’... ‘9,’

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H400	Type, Model, Polarity	33-80	12A4
H401	Crew name, Comment	33-80	12A4
H402	Sample int. Record Len.	33-80	12A4
H403	Number of channels	33-80	12A4
H404	Tape type, format, density	33-80	12A4
H405	Filter_alias Hz, dB pnt, slope	33-80	12A4
H406	Filter_notch Hz, -3 dB points	33-80	12A4
H407	Filter_low Hz, dB pnt, slope	33-80	12A4
H408	Time delay FTB-SOD app Y/N	33-80	12A4
H409	Multi component recording	33-80	12A4
H410	Aux. channel 1 contents	33-80	12A4
H411	Aux. channel 2 contents	33-80	12A4
H412	Aux. channel 3 contents	33-80	12A4
H413	Aux. channel 4 contents	33-80	12A4
H414	Spare	33-80	12A4
...	...	...	...
H419	Spare	33-80	12A4

Receiver code (Rx) tables

Header Records: H600-H609: code 1,
H610-H619: code 2...
H690-H699: code 10

Receiver code must be entered in cols 33-34. Example of possible codes:

G1..to.G9 for geophones H1..to.H9 for hydrophones

R1..to.R9 for multi comp. and other types

PM = Permanent marker KL = Kill or omit receiver station

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H600	Type, model, polarity	33-80	12A4
H601	Damp coeff, natural freq.	33-80	12A4
H602	Nunits, len(X), width(Y)	33-80	12A4
H603	Units spacing X, Y	33-80	12A4
H604	Spare	33-80	12A4
...	...	...	...
H609	Spare	33-80	12A4

For ‘PM’ and ‘KL’ use H26 records (free format description)

Source code (Sx) tables

Header Records: H700-H719: code 1,
H720-H739: code 2...
H880-H899: code 10

Source code must be entered in cols 33-34. Example of possible codes:

V1..to.V9 for vibroseis E1..to.E9 for explosive

A1..to.A9 for air gun W1..to.W9 for water gun

S1..to.S9 for other types KL = Kill or omit shotpoint

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H700	Type, model, polarity	33-80	12A4
H701	Size, vert. stk fold	33-80	12A4
H702	Nunits, len(X), width(Y)	33-80	12A4
H703	Units spacing X, Y	33-80	12A4

Following records are only required if **source type = Vibroseis V1..V9**

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H704	Control type	33-80	12A4
H705	Correlator, noise supp	33-80	12A4
H706	Sweep type, length	33-80	12A4
H707	Sweep freq start, end	33-80	12A4
H708	Taper, length start, end	33-80	12A4
H709	Spare	33-80	12A4
H710	Spare	33-80	12A4

Following records are only required if **source type = Explosive E1..E9**

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H711	Nom. shot depth, charge len.	33-80	12A4
H712	Nom. soil, drill method	33-80	12A4
H713	Weathering thickness	33-80	12A4
H714	Spare	33-80	12A4
H715	Spare	33-80	12A4

Following records are only required if

source type = air gun A1..A9

or = water gun W1..W9

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H716	P-P bar/m, prim/bubble	33-80	12A4
H717	Air pressure psi	33-80	12A4
H718	No. sub arrays, Nom depth	33-80	12A4
H719	Spare	33-80	12A4

Quality Control check records

Type	Parameter description Pos: 5-32	Parameter	
		Pos	Format
H990	R,S,X file quality control	33-60	2A4,I4,4A4
H991	Coord. status final/prov	33-68	4A4,I4,4A4

Point record specification

This record type contains details at the position of the shotpoint at the time of recording or at the position of a receiver at the time of first shotpoint recorded into the receiver.

Item	Definition of field	Cols	formats	Min.to Max.	Default	Just.	Units
1	Record identification	1-1	A1	“S” or “R”	None	N/A	-
2	Line name (left adj)	2-11	F10.2	-999999.99 to 9999999.99	None	Right	-
3	Point number (right adj)	12-21	F10.2	-999999.99 to 9999999.99	None	Right	-
+		22-23			Blank		Blank
4	Point index	24-24	I1	1 to 9	1	Right	-
*5	Point code*	25-26	A2	A#	None	Left	-
6	Static correction	27-30	I4	-999 to 999	Blank	Right	ms
7	Point Depth	31-34	F4.1	0 to 99.9	0	Right	header defined
8	Seismic datum	35-38	I4	-999 to 9999	0	Right	header defined
9	Uphole time	39-40	I2	0 to 99	Blank	Right	ms
10	Water depth	41-46	F6.1	0 to 9999.9	Blank	Right	header defined
11	Map grid easting	47-55	F9.1	None	None	Right	-
12	Map grid northing	56-65	F10.1	None	None	Right	-
13	Surface Elevation	66-71	F6.1	-999.9 to 9999.9	None	Right	Metre
14	Day of year	72-74	I3	1 to 999	None	Right	-
15	Time hhmmss	75-80	3I2	000000 to 235959	None	N/A	-

* Example Point codes:

0 to 9 - SERCEL Process Type.
“PM” - permanent marker, “KL” - kill or omit point
“G1” ..”G9” “H1”..”H9”, “R1”,..”R9” - receiver codes
“V1”..”V9” “E1”..”E9”, “A1”..”A9”, “W1”..”W9”,
“S1”..”S9”.- source codes

+ For compatibility reasons cols 22-23 are left blank.

Note

- Alphanumeric (A) fields are to be left justified and
- Numeric (I and F) fields are to be right justified unless specified otherwise.

Relation record specification

This record type is used to define the relation between the field record number and shotpoint and between recording channels and receiver groups. For each shotpoint there is at least one “Relation Record”. Each of these records specifies a section of consecutively numbered channels and receiver groups. After a numbering gap or a change in line name or repositioning for the receiver groups a new “Relation Record” has to be given. Channel numbers should be in ascending order.

Fields 6, 7 and 8 must be identical to fields 2, 3 and 4 of the corresponding shotpoint record. While the receiver line and point numbers in fields 13, 14 and 15 must be the same as used in the receiver point records.

Item	Definition of field	Cols	formats	Min. to Max.	Default	Just.
1	Record identification	1-1	A1	“X”	None	N/A
2	Field tape number (I adj)	2-7	3A2	Free	None	Right
3	Field record number	8-15	I8	0 to 16777216	None	Right
4	Field record increment	16-16	I1	1 to 9	1	Right
5	Instrument code	17-17	A1	1 to 9	1	Right
6	Line name	18-27	F10.2	-999999.99 to 9999999.99	None	Right
7	Point number	28-37	F10.2	-999999.99 to 9999999.99	None	Right
8	Point index	38-38	I1	1 to 9	1	Right
9	From channel	39-43	I5	1 to 99999	None	Right
10	To channel	44-48	I5	1 to 99999	None	Right
11	Channel increment	49-49	I1	1 to 9	1	Right
12	Line name	50-59	F10.2	-999999.99 to 9999999.99	None	Right
13	From receiver	60-69	F10.2	-999999.99 to 9999999.99	None	Right
14	To receiver	70-79	F10.2	-999999.99 to 9999999.99	None	Right
15	Receiver index	80-80	I1	1 to 9	1	Right

Note Alphanumeric (A) fields are to be left justified and Numeric (I and F) fields are to be right justified unless specified otherwise.

Comment Record specification (optional)

This record type is used for comments, for example to flag bad/noisy traces per record, test file details and another supplementary information normally given in the observers report.

Item	Definition of field	Cols	formats	Min. to Max.	Default	Units
1	Record identification	1-1	A1	"C"	None	-
2	Comment	2-80	79A1	Free	Blank	-

Header record description

The text in bold type face are the parameter descriptions to be entered, left justified, into positions 5-32. The text in italics are examples of parameters to be entered, left justified, into positions 33-80. Positions 33 and 34 must always contain the instrument or receiver or source code. To enable parsing of free format (12A4) parameter fields the following rule should be used “The parameters entered into positions 33-80 must be separated by a comma and the parameter string must be terminated by a semi colon. Parameter text cannot contain commas ',' or semi colons';' “.

Note All units of distance are in metres except the grid coordinates whose units are defined by H20 and can be converted to metres using the conversion factor defined by H201.

H00 **SPS format version num**: The format version number should be in this format.
Example: SPS 2.1;

H01 **Description of survey area**: The name of the country, survey area, survey type (land: L2D/L3D or Transition zone; TZ2D/ TZ3D) and project number.
Example: The Netherlands,Dordrecht,L3D,0090GA;

H02 **Date of survey**: The date of recording first shotpoint of survey and the last date of survey on this file.
Example: 21.05.1990,28.05.1990;

H021 **Post-plot date of issue**: The date when this tape or disc was issued and confirmed checked.
Example: 30.05.90;

H022 **Tape/disk identifier**:
Example: 0090GA0;

H023 **Line sequence number**: The line sequence number allows more than one production line per tape as long as a unique combination of field file number and line sequence number are used per storage unit.
Example:5;

H03 **Client**: The client's company name.
Example: NAM;

H04 **Geophysical contractor**: The company name of the main seismic contractor, and the seismic party name.
Example: Prakla Seismos,SON 1;

H05 **Positioning contractor**: The company name of contractor or sub-contractor responsible for the positioning survey/control in the field.
Example: Prakla Seismos,

H06 **Pos. proc. contractor**: The company name of contractor or sub-contractor responsible for the post processing of the positioning data.
Example: Prakla Seismos,SON 1;

H07 **Field computer system(s)**: The acquisition management system name, name of seismic recording instrument, and the method of direct transfer to/from the seismic recording instrument (if no direct transfer enter "***manual entry***").
Examples: CDB,SN368/FLUKE,FDOS discs; or None,SN368, manual entry;

H08 **Coordinate location**: The description of what the coordinates refer to.
Example: centre of source pattern and centre of receiver pattern;

H09 **Offset to coord. location**: The offset from a vessel or vehicle reference position to coordinate location as defined in H08, including method of angular offset used.
Example: 170M,180DEG from vessel gyro heading;

H10 **Clock time w.r.t. GMT**: The number of hours that the local (clock) time is behind or ahead of GMT
Example: +2;or -6; or 0;

H11 **Spare**

H12 **Geodetic datum,-spheroid**: Datum name, spheroid name, semi major axis (a), inverse flattening (1/f) as used for survey.
Example: RD datum Bessel 1841 6377397.155 299.15281

H13 Spare

H14 **Geodetic datum parameters**: Datum transformation parameters to WGS72 (dx,dy,dz,rx,ry,rz,ds) as used for survey.
Example: 595.000 11.300 478.900 0.000 0.000 0.000 0.000

The datum transformation parameters are defined by the following model:

$$\begin{vmatrix} x \\ y \\ z \end{vmatrix} = \begin{vmatrix} \\ (2) \end{vmatrix} \begin{vmatrix} dx \\ dy \\ dz \end{vmatrix} + |scale| * \begin{vmatrix} 1 & -rz & +ry \\ +rz & 1 & -rx \\ -ry & +rx & 1 \end{vmatrix} * \begin{vmatrix} x \\ y \\ z \end{vmatrix} \begin{vmatrix} \\ (1) \end{vmatrix}$$

where: x,y,z are the geocentric cartesian coordinates in metres, dx, dy, dz are translation parameters in metres, rx, ry, rz are clockwise rotation defined in arcsecs, but converted to radians for use in the formula. Scale is [1+ds(10E-6)], where ds is in parts per million.

For this example (1) is RD datum, (2) is WGS84 datum.

H15 Spare

H16 Spare

H17 **Vertical datum description**: Name, type (i.e. equipotential, LAT or spheroidal), origin (name or lat,long) and undulation of vertical datum with respect to WGS84.
Example: NAP, Equipotential, Amsterdam, 0; or MSL-Syria,Equipotential, 34 degr N, 38 degr E, 23.6 m;

H18 **Projection type**: Type of map projection used
Example: Transverse Mercator;

H19 **Projection zone**: Zone and hemisphere for UTM projections.
Example: Zone 30, North;

H20 **Description of grid units**: Unit of coordinates.
Example: Metres; or International Feet; or Indian Feet; or American Feet;

H201 **Factor to metre**: The multiplication factor to convert grid units to metres. For American Feet the factor is:
Example: 030480061

H210 **Lat. of standard parallel(s)**: Latitude and longitude of standard parallel(s) as required for projection as per H18, in dddmmss.sss N/S. For 2 standard parallels of 5 degr N and 10 degr N:
Example: 0050000.0000100000.000N

H220 **Long. of central meridian**: Longitude of central meridian as required for projection as per H18 above, in dddmmss.sss E/W. For 15 degr 30 minE:
Example: 0153000.000E

H231 **Grid origin**: Latitude and longitude of the grid origin in dddmmss.sss N/S dddmmss.sss E/W. For 5 degr N and 15 deg 10 min and 25 secE:
Example: 0050000.000N0151025.000E

H232 **Grid coord. at origin**: Grid coordinates (Eastings and Northings) at the origin of the projection system. For false Easting of 500000 and false Northing of 0:
Example: 50000000.0E 0.00N

H241 **Scale factor**: Scale factor for defined projection.
Example: 0.9996000000

H242 **Lat.,Long. scale factor**: Latitude and longitude at which the scale factor (H241) is defined.
Example: 0050000.000N 151025.000E

H256 **Lat. Long. initial line**: The two points defining the initial line of projection, as latl, longl, lat2, long2. For 5, degr N, 20 degr E, 10 degr N, 30 degr E.
Example:
0050000.000N0200000.000E0100000.000N0300000.000E

H257 **Circular bearing of H256**: This is the true bearing to the east in the origin of the initial line of projection in dddmmss.ssss (max of 360 degrees).
Example: 1200000.0000

H258 **Quadrant bearing of H256**: Quadrant bearing of the initial line of projection in N/S ddmmss.sss E/W.
Example: S300000.000E

H259 **Angle from skew**: The angle between the skew and the rectified (North oriented) grid, in dddmmsss.sss.
Example: 0883000.0000

H26 **Free format in positions 5-80**: Any other information can be included using header records of this type.

H30 **Project code and description**: A six character code, the survey area name and survey type (see H01).
Example: 0090GA,Dordrecht,L3D;

H31 **Line number format** (**Obsolete**): Specifies the internal format of the line number field in the data records. The specification shall be:
NAME1(POS1:LEN1),NAME2(POS2:LEN2),NAME3(POS3:LEN3);
Where NAMEn is the name of the sub-identifier, POSn is the first character position within the line number field and LENn is the length of the sub field.
Example: BLOCK(1:4),STRIP(5:4),LINE NUMBER(9:8);
If no sub division of the field is required then enter ‘LINE NUMBER(1:16);’

Seismic instrument header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H400-H419 are to be used to define tables for the first instrument code, and H420-H439 for the second up to H560-H579 for the ninth code. A new table must be defined, with a different code, for each instrument used or if any parameter in the table is changed.

The instrument code must always be in cols. 33-34, for example ‘1,’ to ‘9,’

H400 **Type,Model,Polarity**: The type and model name of seismic recording instrument, the unique model number of the instrument and the polarity defined as SEG or NON SEG. The definition of SEG is “A **compression** shall be recorded as a **negative** number on tape and displayed as a **downward** deflection on monitor records”.
Example: 1,SN368+LXU,12345,SEG;

H401 **Crew name,Comment**: The name of the crew and any other comments.
Example: 1,Prakla SON 1;

H402 **Sample int.,Record Length**: The recording sample rate and the record length on tape.
Example: 1,2MSEC,6SEC;

H403 **Number of channels**: The number of channels per record.
Example: 1,480;

H404 **Tape type, format, density**: The type of tape (9 track or cartridge), recording format of the data on tape and the recording density.
Example: 1,9 track,SEGD,6250;

H405 **Filter_alias Hz,dB pnt,slope**: The anti-alias or high-cut filter setting of the recording instrument or field boxes specified in hertz, the dB level at the frequency value and the filter slope in

dB per octave.
Example: 177HZ,-6DB,72 DB/OCT;

H406 **Filter_notch Hz,-3db points**: The centre frequency of the filter setting of the recording instrument or field boxes specified in hertz and the frequency values at the -3dB points.
Example: 1,NONE;or 1,50,45,55;

H407 **Filter_low Hz,dB pnt,slope**: The low-cut filter setting of the recording instrument or field boxes specified in hertz, the dB level at the frequency value and the filter slope in dB per octave.
Examples: 1,NONE;or 1,8HZ,-3DB,18 DB/OCT;

H408 **Time delay,FTB-SOD app Y/N**: The value of any time delay and if the delay between field time break and start of data has been applied to the seismic data recorded on tape.
Example: 1,0 Msec,not applied;

H409 **Multi component recording**: Describes the components being recorded and their recording order on consecutive channels, allowed values are ‘X’,’Y’,’Z’.
Examples: 1,Z; or 1,Z,X,Y;

H410 **Aux. channel 1 contents**: Describes the contents of an auxiliary channel.
Examples: 1,FTB; or 1,NONE;

H411 Aux. channel 2 contents

H412 Aux. channel 3 contents

H413 Aux. channel 4 contents

H414 Spare

to

H419 Spare

Seismic receiver header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H600-H609 are to be used to define tables for the first receiver code, and H610-H619 for the second up to H690-699 for the tenth code. A new table must be defined, with a different code, for each receiver type used or if any parameter in the tables is changed.

The receiver code must always be in cols. 33-34. Example of possible codes:

G1..to.G9 for geophones H1.. to.H9 for hydrophones

R1..to.R9 for multi comp. and other types

PM = Permanent marker KL = Kill or omit receiver station

H600 **Type,model,polarity**: The type (land geophone, marsh geophone, hydrophone), model name of seismic detector and the polarity defined as SEG or NON SEG. The definition of SEG is "A **compression** shall be recorded as a **negative** number on tape and displayed as a **downward** deflection on monitor records". *Example: G1,SM-4,1234,SEG;*

H601 **Damping coeff,natural freq**
Example: G1,0.68,10Hz;

H602 **Nunits,len(X),width(Y)**: The number of elements in the receiver group, the inline and the cross-line dimension of the receiver group pattern.
Example: G1,12,25M,6M;

H603 **Units spacing X,Y**: The distance between each element of the receiver group, inline (X), and cross-line (Y).
Example: G1,4M,6M;

H604 Spare

to

H609 Spare

Seismic source header records

The user must define the set of code definitions for surveys, areas and vintages. Header record types H700-H719 are to be used to define tables for the first source code, and H720-H739 for the second up to H880-899 for the tenth code. A new table must be defined, with a different code, for each source type used if any parameter in the table is changed.

The source code must always be in cols. 33-34. Example of possible codes:

V1..to.V9 for vibroseis E1.. to.E9 for explosive

A1..to.A9 for air gun W1..to.W9 for water gun

S1..to.S9 for other types

KL = Kill or omit receiver shotpoint

H700 **Type,model,polarity**: Source type (explosive, air gun etc.), make or model and the polarity defined as SEG or NON SEG. The definition of SEG is “A **compression** shall be recorded as a **negative** number on tape and displayed as a **downward** deflection on monitor records”.
Examples: E1,EXPLOSIVE, SEISMOGEL 125 gram,SEG; or V1,VIBROSEIS,MERTZ 22,SEG EQU;

H701 **Size,vert. stk fold**: The total charge size, force or air volume of the source pattern, the vertical fold of stack or number of sweeps per VP.
Examples: E1,1000 gram,1; or V1,93 kN,1 SWEEP/VP;

H702 **Nunits,len(X),width(Y)**: The number of elements in the source pattern, the inline and the cross-line dimension of the source pattern.
Examples: E1,6,25M,0M; or V1,4 VIBS,25M,45M;

H703 **Units spacing X,Y**: The distance between each element of the source pattern, inline (X), and cross-line (Y).
Examples: E1,5M,0; or V1,8M,15M;

Following records are only required if source **type= Vibroseis V1..V9**

H704 **Control type**: The type of control used.
Example: V1,GND FORCE PHASE&AMPL LOCK;

H705 **Correlator,noise supp**: The type correlator/stacker, and the type of noise suppression applied before summing.
Example: V1,SERCELCS-2502,NO NOISE SUPP;

H706 **Sweep type,length**: The type and length of the sweep.
Example: V1,LINEAR,30 SECONDS;

H707 **Sweep frequency start,end**: The start and end frequency of the sweep.
Example: V1,5HZ,60HZ;

H708 **Taper,length start,end**: The type of taper and the taper length (start and end).
Example: V1,COSINE,500MSEC,500MSEC;

H709 Spare

H710 Spare

Following records are only required if source **type= Explosive E1..E9**

H711 **Nom. shot depth,charge len.**: The nominal shot depth, and the length of the charge.
Example: E1,15M,1M;

H712 **Nom.soil, drill method**: The nominal type of soil or near surface medium, and the method of drilling (flushing, hand auger, portable drill unit etc.).
Example: E1,CLAY,PORTABLE UNITS;

H713 **Weathering thickness**: The nominal depth to the base of weathered layer.
Example: V1,8-12M;

H714 Spare

H715 Spare

Following records are only required if source

type=air gun A1..A9

water gun W1..W9

H716 **P-P bar/m,prim/bubble**: The Peak-peak output in bar metres, and the primary to bubble ratio measured through a 0-125 Hz filter at a depth of 6 metres.
Example: A1,50,13:1;

H717 **Air pressure psi**: The nominal operating air pressure.
Example: A1,2000PSI;

H718 **No. sub arrays,nom depth**: The number of sub arrays and the nominal towing depth.
Example: A1,3,5.5M;

H719 Spare

Quality Control check records

H990 **R,S,X file quality control**: The date and time of the Q.C. check, and the name of the person who performed the quality control of the file.
Example: 01JUN90,0930,Mr J Smith;

H991 **Coord. status final/prov**: The status of the coordinates contained in the R and S files (final or provisional), the date and time of the status, the name of the surveyor responsible for the coordinate integrity.
Example: Final01jun90,930,Mr J.Jansen;

Point record description

2 **Line name**: Identifier for the shotpoint or receiver line. It is a numeric number with the format of F10.2. If no decimal point is provided it should be taken as implied. It can be composed of a block or strip number and a line number. The internal format of this field must be defined in the header.

3 **Point number**: Identifier for the shotpoint or receiver group number defined as the centre of the source or receiver array as staked out in the field. The value should be read as a numeric F10.2 and be right justified.

4 **Point index**: Identifier for the shotpoint or receiver index.

Shotpoint:To be 1 for original shot within the grid cell denoted by fields 2 and 3, and be incremented by 1 for each subsequent shot within the same grid cell.
Exceptions: shots to be vertically stacked (unsummed vibroseis).

Receiver:To be 1 for the original positioning of a receiver group, and be incremented by 1 every time the receiver group is moved or repositioned, even when put back to any previous position.

5 **Point code**: A shotpoint or receiver code which is defined in the header by a table that describes the characteristics of the source or receiver group used at the point.

6 **Static correction**: The shotpoint or receiver static correction defined as a static time shift in Msec. that has been computed in the field to correct any seismic recording for the effects of elevation, weathering thickness, or weathering velocity at the point. The correction should be with reference to the seismic datum as defined by field 8 of this record. If no static was computed leave ‘blank’.

7 **Point Depth**: The depth of the shotpoint source or receiver group. Header defined units with respect to the surface down to the top of the charge or vertical receiver array. When the surface elevation can vary with time (e. g. a tidal water surface), then for

shotpoints the value should be at the time of recording, and for receivers at the time of recording of the first shotpoint into that receiver. (See figures 3 and 4).

8 **Seismic datum**: Header defined units as an offset to the datum defined in header record H17. It is +ve when above datum,-ve when below datum or zero when at datum. If the seismic datum is equal to H17, enter zero. (See figures 3 and 4).

9 **Uphole time**: Defined for a shotpoint as the vertical travel time to surface, recorded in msec and is always positive or zero. If no uphole was recorded leave 'blank'. Not defined for receiver leave 'blank', unless a reverse uphole is taken then the shotpoint definition applies.

10 **Water depth**: Header defined units of the measured (or reliably determined) height of water surface above the sea bed or water bottom. In case the water depth varies in time by more than one metre (e. g. tidal areas) then for shotpoints the value should be at the time of recording and for receivers at the time of recording of the first shotpoint into that receiver. The water depth value is always positive. (See figures 3 and 4).

11 **Map grid easting**: The easting for the point, in the coordinate system defined by header record H13.

12 **Map grid northing**: The northing for the point, in the coordinate system defined by header record H13. To accommodate large TM northing values for surveys straddling the equator, this field format has one more digit than UKOOA P1/90.

13 **Surface elevation**: The topographical surface with respect to the vertical datum defined by header record H17. The surface elevation is +ve when above datum, -ve when below datum or zero when at datum. When the surface elevation with respect to the datum can vary with time (e. g. a tidal water surface), then for shotpoints the value should be at the time of recording, and for receivers at the time of recording of the first shotpoint into that receiver. (See Figure 6-3 and Figure 6-4).

14 **Day of year**: The julian day. For shotpoints the value should be the day of recording, and for receivers the day of recording of the first shotpoint into that receiver. When the survey continues into the next year, the day should keep increasing and not be reset to zero (1st January would then be 366 or367).

15 **Time hhmmss**: The time taken from the clock of the master seismic recording instrument. For shotpoints the value should be the time of recording, and for receivers the time of recording of the first shotpoint into that receiver.

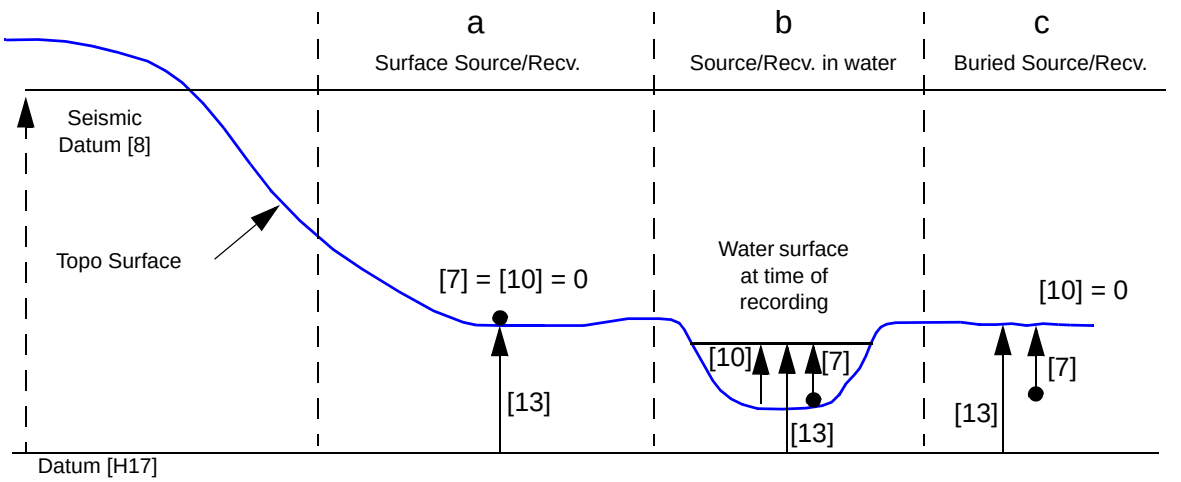


Figure 6-3 Land elevations

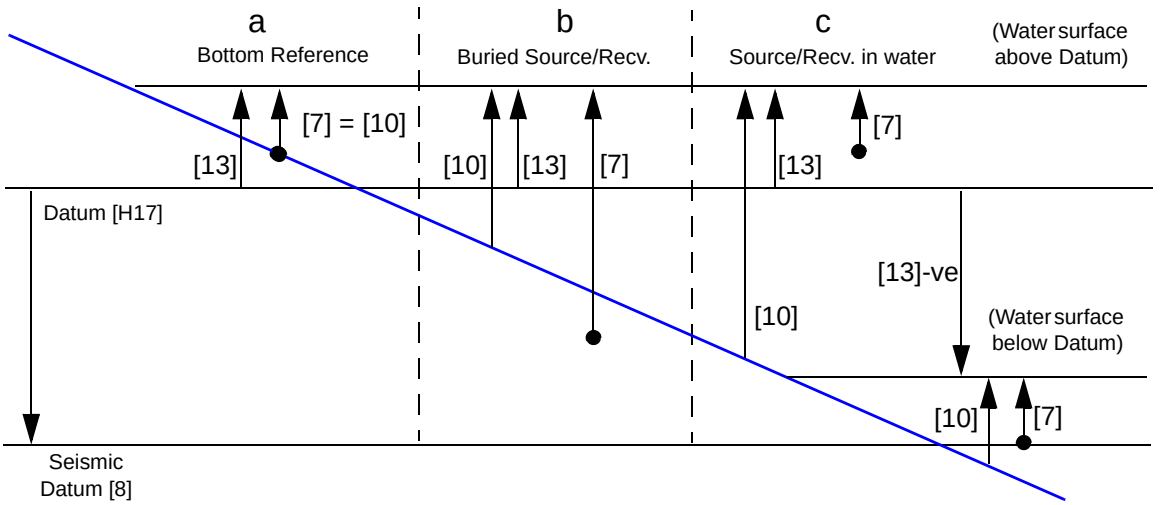


Figure 6-4 Tidal elevations

[7] = Point Depth

[10] = Water Depth at time of recording

[13] = Surface Elevation w.r.t. Datum [H17]

[x] = Item number in Point Record

Relation record description

2 **Field tape number**: The identifier of the data carrier (tape) on which the seismic recording of the spread defined by this record is written. To accommodate alphanumeric tape numbers this field is defined as 3A2 and is left-justified in the field.

3 **Field record number**: The number of the seismic recording given by the field instrument used to record the spread defined by this record.

4 **Field record increment**: The increment for the field record numbers, defined to allow several consecutive records which recorded the same shotpoint and spread to be defined by one ‘X’ record’ (eg. unsummed vibroseis records).

5 **Instrument code**: Defined in the header by a table that describes the type, and settings of the instrument used to record the spread defined by this record.

6 **Line name**: Identifier for the shotpoint line. Must be identical to field 2 of the corresponding shotpoint record.

7 **Point number**: Identifier for the shotpoint number. Must be identical to field 3 of the corresponding shotpoint record.

8 **Point index**: Identifier for the shotpoint index. Must be identical to field 4 of the corresponding shotpoint record.

9 **From channel**: The seismic channel number as recorded in the seismic trace header corresponding to the data from the receiver group number defined by fields 12 and 13 of this record.

10 **To channel**: The seismic channel number as recorded in the seismic trace header corresponding to the data from the receiver group number defined by fields 12 and 14 of this record.

11 **Channel increment**: This field can be used for multi-component receivers when the three components (Z, X and Y) for one receiver point are recorded on three consecutive seismic channels. Then one ‘X’ record can define three components

using a channel increment of 3. The components and their order are defined by the instrument code.

12 **Line name**: Identifier for the **receiver line** for the range of receivers defined by fields 13 and 14 of this record. The identifier must be identical to field 2 of the receiver point records that correspond to the same receiver line.

13 **From receiver**: Identifier for the **receiver group** number that corresponds to the From channel number defined in field 9. The identifier must be identical to field 3 of the receiver point record that corresponds to the same receiver group.

14 **To receiver**: Identifier for the **receiver group** number that corresponds to the To channel number defined in field 10. The identifier must be identical to field 3 of the receiver point record that corresponds to the same receiver group.

15 **Receiver index**: The receiver index value for the range of receivers defined by fields 12, 13 and 14 of this record. The combination of fields 12, 13, 15 and 12, 14, 15 must correspond to the same range of receivers as defined by records in the receiver point file.

Examples of SPS files

R file

```
H00 SPS format version number   SPS 2.1;
H01 Description of survey area  Area A, Sparse 3-D, EXPLORATION;
H02 Date of survey              11.01.2006,21.01.2006;
H021Post/plot date of issue     22.01.2006;
H022Tape/disk identifier        B79437-B79503;
H03 Client                      SEG;
H04 Geophysical contractor      Contractor A;
H05 Positioning contractor      Contractor A;
H06 Pos. proc. contractor       Contractor A;
H07 Field computer system(s)    Sercel SN 408CMXL;
H08 Coordinate location         CENTRE OF SOURCE AND RECEIVER PATTERNS;
H09 Offset from coord. location 000M,000DEG;
H10 Clock time w.r.t. GMT       +3;
H11 Spare                       ;
H12 Geodetic datum,-spheroid    INTERNATIONAL 6378388.000 297.0000000
H13 Spare                       ;
H14 Geodetic datum parameters   -179.466-207.757 -54.446-2.598 0.287 0.843-1.000
H26 H14 are datum transformation parameters to WGS84
H15 Spare                       ;
H16 Spare                       ;
H17 Vertical datum description  MSL - mean sea level;
H18 Projection type             UTM;
H19 Projection zone             Zone 39, N;
H20 Description of grid units   METERS;
H201Factor to meter             1.00000000
H220Long. of central meridian   0510000.000E;
H231Grid origin                 0000000.000N0510000.000E;
H232Grid coord. at origin       00500000.00E00000000.00N;
H241Scale factor                0.9996000000;
H242Lat., long. scale factor    0000000.000N0510000.000E;
H30 Project code and descriptionArea A, Sparse 3-D,3D;
H400Type,Model,Polarity         1, Sercel,SN 408CMXL,SEG;
H401Crew name,Comment           1, S-51, Chief Ob. xxxxx;
H402Sample int.,Record Len.     1, 2msec, 6000msec;
H403Number of channels          1, 1920;
H404Tape type,format, density   1, cartridge 3590, Code 8058, 38000 bpi;
H405Filter_alias Hz,dB pnt,slope1, 200Hz,-3dB, 370.00;
H406Filter_notch Hz,-3dB points 1, NONE;
H407Filter_low Hz,dB pnt,slope  1, NONE;
H408Time delay FTB-SOD app Y/N  1, 0 MSEC, not applied;
H409Multi component recording   1, Z;
H410Aux. channel 1 contents     1, autocorrelation of true reference delayed 1s;
H411Aux. channel 2 contents     1, autocorrelation of true reference delayed 1s;
H412Aux. channel 3 contents     1, true reference;
```

```
H413Aux. channel 4 contents      1, return reference;
H414Spare                        ;
H415SPare                        ;
H416Spare                        ;
H417Spare                        ;
H26 SPS SEISMIC RECEIVER HEADER  RECORDS;
H26 DESCRIPTION OF RECEIVER CODE G1 (NORMAL GEOPHONE);
H26                              ;
H600Type,model,polarity          G1, Sensor, SM-24, SEG;
H601Damp coeff,natural freq.     G1, 0.685, 10Hz;
H602Nunits,len(X),width(Y)       G1, 36, 25.00m, 55.00m;
H603Unit spacing X,Y             G1, 5m, 5m;
H604Spare                        ;
H605Spare                        ;
H606Spare                        ;
H607Spare                        ;
H26 Description G1               G1, SAND, GRAVEL PLAIN, NORMAL PATTERN;
H26 DESCRIPTION OF RECEIVER CODE G2 (COMPRESSED GEOPHONE);
H610Type,model,polarity          G2, Sensor, SM-24, SEG;
H611Damp coeff,natural freq.     G2, 0.685, 10Hz;
H612Nunits,len(X),width(Y)       G2, 36, 20.00m, 55.00m;
H613Unit spacing X,Y             G2, 5m, 5m;
H614Description G2               G2, SAND, GRAVEL PLAIN, COMPRESSED PATTERN;
H615Spare                        ;
H616Spare                        ;
H617Spare                        ;
H618Spare                        ;
H619Spare                        ;
H26 DESCRIPTION OF RECEIVER CODE G3 (BUNCHED GEOPHONE);
H620Type,model,polarity          G3, Sensor, SM-24, SEG;
H621Damp coeff,natural freq.     G3, 0.685, 10Hz;
H622Nunits,len(X),width(Y)       G3, 36, 0.00m, 25.00m;
H623Unit spacing X,Y             G3, 0m, 0m;
H624Description G3               G3, SAND, GRAVEL PLAIN, BUNCHED PATTERN;
H625Spare                        ;
H626Spare                        ;
H627Spare                        ;
H628Spare                        ;
H629Spare                        ;
H26 SPS SEISMIC SOURCE HEADER RECORDS;
H26 DESCRIPTION OF SOURCE CODE   V6 (VIBROSEIS),PARALLELOGRAM PATTERN;
H26 GRAVEL PLAIN:                ;
H800Type,model,polarity          V6, VIBROSEIS,VE432,SEG;
H801Size,vert. stk fold          V6, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H802Nunits,len(X),width(Y)       V6, 5 VIBS, 48M, 0M;
H803Unit spacing X,Y             V6, 12M, 0M;
H804Control type                 V6, GNDFORCE;
H805Correlator,noise supp        V6, 408CMXL, NO NOISE SUPP;
H806Sweep type,length            V6, LINEAR UPSWEEP, 12sec;
H807Sweep freq start,end         V6, 4HZ, 84HZ;
```

```
H808Taper,length start,end      V6, COSINE, 1000MSEC, 1000MSEC;
H809Spare                       V6, All points on high side of median line;
H810Spare                       ;
H820Type,model,polarity         V7, VIBROSEIS,VE432,SEG;
H821Size,vert. stk fold         V7, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H822Nunits,len(X),width(Y)      V7, 5 VIBS, 48M, 0M;
H823Unit spacing X,Y            V7, 12M, 0M;
H824Control type                V7, GNDFORCE;
H825Correlator,noise supp       V7, 408CMXL, NO NOISE SUPP;
H826Sweep type,length           V7, LINEAR UPSWEEP, 12sec;
H827Sweep freq start,end        V7, 4HZ, 84HZ;
H828Taper,length start,end      V7, COSINE, 1000MSEC, 1000MSEC;
H829Spare                       V7, All points on low side of median line;
H830Spare                       ;
H840Type,model,polarity         V8, VIBROSEIS,VE432,SEG;
H841Size,vert. stk fold         V8, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H842Nunits,len(X),width(Y)      V8, 5 VIBS, 48M, 0M;
H843Unit spacing X,Y            V8, 12M, 0M;
H844Control type                V8, GNDFORCE;
H845Correlator,noise supp       V8, 408CMXL, NO NOISE SUPP;
H846Sweep type,length           V8, LINEAR UPSWEEP, 12sec;
H847Sweep freq start,end        V8, 4HZ, 84HZ;
H848Taper,length start,end      V8, COSINE, 1000MSEC, 1000MSEC;
H849Spare                       V8, All points on secordary source lines;
H850Spare                       ;
H26 Percentage hold down weight 70% of peak force;
H990R,S,X file quality control  22/Jan/06,0930,Party Manager;
H991Coord. status final/prov    Final,22/Jan/06,1600,Party Manager;
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
R   5646.00 534450.00  1G1     0.0             238510.1 3058380.0  85.2 18213250
R   5646.00 534500.00  1G1     0.0             238540.0 3058380.0  84.3 18213250
R   5646.00 534550.00  1G1     0.0             238570.0 3058380.0  83.2 18213101
R   5646.00 534600.00  1G1     0.0             238600.0 3058380.0  82.4 18213101
R   5646.00 534650.00  1G1     0.0             238630.0 3058380.0  82.0 18212717
R   5646.00 534700.00  1G1     0.0             238660.0 3058380.0  81.9 18212717
R   5646.00 534750.00  1G1     0.0             238690.0 3058380.0  81.5 18212457
R   5646.00 534800.00  1G1     0.0             238720.0 3058380.0  81.8 18212457
R   5646.00 534850.00  1G1     0.0             238750.0 3058380.0  82.4 18212328
```

S file

```
H00 SPS format version number   SPS 2.1;
H01 Description of survey area  Area A, Sparse 3-D, EXPLORATION;
H02 Date of survey              19.01.2006,21.01.2006;
H021Post/plot date of issue     22.01.2006;
H022Tape/disk identifier        B79480;
H023Line sequence number        5;
H03 Client                      SEG;
H04 Geophysical contractor      Contractor A;
H05 Positioning contractor      Contractor A;
H06 Pos. proc. contractor       Contractor A;
H07 Field computer system(s)    Sercel SN 408CMXL;
H08 Coordinate location         CENTRE OF SOURCE AND RECEIVER PATTERNS;
H09 Offset from coord. location 000M,000DEG;
H10 Clock time w.r.t. GMT       +3;
H11 Spare                       ;
H12 Geodetic datum,-spheroid    INTERNATIONAL 6378388.000 297.0000000
H13 Spare                       ;
H14 Geodetic datum parameters   -179.466-207.757 -54.446-2.598 0.287 0.843-1.000
H26 H14 are datum transformation parameters to WGS84
H15 Spare ;
H16 Spare ;
H17 Vertical datum description  MSL - mean sea level;
H18 Projection type             UTM;
H19 Projection zone             Zone 39, N;
H20 Description of grid units   METERS;
H201Factor to meter             1.00000000
H220Long. of central meridian   0510000.000E;
H231Grid origin                 0000000.000N0510000.000E;
H232Grid coord. at origin       00500000.00E00000000.00N;
H241Scale factor                0.9996000000;
H242Lat., long. scale factor    0000000.000N0510000.000E;
H30 Project code and descriptionArea A, Sparse 3-D,3D;
H400Type,Model,Polarity         1, Sercel,SN 408CMXL,SEG;
H401Crew name,Comment           1, S-51, Chief Ob. xxxxx;
H402Sample int.,Record Len.     1, 2msec, 6000msec;
H403Number of channels          1, 1920;
H404Tape type,format, density   1, cartridge 3590, Code 8058, 38000 bpi;
H405Filter_alias Hz,dB pnt,slope1, 200Hz,-3dB, 370.00;
H406Filter_notch Hz,-3dB points 1, NONE;
H407Filter_low Hz,dB pnt,slope  1, NONE;
H408Time delay FTB-SOD app Y/N  1, 0 MSEC, not applied;
H409Multi component recording   1, Z;
H410Aux. channel 1 contents     1, autocorrelation of true reference delayed 1s;
H411Aux. channel 2 contents     1, autocorrelation of true reference delayed 1s;
H412Aux. channel 3 contents     1, true reference;
H413Aux. channel 4 contents     1, return reference;
H414Spare                       ;
H415SPare                       ;
```

```
H416SPare                          ;
H417Spare                          ;
H26 SPS SEISMIC RECEIVER HEADER RECORDS;
H26 DESCRIPTION OF RECEIVER CODE G1 (NORMAL GEOPHONE);
H26 ;
H600Type,model,polarity            G1, Sensor, SM-24, SEG;
H601Damp coeff,natural freq.       G1, 0.685, 10Hz;
H602Nunits,len(X),width(Y)         G1, 36, 25.00m, 55.00m;
H603Unit spacing X,Y               G1, 5m, 5m;
H604Spare                          ;
H605Spare                          ;
H606Spare                          ;
H607Spare                          ;
H26 Description G1                 G1, SAND, GRAVEL PLAIN, NORMAL PATTERN;
H26 DESCRIPTION OF RECEIVER CODE G2 (COMPRESSED GEOPHONE);
H610Type,model,polarity            G2, Sensor, SM-24, SEG;
H611Damp coeff,natural freq.       G2, 0.685, 10Hz;
H612Nunits,len(X),width(Y)         G2, 36, 20.00m, 55.00m;
H613Unit spacing X,Y               G2, 5m, 5m;
H614Description G2                 G2, SAND, GRAVEL PLAIN, COMPRESSED PATTERN;
H615Spare                          ;
H616Spare                          ;
H617Spare                          ;
H618Spare                          ;
H619Spare                          ;
H26 DESCRIPTION OF RECEIVER CODE G3 (BUNCHED GEOPHONE);
H620Type,model,polarity            G3, Sensor, SM-24, SEG;
H621Damp coeff,natural freq.       G3, 0.685, 10Hz;
H622Nunits,len(X),width(Y)         G3, 36, 0.00m, 25.00m;
H623Unit spacing X,Y               G3, 0m, 0m;
H624Description G3                 G3, SAND, GRAVEL PLAIN, BUNCHED PATTERN;
H625Spare                          ;
H626Spare                          ;
H627Spare                          ;
H628Spare                          ;
H629Spare                          ;
H26 SPS SEISMIC SOURCE HEADER RECORDS;
H26 DESCRIPTION OF SOURCE CODE     V6 (VIBROSEIS),PARALLELOGRAM PATTERN;
H26 GRAVEL PLAIN:                  ;
H800Type,model,polarity            V6, VIBROSEIS,VE432,SEG;
H801Size,vert. stk fold            V6, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H802Nunits,len(X),width(Y)         V6, 5 VIBS, 48M, 0M;
H803Unit spacing X,Y               V6, 12M, 0M;
H804Control type                   V6, GNDFORCE;
H805Correlator,noise supp          V6, 408CMXL, NO NOISE SUPP;
H806Sweep type,length              V6, LINEAR UPSWEEP, 12sec;
H807Sweep freq start,end           V6, 4HZ, 84HZ;
H808Taper,length start,end         V6, COSINE, 1000MSEC, 1000MSEC;
H809Spare                          V6, All points on high side of median line;
H810Spare                          ;
```

```
H820Type,model,polarity          V7, VIBROSEIS,VE432,SEG;
H821Size,vert. stk fold V7,      70% of peak force, 1 SWEEP /VIBRATOR/VP;
H822Nunits,len(X),width(Y)       V7, 5 VIBS, 48M, 0M;
H823Unit spacing X,Y             V7, 12M, 0M;
H824Control type                 V7, GNDFORCE;
H825Correlator,noise supp        V7, 408CMXL, NO NOISE SUPP;
H826Sweep type,length            V7, LINEAR UPSWEEP, 12sec;
H827Sweep freq start,end         V7, 4HZ, 84HZ;
H828Taper,length start,end       V7, COSINE, 1000MSEC, 1000MSEC;
H829Spare                        V7, All points on low side of median line;
H830Spare                        ;
H840Type,model,polarity          V8, VIBROSEIS,VE432,SEG;
H841Size,vert. stk fold          V8, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H842Nunits,len(X),width(Y)       V8, 5 VIBS, 48M, 0M;
H843Unit spacing X,Y             V8, 12M, 0M;
H844Control type                 V8, GNDFORCE;
H845Correlator,noise supp        V8, 408CMXL, NO NOISE SUPP;
H846Sweep type,length            V8, LINEAR UPSWEEP, 12sec;
H847Sweep freq start,end         V8, 4HZ, 84HZ;
H848Taper,length start,end       V8, COSINE, 1000MSEC, 1000MSEC;
H849Spare                        V8, All points on secordary source lines;
H850Spare                        ;
H26 Percentage hold down weight  70% of peak force;
H990R,S,X file quality control   22/Jan/06,0930,Party Manager;
H991Coord. status final/prov     Final,22/Jan/06,1600, Party Manager;
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
S   5713.00 542525.00  2V6             0       243355.0 3060390.0  60.6019001150
S   5603.00 542425.00  1V7             0       243295.0 3057090.0  71.1019001218
S   5601.00 542525.00  1V7             0       243355.0 3057030.0  72.7019001414
S   5715.00 542525.00  2V6             0       243355.0 3060450.0  61.0019001452
```

X file

```
H00 SPS format version number   SPS 2.1;
H01 Description of survey area  Area A, Sparse 3-D, EXPLORATION;
H02 Date of survey              19.01.2006,21.01.2006;
H021Post/plot date of issue     22.01.2006;
H022Tape/disk identifier        B79480;
H023Line sequence number        5;
H03 Client                      SEG;
H04 Geophysical contractor      Contractor A;
H05 Positioning contractor      Contractor A;
H06 Pos. proc. contractor       Contractor A;
H07 Field computer system(s)    Sercel SN 408CMXL;
H08 Coordinate location         CENTRE OF SOURCE AND RECEIVER PATTERNS;
H09 Offset from coord. location 000M,000DEG;
H10 Clock time w.r.t. GMT       +3;
H11 Spare                       ;
H12 Geodetic datum,-spheroid    INTERNATIONAL 6378388.000 297.0000000
H13 Spare                       ;
H14 Geodetic datum parameters   -179.466-207.757 -54.446-2.598 0.287 0.843-1.000
H26 H14 are datum transformation parameters to WGS84
H15 Spare                       ;
H16 Spare                       ;
H17 Vertical datum description  MSL - mean sea level;
H18 Projection type             UTM;
H19 Projection zone             Zone 39, N;
H20 Description of grid units   METERS;
H201Factor to meter             1.00000000
H220Long. of central meridian   0510000.000E;
H231Grid origin                 0000000.000N0510000.000E;
H232Grid coord. at origin       00500000.00E00000000.00N;
H241Scale factor                0.9996000000;
H242Lat., long. scale factor    0000000.000N0510000.000E;
H30 Project code and descriptionArea A, Sparse 3-D,3D;
H400Type,Model,Polarity         1, Sercel,SN 408CMXL,SEG;
H401Crew name,Comment           1, S-51, Chief Ob. xxxxx;
H402Sample int.,Record Len.     1, 2msec, 6000msec;
H403Number of channels          1, 1920;
H404Tape type,format, density   1, cartridge 3590, Code 8058, 38000 bpi;
H405Filter_alias Hz,dB pnt,slope1, 200Hz,-3dB, 370.00;
H406Filter_notch Hz,-3dB points 1, NONE;
H407Filter_low Hz,dB pnt,slope  1, NONE;
H408Time delay FTB-SOD app Y/N  1, 0 MSEC, not applied;
H409Multi component recording   1, Z;
H410Aux. channel 1 contents     1, autocorrelation of true reference delayed 1s;
H411Aux. channel 2 contents     1, autocorrelation of true reference delayed 1s;
H412Aux. channel 3 contents     1, true reference;
H413Aux. channel 4 contents     1, return reference;
H414Spare                       ;
H415SPare                       ;
```

```
H416SPare                       ;
H417Spare                       ;
H26 SPS SEISMIC RECEIVER HEADER RECORDS;
H26 DESCRIPTION OF RECEIVER CODE G1 (NORMAL GEOPHONE);
H26                             ;
H600Type,model,polarity         G1, Sensor, SM-24, SEG;
H601Damp coeff,natural freq.    G1, 0.685, 10Hz;
H602Nunits,len(X),width(Y)      G1, 36, 25.00m, 55.00m;
H603Unit spacing X,Y            G1, 5m, 5m;
H604Spare                       ;
H605Spare                       ;
H606Spare                       ;
H607Spare                       ;
H26 Description G1              G1, SAND, GRAVEL PLAIN, NORMAL PATTERN;
H26 DESCRIPTION OF RECEIVER CODE G2 (COMPRESSED GEOPHONE);
H610Type,model,polarity         G2, Sensor, SM-24, SEG;
H611Damp coeff,natural freq.    G2, 0.685, 10Hz;
H612Nunits,len(X),width(Y)      G2, 36, 20.00m, 55.00m;
H613Unit spacing X,Y            G2, 5m, 5m;
H614Description G2              G2, SAND, GRAVEL PLAIN, COMPRESSED PATTERN;
H615Spare                       ;
H616Spare                       ;
H617Spare                       ;
H618Spare                       ;
H619Spare                       ;
H26 DESCRIPTION OF RECEIVER CODE G3 (BUNCHED GEOPHONE);
H620Type,model,polarity         G3, Sensor, SM-24, SEG;
H621Damp coeff,natural freq.    G3, 0.685, 10Hz;
H622Nunits,len(X),width(Y)      G3, 36, 0.00m, 25.00m;
H623Unit spacing X,Y            G3, 0m, 0m;
H624Description G3              G3, SAND, GRAVEL PLAIN, BUNCHED PATTERN;
H625Spare                       ;
H626Spare                       ;
H627Spare                       ;
H628Spare                       ;
H629Spare                       ;
H26 SPS SEISMIC SOURCE HEADER RECORDS;
H26 DESCRIPTION OF SOURCE CODE  V6 (VIBROSEIS),PARALLELOGRAM PATTERN;
H26 GRAVEL PLAIN:               ;
H800Type,model,polarity         V6, VIBROSEIS,VE432,SEG;
H801Size,vert. stk fold         V6, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H802Nunits,len(X),width(Y)      V6, 5 VIBS, 48M, 0M;
H803Unit spacing X,Y            V6, 12M, 0M;
H804Control type                V6, GNDFORCE;
H805Correlator,noise supp       V6, 408CMXL, NO NOISE SUPP;
H806Sweep type,length           V6, LINEAR UPSWEEP, 12sec;
H807Sweep freq start,end        V6, 4HZ, 84HZ;
H808Taper,length start,end      V6, COSINE, 1000MSEC, 1000MSEC;
H809Spare                       V6, All points on high side of median line;
H810Spare                       ;
```

```
H820Type,model,polarity          V7, VIBROSEIS,VE432,SEG;
H821Size,vert. stk fold          V7, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H822Nunits,len(X),width(Y)       V7, 5 VIBS, 48M, 0M;
H823Unit spacing X,Y             V7, 12M, 0M;
H824Control type                 V7, GNDFORCE;
H825Correlator,noise supp        V7, 408CMXL, NO NOISE SUPP;
H826Sweep type,length            V7, LINEAR UPSWEEP, 12sec;
H827Sweep freq start,end         V7, 4HZ, 84HZ;
H828Taper,length start,end       V7, COSINE, 1000MSEC, 1000MSEC;
H829Spare                        V7, All points on low side of median line;
H830Spare                        ;
H840Type,model,polarity          V8, VIBROSEIS,VE432,SEG;
H841Size,vert. stk fold          V8, 70% of peak force, 1 SWEEP /VIBRATOR/VP;
H842Nunits,len(X),width(Y)       V8, 5 VIBS, 48M, 0M;
H843Unit spacing X,Y             V8, 12M, 0M;
H844Control type                 V8, GNDFORCE;
H845Correlator,noise supp        V8, 408CMXL, NO NOISE SUPP;
H846Sweep type,length            V8, LINEAR UPSWEEP, 12sec;
H847Sweep freq start,end         V8, 4HZ, 84HZ;
H848Taper,length start,end       V8, COSINE, 1000MSEC, 1000MSEC;
H849Spare                        V8, All points on secordary source lines;
H850Spare                        ;
H26 Percentage hold down weight  70% of peak force;
H990R,S,X file quality control   22/Jan/06,0930,Party Manager;
H991Coord. status final/prov     Final,22/Jan/06,1600, Party Manager;
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
XB79480       111   5713.00 542525.002    1  3201   5646.00 534550.00 550500.001
XB79480       111   5713.00 542525.002  321  6401   5662.00 534550.00 550500.001
XB79480       111   5713.00 542525.002  641  9601   5678.00 534550.00 550500.001
XB79480       111   5713.00 542525.002  961 12801   5694.00 534550.00 550500.001
XB79480       111   5713.00 542525.002 1281 16001   5710.00 534550.00 550500.001
XB79480       111   5713.00 542525.002 1601 19201   5726.00 534550.00 550500.001
XB79480       211   5603.00 542425.001    1  3201   5646.00 534450.00 550400.001
XB79480       211   5603.00 542425.001  321  6401   5662.00 534450.00 550400.001
XB79480       211   5603.00 542425.001  641  9601   5678.00 534450.00 550400.001
XB79480       211   5603.00 542425.001  961 12801   5694.00 534450.00 550400.001
XB79480       211   5603.00 542425.001 1281 16001   5710.00 534450.00 550400.001
```

Chapter 7 APS and SPS-like formats

This chapter describes the file formats used to export shot point attributes for source Quality Control tools when using vibrators. The files can be analyzed in the VE432 or VE464 environment and graphically displayed in the Positioning environment.

It also describes the SPS-like formats used to generate a receiver position history file to be viewed in the Log environment and to print source COG files.

This chapter includes the following sections:

APS Vibrator attributes export format

This file is updated after each acquisition. There is one record for each vibrator, and it is very useful, to analyse the behaviour of a vibrator during the production.

Item	Definition of field	Cols	formats	Min.to Max.	Default	Units
1	Record identification	1-1	A1	"A"	None	-
2	Line name	2-17	4A4	Free	None	-
3	Point number	18-25	2A4	Free	None	-
4	Point index	26-26	I1	1-9	1	-
5	Vibrator fleet number	27-27	I1	Free	None	-
6	Vibrator number	28-29	I2	Free	None	-
7	Vibrator drive level	30-32	I3	0-100	None	%
8	Average phase	33-36	I4	-180 to 180	None	degree
9	Peak phase	37-40	I4	-180 to 180	None	degree
10	Average distortion	41-42	I2	0-99	None	%
11	Peak distortion	43-44	I2	0-99	None	%
12	Average force	45-46	I2	0-99	None	%
13	Peak force	47-49	I3	free	None	%
14	Average ground stiffness	50-52	I3	free	None	-
15	Average ground viscosity	53-55	I3	free	None	-
16	Vib. position Easting	56-64	F9.1	free	None	metre
17	Vib. position Northing	65-74	F10.1	free	None	metre
18	Vib. position elevation	75-80	F6.1	-999.9 to 9999.9	None	metre

Note A single character can be recorded in column 27 (item 5). If the Vibrator Fleet Number is a 2-digit number, then it is replaced by a letter with the following encoding: A=10, B=11, C=12, D=13, E=14, F=15, G=16, H=17, I=18, J=19, K=20, L=21, M=22, N=23, O=24, P=25, Q=26, R=27, S=28, T=29, U=30, V=31, W=32.

Note Items 7 to 18 are left blank if no vibrator attributes are available.

Note Items 16 to 18 are left blank if GPS failure or bad quality.

Note Unless the coordinates supplied by the radiopositioning receiver to the DPG are already in a projection format, the vibrator coordinates are converted using the projection selected in the POSITIONING client window.

Note Check to see if the appropriate projection is selected.

Note The Elevation reported is the elevation contained in the $GPGGA messages from radiopositioning receivers (referenced to the geoidal model).

Example

```
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
A1010.0           1015.511 1 70   3  -6152368 81  8 80 603766.1 4680820.3-999.9
A1010.0           1015.511 2 70   3  -6172068 78 10 74 603752.1 4680812.9-999.9
A1010.0           1015.511 3 70   5 -13162574 81  8 81 603738.3 4680805.7-999.9
A1010.0           1015.511 4 70   2  -7151971 82  6 66 603724.3 4680798.3-999.9
A1010.0           1015.511 1 70   3  -6162068 81  9 76 603787.7 4680807.7-999.9
A1010.0           1015.511 2 70   3  -7121867 78 10 89 603773.7 4680800.3-999.9
A1010.0           1015.511 3 70   0   0 0 0 0  0  0  0 603759.9 4680793.1-999.9
A1010.0           1015.511 4 70   3  -7132068 80 11 81 603745.9 4680785.7-999.9
A1010.0           1016.511 1 70   3  -5141967 80 12 71 603809.3 4680795.1-999.9
A1010.0           1016.511 2 70   3  -6131666 78 11 76 603795.3 4680787.7-999.9
A1010.0           1016.511 3 70   4 -13182473 82 10 78 603781.5 4680780.5-999.9
A1010.0           1016.511 4 70   3  -9122167 80 10 88 603767.5 4680773.1-999.9
A1010.0           1016.511 1
A1010.0           1016.511 2 70   3  -6141566 78 12 72 603816.9 4680775.1-999.9
A1010.0           1016.511 3 70   5 -12172271 83 12 64 603803.1 4680767.9-999.9
A1010.0           1016.511 4 70   3  -6142067 80 12 74 603789.1 4680760.5-999.9
A1010.0           1017.511 1 70   5 -15297462 78 12 60 603852.5 4680769.9-999.9
A1010.0           1017.511 2 70   3  -6151769 80  9 60 603838.5 4680762.5-999.9
A1010.0           1017.511 3 70   5 -20316968 84 12 61 603824.7 4680755.3-999.9
A1010.0           1017.511 4 70   3  -7151967 80 12 69 603810.7 4680747.9-999.9
```

Verbose APS Vibrator Attributes file

This file is the same as the APS file with some additional information. It can be imported back into the Sercel software database in the Log client window.

Item	Definition of field	Cols	format	Min.to Max.	Default	Units
1	Record identification	1-1	A1	"A"	None	-
2	Line name	2-17	4A4	Free	None	-
3	Point number	18-25	2A4	Free	None	-
4	Point index	26-26	I1	1-9	1	-
5	Vibrator fleet number	27-27	I1	Free	None	-
6	Vibrator number	28-29	I2	Free	None	-
7	Vibrator drive level	30-32	I3	0-100	None	%
8	Average phase	33-36	I4	-180 to 180	None	deg
9	Peak phase	37-40	I4	-180 to 180	None	deg
10	Average distortion	41-42	I2	0-99	None	%
11	Peak distortion	43-44	I2	0-99	None	%
12	Average force	45-46	I2	0-99	None	%
13	Peak force	47-49	I3	free	None	%
14	Average ground stiffness	50-52	I3	free	None	-
15	Average ground viscosity	53-55	I3	free	None	-
16	Vib. position Easting	56-64	F9.1	free	None	metre
17	Vib. position Northing	65-74	F10.1	free	None	metre
18	Vib. position elevation	75-80	F6.1	-999.9 to 9999.9	None	metre
19	Shot Number	82-86	I5	1-99999	None	-
20	Acquisition Number	87-88	I2	1-32	None	-
21	2-digit vibrator fleet number	89-90	I2	1-32	None	-
22	Vib Status Code	91-92	I2	1-98	None	-
23	Mass 1 Warning	94-94	A1	space or W	None	-
24	Mass 2 Warning	95-95	A1	space or W	None	-
25	Mass 3 Warning	96-96	A1	space or W	None	-
26	Plate 1 Warning	100-100	A1	space or W	None	-
27	Plate 2 Warning	101-101	A1	space or W	None	-
28	Plate 3 Warning	102-102	A1	space or W	None	-
29	Plate 4 Warning	103-103	A1	space or W	None	-
30	Plate 5 Warning	104-104	A1	space or W	None	-
31	Plate 6 Warning	105-105	A1	space or W	None	-

Item	Definition of field	Cols	format	Min.to Max.	Default	Units
32	Force Overload	106-106	A1	space or F	None	-
33	Pressure Overload	107-107	A1	space or P	None	-
34	Mass Overload	108-108	A1	space or M	None	-
35	Valve Overload	109-109	A1	space or V	None	-
36	Excitation Overload	110-110	A1	space or E	None	-
37	Stacking Fold	111-112	I2	1-32	None	-
38	Computation Domain	113-113	A1	T or F	None	-
39	Ve432 Version	114-117	A4	Free	None	-
40	Day of Year	118-120	I3	1-999	None	-
41	Time hhmmss	121-126	3I2	000000-235959	None	-
42	HDOP	127-130	F4.1	1.0-99.9	None	-

Note A single character can be recorded in column 27 (item 5). If the Vibrator Fleet Number is a 2-digit number, then it is replaced by a letter with the following encoding: A=10, B=11, C=12, D=13, E=14, F=15, G=16, H=17, I=18, J=19, K=20, L=21, M=22, N=23, O=24, P=25, Q=26, R=27, S=28, T=29, U=30, V=31, W=32. The vibrator fleet number is duplicated into columns 89-90 where it appears in plain, since this allows two digits to be recorded (item 21).

Note Items 7 to 18 are left blank if there are no vibrator attributes and items 16 to 18 are left blank if GPS fails or if there is a bad quality.

Note The Elevation reported is the elevation contained in the $GPGGA messages from radiopositioning receivers (referenced to the geoidal model).

FPS file

When the system is used in “SQC Dump” mode (for recording vibrator motion signals) a File Per Source (FPS) file is generated for each acquisition. It includes vibrator attributes (much like a verbose APS file) plus the SEGD file number. It allows the user to relate the position of each source to a file number.

Item	Definition of field	Cols	format	Min.to Max.	Default	Units
1	Record identification	1-1	A1	'F'	None	-
2	Line name	2-17	4A4	Free	None	-
3	Point number	18-25	2A4	Free	None	-
4	Point index	26-26	I1	1-9	1	-
5	Fleet number	27-27	I1	1-4	None	-
6	Vibrator number	28-29	I2	Free	None	-
7	Vibrator drive level	30-32	I3	0-100	None	%
8	Average phase	33-36	I4	-180 to 180	None	deg
9	Peak phase	37-40	I4	-180 to 180	None	deg
10	Average distortion	41-42	I2	0-99	None	%
11	Peak distortion	43-44	I2	0-99	None	%
12	Average force	45-46	I2	0-99	None	%
13	Peak force	47-49	I3	Free	None	%
14	Average ground stiffness	50-52	I3	Free	None	-
15	Average ground viscosity	53-55	I3	Free	None	-
16	Vib. position Easting	56-64	F9.1	Free	None	metre
17	Vib. position Northing	65-74	F10.1	Free	None	metre
18	Vib. position elevation	75-80	F6.1	-999.9 to 9999.9	None	metre
19	Shot Nb	82-86	I5	1-99999	None	-
20	Acquisition Nb	87-88	I2	1-32	None	-
21	Fleet Nb	89-89	I1	1-4	None	-
22	Vib Status Code	91-92	I2	1-98	None	-
23	Mass 1 Warning VE432 users: Magic No	94-94	A1	space or W	None	-
24	Mass 2 Warning VE432 users: Magic No	95-95	A1	space or W	None	-
25	Mass 3 Warning VE432 users: Magic No	96-96	A1	space or W	None	-

Item	Definition of field	Cols	format	Min.to Max.	Default	Units
29	Plate 1 Warning VE432 users: Magic No	100-100	A1	space or W	None	-
30	Plate 2 Warning VE432 users: Magic No	101-101	A1	space or W	None	-
31	Plate 3 Warning VE432 users: Magic No	102-102	A1	space or W	None	-
32	Plate 4 Warning VE432 users: Magic No	103-103	A1	space or W	None	-
33	Plate 5 Warning VE432 users: Magic No	104-104	A1	space or W	None	-
34	Plate 6 Warning VE432 users: Magic No	105-105	A1	space or W	None	-
35	Force Overload	106-106	A1	space or F	None	-
36	Pressure Overload	107-107	A1	space or P	None	-
37	Mass Overload	108-108	A1	space or M	None	-
38	Valve Overload	109-109	A1	space or V	None	-
39	Excitation Overload	110-110	A1	space or E	None	-
40	Stacking Fold	111-112	I2	1-32	None	-
41	Computation Domain	113-113	A1	T or F	None	-
42	Ve432 or VE464 Version	114-117	A4	Free	None	-
43	Day of Year	118-120	I3	1-999	None	-
44	Time hhmmss	121-126	3I2	000000 to 235959	None	-
45	HDOP	127-130	F4.1	1.0-99.9	None	-
46	File Nb	131-136	I6	1-999999	None	-

Note Items 7 to 18 are left blank if there are no vibrator attributes and items 16 to 18 are left blank if GPS fails or if there is a bad quality.

Note **Items 23 to 34**: To replace warnings by the VE432 Magic Number, create a blank file named
ApsModified.user408.hci408
in the “/users/user408” directory.

Note The Elevation reported is the elevation contained in the $GPGGA messages from radiopositioning receivers (referenced to the geoidal model).

Source COG file format

Information on the Centre Of Gravity of the source is logged into a daily file, identified by its julian day, that can be viewed and exported using the Log client window.

Item	Definition of field	Cols	Format	Min.to Max.	Default	Units
1	Record identification	1-1	A1	C	None	-
2	Line name	2-17	4A4	Free	None	-
3	Point number	18-25	2A4	Free	None	-
4	Point Index	26-26	I1	1 to 9	1	-
5	COG status	28-28	I1	0 to 7 See COG status code (page 165)	None	-
6	COG position Easting	30-38	F9.1	Free	None	metre
7	COG position Northing	40-49	F10.1	Free	None	metre
8	COG position elevation	51-56	F6.1	Free	None	metre
9	COG - Source deviation	60-69	F10.1	Free	None	metre

Note Item 8: the altitude correction specified in the Positioning window's **Projection** setup is taken into account in computing the elevation. The Elevation reported is the elevation referenced to the geoidal model.

Note The Line Number, Point Number, Point index are those from the input SPS Source file.

Example

```
H26      1         2         3         4         5         6         7         8
H26 5678901234567890123456789012345678901234567890123456789012345678901234567890
H26
C8.0                344.01 3 2784415.9   330302.4    0.0       0.0
C8.0                344.02 3 2784415.9   330302.4    0.0       0.0
C8.0                374.01 3 2785782.6   330949.1    0.0       2.5
```

COG status code

0 : No COG	The system was unable to calculate the COG.
1 : Estimated COG	Although the GPS position from one or more vibrators was not available, an estimated COG was calculated, deduced from the vibrator pattern of the previous source point. The estimated COG lies within the allowable circle determined by the "**COG Radius Threshold**" specified in the Positioning main window's **Setup** menu (no radial error). See User's Manual Volume 1 for details.
2 : Estimated, Radial Error	An estimated COG position was calculated (some vibrator positions were not available) and it does not fall within the allowable circle determined by the "**COG Radius Threshold**" (e.g. a status message was indicating that a vibrator failed to vibrate, so the estimated COG was calculated without the position of that vibrator, leading to a radial error).
3 : Actual COG	All vibrator positions were available; the source COG was calculated and no radial error was found.
4 : Radial Error	An actual COG position was calculated (i.e. all vibrator positions were available) but it does not fall within the allowable circle

	determined by the "**COG Radius Threshold**" specified in the Positioning main window's **Setup** menu.
5 : Missing Position	One or more vibrator positions were not available. The system was unable to calculate the COG.
6 : Inaccurate COG	An actual COG position was calculated. All vibrator positions were available, but one or more vibrator position standard deviations exceeded the "**Vib Position Accuracy Threshold**" specified in the **Setup** menu). As a result, the COG is regarded as inaccurate.
7 : Straight GPS COG	All vibrator positions were available, the source COG was calculated, no radial error was found, but the GPS receivers were supplying positions with no differential corrections.

Appendix A Organization Codes

Organization codes are assigned by the Petroleum Open Standards Consortium (POSC).

To request a new organization code, contact:

POSC

24 Greenway Plaza

Suite 1000-B

Houston, TX 77046 USA

+1 713 784-1880 telephone

+1 713 784-9219 fax

info@posc.org

Code	Organization
0	Subcommittee On Recommended Format For Digital Well Data, Basic Schema
1	Operator
2	Driller
3	Mud Logger
9	Amerada Hess
10	Analysts, The
15	Baker Hughes Inteq
20	Baroid
30	Birdwell
40	Reeves (1 Jan 99; formerly BPB)
50	Brett Exploration
60	Cardinal
65	Center Line Data
66	Subcommittee On Recommended Format For Digital Well Data, DLIS Schema
70	Century Geophysical
77	CGG Logging, Massey France
80	Charlene Well Surveying
90	Compagnie de Services Numerique
95	Comprobe
100	Computer Data Processors
110	Computrex
115	COPGO Wood Group
120	Core Laboratories
125	CRC Wireline, Inc.
126	Crocker Data Processing Pty Ltd
127	Tucker Wireline Services (formerly Davis Great Guns Logging, Wichita, KS)
130	Digigraph
137	Tucker Technologies (formerly Digital Logging Inc.), Tulsa, OK.
140	Digitech
145	Deines Perforating
148	Drillog Petro-Dynamics Limited
150	Baker Atlas (formerly Dresser Atlas)
160	Earthworm Drilling

A

Code	Organization
170	Electronic Logging Company
180	Elgen
190	El Toro
200	Empire
205	Encom Technology, Ltd.
206	Ensigh Geophysics, Ltd.
210	Frontier
215	Geolog
217	Geoshare
218	GEO·X Systems Ltd.
220	G O International
230	Gravilog
240	Great Guns Servicing
250	Great Lakes Petroleum Services
260	GTS
268	Guardian Data Seismic Pty. Ltd.
270	Guns
280	Halliburton Logging
285	Horizon Production Logging
290	Husky
300	Jetwell
305	Landmark Graphics
310	Lane Wells
315	Logicom Computer Services (UK) Ltd
320	Magnolia
330	McCullough Tool
332	Mitchell Energy Corporation
335	Paradigm Geophysical (formerly Mincom Pty Ltd)
337	MR-DPTS Limited
338	NRI On-Line Inc
339	Oilware, Inc.
340	Pan Geo Atlas
342	Pathfinder Energy Services
345	Perfco

Code	Organization
350	Perfojet Services
360	Perforating Guns of Canada
361	Petcom, Inc.
362	Petroleum Exploration Computer Consultants, Ltd.
363	Petrologic Limited
366	Phillips Petroleum Company
368	Petroleum Geo-Services (PGS)
370	Petroleum Information
380	Petrophysics
390	Pioneer
392	The Practical Well Log Standards Group
395	IHS Energy Log Services (formerly Q. C. Data Collectors)
400	Ram Guns
410	Riley's Datashare
418	RODE
420	Roke
430	Sand Surveys
440	Schlumberger
450	Scientific Software
460	Seismograph Service
462	SEGDEF
463	SEG Technical Standards High Density Media Format Subcommittee
464	Shell Services Company
465	Stratigraphic Systems, Inc.
467	Sperry-Sun Drilling Services
468	SEPTCO
469	Sercel, Inc.
470	Triangle
475	Troika International
480	Welex
490	Well Reconnaissance
495	Wellsite Information Transfer Specification (WITS)
500	Well Surveys

Code	Organization
510	Western
520	Westronics
525	Winters Wireline
530	Wireline Electronics
540	Worth Well
560	Z & S Consultants Limited
999	Reserved for local schemas
1000	POSC

Appendix B Glossary of abbreviations and acronyms

A

AC	Alternating Current.
Acq.	An abbreviation for Acquisition.
ADC	Analog-to-Digital Converter.
ADS-TA	Ancillary Data Standard for Trace Attributes data. Used to exchange trace and shot domain attributes, in conjunction with ADS-TE records.
ADS-TE	Ancillary Data Standard for Trace Edit data. Used in conjunction with ADS-TA records, to track trace exclusion information for a seismic data volume.
AGC	Automatic Gain Control.
AIB	Auxiliary Interface Box. Used to connect analog pilot signals from a DPG to FDUs used as auxiliary channels.
API	American Petroleum Institute.

APS	Attribute Processing Support format. A standard for exporting shot point attributes for source Quality Control tools.
ASCII	American Standard Code for Information Interchange.
Aux.	An abbreviation for Auxiliary.
Avg.	An abbreviation for Average.
AWD	Accelerated Weight Drop.
AWG	American Wire Gauge.

B

Bacc.	An abbreviation for Base plate Acceleration (vibrator).
BCD	Binary-Coded Decimal.
BOB	Break Out Box.
BOT	Beginning Of Tape.
Bvel.	An abbreviation for Base plate Velocity (vibrator).

C

CD	Compact Disk.
CD490E	Sercel-packaged 3490E cartridge drive.
CD590	Sercel-packaged 3590 cartridge drive.
CDP	Common Depth Point. The situation where the same portion of subsurface produces reflections at different offset distances on several profiles.
CDU	Cabinet Distribution Unit.
Chan.	An abbreviation for Channel.
CMP	Common Mid-Point.

CMRR	Common-Mode Rejection Ratio. Expresses the ability of a device to reject the effect of a voltage that is applied simultaneously to both input terminals.
COG	Centre Of Gravity.
Config.	An abbreviation for Configuration.
Coord.	An abbreviation for Coordinates.
Correl.	An abbreviation for Correlation.
CR	Carriage Return.
CRC	Cyclic Redundancy Code. An error correction code used to catch errors in the data.
CT400	428XL Cable Tester. Used to check a length of cable for compliance with the input/output specifications of 428XL field electronics.
CTB	Confirmed Time Break.
Ctrl.	Abbreviation for Control.

D

DAC	Digital-to-Analog Converter.
dB	Decibel.
DC	Direct Current.
DFT	Discrete Fourier Transform.
DGPS	Differential GPS. The DGPS technique uses a fixed ground-based reference station to broadcast the difference between the position indicated by the satellite system and the known fixed position. The base station broadcasts the difference between the measured satellite pseudoranges and actual (internally computed) pseudoranges, so that receiver stations can correct their pseudoranges by the same amount.

DHCP	Dynamic Host Configuration Protocol (protocol for automating the configuration of computers that use TCP/IP)
DIP	Dual Inline Package.
DMZ	Demilitarized Zone (PCs directly connected online).
DPG	Digital Pilot Generator (VE432/VE464). A control unit for the vibrator electronics (DSD). Connects to the LCI-428.
DPR	Dual Port RAM.
DQPSK	Differential Quadrature Phase Shift Keying (transmission encoding).
DSCSI	Differential SCSI. See SCSI.
DSD	Digital Servo Drive (VE432/VE464). Performs real-time control of the energy imparted into the earth by a vibrator. Communicates with a DPG via a radio link.
DSP	Digital Signal Processor.
DSU	Digital Sensor Unit. An integrated package including station electronics and three digital accelerometers based on the MEMS technology.
DTS	Data Transfer Sequence.
DVD	Digital Versatile Disc.
DXF	(1) Drawing Interchange Format (2) Data Exchange Format (3) AutoCAD File (file extension).

E

e-428	Sercel's seismic network software based on a client/server architecture. Totally controls the spread and the operations, and also performs all the requested computations (stacks, correlations) before recording data onto tapes or disks.
EEPROM	Electrically Erasable Programmable Read-Only Memory.
EOF	End Of File.

EOM	End Of Media.
EOT	End Of Tape.
ESD	Electrostatic Discharge.
eSQC-Pro	Seismic Quality Control software.
Explo.	An abbreviation for Explosive.

F

FC	Fibre Channel.
FDPA428	Field Deployment Aid for LRU.
FDU	Field Digitizing Unit. An analog-to-digital converter for a seismic or auxiliary channel. Includes a digitally controlled test signal generator.
FDU2S	ULS technology, dual-channel FDU.
FFT	Fast Fourier Transform. A Fourier Transform method for calculating the frequency spectrum, in both magnitude and angle, for any function of time.
Flt.	An abbreviation for Fleet.
FM4	Hermaphrodite connector (4-pin, male and female).
FO	Firing Order sent to a source controller.
FPS	File Per Source (file including vibrator attributes plus SEGD file number)
Freq	An abbreviation for Frequency.
FT	FT analysis: Frequency vs Time representation of the amplitude of a signal. Alternately, an abbreviation for Fourier Transform.
FTP	File Transfer Protocol.

G

GIS	Geographical Information System.
GMT	Greenwich Mean Time.
GPS	Global Positioning System. A satellite-based global navigation system that consists of a constellation of 24 satellites orbiting the Earth, several in-orbit spares, and a ground-based control segment. The GPS is owned and operated by the U.S. Department of Defense but is available for general use around the world. The satellites transmit signals that are used for extremely accurate three-dimensional (latitude, longitude, and elevation) global navigation (position determination), and for the dissemination of precise time. GPS-derived position determination is based on the arrival times, at an appropriate receiver, of precisely timed signals from the satellites that are above the user's radio horizon. The location accuracy is anywhere from 100 to 10 metres for most equipment. Accuracy can be pinpointed to within one meter with special military-approved equipment.
GUI	Graphical User Interface.

H

HC	High Cut (RF filtering).
HDOP	Horizontal Dilution Of Precision (GPS).
Hex.	An abbreviation for Hexadecimal.
HFVS	High Fidelity Vibratory Seismic. A method for improving the fidelity of data acquired with a vibratory source. Involves the measurement and recording of suitable motions from each vibrator so that these actual motions can be used to separate simultaneous sources and process the data.
HSU	Hand-Shake Unit. An interface between an LSI and a blaster controller, used by the field operator to tell the central unit when a firing device is armed and tell the number of the corresponding shot point.

HV	High Voltage.
HVD	High Voltage Differential (SCSI interface).

I

ID	(1) Identification, identity. (2) Inner Diametre.
Ident.	An abbreviation for Indentity.
Incr.	An abbreviation for Increment
Info.	An abbreviation for Information
Init.	An abbreviation for (1) Initialize (2) Initialization.
Instr.	An abbreviation for Instrument.
IP	Internet Protocol.
ITB	Internal Time Break.

K

kN	1000 Newton.

L

LAN	Local Area Network. A data communications system that (a) lies within a limited spatial area, (b) has a specific user group, (c) has a specific topology, and (d) is not a public switched telecommunications network, but may be connected to one.
Lat.	An abbreviation for Latitude.
LAUL	Line Acquisition Unit, Line. An interconnecting unit along an acquisition line. Used to control the data flow from the acquisition lines to the recording truck, and for power management on the line.
LAULS	ULS-technology LAUL.

LAUR	Line Acquisition Unit, Radio telemetry, capable of acquiring up to 30 channels of seismic data at 2 ms sampling rate in real-time on radio line segments.
LAUX	Line Acquisition Unit, Crossline. An interconnecting unit along an acquisition Transverse or a line. Used to control the path of the data flow from the acquisition lines to the recording truck, and for power management on line sections.
LAUXS	ULS-technology LAUX.
LC	Low Cut (RF filtering).
LCD	Liquid Crystal Display.
LCI-428	Line Controller Interface (428XL control module that can handle up to 10 000 channels in real-time at 2 ms sampling rate).
LED	Light Emitting Diode.
LF	Line Feed.
LLX400	428XL Laser Link. Consists of two laser transceivers for license-free, line-of-sight, infrared data transmission over obstacles within a Line or a Transverse. Connects to the wireline electronics via two LXIU interface boxes.
Long.	An abbreviation for Longitude.
LRU	Line Remote Unit, used as a long range point-to-point radio relay, or as master transceiver in a radio cell. It can be inserted anywhere in a spread as an element of the 428XL network to relay the data transmission on a Line. Connects to any type of 428XL field electronics (LAUX, LAUL, FDU Link, etc.), except for 100 MHz Ethernet ports.
LSI	Line Source Interface. A remote blaster connector box used to connect a blaster controller along an acquisition line instead of connecting it to the control unit's Blaster connector. The blaster controller connects to the LSI via an HSU unit.
LSS	Line Shooting System. An LSI connected to an HSU.

LT428	428XL Line tester. A pocket terminal that connects to the XDEV connector of an LAUL or LAUX, used to check the performance of a line section. The test results are displayed on the pocket terminal.
LVD	Low Voltage Differential (SCSI interface).
LXIU-400	Laser Transceiver Interface Unit. Interfaces an LAUX or LAUL with a laser unit.

M

MAC	Media Access Control data communication protocol. Provides addressing and channel access control mechanisms that make it possible for several terminals or network nodes to communicate within a multipoint network, typically a Local Area Network.
Macc.	An abbreviation for Mass Acceleration (vibrator).
Max.	Abbreviation for Maximum.
MB	Megabyte.
Mbps	Megabits Per Second.
MDR	Mirage Data Recorder.
MEMS	Micro-machined Electro-Mechanical Sensor.
MGA	Multipurpose Geophone Analyzer.
Min.	An abbreviation for (1) Minimum (2) Minute.
Misc.	An abbreviation for Miscellaneous.
MRU	Mobile Receiver Unit. A radiopositioning transceiver used for service vehicle tracking.
MSI	Multi-Slave Interface box. Used to connect several (up to four) VE432 DPG units to a 428XL control module (LCI-428).
MTB1590S	8-metre portable telescopic mast.
Mvel.	An abbreviation for Mass Velocity (vibrator).

N

NA	Not Available.
NAN	Not A Number.
NAS	Network Attached Storage system
NB	An abbreviation for “Number”.
NC	Not Connected.
NCS	Network Control Sequence
NFS	Network File System.
NMEA	National Marine Electronics Association.
NMO	Normal Move-Out. The variation of reflection arrival time because of variation in the shotpoint to geophone distance (offset) which causes an increase of the length of the reflection travel path.
Num.	An abbreviation for (1) Number (2) Numerical.

O

Obs.	An abbreviation for Observer.
OD	Outer diametre.
OS	Operating System. Software designed to control the hardware of a specific data-processing system in order to allow users and application programs to make use of it.
OVC	Open Vibrator Controller.

P

PB	Play Back.
PC	Personal Computer
PCB	Printed Circuit Board.

PDF	Portable Document Format
PN	Part Number.
POSC	Petroleum Open Standards Consortium.
PPM	Parts Per Million.
PPS	Pulses Per Second
PRM	Processing Module in a 428XL system. Software running on the server computer, for formatting the data to and from the recording media, to the plotters and eSQC-Pro, and for noise editing, correlation and stacking.
Proc	An abbreviation for (1) Processing (2) Process (3) Processor.
PWB	Printed Wiring Board.

Q

QC	Quality Control.
QPSK	Quadrature Phase Shift Keying (transmission encoding).
QT400	Quick Tester. Allows quick checks for transmission and power supply on a 428XL line (wireline telemetry).

R

RAID	Redundant Array of Independent Disks.
RAM	Random-Access Memory.
Rcv.	An abbreviation for Receiver.
RDM	Removable Disk Module.
Rdy.	An abbreviation for Ready.
Rec.	An abbreviation for (1) Record (2) Recorder.
Ref.	An abbreviation for Reference.

RF	Radio Frequency.
RJ45	Registered Jack - 45 (8 wire connector used in networking).
RMS	Root-Mean-Square. The square root of the average of the squares of a series of related values (for a sine wave, 0.707 times the peak value).
RP	Receiver Position.
RTK	Real-Time Kinematic (GPS). The RTK technique allows centimetric accuracy to be achieved.
Rtv.	An abbreviation for (1) Retrieve (2) Retrieval.
RVT	Removable Virtual Tape.
Rx.	An abbreviation for Receive.

S

SCSI	Small Computer Systems Interface. SCSI is a system level interface and as such it uses high level commands, and logical block addressing. This considerably simplifies the task of the device driver and saves CPU time on every single I/O. Moreover, because the SCSI device does operations like “rewind the tape” or “format this disk” without host intervention, the host saves even more CPU time.
SD or SDev.	Standard Deviation.
SE	Single-End.
SEG	Society of Exploration Geophysicists. The SEG promotes the science of geophysics and the education of exploration geophysicists.
SEG-D	One of the formats developed by the SEG for recording seismic data, used in processing and interpretation software to determine how the tape should be read.
Seq.	An abbreviation for Sequence.

SGA	Signal Graphic Analyzer. Software used to analyse radio or wireline-similarity signals acquired on Sercel systems. Allows the user to monitor the phase, distortion or force of the vibrator source signal (on auxiliary traces) in real time.
SGT	Sercel Geophone Tester.
Simult.	An abbreviation for Simultaneous.
SMT	Surface-Mount Technology.
SN	Serial Number.
SNMP	Simple Network Management Protocol.
SNR	Signal-to-Noise Ratio.
SP	Shot Point.
SPL	Source Point Line.
SPN	Source Point Number.
SPS	SHELL Processing Support format. A standard for the transfer of positioning and geophysical support data from land field crews to seismic processing centres.
SR	Sample Rate. The sampling interval in a seismic acquisition.
SRHRF	Strain Relief High Rate Flex telemetry cable.
ST	Standard Telemetry cable.
Stat.	An abbreviation for Statistics.
STSR	Standard Telemetry cable, Strain Relief.
SWR	Standing Wave Ratio. The ratio of the maximum to the minimum amplitudes of corresponding components of a field, voltage or current along a transmission line or waveguide in the direction of propagation and at a given frequency. Alternately, the reciprocal of this ratio.

T

TB	Time Break. A time mark indicating the shot instant or the time at which the seismic wave was generated.
TBP	Tape By-Pass.
TCP	Transmission Control Protocol (with Internet Protocol, the main protocol of the Internet).
TCXO	Temperature-Controlled Crystal Oscillator.
TDM	Time-Division Multiplex.
TDMA	Time Division Multiple Access.
TE	Transmit Error.
TFOI	Transverse Fibre Optics Interface.
TMS428	428XL Test and Maintenance system. A PC computer and an interface unit (TMU428), the core of which is an LAUX fitted with specific software, used for testing 428XL field electronics.
TMU428	TMS428 system's interface unit.
Topo.	An abbreviation for Topographical.
TREP-428	428XL Transverse Repeater.
Tx.	An abbreviation for Transmit.

U

UH	Up-Hole. (1) Uphole geophone: a geophone placed a few feet from a shothole to detect the Uphole time. (2) Uphole time: the time for the first wave from an explosion to reach the surface at or near the shotpoint.
UL	Sercel Ultra-Link product line.
ULS	Sercel Ultra-Link Submersible technology.
UPS	Uninterruptible Power Supply.

URL	Uniform Resource Locator (world wide web address).
USB	Universal Serial Bus.
UTC	Universal Time Coordinated. Greenwich Mean Time updated with leap seconds each year to compensate for changes in the rotation of the earth.
Util.	An abbreviation for Utility.

V

Var.	An abbreviation for Variable.
VE432, VE434	Vibrator Electronics, consisting of a control unit (DPG) connecting to the 428XL control module (LCI-428), and a vibrator control unit (DSD) installed in each vibrator truck.
Vib.	An abbreviation for Vibrator.
VLSI	Very Large-Scale Integration.
VP	Vibrator Point. The Shot Point when a vibratory source is used.
VQC88	A standalone field system used for vibrator maintenance or trouble-shooting, capable of acquiring 7 analog channels (including two independent accelerometer sensors).
VSR	Vibrator Signal Recording. A function used to record actual vibrator motions from each vibrator.
VSWR	Voltage Standing Wave Ratio. The ratio of the electronic field or voltage at a voltage minimum to that at the adjacent maximum in a stationary-wave system, as in a coaxial cable.

W

WGS84	World Geodetic System 1984.
WPSR	Water-Proof, Strain-Relief telemetry cable.
WZ	WZ velocity: the propagation velocity of the shot wave in the ground.

X

XDEV	A connector used to connect an external device (e. g. an LT428) on field electronics.
Xdump.	Extra Dump.
Xmit.	An abbreviation for Transmit or Transmitter.
Xtalk.	An abbreviation for Crosstalk. The signal picked up by an acquisition channel because of undesired coupling to another channel.

Index

IM = Installation Manual

U1 = User's Manual Vol. 1

U2 = User's Manual Vol. 2

U3 = User's Manual Vol. 3

TM = Technical Manual

Numerics

A

B

C

D

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z