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1 Introduction

The purpose of this document is to describe the SEGD data format for DTCC. The data format acquisition by DTCC system can be storing to Receivers Gathers, Shot Gathers or Continuous Gathers according to the SEG-D Revision 2.1 (V5) standards, using the 8058 format, Most of the General Header, Scan Type Headers, and Trace Headers all follow this standard directly, some are different just because the data have three format (Shot Gather, Triggered Time Receiver Gather, Continuous Time Receiver Gather).

1.1 Glossary

Shot Gather (SG) –All traces share a common first sample time as expressed in bytes 12 – 16 and fractionally in the Extended Header. This time usually corresponds to a trigger event plus an optional commonly applied positive or negative offset. Each trace comprises data of a unique sensor component from one of many receiver locations or auxiliary channels. When the field is used in this way, the file is a traditional SEG-D Rev 2.x standard file.

Continuous Time Receiver Gather (CG) –All traces share the same receiver location or auxiliary device. Each initial trace for a sensor component of the receiver point, or channel of the auxiliary device, has an identical first sample time as expressed in bytes 12 – 16 and fractionally in the Extended Header. Each subsequent trace for a given sensor or auxiliary channel forms a continuation with no missing samples of the preceding trace of that certain sensor or auxiliary channel. When the field is used in this way, the file is a non-standard.

Triggered Time Receiver Gather (RG) –All traces share the same receiver location or auxiliary device. A trace for each sensor component of the receiver point, or channel of the auxiliary device, is recorded for a set of distinct times, each of which usually corresponds to a trigger event plus an optional commonly applied positive or negative time offset.

1.2 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

2 Format of SG
2.1 File Headers

2.1.1 General Header #1

Byte No.	Number of Bytes	Data Type	Value	Description
1 - 2	2	bcd	XXXX	File number (0-9999). Set to FFFF when the file number is greater than 9999. The expanded file number is contained in bytes 1-3 of General Header Block #2.
3 - 4	2	bcd	8058	Format code (32 IEEE demultiplexed)
5 -10	6	bcd	X	General constants
11	1	bcd	XX	Last two digits of Year (0-99)
12	½	Binary	2	Number of additional blocks in general header
12-13	1-1/2	bcd	XXX	Julian day, 3 digits (1-366)
14-16	1	bcd	XX	1st shot point or time slice UTC time (HHMMSS)
17	1	bcd	13	Manufacturer's code, DTCC is 61.
18-19	2	bcd	0	Manufacturer's serial number
20-22	3	bcd	XXXXXX	Bytes Per Scan – *This field is unused in demultiplexed data recording.*
23	1	Binary	XX	Base scan interval: 4 = 0.25 ms 8 = 0.5 ms
24H	½	Binary	0 to8& 12	Polarity (untested) Accounts for sensors, cables, instrument, and source. 0 = Untested 4 = 135 degrees 8 = 315 degrees1 = Zero 5 = 180 degree 12 = unassigned 2 = 45 degrees6 = 225 degrees 3 = 90 degrees 7 = 270 degrees
24L	1-1/2	Binary	0, 1, or 2	Gather Type:0 = SG, 1 = RG, 2 = CG
25		Binary		Not used
26H	½	Binary	X	Record type: 8 = normal 2 = test record
26L-27	1-1/2	bcd	FFF	Record length (extended record length used)
28	1	bcd	01	Scan type per record
29	1	bcd	XX	Number of channel sets per record, 16 for land operations.
30	1	bcd	00	Number of sample skew 32 byte extensions
31	1	bcd	32	Extended header length

Byte No.	Number of Bytes	Data Type	Value	Description
32	1	bcd	XX	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.

2.1.2 General Header #2

Byte No.	Number of Bytes	Data Type	Value	Description
1-3	3	Binary	XXXXXX	Extended file number Replaces/overrides General Header: Block-1: Bytes-1 & 2 when those bytes are set to 0xFFFF.
4-5	2	Binary	0	Extended channel sets per scan type
6-7	2	Binary	0	Extended header blocks
8-9	3	Binary	XXXX	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	1			Not used
11-12	2	Binary	1.0	SEG-D Revision Number
13-14	2	Binary	0	Number of 32-byte general trailer blocks
15-17	3	Binary	XXXXXX	Extended record length in milliseconds (0-128000 ms)
18	1	-	0	Undefined (0)
19	1	Binary	2	General header block number
20-32	13	-	0	Undefined (0)

2.1.3 General Header #3

Byte No.	Number of Bytes	Data Type	Value	Description
1 - 3	2		XXXXXX	Expanded file number
4 - 8	5	Binary	XXXXX.XX	Source Line Number Defaults to GUI setup, or updated by navigation system.

Byte No.	Number of Bytes	Data Type	Value	Description
9-13	5	Binary	XXXXX.XX	Source Point Number (0-99999.99) Defaults to GUI setup, or updated by navigation system.
14	1	Binary	XX	Source Point Index (1-9)
15	1		0	Phase Control (not recorded)
16	1		0	Vibrator Type (not recorded)
17-18	2		0	Phase angle (not recorded)
19	1	Binary	3	General Header Block Number
20	1	Binary	XX	Source Set Number Defaults to GUI setup, or updated by navigation system.
21 - 32	12		0	Not used

2.1.4 Scan Type Header（Channel Set）

There may be multiple channel set descriptor blocks if auxiliary data is recorded within the same file. There usually 16 Channel Set for Rev2.1SEGD.

Byte No.	Number of Bytes	Data Type	Value	Description
1	1	bcd	01	Scan type number
2	1	bcd	XX	Channel set number
3-4	2	Binary	XXXX	Channel set start time in milliseconds
5-6	2	Binary	XXXX	Channel set end time in milliseconds
7	1	Binary	XXXX	Optional MP factor extension bytes
8	1	Binary	XXXX	MP factor descaler multiplier
9-10	2	bcd	XXXX	Number of channels in channel set
11H	½	Binary	X	Channel type code 1 = Seis；9 = Aux
11L	½	Binary	0	Unused
12H	½	bcd	0	Number of sub-scans
12L	½	Binary	3	Gain control type
13-14	2	bcd	XXXX	Alias filter frequency in Hertz
15-16	2	bcd	XX	Alias filter slope in dB per octave
17-18	2	bcd	XX	Low cut filter frequency in Hertz
19-20	2	bcd	XX	Low cut filter slope in dB per octave
21-22	2	bcd	0	First Notch Frequency

23-24	2	bcd	0	Second Notch Frequency
25-26	2	bcd	0	Third Notch Frequency
27-28	2	Binary	0	Extended channel set number
29H	½	Binary	0	Extended header flag
29L	½	Binary	7	Trace Header Extensions
30	1	Binary	XX	Vertical stack size
31	1	Binary	XX	Streamer cable number ,0 in land operations
32	1	Binary	1	Array forming

2.1.5 Extended Header

Byte No.	Number of Bytes	Data Type	Value	Description
1 - 4	4	bin	XXXX	Acquisition length (1000 to 128000 ms)
5-8	4	bin	XXXX	Sample rate
9-12	4	bin	XXXX	Total number of traces
13-16	4	bin	XXXX	Number of Auxes
17-20	4	bin	XXXX	Number of Seis traces
21-24	4	bin	XXXX	Number of dead Seis traces
25-28	4	bin	XXXX	Number of live Seis traces
29-32	4	bin	XXXX	Type of source 0 = no source 1 = Impulsive 2 = Vibrator
33-36	4	bin	XXXX	Number of samples in trace
37-40	4	bin	XXXX	Shot number
41-44	4	flt	XXXX	TB window

45-48	4	bin	XXXX	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	4	bin	XXXX	Spread first line
53-56	4	bin	XXXX	Spread first number
57-60	4	bin	XXXX	Spread number
61-64	4	bin	XXXX	Spread type 1 = Generic 2 = Absolute
65-68	4	bin	XXXX	Timebreak
69-72	4	bin	XXXX	Uphole time
73-76	4	bin	XXXX	Blaster id
77-80	4	bin	XXXX	Blaster status
81-84	4	bin	XXXX	Refraction delay
85-88	4	bin	XXXX	TB to T0 time(ms)
89-92	4	bin	XXXX	Internal time break(0 = no.1 = yes)
93-96	4	bin	XXXX	Prestack within field units(0 = no.1 = yes)
97-100	4	bin	XXXX	Noise elimination type
101-104	4	bin	XXXX	Low trace percentage
105-108	4	bin	XXXX	Low trace value
109-112	4	bin	XXXX	Number of windows (Div.)
113-116	4	bin	XXXX	Historic editing type (1 = Zeroing.2 = Clipping.)
117-120	4	bin	XXXX	Noisy trace percentage

121-124	4	bin	XXXX	Historic range
125-128	4	bin	XXXX	Historic taper length 2's exponent
129-132	4	bin	XXXX	Threshold Hold/Var
133-136	4	bin	XXXX	Historic threshold Init value(0 to 132 dB)
137-140	4	bin	XXXX	Historic zeroing length
141-144	4	bin	XXXX	Type of process 1 No operation (raw data). 2 Stack. 3 Correlation After stack. 4 Correlation Before stack.
145-272	128	bin	XXXX	Acquisition type tables
273-400	128	bin	XXXX	Threshold type tables
401-404	4	bin	XXXX	Stacking fold
405-484	80	asc	XXXX	Not used
485-488	4	bin	XXXX	Record length(ms)
489-492	4	bin	XXXX	Autocorrelation peak time(ms)
493-496	4	bin	XXXX	Not used
497-500	4	bin	XXXX	Correlation Pilot No.
501-504	4	bin	XXXX	Pilot length
505-508	4	bin	XXXX	Sweep length
509-512	4	bin	XXXX	Acquisition number
513-516	4	flt	XXXX	Max of max, Aux
517-520	4	flt	XXXX	Max of max, Seis
521-524	4	bin	XXXX	Dump stacking fold
525-540	6	asc	XXXX	Tape label (ASCII text, 16 characters.)
541-544	4	bin	XXXX	Tape number(1 to 9999)
545-560	6	asc	XXXX	Software version
561-572	12	asc	XXXX	Date
573-580	8	dbl	XXXX	Source easting
581-588	8	dbl	XXXX	Source northing
589-592	4	flt	XXXX	Source elevation
593-596	4	bin	XXXX	Slip sweep mode used
597-600	4	bin	XXXX	Files per tape
601-604	4	bin	XXXX	File count
605-764	160	asc	XXXX	Acquisition error description

Byte No.	Number of Bytes	Data Type	Value	Description
765-768	4	bin	XXXX	Filter type
769-772	4	bin	XXXX	Stack i s dumped.
773-776	4	bin	XXXX	Stack sign(current).
777-780	4	bin	XXXX	PRM Tilt Correction used.
781-844	4	asc	XXXX	Swath name.
845-848	4	bin	XXXX	Operating mode.
849-852	4	bin	XXXX	Reserved.
853-856	4	bin	XXXX	No log.
857-860	4	bin	XXXX	Listening time.
861-864	4	bin	XXXX	Type of dump.
865-868	4	bin	XXXX	Reserved.
869-872	4	bin	XXXX	Swath Id
873-876	4	bin	XXXX	Seismic trace offset removal is disabled.
877-884	8	bin	XXXX	GPS time of acquisition Time Break in stack, expressed as the number of microseconds since January 6, 1980 at 0:00 a.m. UTC (signed integer).
885-892	8	bin	XXXX	Aligned GPS time of acquisition
893-1024	132		0	Reserved.

2.1.6 External Header

Byte No.	Number of Bytes	Data Type	Value	Description
1-4	4	bin	xxxx	Field file number (External FFID)
4-8	4	bin	xxxx	File Number

2.2 Trace Headers

Trace-header	Trace header extension block # 1	Trace header extension block #2	Trace header extension block # 3	Trace header extension block # 4	Trace header extension block # 5	Trace header extension block # 6	Trace header extension block # 7	Trace data

20 bytes	2 bytes	32 bytes	32 bytes	32 bytes	32 bytes	32 bytes	32 bytes	N bytes

244 bytes
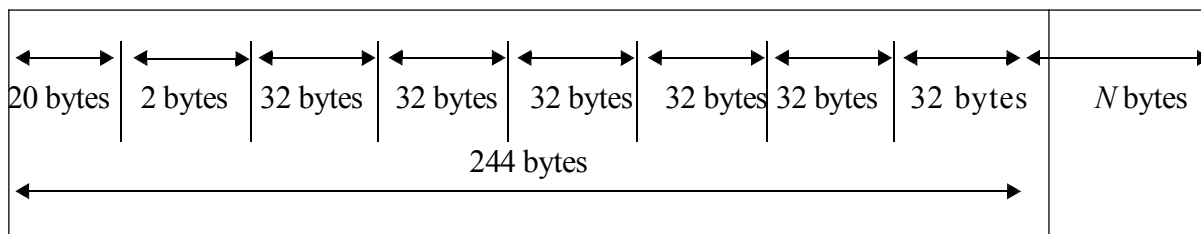
Trace data black Structure

2.2.1 Trace Headers

Byte No.	Number of Bytes	Data Type	Value	Description
1-2	2	bcd	XXXX	Four-digit file number (0-9999) if file nb > 9999, set to FFFF and *Extended File Num* is used.
3	1	bcd	01	Scan Type Number
4	1	bcd	XX	Channel Set Number
5-6	2	bcd	XXXX	Trace Number
7-9	3	bin	XXXX	First Timing Word
10	1	bin	7	Trace Header Extension
11	1		0	Sample skew
12	1	bin	XX	Trace edit00　No edit applied. 02　Muted or dead prior to acquisition.
13-15	3	bin	XXXX.XX	Time break window
16-17	2		0	Extended channel set number
18-20	3		XXXXXX	Extended file number

2.2.2 Extension Headers#1 (SEG-D 1.0)

Byte No.	Number of Bytes	Data Type	Value	Description
1-3	3	bin	XXXXXX	Receiver Line Number
4-6	3	bin	XXXXXX	Receiver Point Number
7	1	bin	XX	Receiver point index
8-10	3	bin	XXXXXX	Number of samples per trace
11-15	5		0x0	Extended Receiver Line number
16-20	5		0x0	Extended Receiver Point number

Byte No.	Number of Bytes	Data Type	Value	Description
21	1	bin	XX	Sensor Type recorded on this Trace. (not to be mistaken for the "Sensor Type Number" recorded in Trace Header Extension block # 2)
22-32	11		0	Not used.

Extension Headers#1 (SEG-D rev 2.1)

Byte No.	Number of Bytes	Data Type	Value	Description
1-3	3	bin	0xFFFFFF	Receiver Line Number
4-6	3	bin	0xFFFFFF	Receiver Point Number
7	1	bin	XX	Receiver point index
8-10	3	bin	XXXXXX	Number of samples per trace
11-15	5	dbl	XXXXXX.xx	Extended Receiver Line number
16-20	5	dbl	XXXXXX.xx	Extended Receiver Point number
21	1	bin	XX	Sensor Type recorded on this Trace. (not to be mistaken for the "Sensor Type Number" recorded in Trace Header Extension block # 2)
22-32	11		0	Not used.

2.2.3 Extension Headers#2

Byte No.	Number of Bytes	Data Type	Value	Description
1-8	8	dbl	XXXXXXXX	Receiver point easting
9-16	8	dbl	XXXXXXXX	Receiver point northing
17-20	4	flt	XXXX	Receiver point elevation
21	1	bin	XX	Sensor Type Number, (1 to 9) (not be mistaken for the "Sensor Type Recorded on this Trace " recorded in Trace Header Extension block # 1).
22-24	3		0	Not used
25-28	4	bin	XXXX	DSD identification No.
29-32	4	bin	XXXX.	Extended Trace Number

2.2.4 Extension Headers#3

Byte No.	Number of Bytes	Data Type	Value	Description
1-8	8	bin	XXXXXXXX	TB GPS Time in microseconds
9-10	2	bin	XXXX	TB offset in microseconds
12-32	22			Not Used

2.2.5 Extension Headers#4

Byte No.	Number of Bytes	Data Type	Value	Description
1-32	32		0	Not used

2.2.6 Extension Headers#5

Byte No.	Number of Bytes	Data Type	Value	Description
1-32	32		0	Not used

2.2.7 Extension Headers#6

Byte No.	Number of Bytes	Data Type	Value	Description
1	1	bin	0	Unit type
2-5	4	bin	XXXXXXXX	Unit serial number
6	1	bin	X	Channel number
7-32	26		0	Not used (0)

2.2.8 Extension Headers#7

Byte No.	Number of Bytes	Data Type	Value	Description
1-32	32	bin	0	Not used

3 Format of RG&CG

As DTCC can supply Receiver Gather and Continuous Gather as the final data format to the client, the RG and CG have the same format to the SG, but some item on the SEGD header have different meaning, below show the

mainly different items:

3.1 File Headers

General Header#1		
12-13	Julian day, 3 digits (1-366)	If the gather type is RG, the time information is the first shot's time break that use this receiver points; if the gather type is CG the left item is the time information that the node start to acquisition.
14-16	1st shot point or time slice UTC time (HHMMSS)	
General Header#3		
4 - 8	Source Line Number	Represents "Receiver information" when the gather type of the file is CG or RG.
9-13	Source Point Number	
14	Source Point Index	
Extended Header		

3.2 Trace Headers

Extension Headers#1		
1-3	Receiver Line Number	If the gather type is RG, the information is the Source points; If the gather type is CG the left items are all 0.
4-6	Receiver Point Number	
7	Receiver point index	
11-15	Extended Receiver Line number	
16-20	Extended Receiver Point number	
Extension Headers#2		
1-8	Receiver point easting	If the gather type is RG, the position information is the Source points; If the gather type is CG the left items are all 0.
9-16	Receiver point northing	
17-20	Receiver point elevation	