BOB

UKOOA P2/86 RAW MARINE POSITIONING DATA

EXCHANGE TAPE FORMAT

VERSION 1.1

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INDEX

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EXCHANGE TAPE FORMAT

1. Introduction

This format is designed to hold raw survey data for both 2D & 3D offshore seismic surveys. The format uses a flexible coded system of records so that certain record types may be omitted entirely if they are not relevant. This allows the format to be space efficient in the face of widely differing data requirements, e.g. multi-vessel and multi-streamer surveys.

"Raw data" is deemed to be the observations taken from positioning receivers at the time of a seismic event and before the application of (C-O) corrections. However, for satellite systems, no attempt is made to cater for the observables (doppler count, pseudo-range, etc.) and provision is made simply for position derived by the satellite system from the observations. For short baseline acoustic systems which often cannot output uncorrected data, provision is made to flag whether corrections have been applied.

2. File Structure

Data is stored in a variety of 80 byte "card image" records. On a 9 track tape a file may consist of any number of these records and should be terminated by a single end of file mark. A tape may contain a number of such files and the last file should be terminated by two consecutive end of file marks.

The 9 track tape should conform to the IBM standard and the data should be stored as follows:

Density:	1600 bpi
Block size:	4000 bytes
Record size:	80 bytes
Character code:	EBCDIC

Variations to this specification may be allowed but only with the express agreement of all parties involved in a data transfer. The tape shall be labelled with the specifications of the stored data.

3. Logical File Structure

The format defines three main types of record which are identified by the first character:

H - survey header data
L - line header data
E - event data

Character positions 2-5 of these records contain a numeric code which defines the contents of the remaining 75 bytes.

Each tape file must start with a complete set of the relevant survey header records. The data for any number of seismic lines may then follow as long as all the survey header data remains applicable. If any of the survey header parameters change, then a new file should be opened, starting with a complete set of revised survey header records.

The event data for any seismic line must be preceeded by a single set of line header records to indicate the start of a new line.

Thus a survey may be stored as follows:

<u>Records within a file:</u>

H
H
H
.
.
.
H
L
L
L
E
E
.
.
.
E
L
L
L
E
E
.
.
.
E
L
L
L
E
E
.
.
.
E

<u>Files on a tape:</u>

File 1
EOF mark
File 2
EOF mark
.
.
.
File N
EOF mark
EOF mark

4. Summary of Record Codes

The full coding system may be summarised as follows:

@=vessel number
#=device/definition number

General Definitions

m	H0000	Project definition
m	H0001	Project description
m	H0002	Tape specification
m	H0003	Client
m	H0004	Geophysical contractor
m	H0005	Positioning contractor
	H0006	Positioning processing contractor
	H0007	Any other information

Survey Definition Codes

m	H0010	Survey definition codes

Geodetic Definitions

m	H0100	Magnetic variation
m	H011#	Spheroid & datum definitions
m	H012#	Datum shifts
m	H0130	Projection type
m	H0140	Normal aspect projection origin
m	H0150	Projection grid origin
	H0160	Projection scale factor
	H0170	Oblique cylindrical projection orientation

Vessel Definitions

m	H020@	Vessel general definitions
m	H021@	Vessel reference point definition
m	H022@	Steered point definition
m	H023@	Onboard processing system
m	H024@	Time definition
m	H025@	Echo sounder definition
m	H026@	Gyro definition

Pattern Definitions

m	H10##	Pattern description
	H11##	Station definition - fixed base station 1
	H12##	Station definition - fixed base station 2
	H13##	Station definition - "vessel" borne base station
	H14##	Pattern properties

Pattern Receiver Definitions

m	H20@0	Vessel pattern receiver definitions
	H21@#	Streamer pattern receiver definitions
	H22@#	Gun array pattern receiver definitions

Streamer Definitions

H30@#	General streamer definitions
H31@#	General streamer definitions
H32@#	Compass locations
H33@#	Compass corrections
H34@#	Seismic receiver group definitions
H35@#	Streamer depth sensor definitions

Gun Array Definitions

H40@#	Gun array definitions

Relative Acoustic System Definitions

H50@#	USBL transducer on vessel definition
H51@#	SBL transducer/transponder on vessel definition
H52@#	SBL transducer/transponder on streamer definition
H53@#	SBL transducer/transponder on gun array definition

Satellite System Definitions

H600#	Satellite system description
H61@#	Satellite receiver on vessel definition
H62@#	Satellite receiver on streamer definition
H63@#	Satellite receiver on gun array definition

Line Definitions

L00@0	Line name
L01@0	Start of line definition
L02@0	End of line definition

General Event Data

E00@0	General event data
E01@0	Field positioning derived data

Pattern Data

E10@0	Pattern data

Streamer Data

E20@0	Streamer data
E21@#	Compass data
E22@#	Depth sensor data

Acoustic Data

E3000	USBL acoustic data
E3100	SBL acoustic data

Satellite Data

E40@0	Satellite data

For simple 2D surveys, this may reduce to the following records:

General Definitions

H0000	Project definition
H0001	Project description
H0002	Tape specification
H0003	Client
H0004	Geophysical contractor
H0005	Positioning contractor
H0006	Positioning processing contractor
H0007	Any other information

Survey Definition Codes

H0010	Survey definition codes

Geodetic Definitions

H0111	Spheroid & datum definitions
H0121	Datum shifts
H0130	Projection type
H0140	Normal aspect projection origin
H0150	Projection grid origin
H0160	Projection scale factor

Vessel Definitions

H0201	Vessel general definitions
H0211	Vessel reference point definition
H0221	Steered point definition
H0231	Onboard processing system
H0241	Time definition
H0251	Echo sounder definition
H0261	Gyro definition

Pattern Definitions

H10##	Pattern description
H11##	Station definition - fixed base station 1
H12##	Station definition - fixed base station 2
H13##	Station definition - "vessel" borne base station
H14##	Pattern properties

Pattern Receiver Definitions

H2010	Vessel pattern receiver definitions

Gun Array Definitions

H4011	Gun array definition

Line Definitions

L0010	Line name
L0110	Start of line definition
L0210	End of line definition

General Event Data

E0010 General event data
E0110 Field positioning derived data

Pattern Data

E1010 Pattern data

5. General Rules

a) All records shall be 80 characters long, i.e. padded with spaces if necessary.

b) A non-mandatory record may be omitted if none of the data items are relevant.

c) If some of the items within a record are not applicable they may be left blank or preferably replaced with the characters "n/a".

d) All distances will be in metres unless otherwise specified.

e) All angles will be in degrees decimal unless otherwise specified.

f) All angles will be measured clockwise from an axis parallel to the ship's head.

g) All offsets will be measured from the ship's reference point.

h) All correction items will be added to the raw value.

i) Decimal points should be included where applicable.

j) The sequence of survey header records is not crucial but they should follow the logical groupings indicated in this document.

k) The sequence of event records is more important; the start of an event is indicated by an E0000 record, all subsequent records are assumed to belong to that event.

l) The start of a new line should be indicated by a set of line headers. If a line involves several "dog-leg" sections then each section should start with a set of line headers even though the line name will not change.

m) No line shall be split between tapes.

n) An event occurs at the moment of the seismic shot. All data logged for that event is assumed to apply to that moment in time.

o) Unless otherwise specified, all text items (specifier A) shall be left adjusted and all numeric items (specifiers F & I) shall be right adjusted.

p) Data records for a wide range of information have been defined. Some of them may not be required for a particular survey. Many records are optional, subject to data availability and client requirements. However, some are marked as mandatory and must be included; this is indicated in the following record descriptions.

6. Survey Header Records

6.1 General Definitions

H0000 : Project definition		- Mandatory	
"Project Definition:"	[6,24]	A19	
Project Identifier	[29,36]	A8	e.g. P86001
Project name, start and end dates of survey	[38,80]	A43	free text
H0001 : Project description		- Mandatory	
"Project Description:"	[6,25]	A20	
Type of survey, location	[29,80]	A52	free text
H0002 : Tape Specification		- Mandatory	
"Tape Specification:"	[6,24]	A19	
Date of issue, tape version number, prepared by, format name & revision code	[29,80]	A52	free text
H0003 : Client		- Mandatory	
"Client:"	[6,12]	A7	
Description of client	[29,80]	A52	free text
H0004 : Geophysical contractor		- Mandatory	
"Geophysical Contractor:"	[6,28]	A23	
Description of geophysical contractor	[29,80]	A52	free text
H0005 : Positioning contractor		- Mandatory	
"Positioning Contractor:"	[6,28]	A23	
Description of positioning contractor	[29,80]	A52	free text
H0006 : Positioning processing contractor		- Optional	
"Processing Contractor:"	[6,27]	A22	
Description of positioning processing contractor	[29,80]	A52	free text
H0007 : Other Information		- Optional	
Any other information	[6,80]	A75	free text

Additional Comments

All these records should be included at the start of a set of header records. The H0007 record may be used to contain any other general information that is considered relevant to the survey. It may be repeated as necessary.

6.2 Survey Definition Codes

H0010 : Survey definition codes		- Mandatory	
No of defined patterns	[6,7]	I2	range 0-99
USBL or SBL acoustics in use?	[8,8]	I1	1=yes 0=no
Satellites in use?	[9,9]	I1	1=yes 0=no
No of survey vessels	[10,10]	I1	range 1-9
No of defined Spheroids and datums	[11,11]	I1	range 1-9
Offset mode	[12,12]	I1	1=polar 2=rectangular

Additional Comments

This record is mandatory for all types of survey. It is intended to define the subsequent header records. Therefore, if satellite fixing was used during a survey but no satellite data was actually logged, then the "satellites in use" flag should be set to zero.

Up to 99 radio positioning and long baseline acoustic system patterns used for absolute positioning may be defined in records H10##, H11##, H12##, H13## and H14## (see section 6.6). USBL or SBL systems used for relative positioning of devices from a vessel are defined in records H50@0, H51@0, H52@0, and H53@0 (see section 6.10).

The offset mode defines the nature of all subsequent offset information to be in either polar or rectangular co-ordinates.

Polar mode, Offset A = radial distance from ship's reference point to the point in question
Offset B = angle from ship's head (clockwise)

Rectangular mode, Offset A = X axis offset across ship's axis, positive to starboard.
Offset B = Y axis offset along ship's axis, positive towards the bows.

Note that the offset orientation is always with the ship's head (gyro) and that the origin is the ship's reference point unless otherwise specified. See Appendix I.

ALL offsets must comply with the specified offset mode.

Offset distances will be in metres decimal and offset angles will be in degrees decimal.

The number of pattern receivers, transducers, streamers and gun arrays is defined on a vessel basis in an H020@ record (see section 6.5).

6.3 Geodetic Definitions

H0100 : Magnetic Variation			- Mandatory for 3D surveys
Magnetic variation		[6,11]	F6.2 +/- degrees decimal
Date & source of Mag. Variation		[12,80]	A69 free text
H011# : Spheroid and Datum definitions #=1-9, spheroid & datum number			- H0111 is Mandatory
Spheroid name		[6,23]	A18
Datum name		[24,41]	A18
Semi-major axis (a)		[42,53]	F12.3
Semi-major axis units conversion factor to metres		[54,65]	F12.8
Inverse flattening (1/f)		[66,77]	F12.7
H012# : Datum Shifts			- Mandatory
Datum shift to WGS 72,	Dx	[6,16]	F11.3 metres
Datum shift to WGS 72,	Dy	[17,27]	F11.3
Datum shift to WGS 72,	Dz	[28,38]	F11.3
Datum rotation to WGS 72,	Rx	[39,46]	F8.2 seconds
Datum rotation to WGS 72,	Ry	[47,54]	F8.2
Datum rotation to WGS 72,	Rz	[55,62]	F8.2
Scale factor to WGS 72	S	[63,70]	F8.2 ppm

Additional Comments

The definition of magnetic variation is only relevant for 3D surveys. It is a correction that will be added to raw compass observations; apply +/- appropriately.

Up to 9 different spheroids and datums may be defined. The definition of spheroid and datum number 1 is mandatory for all surveys and will apply to all co-ordinates relating to normal surface positioning, e.g. radio positioning base stations, ship's position.

The spheroid defined as number 1 is that used in the projection definition.

Additional definitions may be made only to cover different satellite systems. The appropriate spheroid and datum number should be included in the definition of any satellite system in record H600# (see section 6.11).

Note that the number of defined spheroids & datums should be specified in record H0010 (see section 6.2).

6.4 Projection Definitions

H0130 : Projection Type		- Mandatory	
Projection type code	[6,8]	I3	see additional comments
Projection type & name	[9,80]	A72	free text
H0140 : Normal Aspect Projection Origin		- Mandatory	
Grid units conversion factor to metres	[6,17]	F12.8	
Latitude of first standard parallel	[18,29]	I3,I2,F6.3,A	d,m,s,N/S
Latitude of second standard parallel	[30,41]	I3,I2,F6.3,A	d,m,s,N/S
Latitude of origin	[42,53]	I3,I2,F6.3,A	d,m,s,N/S
Longitude of central meridian	[54,65]	I3,I2,F6.3,A	d,m,s,E/W
H0150 : Projection Grid Origin		- Mandatory	
Latitude of grid origin	[6,17]	I3,I2,F6.3,A	d,m,s,N/S
Longitude of grid origin	[18,29]	I3,I2,F6.3,A	d,m,s,E/W
Grid Northing at origin	[30,40]	F11.2	
Grid Easting at origin	[41,51]	F11.2	
H0160 : Projection Scale Factor			
Grid scale factor	[6,17]	F12.10	
Latitude at which scale factor is defined	[18,29]	I3,I2,F6.3,A	d,m,s,N/S
Longitude at which scale factor is defined	[30,41]	I3,I2,F6.3,A	d,m,s,E/W

H0170 : Oblique Cylindrical Projection Orientation - Mandatory for skew orthomorphic projections

For two points defining initial line of projection:

Latitude of start point	[6,17]	I3,I2,F6.3,A	d,m,s,N/S
Longitude of start point	[18,29]	I3,I2,F6.3,A	d,m,s,E/W
Latitude of end point	[30,41]	I3,I2,F6.3,A	d,m,s,N/S
Longitude of end point	[42,53]	I3,I2,F6.3,A	d,m,s,E/W
Circular bearing of initial line of projection	[54,65]	F12.8	degrees decimal
Angle from skew to rectified grid	[66,77]	F12.8	degrees decimal

Additional Comments

The following projection type codes have been defined:

- 001 - U.T.M. North
- 002 - U.T.M. South
- 003 - Transverse Mercator (North oriented)
- 004 - Transverse Mercator (South oriented)
- 005 - Lambert conical conformal, one standard parallel
- 006 - Lambert conical conformal, two standard parallel
- 007 - Mercator
- 008 - Cassini-Soldner
- 009 - Skew orthomorphic
- 010 - Stereographic
- 011 - New Zealand Map Grid
- 999 - Any other projection or non-standard variation of the above projections.

It is not expected that every possible projection will be covered by these codes or the elements of the projection header records. The intention is that the majority of standard projections can be defined in a computer interpretable form.

The spheroid parameters given in record H0111 are assumed to apply to the projection.

The records and fields required depend on the projection type and its definition. For example, a UTM or transverse mercator projection (codes 001 to 004) will require records H0130,H0140 (omitting latitude of 1st and 2nd standard parallels), H0150 (in general the grid origin will be coincident with the projection origin), and H0160 (in general the scale factor will be defined at the projection origin). A lambert conical conformal projection with one standard parallel (code 005), Cassini-Soldner (code 008), Stereographic (code 010), and the New Zealand Map Grid (code 011) also will all require these same records and data entry.

A Lambert conical conformal with two standard parallels (code 006) will require records H0130, H0140 (omitting latitude of origin) and H0150.

A Mercator projection (code 007) will require records H0130, H0140 (omitting latitude of origin; the standard parallels will have the same values but be in opposite hemispheres) and H0150 if defined by latitude of unity scale. Alternatively the projection may be defined through H0130, H0140 (omitting latitude of standard parallels and entering equator as latitude of origin), H0150 and H0160 where scale factor is defined at the intersection of equator and central meridian.

A skew orthomorphic projection will require H0130, H0150, H0160 and H0170 records.

6.5 Vessel Definitions

H020@ : Vessel General Definitions			- Mandatory for each vessel
@=1-9, Vessel number, 1-master vessel			
Number of streamers being logged	[6,6]	I1	
Number of gun arrays being logged	[7,7]	I1	
Number of defined pattern receivers	[8,9]	I2	
Number of defined SBL transponders/transducers	[10,11]	I2	
Number of defined USBL transducers	[12,13]	I2	
Number of defined satellite receivers/antennae	[14,15]	I2	
Vessel description	[16,80]	A65	free text

H021@ : Vessel Reference Point Definition			- Mandatory for each vessel
Height above sea level	[6,9]	F4.1	metres
Description of reference point	[10,80]	A71	free text

H022@ : Steered Point Definition			- Mandatory for each vessel
Description of steered point	[6,80]	A75	free text

H023@ : Onboard Processing System			- Mandatory for each vessel may be repeated if required
Details of onboard positioning & processing systems	[6,80]	A75	free text

H024@ : Time Definition			- Mandatory for each vessel
Time difference to GMT (correction to be added to ship's time to convert to GMT)	[6,10]	F5.2	+/- hours

Note: This convention is opposite to that used in the UKOOA P1/84 format

H025@ : Echo Sounder Definition			- Mandatory for each vessel
Offset A to transducer	[6,10]	F5.1	metres
Offset B to transducer	[11,15]	F5.1	degrees or metres
Depth of transducer below sea level	[16,20]	F5.1	metres
Propagation velocity used	[21,27]	F7.2	metres/sec
Calibrated propagation velocity	[28,34]	F7.2	metres/sec
Water depth reference level	[35,35]	I1	1=transducer 2=sea level
Echo sounder description	[36,80]	A45	free text

H026@ : Gyro Definition			- Mandatory for each vessel
Correction to Gyro reading	[6,11]	F6.2	+/- degrees decimal
Description of Gyro	[12,80]	A69	free text

Additional Comments

These records are used to define the positioning elements on a vessel. Up to 9 vessels may be defined according to the nature of the surveys: the number defined must be given in record H0010 (see section 6.2). Vessel number 1 must be defined for all surveys and is the master vessel.

There is some flexibility in the nature of a "vessel" and any independent mobile object can be treated as a vessel, e.g. buoy on which an intermediate surface positioning system has been mounted.

The offset mode is either polar or rectangular, as defined in record H0010 (see section 6.2).

Two propagation velocities are to be given for the echo sounder; that at which the sounder was set during the survey or part survey covered by this file and the velocity determined during calibration. Both velocities should be specified even if they are the same. Raw depths logged by the echo sounder may relate to the transducer or may have been corrected to sea-level: the water depth reference level flag should be set appropriately. In the event of multiple echo sounders or gyro systems all data should refer to the primary survey instruments.

Positioning receiver here is used to cover the receiver reference point e.g. antenna electrical centre, transducer plate centre, etc., for a radio or LBL accoustic system rather than the electronic processing unit. The positions of the receivers are given in records H20@#, H21@# and H22@# (see section 6.7). All shipborne, streamer or gun array receivers must be given a unique identification code. Up to 999 receivers may be defined in total for all vessels, their streamers and gun arrays.

Up to 9 streamers and 9 gun arrays may be defined for each vessel in records H30@# to H40@# (see sections 6.8 and 6.9).

6.6 Pattern Definitions : including LBL acoustics but not USBL or SBL

*H10## : Pattern Description - Mandatory for each pattern
= 01-99, Pattern number

Pattern Identifier	[6,13]	A8	free text
Pattern type code	[14,15]	I2	

The following pattern type codes are defined:

1 = Angle/bearing
2 = Circular range (distance) SYL
3 = Circular range (lane/phase count) ARGO
4 = Acoustic range (time)
5 = Hyperbolic phase comparison
6 = Hyperbolic time pulse

Pattern base station location code	[16,16]	I1	1 = fixed 2 = vessel mounted
Pattern description	[17,80]	A65	free text

* H11## : Station Definition - Fixed Base Station 1 (e.g. master)
- Mandatory for each pattern

Station 1 Name	[6,21]	A16	free text
Station 1 Latitude	[22,33]	I3,I2,F6.3,A	d,m,s,N/S
Station 1 Longitude	[34,45]	I3,I2,F6.3,A	d,m,s,E/W
Station 1 Northing	[46,56]	F11.2	metres
Station 1 Easting	[57,67]	F11.2	metres
Station 1 Height/Depth	[68,74]	F7.2	metres

H12## : Station Definition - Fixed Base Station 2 (e.g. slave)
- Optional

Station 2 Name	[6,21]	A16	free text
Station 2 Latitude	[22,33]	I3,I2,F6.3.A	d,m,s,N/S
Station 2 Longitude	[34,45]	I3,I2,F6.3,A	d,m,s,E/W
Station 2 Northing	[46,56]	F11.2	metres
Station 2 Easting	[57,67]	F11.2	metres
Station 2 Height/Depth	[68,74]	F7.2	metres

H13## : Station Definition - "Vessel" Borne Base Station
- Optional

Vessel number	[6,6]	I1	
Offset A from ship's reference point	[10,14]	F5.1	metres
Offset B from ship's reference point	[15,19]	F5.1	degrees or metres
Transmitter height/depth	[20,24]	F5.1	metres

* H14## : Pattern Properties - Mandatory for each pattern

Propagation velocity	[6,16]	I11	m/sec
Comparison frequency	[17,27]	I11	Hz
Lane width	[28,37]	F10.3	metres
Reading at Station 1	[38,47]	A10	(Right adjusted, decimal point mandatory)
Base station fixed correction	[48,57]	A10	(Right adjusted, decimal point mandatory) SYL DEPTH
Velocity factor (multiplication factor for scale error)	[58,67]	A10	(Right adjusted, decimal point mandatory)

Additional Comments

Three or four records are required to define a radio positioning or long base line accoustic pattern. Normally records H10##, H11## and H14## will be used for a range pattern. For a hyperbolic pattern record H12## will be used in addition. However, if the pattern base station is on a vessel rather than in a fixed location, then record H11## should be replaced with record H13##.

Up to 99 patterns may be defined but not all of them need be in use at any one time. Consequently, all the patterns used during a survey may be defined in the initial block of headers and hence the entire survey may be held in a single file. Similarly, variations in the operating parameters of an individual pattern may be covered by treating it as a number of separate patterns.

The pattern numbers do not have to be sequential but they must be unique. Note that the number of defined patterns must be specified in record H0010 (see section 6.2).

Surface base stations have positive heights and sub-surface base stations have positive depths. For a fixed station, the height/depth is with respect to datum/mean sea level. For a vessel mounted system the height/depth should be with respect to water level.

The pattern type code defines six types of pattern according to the mode of measurement and the nature of the logged raw data. It is intended that sufficient pattern information is available to allow the raw data to be processed. Of particular importance are the three corrections. A fixed correction may be defined in record H14## for the base station; a receiver fixed correction may be included in the pattern receiver definitions, records H20@0, H21@# and H22@# (see section 6.7), and a variable (C-O) correction may be logged in the event data with each pattern value in record E10@0 (see section 8.2).

Thus, to process the data contained in this format, the following general rule applies:

$$Oc = Or + Ctx + Crx + (C-O)$$

where, Oc = corrected pattern value
Or = logged raw pattern value
Ctx = fixed correction for base station
Crx = fixed correction for receiver
(C-O) = variable (C-O) correction

Apply signs to these corrections in the convention that all corrections are added to the raw value, e.g. corrections corresponding to delays will always be negative. Corrections should always be given in the same units as the pattern readings.

The units of some of the pattern parameters may not be compatible. These discrepancies may be accounted for in the velocity (scale) factor, e.g. 0.001 should be used to convert an acoustic range in milliseconds for the velocity of propogation to be in metres per second.

It is intended that raw pattern values should be logged, subject only to the minimum of processing that may be built into the receiver. However, appropriate flags may be set in the event data record E10@0 (see section 8.2) to indicate if the logged pattern values have already been reduced for any of these three corrections.

The records H10## to H14## may be used in various ways according to the type of the pattern being referenced. The relevant items of information may be indicated by the reductions that will be required when the raw data is processed.

a) Pattern type 1: Angle/bearing pattern

A = (Or + Ctx + Crx + (C-O)) + At - Ot

where, A = azimuth from beacon to vessel
Or = logged raw pattern value
Ctx = fixed correction at base station
Crx = fixed correction at target
(C-O) = variable (C-O) correction
At = azimuth form beacon to reference object
Ot = observed value to reference object

Normally the two fixed corrections and the (C-O) will not apply as such corrections should cancel out between the observation to the vessel and the observation to reference object.

For a vessel mounted angular pattern system, it is assumed that the observed angle will be referenced to the ship's head (gyro). In this case, fixed corrections may apply and the difference between the ship's gyro and a gyro in the angular measuring device may be logged as the (C-O) if such a second gyro exists.

Fill in the records as follows:

H10## - use as standard
H11## - use as standard
H12## - co-ordinates of reference object
H13## - replaces H11## & H12## for vessel mounted system
H14## - half-circle reading in "lane width", i.e. 180 or 200 to define degrees or grads
- observed value to RO in "reading at station 1"
- other elements may be left blank unless a fixed correction is required.

b) Pattern type 2: Circular range pattern (distances) SYLEDIS

True slant range = (Or + Ctx + Crx + (C-O)) * Vf

where, Or = logged raw pattern value, e.g. metres
Vf = velocity (scale) factor
Ctx = fixed correction at base station
Crx = fixed correction at receiver
(C-O) = variable (C-O) correction.

Fill in the records as follows:

H10## - use as standard
H11## - use as standard
H12## - use as standard
H13## - use as standard
H14## - use as standard, except "lane width" and "reading at station 1" which may be left blank.

It is assumed that the receiver will have already reduced the measurement to a one-way range. If a two-way range has been logged then the velocity (scale) factor should be approximately 0.5 to cover this reduction.

c) Pattern type 3: Circular ranges (lane/phase count) ARGO

True slant range = V/2f * (Or + Ctx + Crx + (C-O)) * Vf

where, Or = logged raw pattern value
Vf = velocity (scale) factor
Ctx = fixed correction at base station
Crx = fixed correction at receiver
(C-O) = variable (C-O) correction
V = velocity of propagation
f = measuring frequency

Fill in records as standard. It is assumed that the logged raw value is a two-way measurement. If the receiver has already reduced it to one-way, then the velocity (scale) factor should be approximately 2.0 to balance the equation.

d) Pattern type 4: Acoustic ranges (time)

True slant range = V/2 * (Or + Ctx + Crx + (C-O)) * Vf

where, Or = logged raw pattern value, e.g. in milli-seconds
Vf = velocity (scale) factor
Ctx = fixed correction at base station
Crx = fixed correction at receiver
(C-O) = variable (C-O) correction
V = velocity of propagation

Fill in records as standard. Acoustic ranges should be given in milli-seconds. It is assumed that the logged raw value is a two-way measurement If the receiver has already reduced it to one-way, then the velocity (scale) factor should be approximately 2.0 to balance the equation.

e) Pattern type 5: Hyperbolic phase comparison MAIN CHAIN)

Range difference = V/f * (Or + Ctx + Crx + (C-O)) * Vf - b

where, Or = logged raw pattern value
Vf = velocity (scale) factor
Ctx = fixed correction at base station
Crx = fixed correction at receiver
(C-O) = variable (C-O) correction
V = velocity of propagation
f = measuring frequency
b = length of baseline in metres

Fill in records as standard.

f) Pattern type 6: Hyperbolic time pulse

Range difference = V * (Or + Ctx + Crx + (C-O)) * Vf - b

where, Or = logged raw pattern value
Vf = velocity (scale) factor
Ctx = fixed correction at base station
Crx = fixed correction at receiver
(C-O) = variable (C-O) correction
V = velocity of propagation
b = length of baseline in metres

Fill in records as standard.

Note: for pattern type 5, hyperbolic phase comparison, pattern values increase from Station 1 to Station 2. For pattern type 6, hyperbolic time pulse, pattern values decrease from Station 1 to Station 2.

6.7 Pattern Receiver Definitions

H20@0 : Vessel Pattern Receiver Definitions - Mandatory for each receiver
@=1-9, Vessel number

Receiver number	[6,8]	I3	range 1-999
Offset A from reference point to receiver	[9,14]	F6.1	metres
Offset B from reference point to receiver	[15,20]	F6.1	degrees or metres
Receiver height/depth	[21,25]	F5.1	metres
Receiver fixed correction	[26,35]	A10	(Right adjusted,decimal point mandatory)

H21@# : Streamer Pattern Receiver Definitions
@=1-9, vessel number; #=1-9, streamer number

Receiver number	[6,8]	I3	range 1-999
Distance from centre of near seismic receiver group (+ towards tail buoy)	[9,14]	F6.1	metres
Receiver height/depth	[15,19]	F5.1	metres
Receiver fixed correction	[20,29]	A10	(Right adjusted,decimal point mandatory)

H22@# : Gun Array Pattern Receiver Definitions
@=1-9, Vessel number; #=1-9, Gun Array number

Receiver number	[6,8]	I3	range 1-999
Offset A from receiver to centre of gun array	[9,14]	F6.1	metres
Offset B from receiver to centre of gun array	[15,20]	F6.1	degrees or metres
Receiver height/depth	[21,25]	F5.1	metres
Receiver fixed correction	[26,35]	A10	(Right adjusted,decimal point mandatory)

Additional Comments

Receiver here is used to cover the receiver reference point for a radio or LBL acoustic positioning system e.g. antenna electrical centre, transducer plate centre, etc., rather than the electric processing unit. Satellite receivers are defined in records H600#, H61@0, H62@# and H63@# (see section 6.11). USBL and SBL receivers are defined in records H50@0, H51@0, H52@# and H53@# (see section 6.10).

Receiver fixed corrections are explained in the pattern definitions records (see section 6.6).

Up to 999 receivers may be defined by repeating records H20@0, H21@#, H22@# as required. The 3 digit receiver numbers must be unique as they are the key identifiers for the observations logged in the pattern data record E10@0 (see section 8.2).

6.8 Streamer Definitions

H30@# : General Streamer Definitions (see Appendix II)
@=1-9, Vessel number; #=1-9, streamer number

Number of defined seismic receiver groups	[6,8]	I3	
Number of defined compasses	[9,10]	I2	
Number of defined acoustic transponders	[11,12]	I2	
Number of defined radio positioning receivers	[13,14]	I2	
Number of defined satellite receivers	[15,16]	I2	
Number of defined depth sensors	[17,18]	I2	
Lead-in angle measuring device being logged?	[19,19]	I1	1=yes, 0=no
Angle to tail buoy measuring device being logged (PDF)?	[20,20]	I1	1=yes, 0=no
Distance to tail buoy measuring device being logged (PDF)?	[21,21]	I1	1=yes, 0=no
Correction to lead-in angle	[22,26]	F5.1	+/- degrees decimal
Offset A to tailbuoy angle measuring device	[27,31]	F5.1	metres
Offset B to tailbuoy angle measuring device	[32,36]	F5.1	degrees or metres
Correction to measured angle	[37,41]	F5.1	degrees decimal
Offset A to tailbuoy distance measuring device	[42,46]	F5.1	metres
Offset B to tailbuoy distance measuring device	[47,51]	F5.1	degrees or metres
Correction to measured distance	[52,56]	F5.1	metres

H31@# : General Streamer Definitions
@=1-9, Vessel number; #=1-9, streamer number

Offset A to tow point	[6,11]	F6.1	metres
Offset B to tow point	[12,17]	F6.1	degrees or metres
Lead-in length	[18,22]	F5.1	metres
Nominal stretch section length	[23,27]	F5.1	metres
End of stretch section to centre of near seismic receiver group	[28,32]	F5.1	metres
Centre of near seismic receiver group to centre of far seismic receiver group	[33,38]	F6.1	metres
Centre of far seismic receiver group to end of cable	[39,43]	F5.1	metres
End of cable to tailbuoy	[44,48]	F5.1	metres
Number active sections in streamer	[49,51]	I3	e.g. 96
Length of each active section	[52,57]	F6.2	e.g. 25 metres

Additional Comments

Records H30@# and H31@# are mandatory for 3D surveys only. For a single streamer, the tow point will normally be on the vessel. Dual streamers will usually be towed from paravanes. In either case, the geometry from the ship's reference point to the towed point will be assumed to be fixed. If a paravane tow point is being positioned by acoustics, the nominal geometry should still be specified.

In record H31@# the main dimensions specified are the deployment lengths. The number and dimensions of various streamer components are specified here and in records H32@#, H34@# and H35@#. However, not all of the streamer components are accounted for, e.g. Adaptors. Consequently, the locations of key components e.g. Compasses are always referenced to the centre of the near seismic receiver group.

The distance from tow point to centre of near seismic receiver group is the sum of the lead in length, nominal stretch section length and stretch section to centre of near seismic receiver group length. Corrections to the nominal stretch section length may be logged as event items. The number of streamers is defined on a vessel basis in record H020@ (see section 6.5). Up to 9 streamers per vessel may be defined.

H32@# : Compass Locations
@=1-9, Vessel number; #=1-9, Streamer number

Compass reference number	[6,8]	I3	
Distance from centre of near seismic receiver group to centre of compass	[9,14]	F6.1	metres
Length of compass section (if inserted between streamer sections)	[15,18]	F4.1	metres

repeated for up to 4 more compasses at
[19,31], [32,44], [45,57], [58,70]
record may be repeated as required.

Note: Distance is +ve towards the tailbuoy and -ve if the compass is between the vessel and the near seismic receiver group.

H33@# : Compass Corrections
@=1-9, Vessel number; #=1-9, Streamer number

Compass reference number	[6,8]	I3	
Compass serial number	[9,16]	A8	
Fixed correction to reading	[17,21]	F5.1	degrees decimal
Line direction 1	[22,24]	I3	degrees
Correction to reading	[25,29]	F5.1	degrees decimal
Line direction 2	[30,32]	I3	degrees
Correction to reading	[33,37]	F5.1	degrees decimal
.			
.			
.			
Line direction 7	[70,72]	I3	degrees
Correction to reading	[73,77]	F5.1	degrees decimal

Additional Comments

Records H32@# and H33@# are mandatory for 3D surveys only.
The correction to a compass reading may be defined as a single fixed correction and/or as a correction applicable for a particular line direction. Corrections for up to 7 approximate line directions may be defined.

Corrected Compass = Raw Compass + Fixed correction + Correction for line direction

The length of a compass is only relevant if it is inserted in the streamer where it contributes to the length of the streamer. The field should be left blank if the compasses are clipped onto streamer sections.

H34@# : Seismic Receiver Group Definition
@=1-9, Vessel number; #=1-9, Streamer number

Seismic receiver group reference number	[6,8]	I3 e.g. 1-96
Distance from centre of near seismic receiver group	[9,14]	F6.1 +/- metres

repeated for 7 more seismic receiver groups at
[15,23], [24,32], [33,41], [42,50], [51,59], [60,68], [69,77]
record may be repeated as required.

H35@# : Streamer Depth Sensor Definitions
@=1-9, Vessel number; #=1-9, Streamer number

Depth sensor reference number	[6,8]	I3
Distance from centre of near seismic receiver group to centre of depth sensor	[9,14]	F6.1 +/- metres
Correction to depth reading	[15,19]	F5.1 +/- metres
Length of depth sensor (if inserted between streamer sections)	[20,23]	F4.1 metres

repeated for 3 more depth sensors at
[24,41], [42,59], [60,77]
record may be repeated as required.

Additional Comments

Records H34@# and H35@# are optional for 3D surveys, subject to client requirements. Distances from the centre of the near seismic receiver group are positive towards the tailbuoy. The seismic receiver group reference numbers may include zero and may be incremented in either direction.

The length of a depth sensor is only relevant if it is inserted in the streamer where it contributes to the length of the streamer. The field should be left blank if the depth sensors are clipped onto streamer sections.

6.9 Gun Array Definitions

H40@# : Gun Array Definitions - Mandatory
@=1-9, Vessel number; #=1-9, Gun Array number

Number of defined acoustic transponders	[6,7]	I2	
Number of defined radio positioning receivers	[8,9]	I2	
Number of defined satellite receivers/antennae	[10,11]	I2	
Offset A to tow point	[12,17]	F6.1	metres
Offset B to tow point	[18,23]	F6.1	degrees or metres
Nominal layback distance to centre of array	[24,28]	F5.1	metres
Nominal layback angle to centre of array	[29,33]	F5.1	degrees decimal
Description of array	[34,80]	A47*	free text

Additional Comments

The gun array tow point may be a paravane out to one side of the vessel or may be a point on the vessel if the array is being directly towed. In either case the geometry is assumed to be fixed. If the array is being positioned by acoustics, the nominal geometry should still be specified. The firing sequence of the guns may result in one or more "gun array centres". An H40@# record should be used to define each such "gun array centre". The number of gun arrays is defined on a vessel basis in record H020@ (see section 6.5). Up to 9 arrays may be defined for each vessel.

6.10 Relative Acoustic System Definitions

Records H50@0 and H51@0 include short and ultra short baseline systems. Long baseline systems are defined in section 6.6.

H50@0 : USBL Transducer on Vessel Definition
@=1-9, Vessel number

Transducer number	[6,8]	I3	
Offset A from ship's reference point	[9,13]	F5.1	metres
Offset B from ship's reference point	[14,18]	F5.1	degrees or metres
Depth below sea level	[19,23]	F5.1	metres
Correction to horizontal alignment	[24,29]	F6.2	degrees decimal
Correction to pitch alignment	[30,35]	F6.2	degrees decimal
Correction to roll alignment	[36,41]	F6.2	degrees decimal
Assumed velocity of propagation	[42,48]	F7.2	metres/sec
Calibrated velocity of propagation	[49,55]	F7.2	metres/sec
Turn around delay	[56,63]	F8.2	millisecs
Logged data corrected for:			
Turn around delay?	[64,64]	I1	1=yes, 0=no,
Velocity of propagation?	[65,65]	I1	1=assumed, 2=calibrated
Horizontal alignment?	[66,66]	I1	0=no, 1=ship's axis, 2=raw gyro
Pitch alignment?	[67,67]	I1	0=no, 1=raw VRU, 2=corrected VRU
Roll alignment?	[68,68]	I1	0=no, 1=raw VRU 2=corrected VRU
Reduction to ship's reference point?	[69,69]	I1	1=yes, 0=no,
Description, e.g. model number	[70,80]	A11	

Additional Comments

Since USBL systems do not generally provide raw data, the format requires that the extent of the processing by the system be defined. The horizontal alignment correction is that angle required to reduce the USBL system orientation to the ship's head. The pitch and roll corrections are those required to correct the Vertical Reference Unit (VRU). Pitch corrections should be positive for the bow down and roll corrections should be positive for the ship heeling to starboard.

The offsets and depth define the logical location of the USBL transducer. Thus if the device automatically corrects to the ship's reference point, the offsets should be zero.

H51@0 : SBL Transducers/Transponders on Vessel Definition
@=1-9, Vessel number

Transducer/transponder number	[6,8]	I3	
Offset A from ship's reference point	[9,13]	F5.1	metres
Offset B from ship's reference point	[14,18]	F5.1	degrees or metres
Depth below sea level	[19,23]	F5.1	metres
Distance unit (only if transducer)	[24,24]	A1	M=metres S=milliseconds
Fixed correction/delay	[25,31]	F7.3	
Description	[32,80]	A49	free text

H52@# : SBL Transducers/Transponders on Streamer Definition
@=1-9,Vessel No; #=1-9, Streamer number

Transponder number	[6,8]	I3	
Distance from near receiver group	[9,14]	F6.1	metres, + towards tailbuoy
Nominal depth below sea level	[15,19]	F5.1	metres
Distance unit (only if transducer)	[20,20]	A1	M=metres S=milliseconds
Fixed correction/delay	[21,27]	F7.3	
Description	[28,80]	A53	free text

H53@# : SBL Transducers/Transponders on Gun Array Definition
@=1-9, Vessel number; #=1-9, Gun Array number

Transponder number	[6,8]	I3	
Offset A from transponder to centre of gun array	[9,13]	F5.1	metres
Offset B from transponder to centre of gun array	[14,18]	F5.1	degrees decimal
Nominal depth below sea level	[19,23]	F5.1	metres
Distance unit (only if transducer)	[24,24]	A1	M=metres S=milliseconds
Fixed correction/delay	[25,31]	F7.3	
Description	[32,80]	A49	free text

Additional Comments

Up to 999 acoustic transponders/transducers may be defined by repeating records H51@#, H52@# and H53@# as required. The number of acoustic transponders/transducers is defined on a vessel or streamer or gun array basis in records H020@, H30@#, H40@# (see sections 6.5, 6.8 and 6.9). The three-digit reference numbers must be unique as they are the key identifiers for observations logged in the acoustic data records (see section 8.4). Note that acoustic ranges are always slant. The approach to SBL acoustics is that the transponders and transducers form nodes in a trilateration network. The exact nature of a node is not crucial as observations are simply ranges linking two uniquely numbered nodes. Although provision has been made for these ranges to be given as times or distances, the logged observations should be uncorrected two-way times if possible.

6.11 Satellite System Definitions

H600# : Satellite System Description
#=1-9, Satellite system number

Satellite system identification	[6,13]	A8	
Spheroid & datum number	[14,14]	I1	see record H011# section 6.3
Description	[15,80]	A66	free text

H61@0 : Satellite Receiver on Vessel Definition
@=1-9 Vessel number

Receiver/antenna number	[6,8]	I3	
Offset A from ship's reference point to antenna	[9,13]	F5.1	metres
Offset B from ship's reference point to antenna	[14,18]	F5.1	degrees or metres
Antenna height above sea level	[19,23]	F5.1	metres
Description	[24,80]	A57	free text

H62@# : Satellite Receiver on Streamer Definition
@=1-9, Vessel number; #=1-9, Streamer number

Receiver/antenna number	[6,8]	I3	
Distance from centre of near seismic receiver group (+ towards tailbuoy)	[9,14]	F6.1	metres
Antenna height above sea level	[15,19]	F5.1	metres
Description	[20,80]	A61	free text

H63@# : Satellite Receiver on Gun Array Definition
@=1-9, Vessel number; #=1-9, Gun Array number

Receiver/antenna number	[6,8]	I3	
Offset A from antenna to centre of gun array	[9,13]	F5.1	metres
Offset B from antenna to centre of gun array	[14,18]	F5.1	degrees or metres
Antenna height above sea level	[19,23]	F5.1	metres
Description	[24,80]	A57	free text

Additional Comments

Up to 999 satellite receivers may be defined but the reference number of each one must be unique. Data should be referred to the antenna electrical centre. Provision for raw satellite data is not made in this format. The satellite data records E40@0 (see section 8.5) contain only the derived horizontal position.

7. Line Header Records

L00@0 : Line Name @=1-9, Vessel number		- Mandatory	
Line name	[6,21]	A16	
Reject flag	[22,22]	I1	0=OK 1=rejected
Description	[23,80]	A58	free text

L01@0 : Start of Line Definition @=1-9, Vessel number		- Mandatory	
Start of line Latitude	[6,17]	I3,I2,F6.3,A	d,m,s,N/S
Start of line Longitude	[18,29]	I3,I2,F6.3,A	d,m,s,E/W
Start of line Northing	[30,39]	F10.2	
Start of line Easting	[40,49]	F10.2	

L02@0 : End of Line Definition @=1-9, Vessel number		- Mandatory	
End of line Latitude	[6,17]	I3,I2,F6.3,A	d,m,s,N/S
End of line Longitude	[18,29]	I3,I2,F6.3,A	d,m,s,E/W
End of line Northing	[30,39]	F10.2	
End of line Easting	[40,49]	F10.2	

Additional Comments

Records L00@0, L01@0 and L02@0 are mandatory for all types of survey and the three records must occur as a group prior to any event data relating to the line. For "dog-leg" lines, the set of three line headers should be repeated at the start of the second (and subsequent) sections of the line. The co-ordinates should refer to the planned line.

8. Event Data Records

8.1 General Event Data

E00@0 : General Data - Mandatory
@=1-9, Vessel number

Line name	[6,21]	A16
Shot/Event number	[22,29]	A8 (right adjusted)
Seismic record number	[30,37]	A8 (right adjusted)
Year	[38,39]	I2 YY
Julian day	[40,42]	I3 DDD
Time	[43,50]	I2,I2,F4.1 HH,MM,SS.S
Gyro reading	[51,56]	F6.2 degrees
Echo sounder reading	[57,62]	F6.1 metres
Gun arrays fired code (mandatory for alternate shooting)	[63,71]	A9 e.g. 101000000 for 1 & 3

E01@0 : Field Positioning Derived Data - Optional
@=1-9, Vessel number

Ship's reference point Latitude	[6,17]	I3,I2,F6.3,A d,m,s,N/S
Ship's reference point Longitude	[18,29]	I3,I2,F6.3,A d,m,s,E/W
Ship's reference point Northing	[30,40]	F11.2
Ship's reference point Easting	[41,51]	F11.2
Offset A to steered point	[52,57]	F6.1 metres
Offset B to steered point	[58,63]	F6.1 degrees or metres
Course made good (ship's track)	[64,69]	F6.2 degrees
Time to first break	[70,75]	F6.1 milliseconds

Additional Comments

Record E00@0 is mandatory and indicates the start of data for the event. All subsequent data records are assumed to belong to the event. Record E01@0 contains derived or computed data and thus the entire record is optional. The derived position of the ship's reference point should be based on the primary positioning system. The patterns used in the computation shall be flagged in the E10@0 record (see section 8.2).

8.2 Pattern Data

E10@0 : Pattern Data — Mandatory
@=1-9, Vessel number

Pattern number	[6,7]	I2	
Receiver number	[8,10]	I3	
Raw pattern value	[11,20]	A10	(Right adjusted, decimal point mandatory)
Variable (C-O) correction	[21,27]	A7	(Right adjusted, decimal point mandatory)
Raw value corrections flag	[28,28]	I1	see additional comments
Used in position computation?	[29,29]	I1	1=yes, 0=no

repeated for 2 further patterns at
[30,53], [54,77]
record may be repeated as required

Additional Comments

Note that the unique receiver number indicates whether the pattern receiver is on the vessel or on a vessel sub-location such as a streamer or gun array. Receivers are defined in records H20@0, H21@# and H22@# (see section 6.7). The pattern observations are treated as text to cover Decca Main Chain observations.

It is intended that raw pattern values should be logged, subject only to the minimum of processing that may be built into the receiver.

However, the "raw value correction flag" may be used to indicate if the raw data has already been reduced for the following corrections:

Fixed base station correction applied : 1
Receiver fixed correction applied : 2
Variable (C-O) correction applied : 4

Any combination of these may be indicated by a number in the range of 0-7.

8.3 Streamer Data

E20@0 : Streamer Data
@=1-9, Vessel number

Streamer number	[6,6]	I1	
Lead in angle	[7,11]	F5.1	degrees decimal
Lead in angle reject flag	[12,12]	I1	0=OK, 1=rejected
Correction to stretch section nominal length	[13,18]	F6.1	metres
Correction to stretch section reject flag	[19,19]	I1	0=OK, 1=rejected
(PDF) angle to tailbuoy	[20,24]	F5.1	degrees decimal
Angle to tail buoy reject flag	[25,25]	I1	0=OK, 1=rejected
(PDF) distance to tailbuoy	[26,31]	F6.1	metres
Distance to tailbuoy reject flag	[32,32]	I1	0=OK, 1=rejected

repeated for another streamer at
[43,69]
record may be repeated as required

E21@# : Compass Data
@=1-9, Vessel number; #=1-9, Streamer number

Compass reference number	[6,8]	I3	
Reject flag	[9,9]	I1	0=OK, 1=rejected
Compass reading	[10,14]	F5.1	degrees decimal

repeated for 7 other compasses at
[15,23], [24,32], [33,41], [42,50], [51,59], [60,68], [69,77]
record may be repeated as required

E22@# : Depth Sensor Data
@=1-9, Vessel number; #=1-9, Streamer number

Depth sensor reference number	[6,8]	I3	
Reject flag	[9,9]	I1	0=OK, 1=rejected
Depth reading	[10,14]	F5.1	metres

repeated for 7 other depth sensors at
[15,23], [24,32], [33,41], [42,50], [51,59], [60,68], [69,77]
record may be repeated as required

Additional Comments

The correction to stretch section is to the nominal length given in record H31@# (see section 6.8), +ve if longer than nominal length.

The number of streamers is defined on a vessel basis in record H020@ (see section 6.5). The number of streamer compasses and depth sensors are defined on a streamer basis in record H30@# (see section 6.8).

8.4 Acoustic Data

E3000 : USBL Acoustic Data			
From Transducer number	[6,8]	I3	33 - 35
To Transponder number	[9,11]	I3	36 - 38
X range to transponder	[12,18]	F7.2	39 - 45
Y range to transponder	[19,25]	F7.2	46 - 52
Z range to transponder	[26,32]	F7.2	53 - 59

section [6,32] may be repeated at [33,59] record may be repeated as required

Additional Comments

The reference frame for USBL is a set of orthogonal axes nominally aligned with the vessel such that:

X positive to starboard
Y positive to ship's bow
Z positive downwards

E3100 : SBL Acoustic Data		
Velocity of propagation	[6,12]	F7.2
From Transducer number	[13,15]	I3
To Transponder number	[16,18]	I3
Slant range	[19,25]	F7.2

section [13,25] may be repeated at [26,38], [39,51], [52,64], [65,77] record may be repeated as required

8.5 Satellite Data

E40@0 : Satellite Data
@=1-9, Vessel number

Satellite system number	[6,6]	I1
Receiver/antenna number	[7,9]	I3
Latitude	[10,21]	I3,I2,F6.3,A d,m,s,N/S
Longitude	[22,33]	I3,I2,F6.3,A d,m,s,E/W
Position includes dead reckoning	[34,34]	I1 0=No, 1=Yes
Time since last accepted satellite fix	[35,41]	F7.1 seconds
Standard error of last accepted satellite fix, Latitude	[42,48]	F7.3 seconds of arc
Standard error of last accepted satellite fix, Longitude	[49,55]	F7.3 seconds of arc

record may be repeated as required

Additional Comments

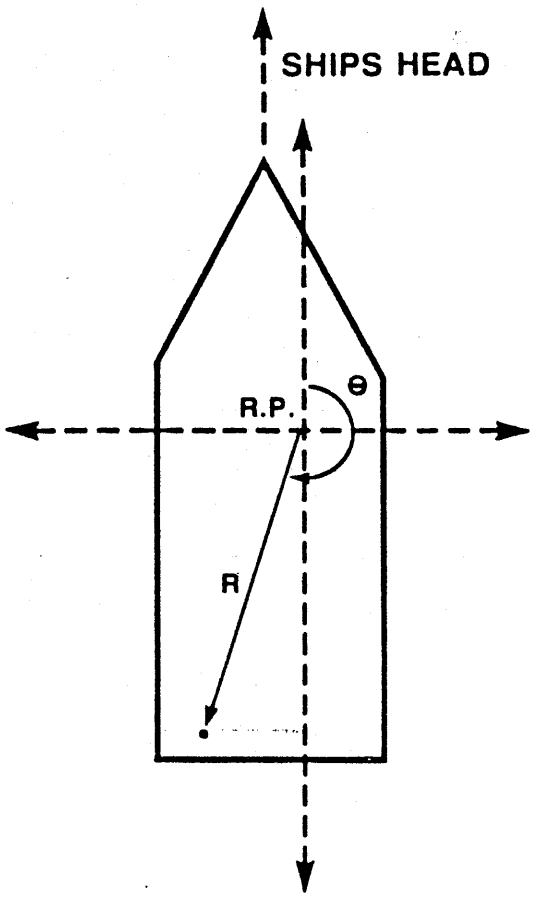
The unique receiver number indicates whether the satellite receiver/ antenna is on the vessel or on a vessel sub-location such as a streamer or gun array.

The position refers to the satellite receiver antenna electrical centre.

If a dead reckoning system involving TRANSIT is being used, then the estimated current position should be logged and the "dead reckoning flag" should be set. For GPS, the position derived from the satellite system at the moment of the satellite fix should be logged as well as the time difference to the seismic event.

No attempt is made to hold true raw data for the TRANSIT system or GPS and the standard errors of the fix are only included as an estimate of the quality of the fix.

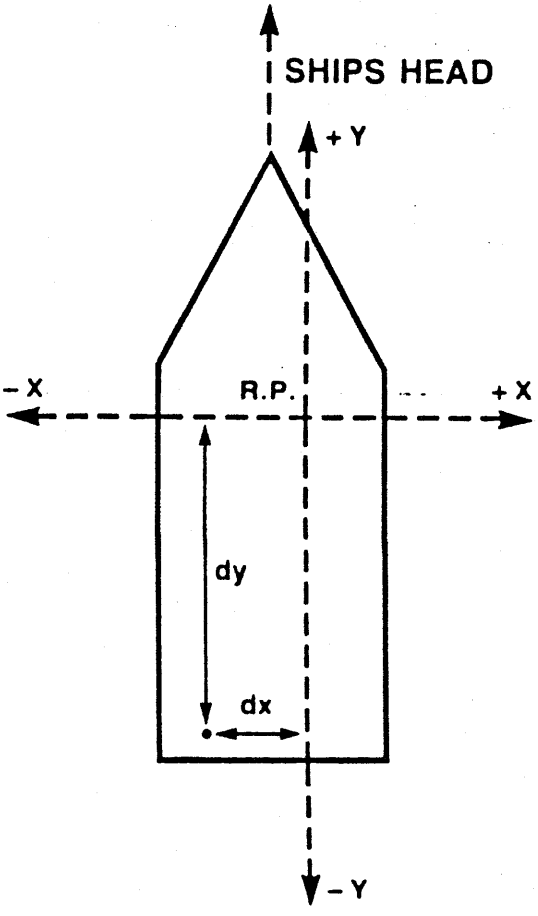
APPENDIX I : OFFSET CONVENTION DIAGRAM



POLAR OFFSET MODE

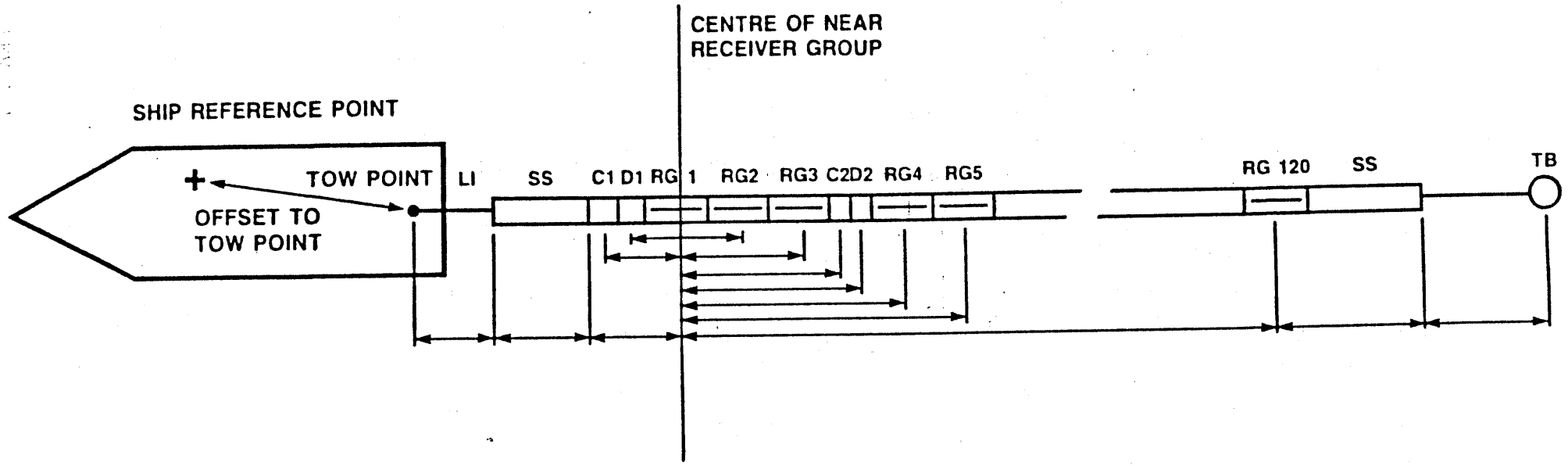
OFFSET A = R
OFFSET B = Θ

R.P. SHIP REFERENCE POINT

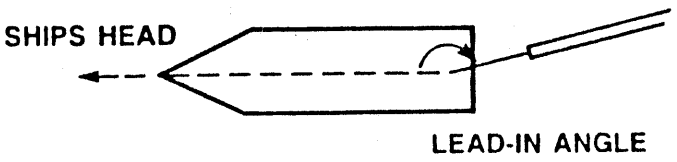


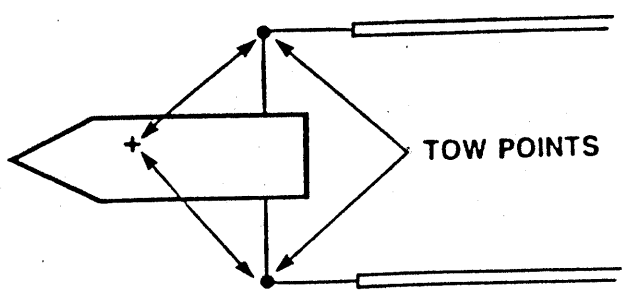
RECTANGULAR OFFSET MODE

OFFSET A = -dx
OFFSET B = -dy

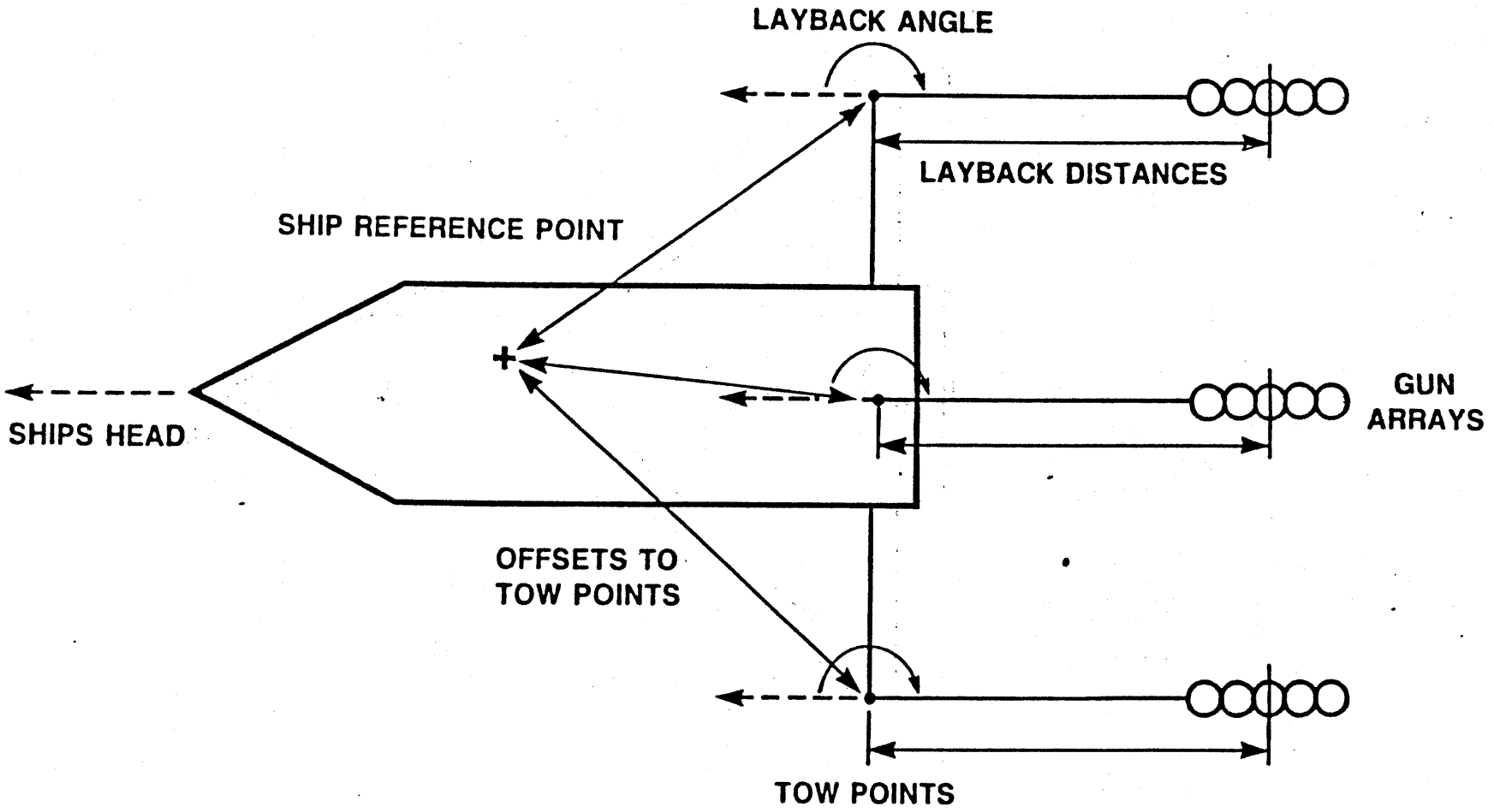


LI - LEAD-IN LENGTH
SS - STRETCH SECTION
C - COMPASS
D - DEPTH SENSOR
RG - RECEIVER GROUP
TB - TAIL BUOY





APPENDIX II : STREAMER DIMENSION DIAGRAM



APPENDIX III : GUN ARRAY DIMENSION DIAGRAM

APPENDIX IV - EXAMPLE FOR 2D SURVEYS

```
10000Project Definition:     PS6001    BRENT,November 1986
10001Project Description:    2D Seismic, Brent Field
   02Tape Specification:     12/12/86,version#1,RJW,UKOOA Raw rev 1.0
   03Client:                 SHELL UK Exploration & Production
10004Geophysical Contractor:Geophysical Resources International Ltd
10005Positioning Contractor:Seatech Surveys
10006Processing Contractor: Seatech Surveys
10007Mobilised at Aberdeen 2 November 1986
10007Nav trials 2-3 November, Baseline Crossings 3 November
10010060011l
10111International      ED50                  6378388.000   1.00000000 297.0000000
10121     -89.500     -93.800    -127.600     -.97     0.00     0.00     0.00
10130001Universal Transverse Mercator Three Degrees East Central Meridian
10140  1.00000000                            0000000.000N0030000.000E
10150000000.000N0030000.000E        0.00  500000.00
10160.999600000000000000.000N0030000.000E
10201010200000MV Sea Searcher
10211127.5PULSE/8 Antenna
10221PULSE/8 Antenna
10231Seatech HP1000 system for processing & logging
10241 0.00
10251  3.5180.0  2.51500.001485.501Atlas Deso 10
10261  0.00Robertson SKR 82 Survey Gyro
11001UKHYFC01031Range-Range Hyperfix Forth Chain F1
11101SEAHOUSES          553435.901N  13837.440W 6160323.81  396366.16  10.00
11401  299650000    1897900     78.9430.000000000.000000001.00000000
11002UKHYFC02031Range-Range Hyperfix Forth Chain F1
11102CRAIL              561634.546N  23701.115W 6240044.47  337964.72  10.00
11402  299650000    1897900     78.9430.000000000.000000001.00000000
   03UKHYFC03031Range-Range Hyperfix Forth Chain F1
  .03SWINNEY HILL       581737.623N  31743.985W 6466294.39  306838.67  57.00
11403  299650000    1897900     78.9430.000000000.000000001.00000000
11004SNSP8-12061PULSE/8 Southern Chain
11104STFERGUS 1-2S      573317.275N  14832.883E 6380732.87  391741.82   0.00
12041UTSIRA   1-2S      591827.088N  45148.823E 6584559.09  776781.62   0.00
11404  299594000    1000000   149.79713408.815 10500.000 1.00000000
11005SNSP8-13061PULSE/8 Southern Chain
11105STFERGUS 1-3S      573317.275N  14832.883E 6380732.87  391741.82   0.00
12051ROEMOE   1-3S      550446.225N  83242.539E 6137189.76 1044863.66   0.00
11405  299594000    1000000   149.79728150.428 23500.000 1.00000000
11006SNSP8-15061PULSE/8 Southern Chain
11106STFERGUS 1-5S      573317.275N  14832.883E 6380732.87  391741.82   0.00
12061H'BURGH  1-5S      525006.496N  13106.164E 5855134.68  602288.41   0.00
11406  299594000    1000000   149.79751781.129 48000.000 1.00000000
20100010.0   0.0 19.5        0.0
20100025.8 180.0 18.2        0.0
40110000000  50.0 180.0 10.0180.0Air guns
00010UK86-100          0Tie Line Through Wellhead
01100 564837.087N  12638.293E6297340.42 588164.56
02100 5564626.28N  13130.689E6293403.92 593213.33
00010UK86-100              100      10086312091510.0135.00  56.6100000000
01100 564830.592N  12652.387E 6297144.64  588407.84   0.0   0.0134.82 100.0
10100100l    3114.56    0.110102001    3037.18    0.100103001    3398.20    0.3601
10100400212387.76    0.080005002  26724.62  -0.170006002  50653.71  -0.1800
00010UK86-100              101      10186312091520.5135.50  57.6100000000
01100 564823.244N  12709.686E 6296923.67  588706.05   0.0   0.0135.01 100.0
  1001001    3131.29    0.110102001    3059.18    0.100103001    3418.43    0.3601
.01004002  12386.62    0.080005002  26722.24  -0.170006002  50651.73  -0.1800
00010UK86-100              102      10286312091529.5135.90  57.0100000000
01100 564822.061N  12712.638E 6296888.18  588756.89   0.0   0.0134.75 100.0
10100100l    3134.62    0.110102001    3063.58    0.100103001    3422.58    0.3601
10100400212386.43    0.080005002  26721.83  -0.170006002  50651.41  -0.1800
```

APPENDIX V - EXAMPLE FOR 3D SURVEYS

```
H0000Project Definition:     P86200   Sean 3D, November 1986
H0001Project Description:    3D Seismic, Inde  Field
H0002Tape Specification:     15/12/86,version#1,RJW,UKOOR Raw rev 1.0
H0003Client:                 SHELL UK Exploration & Production
H0004Geophysical Contractor:Geophysical Resources International Ltd
H0005Positioning Contractor:Seatech Surveys
H0006Processing Contractor: Seatech Surveys
H0007Mobilised at Immingham 5 November 1986
H00100601121
H0100 -6.20British Geological Surveys
H0111International      ED50                  6378388.000  1.00000000 297.0000000
H0121     -89.500     -93.800    -127.600     -.97     0.00     0.00     0.00
H0112WGS 72              WGS 72               6378135.000  1.00000000 298.2600000
H0122       0.000       0.000       0.000     0.00     0.00     0.00     0.00
H0130003Transverse Mercator Zero Degrees Central Meridian
H0140  1.00000000                            0000000.000N0000000.000E
H01500000000.000N0000000.000E        0.00  500000.00
H01600.99960000000000000.000N0000000.000E
H02011102000001MV Sea Searcher
H021127.5Hyperfix Antenna
H0221Near Trace
H0231Seatech HF1000 system for processing & logging
H0241 0.00
H0251   3.5180.0  2.51500.001485.501Atlas Deso 10
H0261   0.00Robertson SKR 82 Survey Gyro
H1001UKHYFC01031Range-Range Hyperfix Forth Chain F1
H1101SEAHOUSES          553435.901N  13837.440W 6160323.81  396366.16  10.00
H1401  299650000    1897900    78.9430.000000000.000000001.00000000
H1002UKHYFC02031Range-Range Hyperfix Forth Chain F1
  102CRAIL              561634.546N  23701.115W 6240044.47  337964.72  10.00
H1402  299650000    1897900    78.9430.000000000.000000001.00000000
H1003UKHYFC03031Range-Range Hyperfix Forth Chain F1
H1103SWINNEY HILL       581737.623N  31743.985W 6466294.39  306838.67  57.00
H1403  299650000    1897900    78.9430.000000000.000000001.00000000
H1004SNSP8-12061PULSE/8 Southern Chain
H1104STFERGUS 1-2S      573317.275N  14832.883E 6380732.87  391741.82   0.00
H1204UTSIRA   1-2S      591827.088N  45148.823E 6584559.09  776781.62   0.00
H1404  299594000    1000000   149.79713408.815 10500.000 1.00000000
H1005SNSP8-13061PULSE/8 Southern Chain
H1105STFERGUS 1-3S      573317.275N  14832.883E 6380732.87  391741.82   0.00
H1205ROEMOE   1-3S      550446.225N  83242.539E 6137189.76 1044863.66   0.00
H1405  299594000    1000000   149.79728150.428 23500.000 1.00000000
H1006SNSP8-15061PULSE/8 Southern Chain
H1106STFERGUS 1-5S      573317.275N  14832.883E 6380732.87  391741.82   0.00
H1206H'BURGH  1-5S      525006.496N  13106.164E 5855134.68  602288.41   0.00
H1406  299594000    1000000   149.79751781.129 48000.000 1.00000000
H2010001    0.0    0.0 19.5        0.0
H2010002    5.8  180.0 18.2        0.0
H3011096100000000008000
H3111  45.5 180.0 30.0 50.0 25.03005.0 50.0 50.0 96 24.75
H3211001 -18.0 3.0002 289.0 3.0003 592.0 3.0004 892.0 3.00051199.0 3.0
H3211006 1502.0 3.00071906.0 3.00082210.0 3.00092614.0 3.00102875.0 3.0
H3311001DIGI0331   0.0 90 -1.2270 -0.9
H3311002DIGI0335   0.0 90 -1.8270  0.2
H3311003DIGI0336   0.0 90  0.8270  0.5
H3311004DIGI0305   0.0 90 -0.5270 -0.8
H3311005DIGI0318   0.0 90  2.1270  1.6
H3311006DIGI0332   0.0 90 -0.2270 -0.1
H3311007DIGI0337   0.0 90 -1.0270 -0.5
H3311008DIGI0320   0.0 90 -0.8270  1.2
H3311009DIGI0322   0.0 90  1.4270 -0.9
H3311010DIGI0306   0.0 90 -1.2270  0.1
```

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H3411001    0.0002  28.5003  52.8004  77.8005 102.8006 127.7007 152.2008 177.2
H3411009 202.2010 227.2011 252.2012 276.6013 301.6014 326.6015 351.6016 376.6
H3411017 401.6018 426.0019 451.0020 476.0021 501.0022 526.0023 551.0024 575.4
H3411025 600.4026 625.4027 650.4028 675.4029 700.4030 724.8031 749.8032 774.8
H3411033 799.8034 824.8035 849.8036 874.2037 899.2038 924.2039 949.3040 974.2
H3411041 999.20421023.60431048.60441073.60451098.60461123.60471148.60481173.0
H34110491198.00501223.00511248.00521273.00531298.00541322.40551347.40561372.4
H34110571397.40581422.40591447.40601471.80611496.80621521.80631546.80641571.8
H34110651596.80661621.20671646.20681671.20691696.20701721.20711746.20721770.6
H34110731795.60741820.60751845.60761870.60771895.60781920.00791945.00801970.0
H34110811995.00822020.00832045.00842069.40852094.40862119.40872144.40882169.4
H34110892194.40902218.80912243.80922268.80932293.80942318.80952343.80962368.2
H3511001 -22.0  0.0 1.0002 293.0  0.0 1.0003  595.0 0.0 1.0004 892.0  0.0 1.0
H35110051122.0  0.0 1.00061506.0  0.0 1.0007 1912.0 0.0 1.00082218.0  0.0 1.0
H4011000000  50.0 180.0 10.0180.0Air guns
H6001GPS     2GPS satellite system, 4 satellites in use.
H6101001  3.0180.0 15.0Magnavox receiver
L0010SE86-200         0
L0110 564837.087N  12638.293E6297340.42 588164.56
L0210 554626.283N  13130.689E6293403.92 593213.33
E0010SE86-200              100     1008631209151O.0089.80  56.6100000000
E0110 564830.592N  12652.387E 6297144.64  588407.84 148.0 179.9089.52 100.0
E101001001   3114.56   0.110102001   3037.18   0.100103001   3398.20   0.3601
E101004002  12387.76   0.080005002  26724.62  -0.170006002  50653.71  -0.1800
E20101        10.00
E21110010 96.20020 96.10030 95.40041 98.90050 96.50060 96.50070 96.10080 95.5
E21110090 97.10100 96.8
E22110010  8.10020  8.00030  7.90040  8.00050  8.10060  8.20070  8.30080  8.2
E401010010564829.547N  12656.786E0   15.0  1.266  0.542
E0010SE86-200              101     1018631209152O.5089.70  57.6100000000
E0110 564823.244N  12709.686E 6296923.67  588706.05 147.0 179.8089.81 100.0
E101001001   3131.29   0.110102001   3059.18   0.100103001   3418.43   0.3601
E101004002  12386.62   0.080005002  26722.24  -0.170006002  50651.73  -0.1800
E20101        10.50
E21110010 96.70020 95.90030 95.80041 98.60050 96.20060 96.90070 96.00080 95.4
E21110090 96.90100 96.6
E22110010  8.00020  8.10030  7.90040  8.10050  8.20060  8.10070  8.10080  8.2
E401010010564829.547N  12656.786E0   25.0  1.266  0.542
E0010SE86-200              102     1028631209152O.5089.60  57.0100000000
E0110 564822.061N  12712.638E 6296888.18  588756.89 149.0 179.5089.55 100.0
E101001001   3134.62   0.110102001   3063.58   0.100103001   3422.58   0.3601
E101004002  12386.43   0.080005002  26721.83  -0.170006002  50651.41  -0.1800
E20101        10.00
E21110010 96.60020 95.80030 96.10041 98.80050 96.10060 96.70070 96.40080 95.5
E21110090 96.80100 96.5
E22110010  8.10020  7.90030  8.00040  8.20050  8.00060  8.00070  8.20080  8.1
E401010010564822.077N  12712.511E0    1.0  0.715  0.611
```