Technical Report Profile KTB 1984 Line 3

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1. Introduction

This is the technical description of the KTB 1984 Line 3 seismic reflection data. The original PHX and SEGY format descriptions and the applied transcription rules (enclosed documents) are attached to this report in the Appendix. These documents might help the experienced user to follow the details of the transcription process from the original PHX tape format to the provided SEGY disk format:

- Barry et al., (1975) Recommended Standards for Digital Tape Formats' - Official SEG-Y technical standard description, revision 0
- SCC/SSL Manual: implemented 'SEGY' Tape Format Description
- SSC/SSL Manual: 'PHXI' Phoenix 'I' Tape Format Description
- SSC/SSL Manual: 'PHX F' Phoenix FamilyTape Format Description
- SSC/SSL Manual, Internal Disk File (IDF) Format Description
- Applied transcription table PHX → SEGY (phx-ordered)
- Applied transcription table PHX → SEGY (segy-ordered)

When using the data please cite:

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2. General

The folder **KTB8403_Data** contains all seismic data and corresponding meta data as well as additional information like, e.g. high-resolution graphic representations of final processing results. All data are based on the original processing carried out at the former DEKORP Processing Centre (DPC) at the Geophysical Institute of the Technical University Clausthal, Germany (Stiller & Thomas, 1989). The seismic data were originally stored on ½-inch 9-track magnetic tapes in PHXF or PHXI trace format as output from the SSC/SSL seismic processing package used at that time. In recent years these tapes have been step-by-step transcribed to SEGY disk files to allow for handling the data with any actual soft- and hardware. The attached format description files (see Appendix B) describe in detail the structure of (1) the SEGY format according to the SEG standard, of (2) the PHXF, PHXI and IDF formats according to the SSC/SSL software manual and (3) the applied conversion tables from PHX to SEGY.

All provided SEGY files are IEEE-32bitFP rev0 with proper binary header and with lots of remapped PHX header entries in addition to the regular ones. In the following, a complete and for all SGY-files identical remapping list is given, however not all of these headers are always filled with values for all files. The template is in Landmark ProMAX format, i.e. *header name, description, Integer/float format, , byte start*. This allows an easy remapping definition for the SEGY input routine of any other software:

```
                          SEG-Y Reel Header
C1: Additional remapped header info (mnemonic,description,format,,byte start/)
lrno,  record index number,            2i,  ,  127/
lrtr,  record index trace number,      2i,  ,  129/
dtst,  trc static correction 1 (datum), 2i,  ,  213/
deds,  trc stat. correct.2 (weathering),2i,  ,  215/
lgta,  trace static correction 3 (bulk),2i,  ,  217/
nspn,  nearest SPON above cdp,         2i,  ,  209/
elac,  elevation nearest loc above CDP, 2i,  ,  203/
dlac,  datum nearest loc above CDP,    2i,  ,  207/
dsac,  depth of shot nearest this CDP,  2i,  ,  151/
utsa,  uphole tim shot nearest this CDP,2i,  ,  153/
avsr,  averag elev all src+rcv this CDP,2i,  ,  205/
rclc,  receiver loc no for this trc,    4i,  ,  185/
stno,  source loc no for this trc,      4i,  ,  181/
flg1,  32bit-flgwrd this trc(bit  1-16),2i,  ,  237/
flg2,  32bit-flgwrd this trc(bit 17-32),2i,  ,  239/
intc,  inverse trace counter within CDP,2i,  ,  211/
nu01,  unassigned (azimuth),           2i,  ,  227/
slac,  nearest surface loc above CDP,   4i,  ,  189/
muls,  multiplex skew,                 2i,  ,  139/
tsns,  trc set nos (scantyp+chn set no),2i,  ,  229/
auts,  some type of automatic statics,  2i,  ,  235/
cstr,  unassigned (CDP residual stat),  2i,  ,  223/
nu03,  unassigned (src residual statics,2i,  ,  219/
nu04,  unassigned (rcv statics),       2i,  ,  221/
nu06,  unassigned,                     2i,  ,  224/
cnts,  copy number of trace,           2i,  ,  231/
ptrn,  original IPN no,                2i,  ,  133/
ausn,  ascii user assigned src no,      4i,  ,  141/
atri,  ascii special trc grp identifier,4i,  ,  145/
olnt,  original line no of this trc,    2i,  ,  233/
cdpx,  CDP bin x coordinate,           4i,  ,  193/
cdpy,  CDP bin y coordinate,           4i,  ,  197/
cd3x,  cdp bin code x,                 2i,  ,  135/
cd3y,  cdp bin code y,                 2i,  ,  137/
suel,  surface elevation over cdp,      2i,  ,  201/
fldr,  float. datum elev for receiver,  2i,  ,  155/
dsrl,  depth of src at receiver loc,    2i,  ,  149/
fs20,  format specific,                2i,  ,  131/
** converted from SSL/PHX xxx_yyyy.IDF to SGY, GFZ Potsdam, dd.mm.yyyy **
```

2.1. Folder structure KTB8403_Data

SeismicData	MainData	PreStack	FFsorted		
			CDPsorted		
		PostStack	FinalStacks_unmigrated	without_coherency	without_summation
					with_summation
				with_coherency	without_summation
					with_summation
				LineDrawings	
			FinalStacks_migrated	without_coherency	without_summation
					with_summation
				with_coherency	without_summation
					with_summation
				LineDrawings	
	AdditionalData	BruteStacks	unmigrated		
			migrated		
		Misc	SpecialProcessing …		

GraphicData	MainData	FinalStacks
		FinalMigrations
		AtlasData
	AdditionalData	BruteProc
		Misc

MetaData	Geometry	Sources
		Receivers
		CDPs
		Relation
		Misc
	SurveyData	FieldReport
		Maps
		Statics
		Misc
	Misc	

In a PDF document in the **KTB8403_Data** parent folder all files contained in the subfolders are again listed together with additional information for a full overview.

3. Seismic Data

The seismic trace data are divided into **MainData** and **AdditionalData**. The main data are the ones most likely required for further evaluation, the additional data are old versions or special processing attempts and will be added step by step later on.

The seismic main data are divided into **PreStack** and **PostStack** data. The pre-stack data are well suited for an entire reprocessing, the final post-stack data to get a structural overview or for reinterpretation.

In the MainData/PreStack subfolder **FFsorted** there is a set of SGY files, each single one is a 1:1 transcription of a FF-sorted (FieldFile) magnetic tape from the respective original processing. The records may extend via two consecutive files. If the order of input during import is correct, the final dataset will contain sorted ensembles with increasing FF numbers, each with increasing channel numbers. The file names are consistently structured like xxx_yyyy.idf.segy where the xxx means a sequentially increasing tape index number within the respective processing stage (in this case ascending FF/Chan-sorted ensembles, unprocessed, without geometry information in the trace headers) from tape 1-38. The CDP geometry can be easily assigned to the FF-sorted data, either via ASCII-to-Header import using the values provided with the metadata, or by resorting the CDP-sorted data back into FF/Chan order. The yyyy is the unique original tape label number, idf is the source format (SSL-PHX Internal Disk Format). A PDF document in the parent folder lists all SGY files again together with additional Information.

In the MainData/PreStack subfolder **CDPsorted** there is a set of SGY files, each single one of which is a 1:1 transcription of a CDP-sorted (CommonDepthPoint) magnetic tape from the respective original processing (crooked-line geometry based on smoothed line through the midpoint scatter points). Again, the gathers may extend via two consecutive files. If the order of input during import is correct, the final dataset will contain sorted ensembles with increasing CDP numbers, each with increasing Offset (Source-Receiver distance). The file names are again structured like xxx_yyyy.idf.segy where the xxx means a sequentially increasing tape index number within the respective processing stage (in this case ascending CDP/Offset-sorted ensembles, unprocessed except bad trace elimination, but with all geometry information in the trace headers) from tape 1-9. The yyyy is the unique original tape label number, idf the source format (SSL-PHX Internal Disk Format). The PDF document in the parent folder lists again all SGY files again together with additional information.

All information that is necessary for recording geometry definition should be already present in the headers (source-/receiver-/CDP locations/coordinates/elevations/static corrections, shot/channel numbers, offsets etc.), so it should be easily possible to set up a matching database by extracting them accordingly.

In the MainData/**PostStack** folder there are SGY files with the results from the final processing carried out at the DPC, they are arranged in subfolders according to the respective poststack processing stage, i.e. **unmigrated** or **migrated, without** or **with** additional **coherency** enhancement, **without** or **with** additional trace **summation** of 2 adjacent traces to reduce the number of traces, and last not least automatic **LineDrawings**. Again, each single one is a 1:1 transcription of the corresponding magnetic tape from the respective original processing. They are always CDP-sorted and structured like xxx_yyyy.idf.segy where the xxx means a sequentially increasing tape index number, if several versions exist. The yyyy is the unique original tape label number, idf is the source format (SSL-PHX Internal Disk Format). The PDF document in the parent folder lists all SGY files again together with additional information.

Some SGY files come with an additional text file of the same name (but with the extension *.his instead of *.segy). Each of these so-called “history” files contains the entire processing history of the same-named SGY file by accumulation of protocols and processing parameters from all processes applied to the respective dataset. The syntax for these 80-column ASCII rows corresponds to the punch card coding of the SSC/SSL seismic software used for the original data processing. Even if no corresponding manual for a detailed explanation is at hand, most of the coding is self-explaining for an experienced operator.

4. Graphic data

The folder **GraphicData** contains graphic representations of the seismic data results. The originally in high-resolution prepared raster files for Versatec VR222, Calcomp CC442 and Geospace GS64 camera plotter were transcribed to PNG which can be displayed with all common graphic viewers that are able to handle images with 25 000 pixels and more. In general, the images come with top label (showing profile-km, topography, geology etc) and with side label (showing field parameter, processing parameter etc.). In some cases, the images are horizontally split into 2 or 3 overlapping fractions which can be easily merged together.

The GraphicData folder structure is analogous to the SeismicData folder and subdivided into MainData and AdditionalData. The GraphicData/**MainData** folder contains in the subfolders **FinalStacks**, **FinalMigrations** and **AtlasData** the different DPC final results in different graphic scales including the sections depicted in the DEKORP Atlas (Meissner & Bortfeld, 1990). Into the GraphicData/**AdditionalData** subfolder, images of old versions or special processing attempts will be added step by step later on.

File name structure is similar to the seismic data files: xxx_yyyy.ras2pbm.png, where the xxx is a sequentially increasing tape index number, if several versions exist, yyyy is the unique original tape label number and ras2pbm indicates the conversion from the original raster source via the portable bitmap.pbm into the png.format. The PDF document in the parent folder lists all PNG files again together with additional information.

5. Metadata

In the folder **MetaData** there is accompanying information to the seismic data. The subfolder **SurveyData** contains scans of the original (PRAKLA) field report including appendices, as well as the original location maps and the original evaluation of field static corrections. The scans might be overlapping and have not been merged together as they are slightly distorted by the optical scanning procedure from blueprints. Unfortunately, everything is in German language, but they are hopefully of help nevertheless.

In the subfolder **Geometry** there are ASCII tables with all source-/receiver-/CDP-location/-coordinates/-elevation, spread and static information, just in case, that for one or the other file something, e.g. the CDP coordinates, might be missing in the trace headers and have to be externally imported. The tables for **Receivers**, **Sources**, **CDP**s, the **Relation** describing the actually active spread and **Misc** (like additional particulars like static corrections if not included in the other files) are self-explaining by the first comment line in each file. The coordinates are given in the rectangular Gauß-Krüger system (Bessel ellipsoid), the used abbreviations are LOCN (geophone location), SPON (shotpoint order number), SLOC (source location), NSPON (nearest SPON to CDP), NLOC (nearest LOCN to CDP) and VEL (either weathering layer velocity or main refractor velocity in m/s). For import into maps or GIS the CDP line is additionally given in geographic coordinates (Longitude, Latitude, WGS84) in ASCII and kml format. The PDF document in the parent folder lists all Metadata files again together with additional information.

The field parameters are compiled in ***Table 1*** and the processing sequence in ***Table 2*** in Appendix A.

6. References

Barry, K.M.; Cavers, D.A.; Kneale, C.W. (1975) Report on Recommended Standards for Digital Tape Formats. Geophysics, 40/2, pp 344-352. http://doi.org/10.1190/1.1440530

Meissner, R. & Bortfield, R.K. (Eds.) (1990). DEKORP-Atlas – Results of Deutsches Kontinentales Reflexionsseismisches Programm. Springer Press, https://doi.org/10.1007/978-3-642-75662-7

Stiller M. & Thomas, R. (1989). Processing of reflection-seismic data in the DEKORP Processing Center, Clausthal. In: Emmermann, R. & Wohlenberg, J. (Eds). The German Continental Deep Drilling Program (KTB). Springer Press, pp 177-232. https://doi.org/10.1007/978-3-642-74588-1_9

7. Appendix A

7.1. *Table 1:* Field parameter summary and geometry dimensions

General information	**Recorded**	September 1984
	by	Prakla-Seismos AG
	for	Geological Survey of Lower Saxony, Germany
	Area	South-western Baden-Wuerttemberg
	Profile length / direction / azimuth	61.68 km / E – W / 10.20761 °
	Total data amount	2.31 GB
Recording	**Recording system**	Sercel SN 348 / MTA-11
	Sample interval	4 ms
	No. of channels	200
	Field filter	Low-cut 12.5 Hz / 12 dB High-cut 62.5 Hz / 72 dB
	Noise reduction	Automatic noise-mute before correlation
	Correlation	with filtered sweep
	Recording format	SEG-B
	Sweep + listening time / recording time	20 s + 12 s = 32 s (uncorrelated) / 12 s (correlated)
Receivers	**Geophone type**	SM 4 (10 Hz)
	Geophones per group	24
	Receiver array	In-line array
	Group spacing	80 m
	Spread length	16 km
	No. of geophone points	786
Sources	**Source type**	Vibroseis (p-waves)
	No. of vibrators	5*VVDA (each 14.1 tons, 84.5 kN peak-force)
	Sweep length / range	20 s / 12 – 48 Hz
	Pattern length	146 m
	Vertical stacking rate	12-fold
	Recording configuration	Symmetrical split-spread (8120 – 200 – VP – 200 – 8120 m)
	Source point spacing	80 m
	No. of source points	571
CDPs	**Coverage (theor. / real)**	100- / 74-fold
	CDP-spacing	40 m
	No. of CDPs	1543
	Final datum	300 m a.s.l.

Geometry dimensions

	Record	**Location**	**X coordinate**	**Y coordinate**	**Longitude**	**Latitude**
			Gauss-Krueger (Bessel, Potsdam)		**Decimal degree (WGS84)**	
Source	2	1001	3481790.	5360831.	8.75311990	48.38504099
	574	1782	3421922.	5350314.	7.94687653	48.28590839
Receiver	1	1001	3481824.	5360854.	8.75357794	48.38524881
	786	1786	3421641.	5350270.	7.94309889	48.28547805
CDP	2002	1002	3481733.	5360815.	8.75235105	48.38489546
	3544	1784	3421765.	5350293.	7.94476522	48.28570019

7.2. *Table 2:* Processing sequence summary

Process	Parameter
Demultiplexing	with Gain Removal
Output 1	*FF-sorted*
CDP Sort	Crooked-Line (with Bad Trace Elimination)
Output 2	*CDP-sorted*
Analytic Gain	Spherical Divergence (T*exp[0.66*T] down to 3.45 s TWT)
Muting	Offset-dependent (from 8 analyses, maximum 3 s TWT at 8 km offset)
Static Correction	to Floating Datum
Dynamic Correction	NMO velocities with 7 analyses (Constant Velocity Stacks with 15 CDPs and 28 test velocities)
Static Correction	to Final Datum (300 m a.s.l.)
Scaling	Random Gain Control (1200 ms time window, 800 ms shift)
CDP Stack	all traces (offsets -8 to 8 km, ~74-fold)
Bandpass Filter	Ormsby 7 – 13 – 35 – 50 Hz
Scaling	Horizontal Trace Equalisation
Output 3 a ***Output 3 b***	*Final Stack* *Final Stack with summation of 2 adjacent traces*
Output 4 a ***Output 4 b***	*Final Stack with Coherency Enhancement (11 traces, 800 ms window, max. dip 9 ms/trace)* *Final Stack with Coherency Enhancement and Summation of 2 adjacent traces*
Output 5	*Final Stack with Automatic Line-Drawing*
Resampling	to 8 ms
Migration	Finite-Differences Method with depth interval 40 ms, Vel_{mig} derived from smoothed Vel_{rms}
Output 6 a ***Output 6 b***	*Final Migration* *Final Migration with summation of 2 adjacent traces*
Output 7 a ***Output 7 b***	*Final Migration with Coherency Enhancement (21 traces, 400 ms window, max. dip 10 ms/trace)* *Final Migration with Coherency Enhancement and Summation of 2 adjacent traces*
Output 8	*Final Migration with Automatic Line-Drawing*

8. Appendix B

Original PHX and SEGY format descriptions and the applied transcription rules

8.1. Barry et al., (1975) Recommended Standards for Digital Tape Formats (Official SEG-Y technical standard description, rev0)

This document has been converted from the original publication:
Barry, K. M., Cavers, D. A. and Kneale, C. W., 1975, Report on recommended standards for digital tape formats: Geophysics, 40, no. 02, 344-352.

RECOMMENDED STANDARDS FOR DIGITAL TAPE FORMATS[1]

K. M. BARRY[2], D. A. CAVERS[3], AND C. W. KNEALE[4]

INTRODUCTION

Recently, a new demand for demultiplexed formats has arisen in the seismic industry due to the utilization of minicomputers in digital field recording systems, and because of a growing need to standardize an acceptable data exchange format.

In 1973 a subcommittee of the SEG committee on Technical Standards was organized to gather information and develop a nine-track, ½-inch tape, demultiplexed format for industry acceptance. Guidelines set for this new format were based on prior work and on the SEG Exchange Tape Format (Northwood et. al, 1967). As a result of the subcommittee's effort based on suggestions from industry personnel, the following demultiplexed format recommendations are made.

The present SEG Exchange Tape Format is often referred to as the SEG "Ex" Format. Because of this, it is recommended that the new demultiplexed format be designated the "SEG Y Format." The Technical Standards committee has elected to withdraw support of the SEG "Ex" Format.

The SEG Y Format was developed for application to computer field equipment and in the present data processing center with flexibility for expansion as new ideas are introduced. Current information for standardization is placed in the "fixed" portion of the format, while new ideas can be added to the unassigned portions later as expansion becomes necessary.

It is assumed that this format will accommodate the majority of field and office procedures and the techniques presently utilized.

FORMAT SPECIFICATION

The following general information describes the recommended demultiplexed format (Figure 1):

1) Tape specifications, track dimensions and numbering, and all other applicable specifications shall be in accordance with IBM Form GA 22-6862 entitled "IBM 2400-Series Magnetic Tape Units Original Equipment Manufacturers' Information".

At the present time, IBM has proposed an American National Standard for the 6250 CPI group coded recording format. Should this format be used within the geophysical industry, the applicable IBM specifications would apply. The additional formatting required by this proposed method is a function of the hardware and thus becomes transparent to the user.

2) Either the NRZI encoded data at 800-bpi density, or the phase encoded (PE) data at 1600-bpi density may be used for recording.
3) All data values are written in two's complement except the 320bit floating point format, Figure 3-A, which is sign, characteristic, and fractional part.
4) Data values are written in eight-bit bytes with vertical parity odd.

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[1]
This report is the work of the Subcommittee on Demultiplexed Field Tape Formats of the SEG Technical Standards Committee. Manuscript received by the Editor October 7, 1974.

[2] Subcommittee Chairman, Teledyne Exploration, Houston. Tex. 77036.
[3] Subcommittee Member, Gulf Research & Development Co., Houston, Tex. 77036.
[4] Subcommittee Member, Texas Instruments Inc., Houston, Tex. 77001.

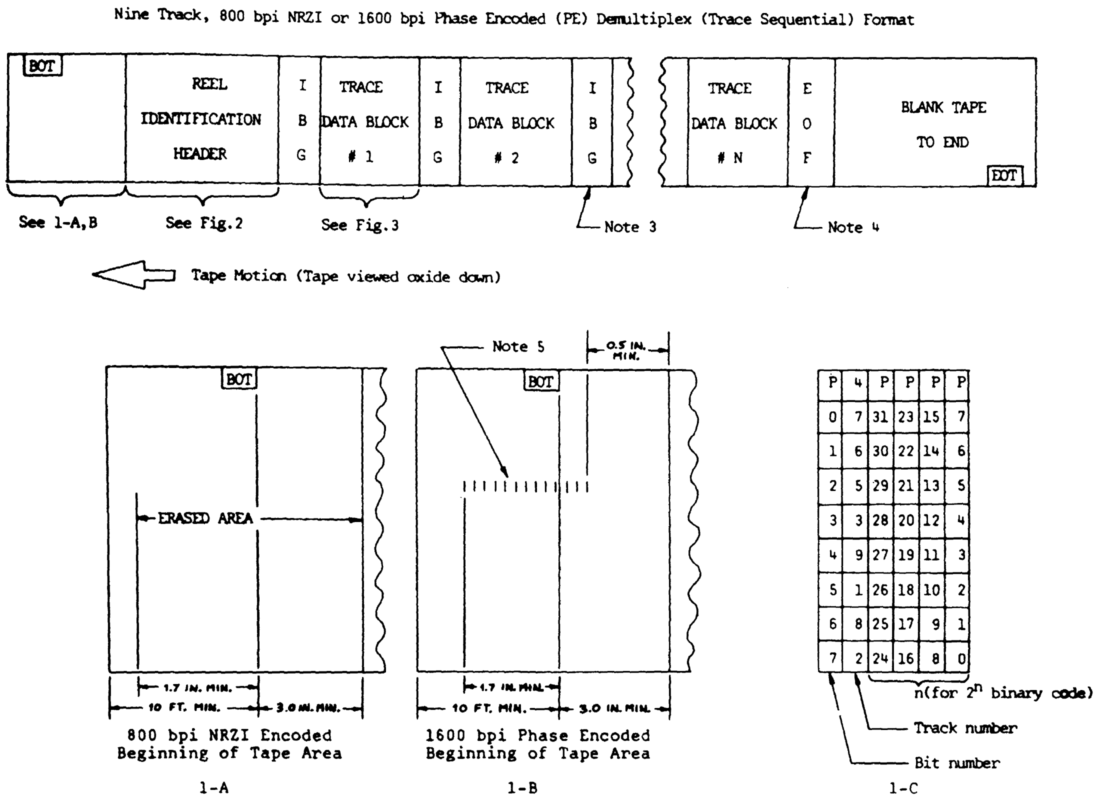
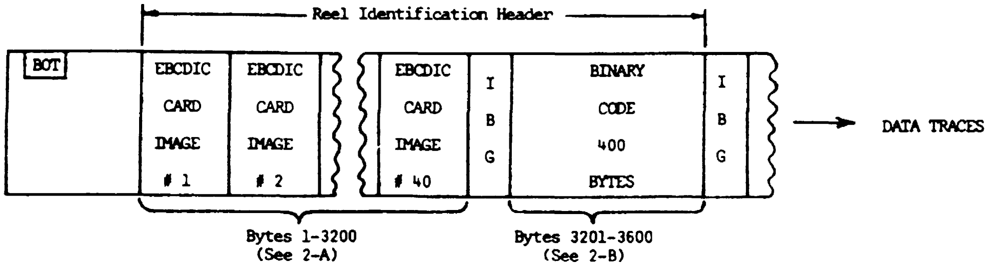


Fig. 1. Recommended demultiplexed format.

Notes:

1. **Preamble-Proceeds each of the 45 blocks within the reel identification header and. each trace data block when 1600 bpi PE is used. Consists of 40 all-zero bytes followed by one all-ones byte.**
2. **Postamble-Follows each of the 45 blocks within the reel identification header and each trace data block when 1600 bpi PE is used. Consists of one all-ones byte followed by 40 all-zero bytes.**
3. **Interblock Gap (IBG)-Consists of 0.6" nominal, 0,5" minimum.**
4. **End of file (EQF)-Consists of an IBG followed by:**
   a) **PE tape mark having 80 flux reversals at 3200 fci in bit numbers F,0,2,5,6, and 7. Bits 1,3, and 4 are dc-erased, or**
   b) **NRZI tape mark having two bytes with one bits in bit numbers 3,6, and 7 separated by seven all-zero bytes**
5. **PE Identification Burst-Consists of 1600 flux reversals per inch in bit number P; all other tracks are erased.**

5) Definitions:
   a) *Interblock gap (IBG)* – Consists of erased tape for a distance of 0.6 inches nominal, 0.5 inches minimum.
   b) *End of file (EOF)* – Consists of the 800-bpi NRZI tape mark or the 1600-bpi tape mark character, as appropriate, preceded by a standard IBG.
   c) *Erased tape* – The tape is magnetized, full width, in a direction such that the rim end of the tape is a north-seeking pole. The read-back signal from such an area shall be less than 4 percent of the average signal level at 3200 flux reversals per inch.
   d) *PE identification burst* – Consists of 1600 flux reversals per inch in bit number P with all other traces DC erased. This burst is written beginning at least 1.7 inches before the trailing edge of the beginning of tape (BOT) reflective marker and continuing past the trailing edge of the marker, but ending at least 0.5 inches before the first block.
   e) *Block* – Continuous recorded information, preceded and followed by a standard IBG. In PE (1600 bpi), a preamble precedes each block and a postamble follows each block.
   f) *Preamble* – Consists of 41 bytes, 40 of which contain zero bits in all tracks; these



2-A EBCDIC CARD IMAGES Free form coding, left justified – 40 card images, 80 bytes per card, card image numbers 23-39 unassigned, for optional information.

are followed by a single byte containing one bits in all tracks.

g) *Postamble* – Consists of 41 bytes of which the first byte contains one bits in all tracks; it is followed by 40 bytes containing zero bits in all tracks.

h) *Two's complement* – Positive values are the true binary number. Negative values are obtained by inverting each bit of the positive binary number and adding one (1) to the least significant bit position.

6) The seismic reel is divided into the reel identification header and the trace data blocks. The reel identification header section contains identification information pertaining to the entire reel and is subdivided into two blocks, the first containing 3200 bytes of EBCDIC card image information (equivalent of 40 cards) and the second consisting of 400 bytes of binary information. These two blocks of the reel identification header are separated from each other by an IBG. Each trace data block contains a trace identification header and the data values of the seismic channel or auxiliary channels. The reel identification header and the first trace data block are separated by an IBG.

7) Each seismic-trace data block is ungapped and is written in demultiplexed format with each trace data block being separated from the next by an IBG. The last trace data block on the reel is followed by one (or more) EOF>

8) When recorded 800 bpi (NRZI), the first block of the reel identification header begins at least 3.0 inches past the trailing edge of the BOT marker.
9) The following conventions pertain to the reel and trace identification headers:
   a) All binary entries are right justified. All EBCDIC entries are left justified.
   b) All times are in milliseconds with the exception of the sample interval which is designated in microseconds.
   c) All frequencies are in hertz.
   d) All frequency slopes are in dB/octave.
   e) All distances (lengths) are in feet or meters, and these systems are not mixed within a reel. The distance or measurement system used is specified in card image 7 and in bytes 3255-3256 of the reel identification header.
   f) A scaler may be applied to certain distance measurements where greater precision is required. See bytes 69-70 and 71-72 of the trace identification header.
   g) The energy source and geophone group coordinates designated in bytes 73-88 of the

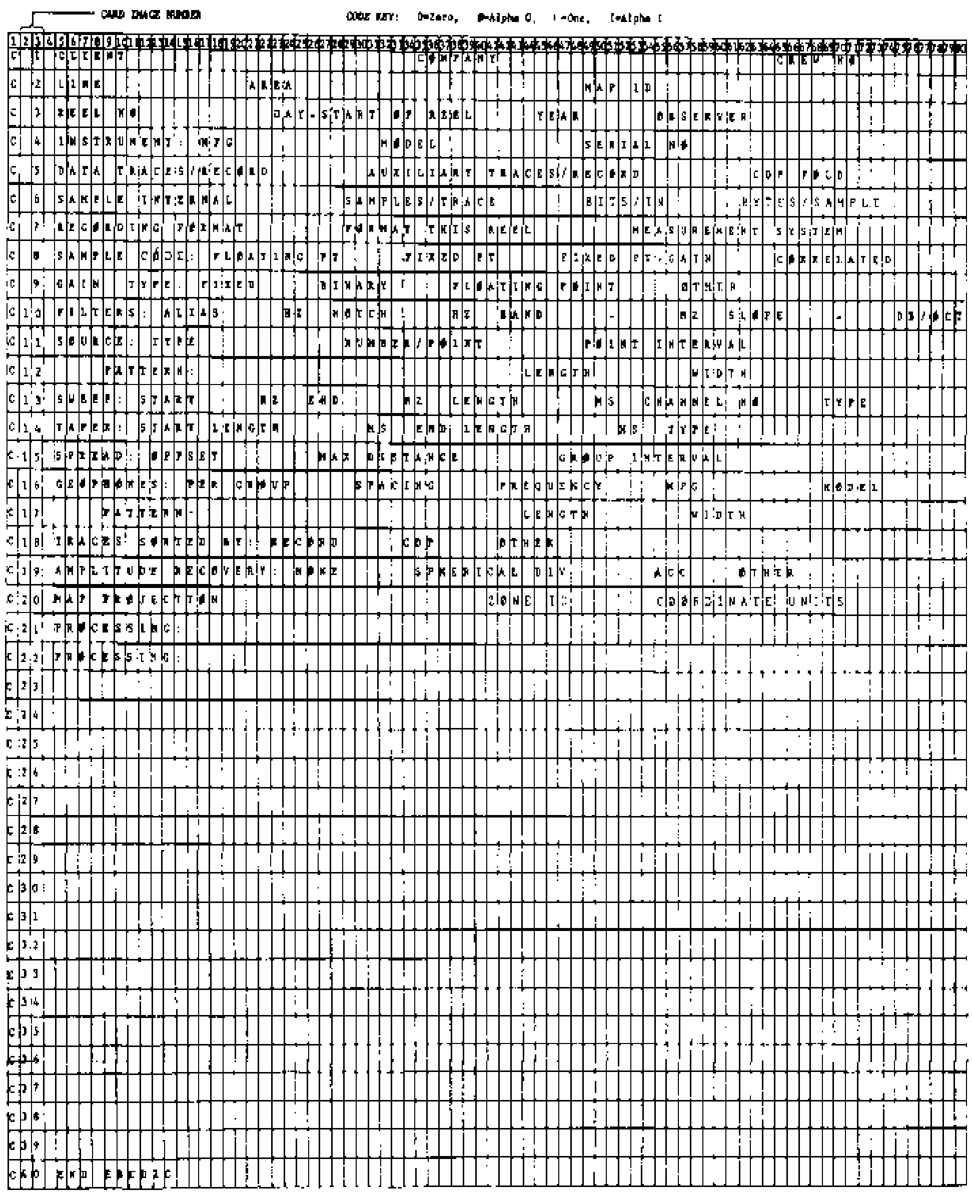


Fig. 2A. Reel identification header. Part 1, the EBCDIC card image block.

trace identification header can be measured in either length or latitude and longitude. The measurement unit used is specified in bytes 89-90 of the trace header. For the latitude/longitude system, the coordinate values are expressed in seconds of arc.

h) All velocities are in feet per second or meters per second, and these units are not mixed within a reel.

i) Elevation is represented by "+" above "—" below mean sea level.

10) The binary coded information convention is defined in Figure 1-C.

DESCRIPTION OF REEL IDENTIFICATION HEADER

The reel identification header (Figure 2) consists of 3600 bytes and is divided into two parts:

1) The card image EBCDIC block (3200) bytes— 40 cards equivalent) followed by an IBG.
2) The binary coded block (400 bytes) followed by an IBG.

The EBCDIC part of the reel header describes the data from a line of shotpoints in a fixed specified format consisting of 40 card images with each image containing 80 bytes. All unused card image characters are EBCDIC Blank. Card image numbers 23 through 39 are unassigned for optional use. Each card image should contain the character "C" in the first card column. Each 80 bytes would yield one line of format print to produce the form shown in Figure 2-A.

The binary coded section of the reel header consists of 400 bytes of information common to the seismic data on the related reel as shown in Figure 2-B. There are 60 bytes assigned; 340 are unassigned for optional use.

There are certain bytes of information that may not apply to a particular recording or processing procedure. It is strongly recommended that bytes designated with an asterisk (*) in Figures 2-B and 3-E always contain the required information

The data in the reel identification header could be printed and edited prior to the actual input of seismic data for processing. A complete header listing of both the EBCDIC and binary parts would accompany an exchange tape and serve as a table of contents and summary of specifications for that reel* of seismic data. No more than one line of seismic data is permitted on any one reel. Additional reels would be used for long lines, and each reel must start with a reel identification header.

DESCRIPTION OF THE TRACE DATA BLOCK

Each trace data block (Figure 3) consists of a fixed 240-byte trace identification header and the seismic trace data block is separated from the next by an IBG. The trace header is written in binary code (refer to Figure 1-C for the binary code information) and is detailed in Figure 3-E.

The trace data samples can be written in one of the four data sample formats described in Figures 3-A, 3-B, 3-C, and 3-D. The trace data format for each reel is identified in bytes 3225-3226 of the reel identification header. Only one data sample format is permitted within each reel.

Figure 3-A details a 32-bit, floating point format in which each data value of a seismic channel is recorded in four successive bytes, in IBM compatible floating point notation as defined in IBM Form GA 22-6821.

The four bytes form a 32-bit word consisting of the sign bit Q_S, a seven-bit characteristic Q_C, and a 24-bit fraction Q_F. Q_S indicates signal polarity and is a one for a negative value. Q_C signifies a power of 16 expressed in excess 64 binary notation allowing both negative and positive powers of 16 to be represented by a true number. Q_F is a six hexadecimal digit (24 amplitude recovery can be described in the binary bit) number with a radix point to the left of the significant digit. The data value represented by a floating point number is

$$\mathbf{Q_S \ X\ 16^{(O\ C—64)}\ X\ Q_F}$$

Figure 3-B details a 32-bit, fixed point format and each data value of a seismic channel is recorded in four successive bytes. This format consists of a sign bit $\mathbf{Q_S}$ (one represents negative) and 31 data bits $\mathbf{Q_D}$ with a radix point at the right of the least significant digit.

Figure 3-C represents a 16-bit, fixed point format, and each data value of a seismic channel is recorded in two successive bytes. This format is similar to figure 3-B except there are 15 data bits $\mathbf{Q_D}$.

Figure 3-D represents a 32-bit, fixed point format with gain values. The first byte of this format is all zeros. The second byte provides eight available gain bits 2^0 through 2^7. The last two bytes are identical to Figure 3-C.

In all four data formats, the channel or trace data should represent the absolute input voltage at the recording instrument. The 32-bit, floating point field format defined as the SEG C (Meiners et al, 1972) comprehends the input voltage level. The fixed point formats 3-B and 3-C require a trace weighting factor (trace identification header, bytes 169-170), defined as 2^{-n} volts for the least significant bit, to comprehend the absolute input voltage level.

In cases where processing parameters such as amplitude recovery are present, the type of amplitude recovery can be described in the appropriate reel identification header sections, and the algorithm described in the unassigned portions.

CONCLUSION

Individual oil companies and contractors may be convinced of their own format's merits, but the use of this recommended exchange demultiplexed format must be given serious consideration in order to achieve some level of industry standardization. Such thought and many suggestions from users have been utilized in establishing a flexible format that yields specifics and can be used by all companies in the industry.

Adoption and use of this format will save substantial sums of money in computer time and programming effort in the future.

ACKNOWLEDGEMENTS

Grateful appreciation goes to many companies and individuals for their suggestions at the start of the subcommittees' work and for their final recommendations. We are also for the assistance of Fred Tischler, Texas Instruments, who was the original subcommittee chairman.

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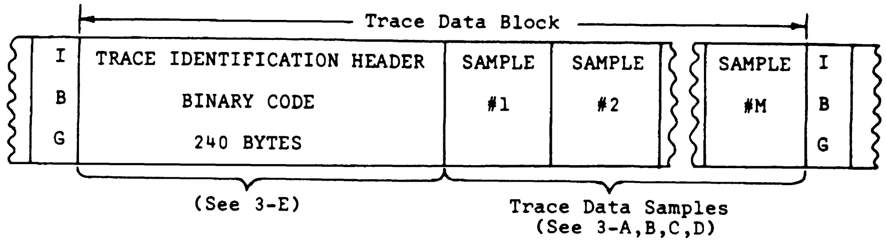
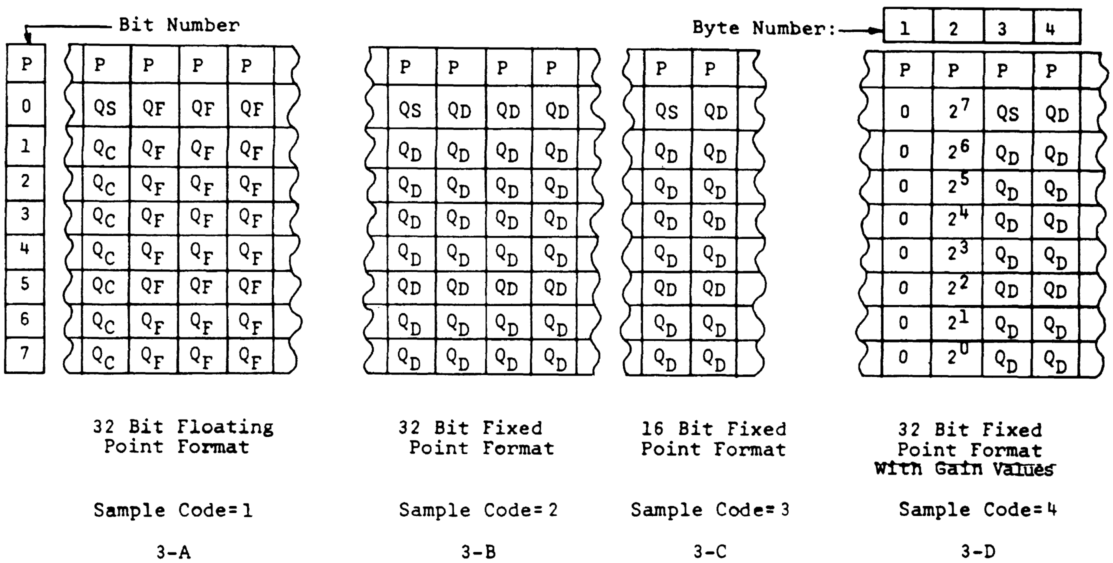
Northwood E. J., Wisinger, R. C., and Bradley J. J., 1967, Recommended standards for digital tape formats: Geophysics, v. 32, p. 1073-1084.



TRACE DATA SAMPLE FORMATS



32 Bit Floating Point Format	32 8it Fixed Point Format	16 Bit Fixed Point Format	32 Bit Fixed Point Format with Gain Values
Sample Code=1 3-A	Sample Code=2 3-B	Sample Code=3 3-C	Sample Code=4 3-D

<u>NOTE</u>: Least significant bit is always in bit position 7 of byte 4 (or byte 2 for 3-C).

Q_S = Sign bit
Q_C = Characteristic
Q_F = Fraction
Q_D = Data bits

FIG. 3A-D. Trace data block. Four data sample options.

2-B. BINARY CODE-Right justified

Byte Numbers		Description		
3201-3204		Job identification number.		
3205-3208	*	Line number (only one line per reel).		
3209-3212	*	Reel number.		
3213-3214	*	Number of data traces per record (includes dummy and zero traces inserted to fill out the record or common depth point).		
3215-3216	*	Number of auxiliary traces per record (includes sweep, timing, gain, sync, and all other nondata traces).		
3217-3218	*	Sample interval in µsec (for this reel of data).	Designated in microseconds to accommodate sample intervals less than one millisecond.	
3219-3220		Sample interval in µsec (for original field recording).		
3221-3222	*	Number of samples per data trace (for this reel of data).		
3223-3224		Number of samples per data trace (for original field recording).		
3225-3226	*	Data sample format code:	1 = floating point (4 bytes) 2 = fixed point (4 bytes.)	3 = fixed point (2 bytes) 4 = fixed point w/gain code
		Auxiliary traces use the same number of bytes per sample. (4 bytes)		
3227-3228	*	CDP fold (expected number of data traces per CDP ensemble).		
3229-3230		Trace sorting code:	1 = as recorded (no sorting) 2 = CDP ensemble	3 = single fold continuous profile 4 = horizontally stacked
3231-3232		Vertical sum code:	1 = no sum, 2 = two sum, ..., N = N sum (N = 32,767)	
3233-3234		Sweep frequency at start.		
3235-3236		Sweep frequency at end.		
3237-3238		Sweep length (msec).		
3239-3240		Sweep type code:	1= linear 2= parabolic	3 = exponential 4 = other
3241-3242		Trace number of sweep channel.		
3243-3244		Sweep trace taper length in msec at start if tapered (the taper starts at zero time and is effective for this length).		
3245-3246		Sweep trace taper length in msec at end (the ending taper starts at sweep length minus the taper length at end).		
3247-3248		Taper type:	1 = linear 2 = cos2	3 = other
3249-3250		Correlated data traces:	1 = no	2 = yes
3251-3252		Binary gain recovered:	1 = yes	2 = no
3253-3254		Amplitude recovery method:	1 = none 2 = spherical divergence	3 = AGC 4 = other
3255-3256		Measurement system:	1 = meters	2 = feet
3257-3258		Impulse signal Polarity	1 = Increase in pressure or upward geophone case movement gives negative number on tape. 2 = Increase in pressure or upward geophone case movement gives positive number on tape.	
3259-3260		Vibratory polarity code:	Seismic signal lags pilot signal by:	
		1 =	337.5° to 22.5°	
		2 =	22.5° to 67.5°	
		3 =	67.5° to 112.5°	
		4 =	112.5° to 157.5°	
		5 =	157.5° to 202.5°	
		6 =	202.5° to 247.5°	
		7 =	247.5° to 292.5°	
		8 =	292.5° to 337.5°	
3261-3600		Unassigned – for optional information.		

*Strongly recommended that this information always be recorded.

Byte Numbers	Description		
1 - 4	* Trace sequence number within line--numbers continue to increase if additional reels are required on same line.		
5 - 8	Trace sequence number within reel--each reel starts with trace number one.		
9 –12	* Original field record number.		
13-16	* Trace number within the original field record.		
17-20	Energy source point number--used when more than one record occurs at the same effective surface location.		
21-24	CDP ensemble number		
25-28	Trace number within the CDP ensemble--each ensemble starts with trace number one.		
29-30	* Trace identification code:		
	1 = seismic data	4 = time break	7 = timing
	2 = dead	5 = uphole	8 = water break
	3 = dummy	6 = sweep	9---- N = optional use (N = 32,767)
31-32	Number of vertically summed traces yielding this trace. (1 is one trace, 2 is two summed traces, etc.)		
33-34	Number of horizontally stacked traces yielding this trace. (1 is one trace, 2 is two stacked traces, etc.)		
35-36	Data use: 1 = production. 2 = test.		
37-40	Distance from source point to receiver group (negative if opposite to direction in which line is shot).		
41-44	Receiver group elevation; all elevations above sea level are positive and below sea level are negative.		
45-48	Surface elevation at source.		
49-52	Source depth below surface (a positive number).		
53-56	Datum elevation at receiver group.		
57-60	Datum elevation at source.		
61-64	Water depth at source.		
65- 68	Water depth at group.		
69-70	Scaler to be applied to all elevations and depths specified in bytes 41-68 to give the real value. Scaler = 1, +10, +100, +1000, or +10,000. If positive, scaler is used as a multiplier; if negative, scaler is used as a divisor.		
71-72	Scaler to be applied to all coordinates specified in bytes 73-88 to give the real value. Scaler = 1, +10, +100, +1000, or +10,000. If positive, scaler is used as a multiplier: if negative, scaler is used as divisor.		
73-76	Source coordinate - X.	If the coordinate units are in seconds of arc, the X values represent longitude and	
77-80	Source coordinate - Y.	the Y values latitude. A positive value designates the number of seconds east of	
81-84	Group coordinate - X.	Greenwich Meridian or north of the equator and a negative value designates the number	
85-88	Group coordinate - Y.	of seconds south or west.	
89-90	Coordinate units: 1 = length (meters or feet). 2 = seconds of arc.		
91-92	Weathering velocity.		
93-94	Subweathering velocity.		
95-96	Uphole time at source.		
97-98	Uphole time at group.		
99-100	Source static correction.		
101-102	Group static correction.		
103-104	Total static applied. (Zero if no static has been applied,)		

FIG. 3E. Trace identification header written in binary code.

Byte Numbers	Description
105-106	Lag time A. Time in ms. between end of 240-byte trace identification header and time break. Positive if time break occurs after end of header, negative if time break occurs before end of header. Time break is defined as the initiation pulse which may be recorded on an auxiliary trace or as otherwise specified by the recording system.
107-108	Lag Time B. Time in ms. between time break and the initiation time of the energy source. May be positive or negative.
109-110	Delay according time. Time in ms. between initiation time of energy source and time when recording of data samples begins. (for deep water work if data recording does not start at zero time.)
111-112	brute time--start.
113-114	Mute time--end.
115-116	* Number of samples in this trace.
117-118	* Sample interval in µsec for this trace.
119-120	Gain type of field instruments: 1 = fixed. 2 = binary. 3 = floating point. 4 --- N = optional use.
121-122	Instrument gain constant.
123-124	Instrument early or initial gain (dB).
125-126	Correlated: 1 = no. 2 = yes .
127-128	Sweep frequency at start.
129-130	Sweep frequency at end.
131-132	Sweep length in ms.
133-134	Sweep type: 1 = linear. 2 = parabolic. 3 = exponential. 4 = other.
135-136	Sweep trace taper length at start in ms.
137-138	Sweep trace taper length at end in ms.
139-140	Taper type: 1 = linear. 2 = cos2. 3 = other.
141-142	Alias filter frequency, if used.
143-144	Alias filter slope
145-146	Notch filter frequency, if used.
147-148	Notch filter slope.
149-150	Low cut frequency, if used .
151-152	High cut frequency, if used .
153-154	Low cut slope
155-156	High cut slope
157-158	Year data recorded .
159-160	Day of year.
161-162	Hour of day (24 hour clock)
163-164	Minute of hour.
165-166	Second of minute.
167-168	Time basis code: I = local. 2 = GMT. 3 = other.
169-170	Trace weighting factor--defined as 2-N volts for the least significant bit. (N = 0, 1, ... 32, 767.)
171-172	Geophone group number of roll switch position one.
173-174	Geophone group number of trace number one within original field record .
175-176	Geophone group number of last trace within original field record.
177-178	Gap size (total number of groups dropped).
179-180	Overtravel associated with taper at beginning or end of line: I = down (or behind). 2 = up (or ahead).
181-240	Unassigned—for optional information.

* Strongly recommended that this information always be recorded.

FIG. 3E. Trace identification header written in binary code (cont.)

9.1. SCC/SSL Manual: implemented 'SEGY' Tape Format Description

'SEGY' SEGY TAPE FORMAT

TRACE HEADER

Note: FS - Format Specific (SEGY - SEGY) words not lost.

Trace Driver Mnemonics	SEGY	PHXF	Description
TSNL	1,2	112,113	Process Trace Counter
FS02	3,4	96,97	Reel Trace Counter
FFNO	5,6	5	Field File Number
FFTR	7,8	6	Field File Trace Number
ESPN	9,10	3	Energy Source Point Number
CDPN	11,12	1,2	CDP Number
CDPT	13,14	4	CDP Trace Number
SYID	15	118	Flag Word
FS03	16	98,99	
NHST	17	14	Fold After Stack
FS04	18	100,101	
ADIS	19,20	43,44	Distance
FS05	21,22	102,103	
FS06	23,24	104,105	
DSAC	25,26	18	Depth of the Shot Nearest CDP
FS07	27,28	106,107	
FS08	29,30	108,109	
FS09	31,32	110,111	
FS10	33,34	124,125	
FS11	35	126,127	Value = 1
FS12	36	128,129	Value = 1
SCOX	37,38	60,61	Source X Coordinate
SCOY	39,40	62,63	Source Y Coordinate
RECX	41,42	64,65	Receiver X Coordinate
RECY	43,44	66,67	Receiver Y Coordinate
FS13	45	130,131	
FS14	46	132,133	
FS15	47	134,135	
UTSA	48	19	Uphole time of the shot nearest this CDP
FS16	49	136,137	
FS17	50	138,139	(See Note below)
DEDS	51	11	Trace Static Number 2, Weathering (See Note below)
LGTA	52	12	Trace Static Number 3, Bulk (See Note below)
FS18	53,54	140,141	
TFS	55	13	Time of First Sample

Note: FS17, DEDS, LGTA, see the Static Value Conversion Table.

Trace Driver Mnemonics	SEGY	PHXF	Description
FS19	56	142,143	
FS20	57	144,145	
FS21	58	146,147	Processing Samples (Tape Common Block)
FS22	59	148,149	Sample Rate (Tape Common * 1000)
FS23	60	150,151	Value = 1
FS24	61	152,153	
FS25	62	154,155	
FS26	63	156,157	
FS27	64	158,159	
FS28	65	160,161	
FS53	66	195	
FS54	67	196	
FS57	68	199	
FS58	69	200	
FS61	70	203	
FS62	71	204	
FS63	72	205	
FS66	73	208	
FS67	74	209	
FS38	75	180	
FS39	76	181	
FS40	77	182	
FS41	78	183	
FS42	79	184	
DAYR	80	35	Day of Year data was recorded
HRDY	81	36	Hour of Day
MNHR	82	37	Minute of Hour
SCMN	83	38	Second of Minute
FS43	84	185	
FS44	85	186	
FS45	86	187	
FS46	87	188	
FS47	88	189	
FS48	89	190	
FS49	90	191	
INTC	91	27	Inverse Trace Counter Within CDP
FS50	92	192	
FS51	93	193	
FS52	94	194	
FS29	95,96	162,163	
FS30	97,98	164,165	
FS55	99	197	
FS56	100	198	
FS31	101,102	166,167	
FS32	103,104	168,169	
FS59	105	201	
FS60	106	202	

Trace Driver Mnemonics	SEGY	PHXF	Description
FS33	107,108	170,171	
FS34	109,110	172,173	
LRNO	111	7	Record Index Number
LRTR	112	8	Record Index Trace Number
FS35	113,114	174,175	
FS64	115	206	
FS65	116	207	
FS36	117,118	176,177	
FS37	119,120	178,179	

Static Value Conversion Table

SEGY Wd 50	SEGY Wd 51	SEGY Wd 52	Conditions	PHXF Wd 10	PHXF Wd 11	PHXF Wd 12	PHXF Word 25 Statics Applied Bit 5	Bit 6	Bit 7
50	51	52	52=50+51 and 52≠0	This	0	52	0	0	1
50	51	52	52=50 and 52≠0	word	50	51	0	1	0
50	51	52	52=51 and 52≠0	is	51	50	0	1	0
50	51	52	52=0	always	0	50+51	0	0	0
50	51	52	52≠50+51, 52≠0, 52≠0, 52≠51, 50≠0 OR 51≠0, AND 52 < 50+51	zero	50+51 -52	52	0	0	1
50	51	52	52≠50+51, 52≠0, 52≠50, 52≠51 AND (50=51=0 OR 52 > 50+51)		50+51	52	0	0	1

This table describes the handling of statics words when converting 'SEGY' to 'PHXF' format.

50 = the value in SEGY trace header word 50

51 = the value in SEGY trace header word 51

52 = the value in SEGY trace header word 52

'PHXF' Word 25

PHXF Bit 5	PHXF Bit 6	PHXF BIT 7	to	SEGY Wd 50	SEGY WD 51	SEGY Wd 52
0	0	0		0	10+11+12	0
0	0	1		0	10+11	12
0	1	1		0	10	11+12
1	1	1		0	0	10+11+12
0	1	0		0	10+12	11
1	0	0		0	11+12	10
1	0	1		0	11	10+12
1	1	0		0	12	10+11

Description of 'SEGY' Reel Identification Header

The SEGY reel identification header consists of 3600 bytes and is divided INTO two parts:

1. The card image EBCDIC block (3200 bytes - 40 images equivalent) followed by an IRG.

2. The binary coded block (400 bytes) followed by an IRG.

SEGY EBCDIC Header

EBCDIC IMAGES: Free form coding, left justified - 40 images. 80 bytes per image - image numbers 23 - 39 unassigned, for optional information.

```
C 1 CLIENT                          COMPANY                          CREW NO
C 2 LINE             AREA                           MAP ID
C 3 REEL NO           DAY-START OF REEL     YEAR      OBSERVER
C 4 INSTRUMENT: MFG               MODEL               SERIAL NO
C 5 DATA TRACES/RECORD         AUXILIARY TRACES/RECORD          CDP FOLD
C 6 SAMPLE INTERVAL        (US) SAMPLES/TRACE        BITS/IN      BYTES/SAMPLE
C 7 RECORDING FORMAT         FORMAT THIS REEL        MEASUREMENT SYSTEM
C 8 SAMPLE CODE:                  FROM SHOT                TO SHOT
C 9 GAIN TYPE:
C10 FILTERS:
C11 SOURCE: TYPE            NUMBER/POINT        POINT INTERVAL
C12     PATTERN:                           LENGTH         WIDTH
C13 SWEEP: START     HZ  END      HZ  LENGTH        MS CHANNEL NO     TYPE
C14 TAPER: START LENGTH       MS  END LENGTH        MS  TYPE
C15 SPREAD: OFFSET         MAX DISTANCE        GROUP INTERVAL
C16 GEOPHONES: PER GROUP     SPACING      FREQUENCY     MFG          MODEL
C17      PATTERN:                          LENGTH         WIDTH
C18 TRACES SORTED BY:               PROJECT                LINE ID
C19 AMPLITUDE RECOVERY:                                      PROCESSED BY
C20 MAP PROJECTION                       ZONE ID        COORDINATE UNITS
C21 FIELD SUM        NAVIGATION SYSTEM                RECORDING PARTY
C22 CABLE TYPE                    DEPTH        SHOOTING DIRECTION
C23
C24
C25
C26
C27
C28
C29
C30
C31
C32
C33
C34
C35
C36
C37
C38
C39
C40 END EBCDIC
```

'SEGY' Binary Reel Header

The Binary header consists of 400 bytes of integer data as defined below.

Byte Numbers	Word Number	Description
*3201-3204	01	Job identification number.
*3205-3208	02	Line number (only one line per reel).
*3209-3212	03	Current reel number.
*3213,3214	lh-04	Number of data traces per record (includes dummy and zero traces inserted to fill out the record or common depth point).
3215,3216	rh-04	Number of auxiliary traces per record (includes sweep, timing, gain, sync and all other non-data traces).
*3217,3218	lh-05	Sample interval in microseconds (for this reel).
*3219,3220	rh-05	Sample interval in microseconds (original reel).
*3221,3222	lh-06	Number of samples per data trace (this reel).
*3223,3224	rh-06	Number of samples per data trace (original recording).
*3225,3226	lh-07	Data sample format code: (Auxiliary is the same). 1 = IBM floating point (32 bits or 4 bytes) 2 = 32-bit fixed point (twos compliment) 3 = 16-bit fixed point (twos compliment) 4 = Fixed point with gain (4 bytes) 5 = 36-bit Univac floating point
*3227,3228	rh-07	CDP fold (expected number of data traces per CDP ensemble), or (maximum fold).
*3229,3230	lh-08	Trace sorting code: 1 = As recorded (no sorting) 2 = CDP ensemble 3 = Single fold continuous profile 4 = Horizontally stacked
*3231,3232	rh-08	Vertical sum code: 1 = no sum, 2 = two sum, etc.
3233,3234	lh-09	Sweep frequency at start.
3235,3236	rh-09	Sweep frequency at end.
3237,3238	lh-10	Sweep length (milliseconds).
3239,3240	rh-10	Sweep type code: 1 = linear 3 = exponential 2 = parabolic 4 = other
3241,3242	lh-11	Trace number of sweep channel.
3243,3244	rh-11	Sweep trace taper length in milliseconds at start if tapered (the taper starts at zero time and is effective for this long).
3245,3246	lh-12	Sweep trace taper length in milliseconds at end (the ending taper starts at sweep length minus the taper length at end).
3247,3248	rh-12	Taper type: 1 = linear 3 = AGC 2 = (cos)**2
3249,3250	lh-13	Correlated data traces: 1 = no 2 = yes
3251,3252	rh-13	Binary gain recovered: 1 = yes 2 = no

*Note: These fields are set by the SSC TRACE DRIVER.

Byte Numbers	Word Number	Description
3253,3254	lh-14	Amplitude recovery method: 1 = none 3 = AGC 2 = spherical divergence 4 = other
*3255,3256	rh-14	Measurement system: 1 = meters, 2 = feet
3257,3258	lh-15	Impulse signal polarity: 1 = increase in pressure or upward geophone case movement gives negative number on tape. 2 = increase in pressure or upward geophone case movement gives positive number on tape.
3259,3260	rh-15	Vibratory Polarity Code: Seismic Signal loss. 1 = Pilot signal by: 337.5* to 22.5* 2 = 22.5* to 67.5* 3 = 67.5* to 112.5* 4 = 112.5* to 157.5* 5 = 157.5* to 202.5* 6 = 202.5* to 247.5* 7 = 247.5* to 292.5* 8 = 292.5* to 337.5*
*3261,3262	lh-16	Trace header length in bytes.
3263-3600	rh16- rh60	Optional information (not used at this time).

*Note: These fields are set by the SSC TRACE DRIVER.

Trace Header Layout, 'SEGY' Format

Byte Numbers	Description
1-4	* Trace sequence number within line; numbers continue to increase if additional reels are required on same line.
5-8	* Trace sequence number within reel; each reel starts with trace number one.
9-12	* Original field record number.
13-16	* Trace number within the original field record.
17-20	Energy source point number; used when more than one record occurs at at the same effective surface location.
21-24	CDP ensemble number.
25-28	Trace number within the CDP ensemble; each ensemble starts with trace number one.
29,30	* Trace identification code: 1 = seismic data 4 = time break 7 = timing 2 = dead 5 = uphole 8 = water break 3 = dummy 6 = sweep 9 to N = optional use (N=32,767)
31,32	Number of vertically summed traces yielding this trace. (1 is one trace, 2 is two summed traces, etc.)
33,34	Number of horizontally stacked traces yielding this trace. (1 is one trace, 2 is two summed traces, etc.)
35,36	Data use: 1 = production, 2 = test.
37-40	Distance from source point to receiver group (negative if opposite to direction in which line is shot).
41-44	Receiver group elevation; all elevations above sea level are positive and below sea level are negative.
45-48	Surface elevation at source.
49-52	Source depth below surface (a positive number).
53-56	Datum elevation at receiver group.
57-60	Datum elevation at source.
61-64	Water depth at source.
65-68	Water depth at group.
69,70	Scaler to be applied to all elevations and depths specified in bytes 41-68 to give the real value. Scaler = 1, ±10, ±100, ±1000, or ±10,000. If positive, scaler is used as a multiplier; if negative, scaler is used as a divisor.
71,72	Scaler to be applied to all coordinates specified in bytes 73-88 to give the real value. Scalar = 1, ±10, ±100, ±1000 or ±10,000. If positive, scaler is used as a multiplier; if negative, scaler is used as a divisor.
73-76	Source coordinate X.
77-80	Source coordinate Y.
81-84	Group coordinate X.
85-88	Group coordinate Y.

Note: If the coordinate units are in seconds of arc, the X values represent longitude and the Y values latitude. A positive value designates the number of seconds east of Greenwich Meridian or north of the equator and a negative south or west.

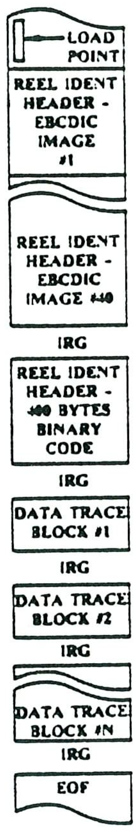
*Note: It is strongly recommended that this information always be recorded.

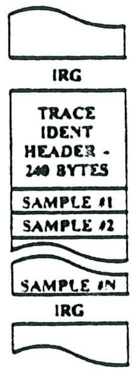
Byte Numbers	Description
89,90	Coordinate units: 1 = length (meters or feet) 2 = seconds of arc.
91,92	Weathering velocity.
93,94	Subweathering velocity.
95,96	Uphole time at source.
97,98	Uphole time at group.
99,100	Source static correction.
101,102	Group static correction.
103,104	Total static applied. (Zero if no static has been applied)
105,106	Lag Time A. Time in milliseconds between end of 240-byte trace identification header and time break. Positive if time break occurs after end of header, negative if time break occurs before end of header. Time break is defined as the initiation pulse which may be recorded on an auxiliary trace or as otherwise specified by the recording system.
107,108	Lag Time B. Time in milliseconds between time break and the initiation time of the energy source. May be positive or negative.
109,110	Delay recording time. Time in milliseconds between initiation time of energy source and time when recording of data samples begins. (For deep water work if data recording does not start at zero time.)
111,112	Mute time, start.
113,114	Mute time, end.
115,116	* Number of samples in this trace.
117,118	* Sample interval in microseconds for this trace.
119,120	Gain type of field instruments: 1 = fixed, 2 = binary, 3 = floating point, 4 to N = optional use.
121,122	Instrument gain constant.
123,124	Instrument early or initial gain (db).
125,126	Correlated: 1 = no, 2 = yes.
127,128	Sweep frequency at start.
129,130	Sweep frequency at end.
131,132	Sweep length in milliseconds.
133,134	Sweep type: 1 = linear, 2 = parabolic, 3 = exponential, 4 = other.
135,136	Sweep trace taper length at start in milliseconds.
137,138	Sweep trace taper length at end in milliseconds.
139,140	Taper type: 1 = linear, 2 = $\cos^2$, 3 = other.
141,142	Alias filter frequency, if used.
143,144	Alias filter slope
145,146	Notch filter frequency, if used.
147,148	Notch filter slope.
149,150	Low cut frequency, if used.
151,152	High cut frequency, if used.
153,154	Low cut slope.
155,156	High cut slope.
157,158	Year data recorded.

*Note: It is strongly recommended that this information always be recorded.

Byte Numbers	Description
159,160	Day of year.
161,162	Hour of day (24 hour clock).
163,164	Minute of hour.
165,166	Second of minute.
167,168	Time basis code: 1 = local, 2 = GMT, 3 = other.
169,170	Trace weighting factor - defined as 2^{-N} volts for the least significant bit. (N = 0, 1, ... 32767).
171,172	Geophone group number of roll switch position one.
173,174	Geophone group number of trace number one within original field record.
175,176	Geophone group number of last trace within original field record.
177,178	Gap size (total number of groups dropped)
179,180	Overtravel associated with taper at beginning or end of line: 1 = down (or behind), 2 = up (or ahead).
181-240	Unassigned - for optional information.

'SEGY' Tape Format





DATA TRACE BLOCK FORMAT
32-BIT IBM FLOATING POINT DATA

9.2. SSC/SSL Manual: ‘PHXI' Phoenix ‘I’ Tape Format Description

'PHXI' PHOENIX 'I' TAPE FORMAT

Trace Driver Mnemonics	External PHXI	Internal PHXF	Description
CDPN	1,2	1,2	CDP Number
ESPN	3	3	SPON
CDPT	4	4	CDP Trace Number
FFNO	5	5	Field File Number
FFTR	6	6	Field File Trace
LRNO	7	7	R.I. Number
LRTR	8	8	R.I. Trace
DIST	9	Hex 8000	Distance
DTST	10	10	Static Word 1
DEDS	11	11	Static Word 2
LGTA	12	12	Static Word 3
TFS	13	13	Time of First Sample
NHST	14	14	Fold
NSPN	15	15	SPON Above CDP
ELAC	16	16	Elevation of Nearest CDP
DLAC	17	17	Datum Elevation
DSAC	18	18	Depth of Shot
UTSA	19	19	Uphole Time
AVSR	20	20	Average Elevation
RCLC	21,22	21,22	Receiver Location
STNO	23,24	23,24	Source Location
FLG1	25	25	Flag Word
FLG2	26	26	Flag Word
INTC	27	27	Inverse Trace Counter
NU01	28	28	Unassigned
SLAC	29,30	29,30	Nearest Surface Location
MULS	31	31	Multiplex Skew
TSNS	32	32	Trace set numbers: upper byte - scan type number lower byte - channel set number
AUTS	33	33	Automatic Static
CSTR	34	34	Cost Residual Static
DAYR	35	35	Day of Year
HRDY	36	36	Hour of Day
MNHR	37	37	Minute of Hour
SCMN	38	38	Second of Minute
NU02	39	39	Unassigned
NU03	40	40	Unassigned
NU04	41	41	Unassigned
NU05	42	42	Unassigned
ADIS	43,44	43,44	Actual Distance (See Note, below)
NU06	45	45	Unassigned
CNTS	46	46	Copy Number of Trace
PTRN	47,48	47,48	Original IPN Number

Note: If 'PHXF' words 43,44 are greater or equal to 32,767, then word 9 of 'PHXI' X '8000' and Words 43,44 of 'PHXF' go to 43,44 of 'PHXI' header.

If 'PHXF' words 43,44 are less than 32,767 words, then 43,44 of 'PHXF' go to word 9 of 'PHXI' header.

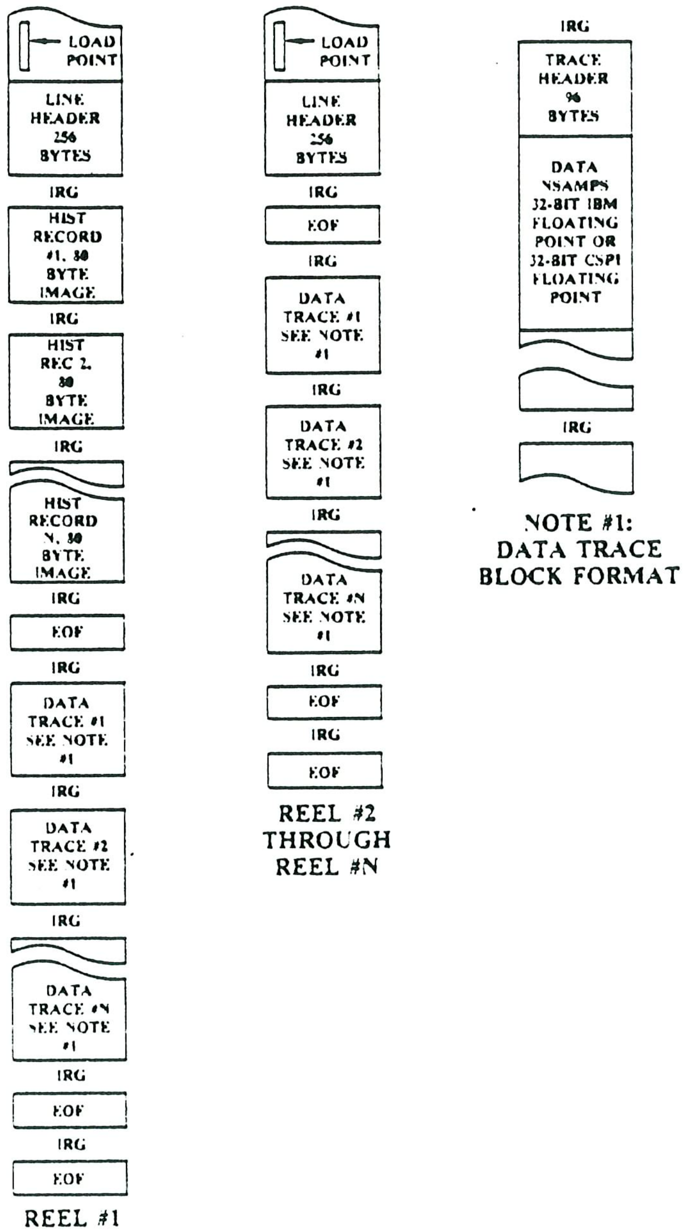
'PHXF' word 9 is always HEX 8000.

Line Header Description

The following is a description of the 'PHXI' line header. The line header is 128 16-bit words long.

Header Word	Description
1-9	Not used
10	Number of samples
11	Not used
12	Number of channels
13	Fold
14	Not used
15-18	8 character ASCII date of creation
19-21	6 character reel identification
22	Reel sequence, 1 - 32767
23	Not used
24	Data format: 4 - IBM 32-bit floating point 7 - CSPI 32-bit floating point 10 - Integer 16-bit two's complement
25,26	Floating point sampling rate, in milliseconds
27-29	Not used
30	Sampling rate in microseconds
31	Type of tape format, Value = 1
32-128	Not Used

'PHXI' PHOENIX 'I' Tape Format



9.3. SSC/SSL Manual: ‘PHXF’ Phoenix Family Tape Format Description

'PHXF' PHOENIX FAMILY TAPE FORMAT

Trace Driver Mnemonics	Trace Header Word	Description
CDPN	1,2	Common depth point number (2-D processing); assigned by geometry generation routines.
ESPN	3	Source position order number; assigned by geometry generation routines.
CDPT	4	Sequential trace number within sort group; initially assigned by geometry generation routines assuming shot ordered data, reassigned by sorting routines.
FFNO	5	Original field file number
FFTR	6	Original field file trace number
LRNO	7	Record index number; assigned by demultiplexing or reformatting routines.
LRTR	8	Record index trace number; assigned by demultiplexing or reformation routines.
DIST	9	Always X '8000'
DTST	10	Trace static correction type 1 (normally datum)
DEDS	11	Trace static correction type 2 (normally weathering)
LGTA	12	Trace static correction type 3 (normally a bulk static)
TFS	13	Time of first sample (integer milliseconds)
NHST	14	Fold of this CDP after stacking
NSPN	15	Nearest SPON above this CDP
ELAC	16	Elevation of the nearest location above this CDP
DLAC	17	Datum elevation of the nearest location above this CDP
DSAC	18	Depth of the shot nearest this CDP
UTSA	19	Uphole time of the shot nearest this CDP
AVSR	20	Average elevations of all sources and receivers contributing to this CDP.
RCLC	21,22	Receiver location number for this trace
STNO	23,24	Source location number for this trace
FLG1	25	32-bit flag word for this trace, bits 1-16 (See Note)
FLG2	26	32-bit flag word for this trace, bits 17-32 (See Note)
INTC	27	Inverse trace counter within CDP
NU01	28	Unassigned
SLAC	29,30	Nearest surface location above CDP
MULS	31	Multiplex skew (milliseconds)
TSNS	32	Trace set numbers: upper byte - Scan type number lower byte - Channel set number
AUTS	33	Some type of automatic static
CSTR	34	Unassigned
DAYR	35	Day of year data was recorded

Note: For more information refer to Section V. FLAG WORD DESCRIPTION

Trace Driver Mnemonics	Trace Header Word	Description
HRDY	36	Hour of day
MNHR	37	Minute of hour
SCMN	38	Second of minute
NU02	39	Unassigned
NU03	40	Unassigned
NU04	41	Unassigned
NU05	42	Unassigned
ADIS	43,44	Actual distance
NU06	45	Unassigned
CNTS	46	Copy number of trace
PTRN	47,48	Original IPN number
SCLR	49	Scalar to be applied to shot, receiver & bin X, Y coordinates; negative for division, positive for multipler. Allowed values 1, ± 10, ± 100, ± 1000, ± 10000 - unassigned
AUSN	50,51	ASCII user assigned source number
ATRI	52,53	ASCII special trace group identifier
TNTG	54	Trace number within special trace group
OLNT	55	Original line number of this trace; used for 3-D processing of prospects that were shot as a series of 2-D lines.
SODL	56,57	Source to original distance along line
RODL	58,59	Receiver to origin distance along line
SCOX	60,61	Source X coordinate
SCOY	62,63	Source Y coordinate
RECX	64,65	Receiver X coordinate
RECY	66,67	Receiver Y coordinate
CDPX	68,69	CDP bin X coordinate; 3-D processing
CDPY	70,71	CDP bin Y coordinate; 3-D processing
CD3X	72	CDP bin code X; 3-D portion
CD3Y	73	CDP bin code Y; 3-D portion
STAW	74,75	Stacking weight to apply to this trace (Floating Point)
SUEL	76	Surface elevation over CDP
FLEL	77	Floating datum elevation over CDP
UDEL	78	User datum elevation over CDP
SUEV	79	Surface of elevation over CMP
FLDE	80	Floating datum elevation over CMP
UDEV	81	User datum elevation over CMP
SUES	82	Surface elevation for source
FLES	83	Floating datum elevation for source
UDES	84	User datum elevation for source
SERE	85	Surface elevation for receiver
FLDR	86	Floating datum elevation for receiver
UDER	87	User datum elevation for receiver
DSSL	88	Depth of source at source location
DSRL	89	Depth of source at receiver location
UPHS	90,91	Uphole time at source location (integer milliseconds)
UPHR	92,93	Uphole time at receiver location (integer milliseconds)
ZERO	94,95	Unassigned

Trace Driver Mnemonics	Trace Header Word	Description
ZERO	96,97	Unassigned
ZERO	98,99	Unassigned
ZERO	100,101	Unassigned
ZERO	102,103	Unassigned
ZERO	104,105	Unassigned
ZERO	106,107	Unassigned
ZERO	108,109	Unassigned
ZERO	110,111	Unassigned
TSNL	112,113	Trace sequence number within line; corresponds with first four bytes in SEGY trace header.
WDSL	114	Water depth at source location
WDRL	115	Water depth at receiver location
WEVL	116	Weathering velocity at CDP
SWVL	117	Subweathering velocity at DDP
SYID	118	SEGY trace identification code: 1 = data 4 = time break 7 = timing 2 = dead 5 = uphole 8 = water break 3 = dummy 6 = sweep 9 - 32767 = user defined
COOR	119	Coordinate units: 1 = length 2 = seconds of arc (SEGY standard)
MUST	120	Mute end time (initialize to 0)
MUET	121	Mute end time
MUTT	122,123	Mute taper time in milliseconds
ZERO	124-209	Unassigned
EVNR	210	Elevation velocity at nearest Rec. to CMP
D1WR	211	Depth of 1st weathering layer at nearest rec. to CMP
D2WR	212	Depth of 2nd weathering layer at nearest rec. to CMP
SNRC	213	Static of nearest receiver to CMP
SNSC	214	Shot static of nearest SPON to CMP
RSNR	215	Residual static of nearest receiver to CMP
RSNS	216	Residual static of nearest SPON to CMP
NSP2	217	Second nearest SPON to CMP
DSN2	218	Depth of shot second nearest to CMP
SSN2	219	Shot static of second nearest to CMP
RSN2	220	Residual static of second nearest to CMP
UPT2	221	Uphole time of second nearest SPON to CMP
TSTS	222	Total static for shot
TSTR	223	Total static for receiver
TSUM	224	Actual static applied trace (not necessarily sum of TSTS + TSTR)
TMIN	225	Tmin for the trace
TMAX	226	Tmax for the trace
SHLN	227	Source point line number
RGLN	228	Receiver group line number
WCSH	229	Water/weathering correction at source
WCRE	230	Water/weathering correction at receiver
ECSH	231	Elevation correction at source
ECRE	232	Elevation correction at receiver

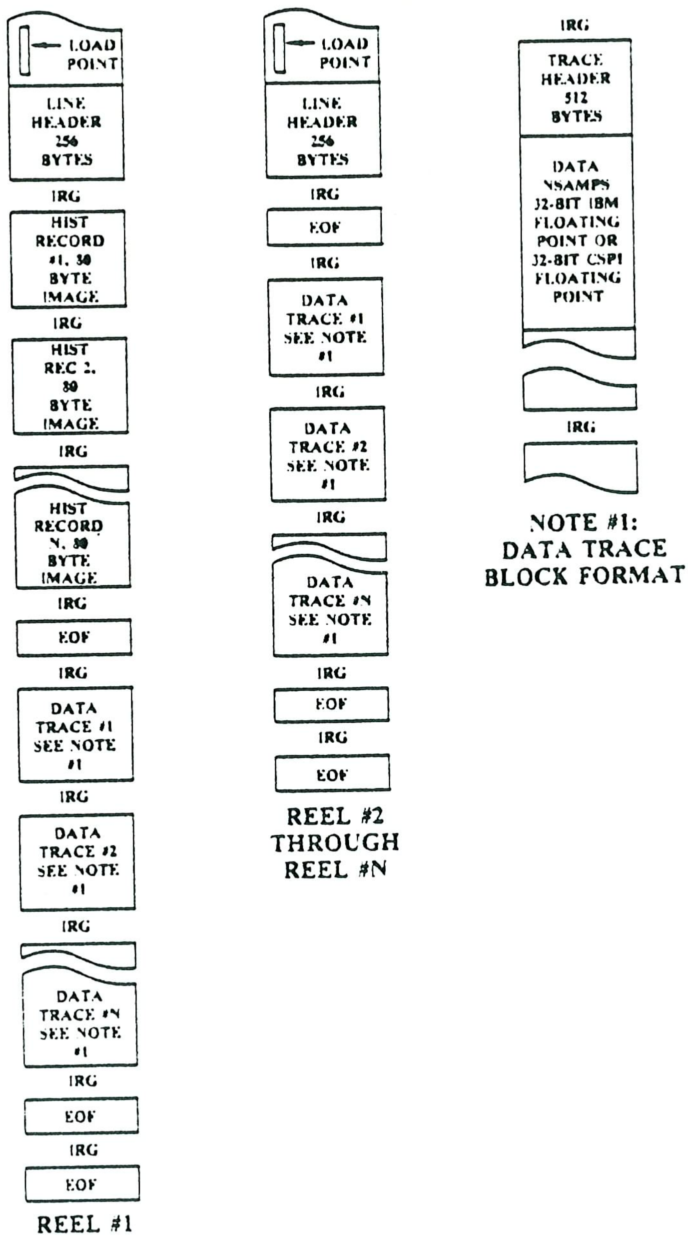
Trace Driver Mnemonics	Trace Header Word	Description
ECSH	231	Elevation correction at source
ECRE	232	Elevation correction at receiver
EVCD	233	Elevation velocity at this CMP
STSH	234	Field static (Elev. stat) for shot
STRE	235	Field static (Elev. stat) for receiver
STSC	236	Static scaler N
DMLD	237	Demultiplexer delay
DRGS	238	Depth of receiver group below surface
BLSN	239	Bin line sequence number
FIND	240,241	Format Specific - Identifier (1-16)
SWST	242,243	Source weathering static to floating datum in milliseconds
RWST	244,245	Receiver weathering static to floating datum in milliseconds
TTCD	246,247	Total trace correction to floating datum in milliseconds
TTCU	248,249	Total trace correction from floating datum in milliseconds
TSRC	250,251	Total source residual correction in milliseconds
TRRC	252,253	Total receiver residual correction in milliseconds
SFCR	254,255	Source fiducial correction
ZERO	256	Always zero

Line Header Description

The following is a description of the 'PHXF' line header. The line header is 128 16-bit words long.

Header Word	Description
1-9	Not used
10	Number of samples
11	Not used
12	Number of channels
13	Fold
14	Not used
15-18	8 character ASCII date of creation
19-21	6 character reel identification
22	Reel sequence, 1 - 32767
23	Not used
24	Data format: 4 - IBM 32-bit floating point 7 - CSPI 32-bit floating point 10 - Integer 16-bit two's complement
25,26	Floating point sampling rate, in milliseconds
27-29	Not used
30	Sampling rate in microseconds
31	Type of tape format, Value = 7
32-128	Not used

'PHXF' PHOENIX Family Tape Format



10.1. SSC/SSL Manual, Internal Disk File (IDF) Format Description

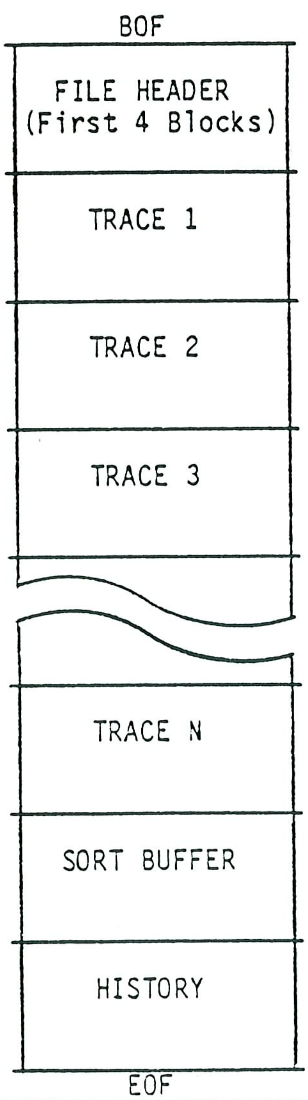
'.IDF' DISK FORMAT

Trace File Description

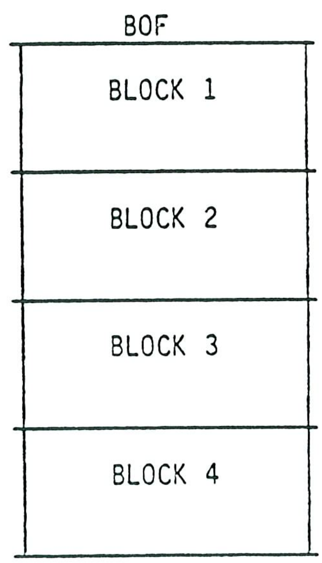
The first block of data in this disk file contains information about the data itself; number of samples, sampling increment in seconds, number of channels, maximum fold, the total number of traces put in the file, etc. Then there are three empty blocks left for future expansion if needed. After these four blocks about the data, each trace is put into the file with a 256 word header.

After all the data has been output to the file, a section is added at the end containing 24 pertinent words from each trace, used in INTRACT to read the data from the file. Finally, history blocks are added to the file if present.

TRACE FILE FORMAT:



FILE HEADER FORMAT:



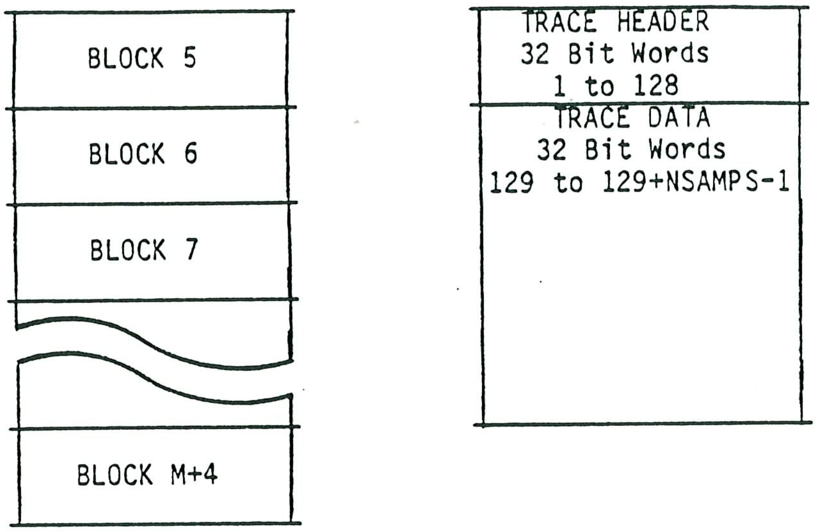
BLOCK 1 FORMAT:

Byte	Index	
1	I*4	Number of samples
5	R*4	Sample rate in milliseconds
9	I*4	Number of channels
13	I*4	Fold
17	I*4	Number of traces in file
21	I*4	Starting block of data
25	I*4	Ending block of data
29	I*4	Starting block of sort buffer
33	I*4	Ending block of sort buffer
37	I*4	Starting block of history card images
41	I*4	Ending block of history card images
45	I*4	Type of File (See Note below)
49 . . . 512		Unused

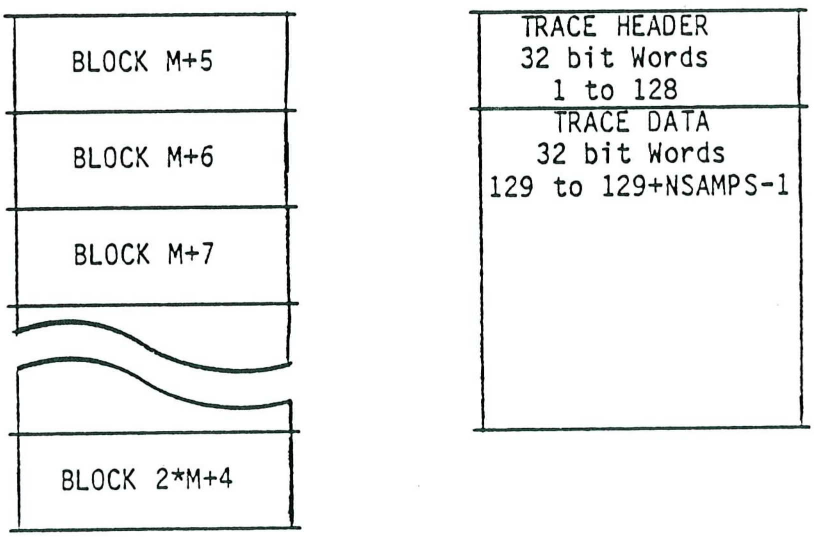
Note: Type of file:
0 = SEISMAP created file
1 = EDITIT created file
2 = DOUT option in INTRACT created file
3 = IDFCON created file
4 = Subroutine IDFFILE created file

The 16 bit Word 12 is used only for software debugging.

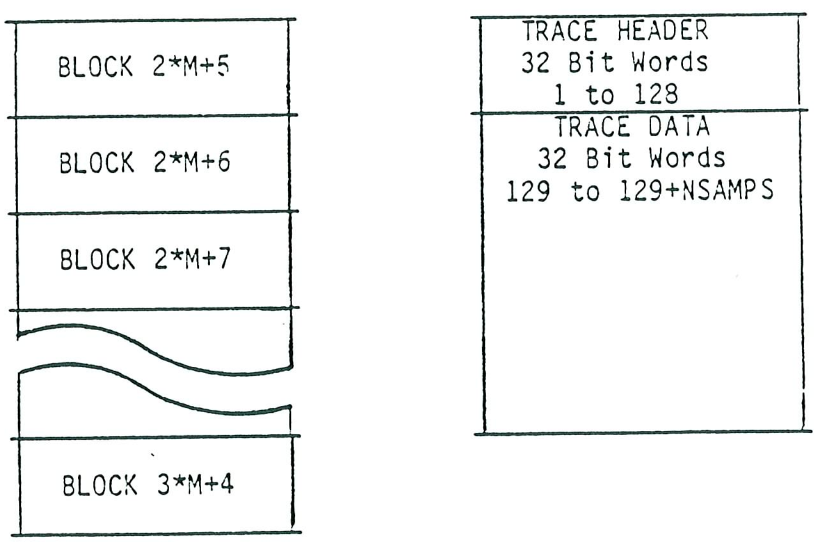
TRACE 1 FORMAT:



TRACE 2 FORMAT:



TRACE 3 FORMAT:

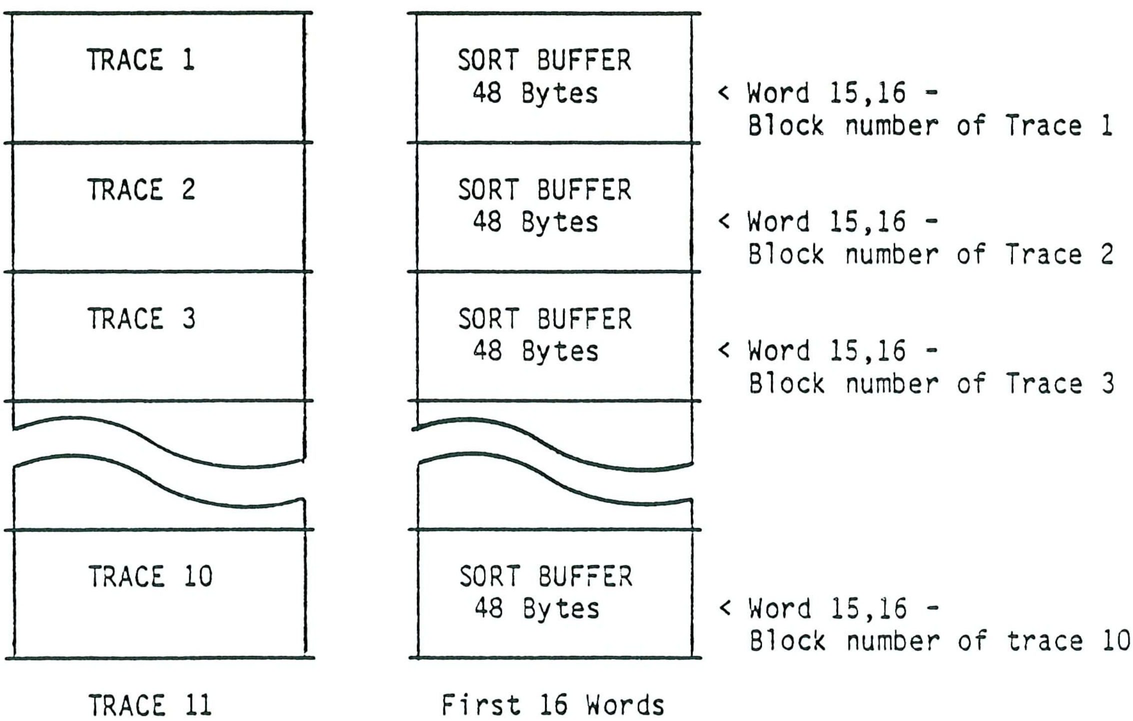


Sort Buffer Format:

The sort buffer is made up of the following 24 I*2 words for each trace.

1-2	CDPN	-	Common depth point
3	ESPN	-	Source position number
4	CDPT	-	Trace number
5	FFNO	-	Field file number
6	FFTR	-	Field file trace number
7	LRNO	-	Record index number
8	LRTR	-	Record index trace number
9,10	ADIS	-	Distance
11,12	RCLC	-	Receiver location number
13,14	STNO	-	Source location number
15,16		-	Block number of data
17	SLAC	-	Nearest surface location
18-24		-	Spare

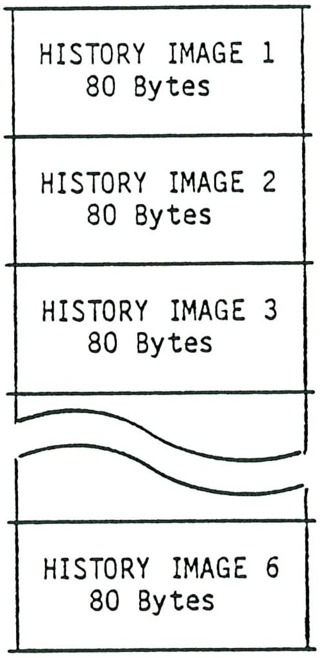
There are 10,667 sort buffers per 512 byte block.



The sort buffers are written to disk in a 24000 I*2 array, taking up 94 blocks and containing 1000 traces. Even though the 94th block is not completely filled, the 1001st trace starts in block 95 and continues through trace 2000.

History Buffer Format:

Six 80-byte records per 512 block on file.



10.2. Applied transcription table PHX → SEGY (phx-ordered)

Standard SEGY headers
Mis-used SEGY headers
Free SEGY headers

Trace Header

INDEX	OFFSET	PHXF-WORD	MNEMONIC	D E S C R I P T I O N	Trace Header SEGY-WORD	OFFSET
0	0	1,2	CDPN	Common depth point number (2-D processing)	11,12	20
1	4	3	ESPN	Source position order number	9,10	16
2	6	4	CDPT	Sequential trace number within sort group	13,14	24
3	8	5	FFNO	Original field file number	5,6	8
4	10	6	FFTR	Original field file trace number	7,8	12
5	12	7	LRNO	Record index number	64	126
6	14	8	LRTR	Record index trace number	65	128
7	16	9	DIST	Always X '8000'		
8	18	10	DTST	Trace static correction type 1 (normally datum)	107	212
9	20	11	DEDS	Trace static correction type 2 (normally weathering)	108	214
10	22	12	LGTA	Trace static correction type 3 (normally bulk static)	109	216
11	24	13	TFS	Time of first sample (integer ms)	55	108
12	26	14	NHST	Fold of this CDP after stacking	17	32
13	28	15	NSPN	Nearest SPON above this CDP	105	208
14	30	16	ELAC	Elevation of the nearest location above this CDP	102	202
15	32	17	DLAC	Datum elevation of nearest location above this CDP	104	206
16	34	18	DSAC	Depth of the shot nearest this CDP	76	150
17	36	19	UTSA	Uphole time of the shot nearest this CDP	77	152
18	38	20	AVSR	Average elevations of all sources and receivers for this CDP	103	204
19	40	21,22	RCLC	Receiver location number for this trace	93,94	184
20	44	23,24	STNO	Source location number for this trace	91,92	180
21	48	25	FLG1	32-bit flag word for this trace (bits 1-16)	119	236
22	50	26	FLG2	32-bit flag word for this trace (bits 17-32)	120	238
23	52	27	INTC	Inverse trace counter within CDP	106	210
24	54	28	NU01	Unassigned (azimuth)	114	226
25	56	29.30	SLAC	Nearest surface location above CDP	95,96	188
26	60	31	MULS	Multiplex skew (milliseconds)	70	138
27	62	32	TSNS	Trace set numbers (Scan type/Channel set number), **ISTR**	115	228
28	64	33	AUTS	Some type of automatic static	118	234
29	66	34	CSTR	Unassigned (CDP residual statics)	112	222
30	68	35	DAYR	Day of year data was recorded	80	158
31	70	36	HRDY	Hour of day	81	160
32	72	37	MNHR	Minute of hour	82	162
33	74	38	SCMN	Second of minute	83	164
34	76	39	NU02	Unassigned (src statics) **39,40 DPTR ?**	50	98
35	78	40	NU03	Unassigned (src residual statics)	110	218
36	80	41	NU04	Unassigned (rcv residual statics) **41,42 STA3 ?**	111	220
37	82	42	NU05	Unassigned (rcv statics)	51	100
38	84	43,44	ADIS	Actual distance	19,20	36
39	88	45	NU06	Unassigned	113	224
40	90	46	CNTS	Copy number of trace	116	230
41	92	47,48	PTRN	Original IPN number	67	132
42	96	49	SCLR	Scalar to be applied to shot, rec and bin X, Y coordinates	36	70
43	98	50,51	AUSN	ASCII user assigned source number	71,72	140
44	102	52,53	ATRI	ASCII special trace group identifier	73,74	144
45	106	54	TNTG	Trace number within special trace group		
46	108	55	OLNT	Original line number of this trace (3D processing of 2D lines)	117	232
47	110	56,57	SODL	Source to origin distance along line		
48	114	58,59	RODL	Receiver to origin distance along line		
49	118	60,61	SCOX	Source X coordinate	37,38	72
50	122	62,63	SCOY	Source Y coordinate	39,40	76
51	126	64,65	RECX	Receiver X coordinate	41,42	80
52	130	66,67	RECY	Receiver Y coordinate	43,44	84
53	134	68,69	CDPX	CDP bin X coordinate, 3D processing	97,98	192
54	138	70,71	CDPY	CDP bin Y coordinate, 3D processing	99,100	196
55	142	72	CD3X	CDP bin code X, 3D portion	68	134
56	144	73	CD3Y	CDP bin code Y, 3D portion	69	136
57	146	74,75	STAW	Stacking weight to apply to this trace (float)		
58	150	76	SUEL	Surface elevation over CDP	101	200
59	152	77	FLEL	Floating datum elevation over CDP		
60	154	78	UDEL	User datum elevation over CDP		

61	156	79	SUEV	Surface of elevation over CMP		
62	158	80	FLDE	Floating datum elevation over CMP		
63	160	81	UDEV	User datum elevation over CMP		
64	162	82	SUES	Surface elevation for source	23,24	44
65	164	83	FLES	Floating datum elevation for source		
66	166	84	UDES	User datum elevation for source	29,30	56
67	168	85	SERE	Surface elevation for receiver	21,22	40
68	170	86	FLDR	Floating datum elevation for receiver	78	154
69	172	87	UDER	User datum elevation for receiver	27,28	52
70	174	88	DSSL	Depth of source at source location	25,26	48
71	176	89	DSRL	Depth of source at receiver location	75	148
72	178	90,91	UPHS	Uphole time at source location (integer ms)	48	94
73	182	92,93	UPHR	Uphole time at receiver location (integer ms)	49	96
74	186	94,95	FS01	Format specific		
75	190	96,97	FS02	Format specific (**TSNR**)	3,4	4
76	194	98,99	FS03	Format specific (**NVSM**)	16	30
77	198	100,101	FS04	Format specific (follow remark below)	18	34
78	202	102,103	FS05	Format specific		
79	206	104,105	FS06	Format specific		
80	210	106,107	FS07	Format specific		
81	214	108,109	FS08	Format specific		
82	218	110,111	FS09	Format specific		
83	222	112,113	TSNL	Trace sequence number within line (SEGY bytes 1-4)		
84	226	114	WDSL	Water depth at source location (in 3D alternativ **CD3U**)	31,32	60
85	228	115	WDRL	Water depth at receiver location (in 3D alternativ **CD3V**)	33,34	64
86	230	116	WEVL	Weathering velocity at CDP	46	90
87	232	117	SWVL	Subweathering velocity at CDP	47	92
88	234	118	SYID	SEGY trace identification code (1-8)		
89	236	119	COOR	Coordinate units (1=length, 2=sec of arc)	45	88
90	238	120	MUST	Mute start time (normally 0)	56	110
91	240	121	MUET	Mute end time (initialize to 0)	57	112
92	242	122,123	MUTT	Mute taper time (ms)		
93	246	124,125	FS10	Format specific	66	130
94	250	126,127	FS11	Format specific (follow remark below)	35	68
95	254	128,129	FS12	Format specific		
96	258	130,131	FS13	Format specific		
97	262	132,133	FS14	Format specific		
98	266	134,135	FS15	Format specific		
99	270	136,137	FS16	Format specific		
100	274	138,139	FS17	Format specific		
101	278	140,141	FS18	Format specific		
102	282	142,143	FS19	Format specific		
103	286	144,145	FS20	Format specific		
104	290	146,147	FS21	Format specific (**NSMT**)		
105	294	148,149	FS22	Format specific (**ISRT**)	59	116
106	298	150,151	FS23	Format specific (follow remark below)	60	118
107	302	152,153	FS24	Format specific	61	120
108	306	154,155	FS25	Format specific	62	122
109	310	156,157	FS26	Format specific	63	124
110	314	158,159	FS27	Format specific		
111	318	160,161	FS28	Format specific		
112	322	162,163	FS29	Format specific		
113	326	164,165	FS30	Format specific		
114	330	166,167	FS31	Format specific		
115	334	168,169	FS32	Format specific		
116	338	170,171	FS33	Format specific		
117	342	172,173	FS34	Format specific		
118	346	174,175	FS35	Format specific		
119	350	176,177	FS36	Format specific		
120	354	178,179	FS37	Format specific		
121	358	180	FS38	Format specific		
122	360	181	FS39	Format specific		
123	362	182	FS40	Format specific		
124	364	183	FS41	Format specific		
125	366	184	FS42	Format specific	79	156
126	368	185	FS43	Format specific	84	166
127	370	186	FS44	Format specific	85	168
128	372	187	FS45	Format specific	86	170

129	374	188	FS46	Format specific	87	172
130	376	189	FS47	Format specific	88	174
131	378	190	FS48	Format specific	89	176
132	380	191	FS49	Format specific	90	178
133	382	192	FS50	Format specific		
134	384	193	FS51	Format specific		
135	386	194	FS52	Format specific		
136	388	195	FS53	Format specific		
137	390	196	FS54	Format specific		
138	392	197	FS55	Format specific		
139	394	198	FS56	Format specific		
140	396	199	FS57	Format specific		
141	398	200	FS58	Format specific		
142	400	201	FS59	Format specific		
143	402	202	FS60	Format specific		
144	404	203	FS61	Format specific		
145	406	204	FS62	Format specific		
146	408	205	FS63	Format specific		
147	410	206	FS64	Format specific		
148	412	207	FS65	Format specific		
149	414	208	FS66	Format specific		
150	416	209	FS67	Format specific		
151	418	210	EVNR	Elevation velocity at nearest receiver to CMP		
152	420	211	D1WR	Depth of 1st weathering layer at nearest receiver to CMP		
153	422	212	D2WR	Depth of 2nd weathering layer at nearest receiver to CMP		
154	424	213	SNRC	Static of nearest receiver to CMP		
155	426	214	SNSC	Shot static of nearest SPON to CMP		
156	428	215	RSNR	Residual static of nearest receiver to CMP		
157	430	216	RSNS	Residual static of nearest SPON to CMP		
158	432	217	NSP2	Second nearest SPON to CMP		
159	434	218	DSN2	Depth of shot second nearest to CMP		
160	436	219	SSN2	Shot static of second nearest SPON to CMP		
161	438	220	RSN2	Residual static of second nearest SPON to CMP		
162	440	221	UPT2	Uphole time of second nearest SPON to CMP		
163	442	222	TSTS	Total static for shot		
164	444	223	TSTR	Total static for receiver		
165	446	224	TSUM	Actual static applied to trace (not always sum of TSTS+TSTR)		
166	448	225	TMIN	Tmin for the trace		
167	450	226	TMAX	Tmax for the trace		
168	452	227	SHLN	Source point line number		
169	454	228	RGLN	Receiver group line number		
170	456	229	WCSH	Water/weathering correction at source		
171	458	230	WCRE	Water/weathering correction at receiver		
172	460	231	ECSH	Elevation correction at source		
173	462	232	ECRE	Elevation correction at receiver		
174	464	233	EVCD	elevation velocity at this CMP		
175	466	234	STSH	Field static (ELEVstat) for shot		
176	468	235	STRE	Field static (ELEVstat) for receiver		
177	470	236	STSC	Static scaler		
178	472	237	DMLD	Demultiplexer delay		
179	474	238	DRGS	Depth of receiver group below surface		
180	476	239	BLSN	Bin line sequence number		
181	478	240,241	FIND	Format identifier ('Tape' DF4, 1-16)		
182	482	242,243	SWST	Source weathering static to floating datum (ms)		
183	486	244,245	RWST	Receiver weathering static to floating datum (ms)		
184	490	246,247	TTCD	Total trace correction to floating datum (ms)		
185	494	248,249	TTCU	Total trace correction from floating datum to user datum (ms)		
186	498	250,251	TSRC	Total source residual correction (ms)		
187	502	252,253	TRRC	Total receiver residual correction (ms)		
188	506	254,255	SFCR	Source fiducial correction		
189	510	256	ZERO	Always zero		
				Process trace counter (renumber)	1,2	0
				Trace identification code (extract from PHX-header25 FLG1)	15	28
	additional remappings:			Data use (set to 1 if PHX-header100-101 FS04 is 0)	18	34
				Scaler for elevations and depths (set to 1 if PHX-header126-127 FS11 is 0)	35	68
				No. of samples this trace (take from PHX line header words 1,2	58	114
				Gain type (set to 1 if PHX-header150-151 FS23 is 0)	60	118

Line Header

					Binary Header	
INDEX	OfFFSET	PHXF-WORD	MNEMONIC	D E S C R I P T I O N	SEGY-WORD	OFFSET
0	18	10		Number of samples	11	20
1	22	12		Number of channels	7	12
2	24	13		Fold	14	26
3	28	15-18		8 character ASCII date of creation	106-109	164
4	36	19-21		6 character ASCII reel identification	110-117	172
5	46	24		Data format	138	274
6	48	25,26		Floating Point sample rate in milliseconds	140,141	278
7	58	30		Sampling rate in microseconds	9	16
8	60	31		Type of tape format (PHXF=7)	139	276
				Data sample format code (1 for IBM or 5 for IEEE)	13	24

SEGY output file name should be xxx_yyyy.sgy (with xxx = sequence number within tape series and yyy = unique tape number)
History output file name should be xxx.yyyy.his (with xxx = sequence number within tape series and yyy = unique tape number)

The following entries into the SEGY binary header are not used for PHX?toSEGY but are used for our existing IDFtoSEGY, so they are mentioned here only for compatibility purposes

File name xxx_yyyy.idf date size path

					Binary Header	
4	16	9,10		Number of traces in file	32,33	62
5	20	11,12		Starting block of data	34,35	66
6	24	13,14		Ending block of data	36,37	70
7	28	15,16		Starting block of sort buffer	38,39	74
8	32	17,18		Ending block of sort buffer	40,41	78
9	36	19,20		Starting block of history	42,43	82
10	40	21,22		Ending block of history	44,45	86
11	44	23,24		Type of file	46	90

From file xxx_yyyy.prt content

			Binary Header	
DAT = tt/mm/jj	8 Byte ASCII	Date of tape creation	106-109	164
TAP = Clxxxxx	8 Byte ASCII	Tape label	110-117	172
END = tt/mmm/jjjj hh:mm:ss	20 Byte ASCII	Date of idf creation	118-137	180

10.3. Applied transcription table PHX → SEGY (segy-ordered)

Standard SEGY headers
Mis-used SEGY headers
Free SEGY headers

Trace Header

Trace Header

INDEX	OFFSET	PHXF-WORD	MNEMONIC	DESCRIPTION	SEGY-WORD	OFFSET
75	190	96,97	FS02	Format specific **(TSNR)**	3,4	4
3	8	5	FFNO	Original field file number	5,6	8
4	10	6	FFTR	Original field file trace number	7,8	12
1	4	3	ESPN	Source position order number	9,10	16
0	0	1,2	CDPN	Common depth point number (2-D processing)	11,12	20
2	6	4	CDPT	Sequential trace number within sort group	13,14	24
76	194	98,99	FS03	Format specific (**NVSM**)	16	30
12	26	14	NHST	Fold of this CDP after stacking	17	32
77	198	100,101	FS04	Format specific (follow remark below)	18	34
38	84	43,44	ADIS	Actual distance	19,20	36
67	168	85	SERE	Surface elevation for receiver	21,22	40
64	162	82	SUES	Surface elevation for source	23,24	44
70	174	88	DSSL	Depth of source at source location	25,26	48
69	172	87	UDER	User datum elevation for receiver	27,28	52
66	166	84	UDES	User datum elevation for source	29,30	56
84	226	114	WDSL	Water depth at source location (in 3D alternativ **CD3U**)	31,32	60
85	228	115	WDRL	Water depth at receiver location (in 3D alternativ **CD3V**)	33,34	64
94	250	126,127	FS11	Format specific (follow remark below)	35	68
42	96	49	SCLR	Scalar to be applied to shot, rec and bin X, Y coordinates	36	70
49	118	60,61	SCOX	Source X coordinate	37,38	72
50	122	62,63	SCOY	Source Y coordinate	39,40	76
51	126	64,65	RECX	Receiver X coordinate	41,42	80
52	130	66,67	RECY	Receiver Y coordinate	43,44	84
89	236	119	COOR	Coordinate units (1=length, 2=sec of arc)	45	88
86	230	116	WEVL	Weathering velocity at CDP	46	90
87	232	117	SWVL	Subweathering velocity at CDP	47	92
72	178	90,91	UPHS	Uphole time at source location (integer ms)	48	94
73	182	92,93	UPHR	Uphole time at receiver location (integer ms)	49	96
34	76	39	NU02	Unassigned (src statics) **39,40 DPTR ?**	50	98
37	82	42	NU05	Unassigned (rcv statics)	51	100
11	24	13	TFS	Time of first sample (integer ms)	55	108
90	238	120	MUST	Mute start time (normally 0)	56	110
91	240	121	MUET	Mute end time (initialize to 0)	57	112
105	294	148,149	FS22	Format specific (**ISRT**)	59	116
106	298	150,151	FS23	Format specific (follow remark below)	60	118
107	302	152,153	FS24	Format specific	61	120
108	306	154,155	FS25	Format specific	62	122
109	310	156,157	FS26	Format specific	63	124
5	12	7	LRNO	Record index number	64	126
6	14	8	LRTR	Record index trace number	65	128
93	246	124,125	FS10	Format specific	66	130
41	92	47,48	PTRN	Original IPN number	67	132
55	142	72	CD3X	CDP bin code X, 3D portion	68	134
56	144	73	CD3Y	CDP bin code Y, 3D portion	69	136
26	60	31	MULS	Multiplex skew (milliseconds)	70	138
43	98	50,51	AUSN	ASCII user assigned source number	71,72	140
44	102	52,53	ATRI	ASCII special trace group identifier	73,74	144
71	176	89	DSRL	Depth of source at receiver location	75	148
16	34	18	DSAC	Depth of the shot nearest this CDP	76	150
17	36	19	UTSA	Uphole time of the shot nearest this CDP	77	152
68	170	86	FLDR	Floating datum elevation for receiver	78	154
125	366	184	FS42	Format specific	79	156
30	68	35	DAYR	Day of year data was recorded	80	158
31	70	36	HRDY	Hour of day	81	160
32	72	37	MNHR	Minute of hour	82	162
33	74	38	SCMN	Second of minute	83	164
126	368	185	FS43	Format specific	84	166
127	370	186	FS44	Format specific	85	168
128	372	187	FS45	Format specific	86	170
129	374	188	FS46	Format specific	87	172
130	376	189	FS47	Format specific	88	174
131	378	190	FS48	Format specific	89	176

132	380	191	FS49	Format specific	90	178
20	44	23,24	STNO	Source location number for this trace	91,92	180
19	40	21,22	RCLC	Receiver location number for this trace	93,94	184
25	56	29.30	SLAC	Nearest surface location above CDP	95,96	188
53	134	68,69	CDPX	CDP bin X coordinate, 3D processing	97,98	192
54	138	70,71	CDPY	CDP bin Y coordinate, 3D processing	99,100	196
58	150	76	SUEL	Surface elevation over CDP	101	200
14	30	16	ELAC	Elevation of the nearest location above this CDP	102	202
18	38	20	AVSR	Average elevations of all sources and receivers for this CDP	103	204
15	32	17	DLAC	Datum elevation of nearest location above this CDP	104	206
13	28	15	NSPN	Nearest SPON above this CDP	105	208
23	52	27	INTC	Inverse trace counter within CDP	106	210
8	18	10	DTST	Trace static correction type 1 (normally datum)	107	212
9	20	11	DEDS	Trace static correction type 2 (normally weathering)	108	214
10	22	12	LGTA	Trace static correction type 3 (normally bulk static)	109	216
35	78	40	NU03	Unassigned (src residual statics)	110	218
36	80	41	NU04	Unassigned (rcv residual statics) **41,42 STA3 ?**	111	220
29	66	34	CSTR	Unassigned (CDP residual statics)	112	222
39	88	45	NU06	Unassigned	113	224
24	54	28	NU01	Unassigned (azimuth)	114	226
27	62	32	TSNS	Trace set numbers (Scan type/Channel set number), **ISTR**	115	228
40	90	46	CNTS	Copy number of trace	116	230
46	108	55	OLNT	Original line number of this trace (3D processing of 2D lines)	117	232
28	64	33	AUTS	Some type of automatic static	118	234
21	48	25	FLG1	32-bit flag word for this trace (bits 1-16)	119	236
22	50	26	FLG2	32-bit flag word for this trace (bits 17-32)	120	238
7	16	9	DIST	Always X '8000'		
45	106	54	TNTG	Trace number within special trace group		
47	110	56,57	SODL	Source to origin distance along line		
48	114	58,59	RODL	Receiver to origin distance along line		
57	146	74,75	STAW	Stacking weight to apply to this trace (float)		
59	152	77	FLEL	Floating datum elevation over CDP		
60	154	78	UDEL	User datum elevation over CDP		
61	156	79	SUEV	Surface of elevation over CMP		
62	158	80	FLDE	Floating datum elevation over CMP		
63	160	81	UDEV	User datum elevation over CMP		
65	164	83	FLES	Floating datum elevation for source		
74	186	94,95	FS01	Format specific		
78	202	102,103	FS05	Format specific		
79	206	104,105	FS06	Format specific		
80	210	106,107	FS07	Format specific		
81	214	108,109	FS08	Format specific		
82	218	110,111	FS09	Format specific		
83	222	112,113	TSNL	Trace sequence number within line (SEGY bytes 1-4)		
88	234	118	SYID	SEGY trace identification code (1-8)		
92	242	122,123	MUTT	Mute taper time (ms)		
95	254	128,129	FS12	Format specific		
96	258	130,131	FS13	Format specific		
97	262	132,133	FS14	Format specific		
98	266	134,135	FS15	Format specific		
99	270	136,137	FS16	Format specific		
100	274	138,139	FS17	Format specific		
101	278	140,141	FS18	Format specific		
102	282	142,143	FS19	Format specific		
103	286	144,145	FS20	Format specific		
104	290	146,147	FS21	Format specific (**NSMT**)		
110	314	158,159	FS27	Format specific		
111	318	160,161	FS28	Format specific		
112	322	162,163	FS29	Format specific		
113	326	164,165	FS30	Format specific		
114	330	166,167	FS31	Format specific		
115	334	168,169	FS32	Format specific		
116	338	170,171	FS33	Format specific		
117	342	172,173	FS34	Format specific		
118	346	174,175	FS35	Format specific		
119	350	176,177	FS36	Format specific		
120	354	178,179	FS37	Format specific		
121	358	180	FS38	Format specific		
122	360	181	FS39	Format specific		

123	362	182	FS40	Format specific		
124	364	183	FS41	Format specific		
133	382	192	FS50	Format specific		
134	384	193	FS51	Format specific		
135	386	194	FS52	Format specific		
136	388	195	FS53	Format specific		
137	390	196	FS54	Format specific		
138	392	197	FS55	Format specific		
139	394	198	FS56	Format specific		
140	396	199	FS57	Format specific		
141	398	200	FS58	Format specific		
142	400	201	FS59	Format specific		
143	402	202	FS60	Format specific		
144	404	203	FS61	Format specific		
145	406	204	FS62	Format specific		
146	408	205	FS63	Format specific		
147	410	206	FS64	Format specific		
148	412	207	FS65	Format specific		
149	414	208	FS66	Format specific		
150	416	209	FS67	Format specific		
151	418	210	EVNR	Elevation velocity at nearest receiver to CMP		
152	420	211	D1WR	Depth of 1st weathering layer at nearest receiver to CMP		
153	422	212	D2WR	Depth of 2nd weathering layer at nearest receiver to CMP		
154	424	213	SNRC	Static of nearest receiver to CMP		
155	426	214	SNSC	Shot static of nearest SPON to CMP		
156	428	215	RSNR	Residual static of nearest receiver to CMP		
157	430	216	RSNS	Residual static of nearest SPON to CMP		
158	432	217	NSP2	Second nearest SPON to CMP		
159	434	218	DSN2	Depth of shot second nearest to CMP		
160	436	219	SSN2	Shot static of second nearest SPON to CMP		
161	438	220	RSN2	Residual static of second nearest SPON to CMP		
162	440	221	UPT2	Uphole time of second nearest SPON to CMP		
163	442	222	TSTS	Total static for shot		
164	444	223	TSTR	Total static for receiver		
165	446	224	TSUM	Actual static applied to trace (not always sum of TSTS+TSTR)		
166	448	225	TMIN	Tmin for the trace		
167	450	226	TMAX	Tmax for the trace		
168	452	227	SHLN	Source point line number		
169	454	228	RGLN	Receiver group line number		
170	456	229	WCSH	Water/weathering correction at source		
171	458	230	WCRE	Water/weathering correction at receiver		
172	460	231	ECSH	Elevation correction at source		
173	462	232	ECRE	Elevation correction at receiver		
174	464	233	EVCD	elevation velocity at this CMP		
175	466	234	STSH	Field static (ELEVstat) for shot		
176	468	235	STRE	Field static (ELEVstat) for receiver		
177	470	236	STSC	Static scaler		
178	472	237	DMLD	Demultiplexer delay		
179	474	238	DRGS	Depth of receiver group below surface		
180	476	239	BLSN	Bin line sequence number		
181	478	240,241	FIND	Format identifier ('Tape' DF4, 1-16)		
182	482	242,243	SWST	Source weathering static to floating datum (ms)		
183	486	244,245	RWST	Receiver weathering static to floating datum (ms)		
184	490	246,247	TTCD	Total trace correction to floating datum (ms)		
185	494	248,249	TTCU	Total trace correction from floating datum to user datum (ms)		
186	498	250,251	TSRC	Total source residual correction (ms)		
187	502	252,253	TRRC	Total receiver residual correction (ms)		
188	506	254,255	SFCR	Source fiducial correction		
189	510	256	ZERO	Always zero		
				Process trace counter (renumber)	1,2	0
				Trace identification code (extract from PHX-header25 FLG1)	15	28
			additional remappings:	Data use (set to 1 if PHX-header100-101 FS04 is 0)	18	34
				Scaler for elevations and depths (set to 1 if PHX-header126-127 FS11 is 0)	35	68
				No. of samples this trace (take from PHX line header words 1,2)	58	114
				Gain type (set to 1 if PHX-header150-151 FS23 is 0)	60	118

Line Header

					Binary Header	
INDEX	OfFFSET	PHXF-WORD	MNEMONIC	D E S C R I P T I O N	SEGY-WORD	OFFSET
1	22	12		Number of channels	7	12
7	58	30		Sampling rate in microseconds	9	16
0	18	10		Number of samples	11	20
2	24	13		Fold	14	26
3	28	15-18		8 character ASCII date of creation	106-109	164
4	36	19-21		6 character ASCII reel identification	110-117	172
5	46	24		Data format	138	274
8	60	31		Type of tape format (PHXF=7)	139	276
6	48	25,26		Floating Point sample rate in milliseconds	140,141	278
				Data sample format code (1 for IBM or 5 for IEEE)	13	24

SEGY output file name should be xxx_yyyy.sgy (with xxx = sequence number within tape series and yyy = unique tape number)
History output file name should be xxx.yyyy.his (with xxx = sequence number within tape series and yyy = unique tape number)

The following entries into the SEGY binary header are not used for PHX?toSEGY but are used for our existing IDFtoSEGY,
so they are mentioned here only for compatibility purposes

File name xxx_yyyy.idf date size path

					Binary Header	
4	16	9,10		Number of traces in file	32,33	62
5	20	11,12		Starting block of data	34,35	66
6	24	13,14		Ending block of data	36,37	70
7	28	15,16		Starting block of sort buffer	38,39	74
8	32	17,18		Ending block of sort buffer	40,41	78
9	36	19,20		Starting block of history	42,43	82
10	40	21,22		Ending block of history	44,45	86
11	44	23,24		Type of file	46	90

From file xxx_yyyy.prt content

			Binary Header	
DAT = tt/mm/jj	8 Byte ASCII	Date of tape creation	106-109	164
TAP = Clxxxxx	8 Byte ASCII	Tape label	110-117	172
END = tt/mmm/jjjj hh:mm:ss	20 Byte ASCII	Date of idf creation	118-137	180