ROYAL AUSTRALIAN NAVY

HYDROGRAPHIC SERVICE

Hydrographic Transfer Format

Version 2.02

Technical Specification

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CHANGE CONTROL PAGE

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Change History

Version	Who	Date	Pages	Reason
HTF v1.0	PJR	16/06/1997	Specification	Evolution – SEA1401 HSS
HTF v2.0	PJR	19/08/1999	Specification & Appendix	Evolution – SEA1430 Data Conversion
HTF v2.01	PJR	25/10/1999	Specification & Appendix	Evolution (Semantics, HTF v2.01 Example)
HTF v2.02	PJR	20/12/1999	Specification & Appendix	Final Evolution (Semantics, Syntax Diagrams, Configuration Example, HTF v2.02 Sample Data) – HTF Tools SOR
HTF v2.02	ADP	01/11/2001	Specification & Appendix	Correction of typographical errors.

Review History

Version	Who	Date	Status
HTF v2.01	PJR/PW/PRR	25/10/1999	AHO review complete, waiting further external review & comment
HTF v2.02	PJR/PRR/PW/AP/HC	20/11/1999	Specification Complete
HTF v2.02	PJR	21/02/2000	Documentation Complete

Distribution

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Position	Who	Date	Signature
H	Capt. G. Geraghty		

Audience

The Hydrographic Transfer Format (HTF) is the format to be used by the Hydrographic Surveying Force (HSF) Units to render their digital sounding data to the Australian Hydrographic Office (AHO) and between other HSF Units. The AHO hopes that the HTF will be adopted by other hydrographic agencies for the rendering of source survey data to the Australian Hydrographic Office. It is further hoped that exposure to HTF will see it adopted as a standard for the exchange of hydrographic survey data. HTF will now be the preferred distribution format for sounding data from the Australian Hydrographic Office

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1. HYDROGRAPHIC TRANSFER FORMAT – SPECIFICATION

1.1. HTF Overview

Hydrographic Transfer Format (HTF) is the format to be used by the Hydrographic Surveying Force (HSF) Units to render their digital sounding data to the Australian Hydrographic Office (AHO) and between other HSF Units.

The data structure of the HTF Sounding Data is defined by its function - data exchange and preservation. The HTF structure is robust, reliable, readable, stable, complete and self-documenting. The HTF format retains elements and attributes captured during survey acquisition and subsequent processing in a portable, non-proprietary form.

1.2. HTF Structure

The HTF Sounding Data file naming convention is SD□□□□□□.HTF where SD indicates Sounding Data, where □□□□□□ uniquely identifies the file (e.g. HI number, Survey Title) with long filenames acceptable and the extension .HTF indicates the file is in the HTF file format. Compression of an HTF file can be used when appropriate although it is not advised for preservation purposes and if compression is used, the compression algorithm must be documented on the media and in a Readme file.

The data is to be encoded and stored in the ASCII character format (standard 128 ASCII character set) such that it is human readable. Fields that are not populated are to contain an asterisk (ASCII #42), the field is not to be left out and the field is not to be populated with a NULL. For Sounding Data, the Field Population Key (FPK) shall be used to indicate what fields will be populated (with data or an asterisk) and those fields that have been excluded for the whole dataset (see FPK explanation in Sounding Data). The FPK has been introduced to reduce space and increase efficiency in processing HTF.

Additional fields can be added to the end of the prescribed mandatory fields, these additional fields must be fully documented in the respective header. Field identifiers must not conflict with the prescribed HTF fields (H1..H55, P1..P3, S1..S3.20).

A separate HTF Sounding Data file should be rendered for each Grid Zone where a grid system has been used for the acquisition and/or processing.

Procedures are to be in place to protect the integrity of the file during processing. To ensure the file cannot be changed in any way, the media on which the HTF file resides is to be set to ‘read only’ and the file permissions set so that the file cannot be corrupted.

A semi colon (ASCII #59) at the start of a line indicates a general comment and can be inserted anywhere within the HTF Header, Polygon Data Description and the Sounding Data Description.

All HTF files must start with “HTF HEADER”. These words are to be used as a sentinel value to identify HTF files regardless of how the files have been named.

1.3. HTF Data Sets

Data stored in the HTF Sounding Data file is contained in three distinct data sets each with a specific content and separated by three new lines to aid in visual editing.

The data sets are:

- **HTF Header Data** describes what data is being transmitted in a given transaction and how that transmission can be handled. It includes metadata that describe the contents and nature of the dataset;

- **Polygon Header and Polygon Data** contains polygons of each region of similar survey criteria, where criteria may be Survey Category, Seafloor Classification, Survey Boundaries or whatever user defined criteria is being captured. A description at the start of the Polygon Data defines the fields within the Polygon Data. There may be numerous Polygon Data records each with a separate commented description defining the criteria upon which the polygons are based;

- **Sounding Header and Sounding Data** contains the actual sounding data. A description at the start of the Sounding Data defines the fields within the Sounding Data. The FPK defines those fields that will be populated and those fields exempt.

Notes on format and type abbreviations for each group of records.

Comment	Text comment within the file.
I I I I I I I I	Represents integers (includes Long and short integers).
NNNN.nn	Represents a number (includes Numbers, float & reals).
CCYYMMDD	Represents the date as Century Century Year Year Month Month Day Day (see ISO 8601 - 1988).
HHMMSS.ss	Represents Hours Minutes Seconds and decimalised seconds to one hundredth of a second.
Alphanumeric	Represents ASCII general text A-Z a-z 0-9 ! @ $ % & , _ ( ) [ ] { }- + | / \ ’ ” ` = < > ? .
;	Reserved Character, a semi-colon at the start of a line indicates a general comment that can be inserted, if required, by the user, in the HTF Header & the Polygon Data, Sounding Data descriptions. Comments are excluded from the data records.
*	Reserved Character, Non populated field, an asterisk indicates that data is unavailable, unknown or not provided for that prescribed field.
:	Reserved Character, A colon is used after a field name to indicate input data is to follow (HTF Header & Polygon Data only).

1.4. HTF Header Data

- Each line in the record that requires an input (ie. not a Comment) will contain the Field Name, terminating in a colon (ASCII #58) and a space (ASCII #32), the relevant input data immediately follows (see Annex A Appendix 2 — HTF Example). All prescribed fields are to be populated with data or an asterisk.
- Each line within the record is to be separated by a new line.
- The format indicates the minimum precision required.

HTF HEADER

	FIELD NAME	FIELD DESCRIPTION	RANGE	FORMAT	Type
H1	HTF HEADER		1 line	Comment	Alphanumeric
H2	HTF VERSION:	Identifies the HTF version	1…99.99	NN.nn	Number
H3	COPYRIGHT INFORMATION:	e.g. (c) Copyright Commonwealth of Australia	1 line	Text	Alphanumeric
H4	DATA USAGE RESTRICTIONS:	e.g. This data is not to be used or relied upon for navigation purposes	1 line	Text	Alphanumeric
H5	CLASSIFICATION OF DATA:	e.g. Unclassified	1 line	Text	Alphanumeric
H6	DATA CUSTODIAN:	e.g. Hydrographic Service RAN	1 line	Text	Alphanumeric
H7	HTF CREATION ROUTINE - NAME & VERSION:	Name, Version of the HTF Sounding Data file creator	1 line	Text	Alphanumeric
H8	LOGGING SYSTEM - NAME & VERSION:	Name, Version of the acquisition system associated with this data	1 line	Text	Alphanumeric
H9	PROCESSING SYSTEM - NAME & VERSION:	Name, Version of the processing system associated with this data	1 line	Text	Alphanumeric
H10	DATE OF HTF FILE CREATION:	File creation date	Date	CCYYMMDD	Integer
H11	HTF SOUNDING DATA VOLUME NUMBER:	Sequential number of this media volume in this transmittal	1..99	I I	Integer
H12	TOTAL HTF VOLUMES FOR THIS SURVEY:	Total number of media volumes comprising this transmittal	1..99	I I	Integer
H13	SURVEY IDENTIFICATION:	Hydrographic Instruction Number	1 line	Text	Alphanumeric
H14	REPORT OF SURVEY DATE:	Date assigned to the Survey Report	Date	CCYYMMDD	Integer
H15	GENERAL LOCALITY:	General area of the survey eg. Torres Strait	1 line	Text	Alphanumeric
H16	SURVEY TITLE:	Survey Title	1 line	Text	Alphanumeric
H17	SURVEY PLATFORM:	Ship or Unit name	1 line	Text	Alphanumeric
H18	SURVEYOR:	Name of Surveyor / Officer In Charge of the survey	1 line	Text	Alphanumeric
H19	UTC START DATE:	Date survey data acquisition commenced	Date	CCYYMMDD	Integer
H20	UTC END DATE:	Date survey data acquisition was finished	Date	CCYYMMDD	Integer
H21	GEODETIC DATUM:	Horizontal positioning datum eg. WGS84	1 line	Text	Alphanumeric
H22	COORDINATE SYSTEM:	List the co-ordinate system (Geographic, Grid or Local) used for the main processing.	1 line	Text	Alphanumeric
H23	SW LATITUDE:	Southernmost latitude of MBR of this data set	0…± 90°	± NN.nnnnnnn	Number
H24	SW LONGITUDE:	Westernmost longitude of MBR of this data set	0…± 180°	± NNN.nnnnnnn	Number
H25	NE LATITUDE:	Northernmost latitude of MBR of this data set	0…± 90°	± NN.nnnnnnn	Number

	FIELD NAME	FIELD DESCRIPTION	RANGE	FORMAT	Type
H26	NE LONGITUDE:	Easternmost longitude of MBR of this data set	0…± 180°	± NNN.nnnnnnn	Number
H27	GRID REFERENCE SYSTEM:	Grid reference system eg. UTM	1 line	Text	Alphanumeric
H28	GRID ZONE:	Zone within the Grid reference system eg. 56	1 line	Text	Alphanumeric
H29	CENTRAL MERIDIAN:	Central meridian of the zone eg. +153	0...± 180°	± NNN.nnnnnnn	Number
H30	SW GRID COORDINATE - EASTING:	Westernmost coordinate of the MBR of this data set	0…1 000 000	NNNNNNN.nn	Number
H31	SW GRID COORDINATE - NORTHING:	Southernmost coordinate of the MBR of this data set	0...10 000 000	NNNNNNNN.nn	Number
H32	NE GRID COORDINATE - EASTING:	Easternmost coordinate of the MBR of this data set	0…1 000 000	NNNNNNN.nn	Number
H33	NE GRID COORDINATE - NORTHING:	Northernmost coordinate of the MBR of this data set	0...10 000 000	NNNNNNNN.nn	Number
H34	NUMBER OF POSITIONING SYSTEMS (PS):	Number of position systems described = α	0...10	I I	Integer
H35	PS 01:	Electronic position fixing system (brand and model)	1 line	Text	Alphanumeric
H36	PS 01 MODE:	Mode used for positioning. eg. DGPS, GPS, Hyperbolic, Range-Range, Kalman filter etc	1 line	Text	Alphanumeric
H37	PS XX:	Repeat for each positioning system used during acquisition	1 line	Text	Alphanumeric
H38	PS XX MODE:	Repeat for each positioning system (when XX = α then end)	1 line	Text	Alphanumeric
H39	SOUNDING DATUM:	Datum to which soundings in the data set are reduced eg. LAT, ISLW, MSL	1 line	Text	Alphanumeric
H40	TOTAL SOUNDINGS:	Total number of soundings in data set	0..999999999	I I I I I I I I I	Integer
H41	TOTAL VALID SOUNDINGS:	Total number of soundings in volume not flagged as rejected	0..999999999	I I I I I I I I I	Integer
H42	NUMBER OF DEPTH SOUNDERS (DS):	Number of depth sounders described = β	0..10	I I	Integer
H43	DS 01:	Echo sounder (brand and model)	1 line	Text	Alphanumeric
H44	DS 01 MODE:	Mode used for sounding. eg. single beam, dual frequency, multibeam etc	1 line	Text	Alphanumeric
H45	DS XX:	Repeat for each echo sounder used during acquisition	1 line	Text	Alphanumeric
H46	DS XX MODE:	Repeat for each echo sounder (when XX = β then end)	1 line	Text	Alphanumeric
H47	NUMBER OF TIDAL STATIONS (TS):	Number of tidal stations described = χ	0..10	I I	Integer
H48	TS 01:	Tidal station name	1 line	Text	Alphanumeric
H49	TS 01 LOCATION:	Tidal station location	1 line	Text	Alphanumeric
H50	TS 01 METHOD:	Means used to compute tidal data. eg. Predicted, observed, co-tidal, benchmark connection	1 line	Text	Alphanumeric
H51	TS XX:	Repeat for each tidal station used to create tidal model	1 line	Text	Alphanumeric
H52	TS XX LOCATION:	Tidal station location	1 line	Text	Alphanumeric
H53	TS XX METHOD:	Repeat for each tidal station (when XX = χ then end)	1 line	Text	Alphanumeric
H54	SCALE:	Scale that original fairsheet was plotted eg. 1 to 5,000	1 line	Text	Alphanumeric
H55	DATA DENSITY:	Grid, bin, cell size, clash radial range eg. 5m x 7m grid, 50m cell, 30m clash radial range	1 line	Text	Alphanumeric
H….	END OF HTF HEADER	Marks the end of the HTF Header	1 line	Comment	Alphanumeric

Note: MBR - Minimum Bounding Rectangle.

1.5. Polygon Data

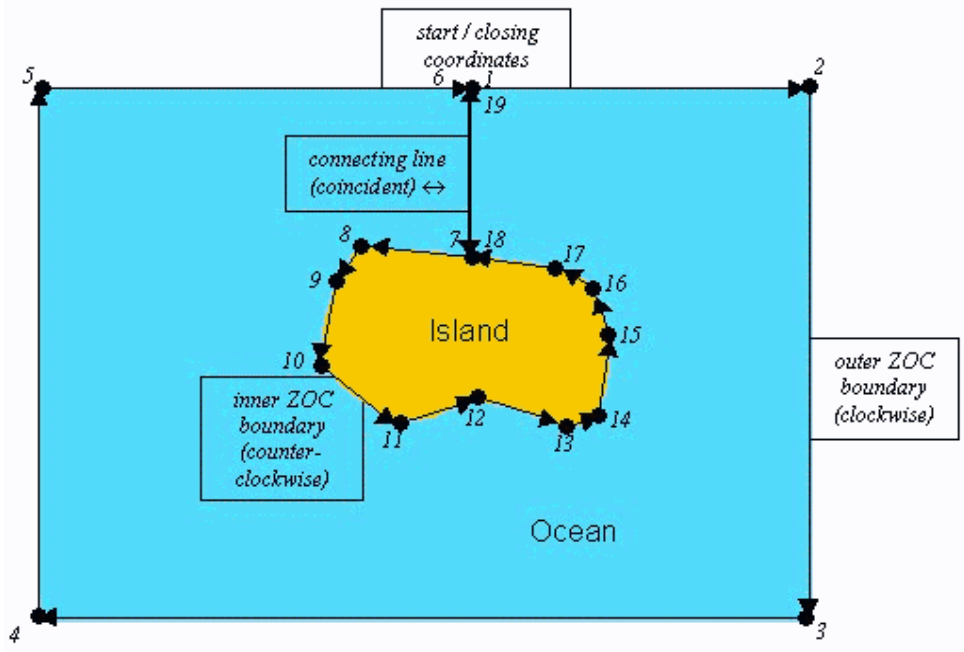
- Polygons are used to distinguish between differing survey categories, such that any significant changes in position/depth accuracy and/or a change in the seafloor coverage will dictate a separate bounding polygon. Polygons may also be used to categorise a user-defined criterion; these criteria must be fully described in the Polygon Data Description (eg. Seafloor Classification, Survey Boundaries, Bin/Cell size, sounding density/resolution etc). This Polygon Data Description details the Polygon Data fields in a form that is easily comprehended by a human reader.

- Multiple Polygon Data records, capturing different criteria, may be used with three new lines separating each Polygon Data record. Polygons of similar survey criteria (ie. Survey Category, Seafloor Classification, Survey Boundaries etc) but with significant different attribute values (seafloor coverage, bottom type, etc) will require a separate polygon (not a separate Polygon Description) separated by two new lines from a polygon of similar survey criteria. See Appendix 2 of Annex A.

- In order to conform with IHO boundary capture principles; polygon boundaries should be encoded in a clockwise direction such that the area of interest always lies to the right of the lines.

- Survey Category polygons should exclude islands. Polygons which surround islands should be captured "doughnut style" by encoding them as a single polygon ensuring that the outer boundary is coded in a clockwise direction and the inner boundaries (islands) are coded in an anticlockwise direction. The inner and outer boundaries should be connected sequentially by a coincident line or lines. The method is illustrated in the diagram opposite.

- Single lines are to be captured, recording any turning points in the line, up to the boundary of a survey area polygon, if applicable. Even if an area is represented by a point or a line, the area it covers must nevertheless be defined as a polygon with a closing coordinate that is the same as the start coordinate. In the diagram opposite, one polygon is captured, starting at coordinate #1 and ending at the same coordinate #19.



- Each line in the record that requires an input (ie. Not a Comment or any Lat/Long/East/North input) will contain the Field Name, terminating in a colon (ASCII #58) and a space (ASCII #32), the input field immediately follows (see Annex A Appendix 3 — HTF Example).
- Every point in the polygon/line is to be separated by a new line. The Latitude, Longitude, Easting and Northings of a point are to be contained on the one line and separated by a space (ASCII #32).
- Fields that have been defined in the Polygon Data Description though do not contain data in the Polygon Data are populated with an asterisk (ASCI #42).

POLYGON DATA DESCRIPTION

	FIELD DESCRIPTION
P1	POLYGON HEADER = The fields within the Polygon Data record are as listed in this header, each polygon or single line is separated by two new lines, each point separated by a new line, each field separated by a space.
P2	POLYGON DESCRIPTION = Defines the polygon theme eg. survey category, seafloor classification, survey boundaries etc
P3	POLYGON IDENTIFIER = Unique polygon identifier for this transmittal.
P4	SEAFLOOR COVERAGE = All significant seafloor features detected (full ensonification/sweep) or full coverage not achieved and uncharted features may exist.
P5	POSITION ACCURACY = ± NNN.n metres at 95% CI (2.45σ) with respect to the given datum.
P6	DEPTH ACCURACY = ± NN.n metres at 95% CI (2.00σ) at critical depths.
P7.1	LATITUDE = Latitude of a point on the perimeter bounding data of similar seafloor coverage. ± NN.nnnnnnn
P7.2	LONGITUDE = Longitude of a point on the perimeter bounding data of similar seafloor coverage. ± NNN.nnnnnnn
P7.3	EASTING = Easting Grid Coordinate in metres of a point on the perimeter bounding data of similar seafloor coverage. NNNNNNN.nn
P7.4	NORTHING = Northings Grid Coordinate in metres of a point on the perimeter bounding data of similar seafloor coverage. NNNNNNNN.nn
P….	END OF POLYGON HEADER

POLYGON DATA

	FIELD NAME	COMMENTS	RANGE	FORMAT	TYPE
P1	POLYGON DATA	Indicates the start of a Polygon Data record	1 line	Comment	Alphanumeric
P2	POLYGON DESCRIPTION:	Defines the polygon theme eg. survey category, seafloor classification, survey boundaries etc.	1 line	Text	Alphanumeric
P3	POLYGON IDENTIFIER:	Unique polygon identifier for this transmittal.	1…999	I I I	Integer
P4	SEAFLOOR COVERAGE:	Indicate if all significant seafloor features detected or full coverage not achieved	1 line	Text	Alphanumeric
P5	POSITION ACCURACY:	± NNN.n metres 95% CI (2.45σ)	0…± 999.9	± NNN.n	Number
P6	DEPTH ACCURACY:	± NN.n metres 95% CI (2.00σ)	0…± 99.9	± NN.n	Number
P7.1	LATITUDE	Latitude of polygon - starting, turning or finishing point	0…± 90°	± NN.nnnnnnn	Number
P7.2	LONGITUDE	Longitude of polygon - starting, turning or finishing point	0…± 180°	± NNN.nnnnnnn	Number
P7.3	EASTING	Grid coordinate of polygon - starting, turning or finishing point	0...1 000 000	NNNNNNN.nn	Number
P7.4	NORTHING	Grid coordinate of polygon - starting, turning or finishing point	0...10 000 000	NNNNNNNN.nn	Number

repeat from field POLYGON IDENTIFIER for next polygon, repeating until all survey data is bounded accordingly.

P….	END OF POLYGON DATA	Marks the end of the Polygon Data record	1 line	Comment	Alphanumeric

1.6. Sounding Data

- The Field Population Key (FPK) shall be used to indicate what fields will be populated (with data or an *) and those fields that have been excluded for the whole dataset. If an FPK is not used, then the prescribed fields (S1...S3.20) must be populated (data or asterisk) in the mandated order & also the FPK field (S2) is populated with [11111111111111111111] indicating that all 20 prescribed fields will be populated with either data or asterisk.

- Mandatory fields to be populated are Latitude, Longitude (or Easting, Northing) and Depth. The FPK for these mandatory fields (eg. Lat, Long, Depth) would be [00000110010000000000] where the first '0' (S3.1) corresponds to the rejected sounding field. If all soundings are valid, then the Rejected Sounding field (S3.1 or [01]) need not be populated, the field is only to be used if invalid soundings are included in the transmittal.

- The FPK is enclosed in square brackets (ASCII #91 and ASCII #93). A '1' indicates a field has been populated and a '0' indicates the field has been excluded.

- A new line separates each sounding record. Each field within the Sounding Data Record is separated by a space (ASCII #32). Spaces are not allowed within a field in the Sounding Data record.

- Additional fields may be added to the Sounding Data after the last prescribed field #21 'Plot Scale'. The additional fields must be described in the Sounding Data Description and included in the FPK if being used.

SOUNDING DATA DESCRIPTION

	FIELD DESCRIPTIONS
S1	SOUNDING HEADER = The fields within the Sounding Data record are as listed in this sub-header, each field separated by a space, each sounding point separated by a new line. All fields not populated contain the asterisk (ASCII #42) character.
S2	FIELD POPULATION KEY = Defines what fields in the Sounding Data record will be populated (with sounding data or an *) and those fields that have been excluded for the whole dataset. eg. The FPK for only the mandatory fields would be [00000110010000000000] indicating Latitude, Longitude and Depth fields are populated.
S3.1	[01] REJECTED SOUNDING = If 0 sounding is valid or if 1 the sounding has been rejected (flagged).
S3.2	[02] LINE NAME = Survey line name/number as unique identifier within the survey.
S3.3	[03] FIX NUMBER = Sequential sounding fix number, unique within the above line name.
S3.4	[04] UTC DATE = UTC date for the sounding CCYYMMDD
S3.5	[05] UTC TIME = UTC TIME for the sounding HHMMSS.ss
S3.6	[06] LATITUDE = Latitude position of the sounding ± NN.nnnnnnn (degrees of arc, south is negative)
S3.7	[07] LONGITUDE = Longitude position of the sounding ± NNN.nnnnnnn (degrees of arc, west is negative)
S3.8	[08] EASTING = Grid coordinate position of the sounding in metres NNNNNNN.nn
S3.9	[09] NORTHING = Grid coordinate position of the sounding in metres NNNNNNNN.nn
S3.10	[10] DEPTH = Reduced sounding value in metres with corrections applied as indicated in the relevant fields, soundings are positive and drying heights are negative ±NNNN.nn metres
S3.11	[11] POSITIONING SENSOR = Indicate positioning system number populated in the HTF Header record (starting H35) eg. 1 or 1, 2, 3, 4 or 2, 5 etc

	FIELD DESCRIPTIONS
S3.12	[12] DEPTH SENSOR = Indicate depth sounder number populated in the HTF Header record (starting H43) eg. 1 or 1, 2 or 2, 4, 5 etc
S3.13	[13] TPE POSITION = Total propagated error of the horizontal component for the sounding. (see Annex A Appendix 3– TPE Description)
S3.14	[14] TPE DEPTH = Total propagated error of the vertical component for the sounding. (see Annex A Appendix 3– TPE Description)
S3.15	[15] NBA FLAG = No Bottom At Flag, if 0 not a NBA depth or if 1 DEPTH [10] is NBA, deeper water probably exists.
S3.16	[16] TIDE = Value of tidal correction applied ±NN.nn metres.
S3.17	[17] DEEP WATER CORRECTION = Value of deep water sounding velocity correction applied ± NN.nn metres.
S3.18	[18] VERTICAL BIAS CORRECTION = Value of vertical bias correction applied ±NN.nn metres….eg. transducer depth correction etc
S3.19	[19] SOUND VELOCITY = Measured sound velocity used to process sounding in metres per second. I I I I
S3.20	[20] PLOTTED SOUNDING = If 0 then the reduced depth did not appear on the original fairsheet or if 1 then reduced depth appeared on the original fairsheet
S…..	END OF SOUNDING HEADER

SOUNDING DATA

	FIELD NAME	COMMENTS	RANGE	FORMAT	TYPE
S1	SOUNDING DATA	Indicates the start of the sounding data record	1 line	Text	Alphanumeric
S2	FIELD POPULATION KEY	Defines what fields will be populated (with sounding data or an *) and those fields that have been excluded for the whole dataset.	[0...100]	I I I	Integer
S3.1	REJECTED SOUNDING	If field does not exist then all soundings are valid	0 or 1	I	Integer
S3.2	LINE NAME	Survey line name/number as unique identifier within the survey	1 line	Text	Alphanumeric
S3.3	FIX NUMBER	Sequential sounding fix number, unique within the above line name.	0..999999	I I I I I I	Integer
S3.4	UTC DATE	UTC date for the sounding	Date	CCYYMMDD	Integer
S3.5	UTC TIME	UTC time for the sounding	Time	HHMMSS.ss	Number
S3.6	LATITUDE	Latitude position of the sounding (Degrees of arc, south is negative)	0...± 90°	± NN.nnnnnnn	Number
S3.7	LONGITUDE	Longitude position of the sounding (Degrees of arc, west is negative)	0...± 180°	± NNN.nnnnnnn	Number
S3.8	EASTING	Grid coordinate position of the sounding in metres	0...1 000 000	NNNNNNN.nn	Number
S3.9	NORTHING	Grid coordinate position of the sounding in metres	0...10 000 000	NNNNNNNN.nn	Number
S3.10	DEPTH	Reduced sounding value in metres, with corrections applied as indicated in the fields.	-99.99…9999.99	± NNNN.nn	Number
S3.11	POSITIONING SENSOR	Indicate positioning system number populated in the HTF Header record eg. 1 or 2 etc.	1 line	Text	Alphanumeric
S3.12	DEPTH SENSOR	Indicate depth sensor number populated in the HTF Header record eg. 1 or 2 etc	1 line	Text	Alphanumeric
S3.13	TPE POSITION	Total propagated error of the horizontal component for the sounding	0…±99.99	± NN.nn	Number
S3.14	TPE DEPTH	Total propagated error of the vertical component for the sounding	0…±99.99	± NN.nn	Number
S3.15	NBA FLAG	No Bottom At Flag, if 0 not a NBA depth or if 1 DEPTH (S3.10) is NBA	0 or 1	I	Integer
S3.16	TIDE	Value of tidal correction applied in metres	0…± 99.99	± NN.nn	Number
S3.17	DEEP WATER CORRECTION	Value of deep water sounding velocity correction applied in metres	0…± 99.99	± NN.nn	Number
S3.18	VERTICAL BIAS CORRECTION	Value of bias correction applied in metres (eg. heave, roll, pitch and yaw).	0…± 99.99	± NN.nn	Number
S3.19	SOUND VELOCITY	Speed of sound used to process sounding in metres per second.	0…9999	I I I I	Integer
S3.20	PLOTTED SOUNDING	If 0 then depth does not appear on fairsheet or if 1 then appears on the fairsheet	0 or 1	I	Integer
	repeat until all sounding points are included				
S…..	END OF SOUNDING DATA	Marks the end of the sounding data	1 line	Text	Alphanumeric

- Any additional fields may be added at the end of the prescribed #20 to fully describe the sounding signal (single beam, multibeam, laser etc) configuration and environment. These descriptions could include frequencies, ping number, ping rate, beam number, beam widths, etc.

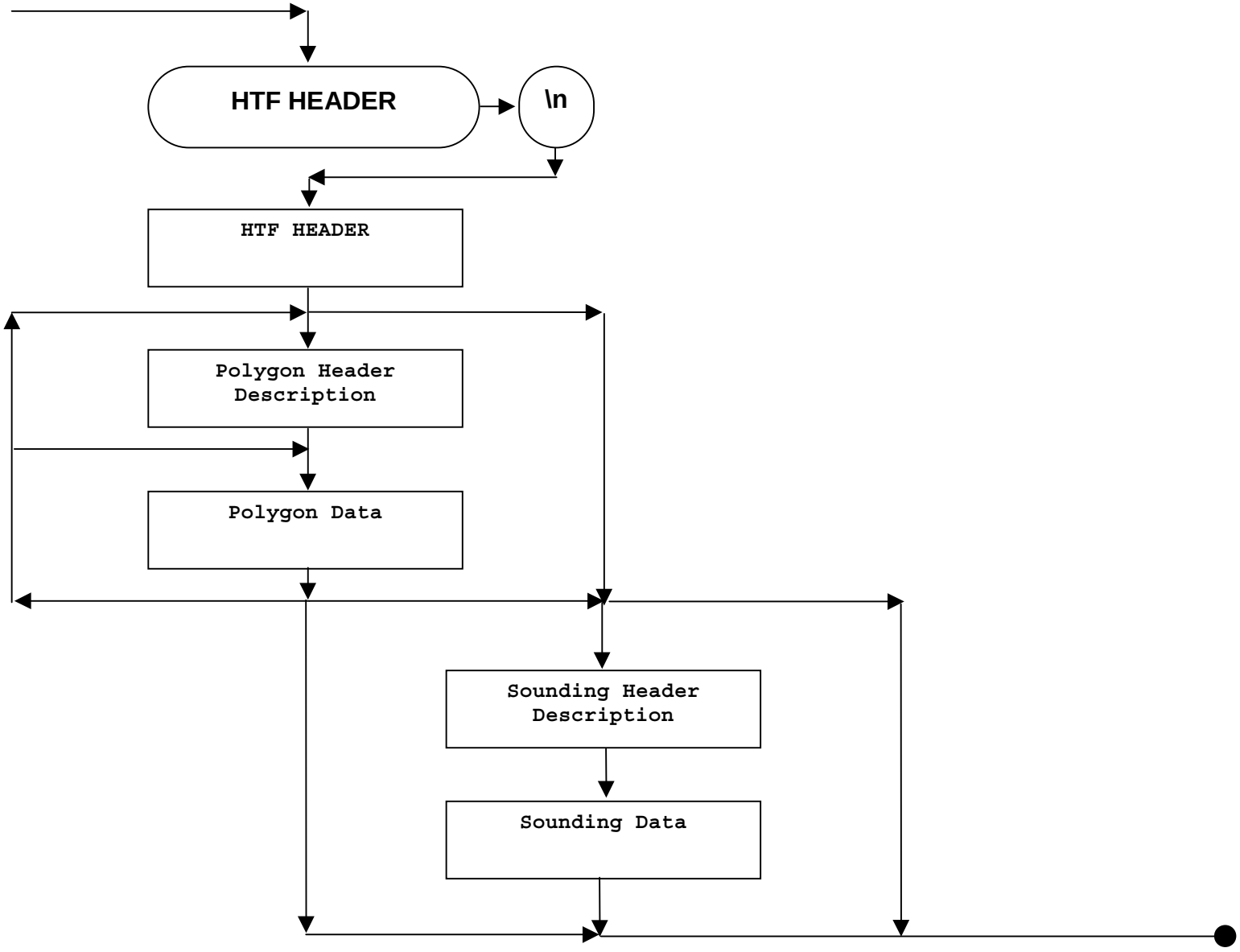
- Additional quality fields are also encouraged especially if TPE is not used. These quality fields might include Confidence values which give an indication of the quality of the sounding (eg. nearest neighbor, residual bias), PDOP, HDOP, DRMS etc.

- Additional fields to describe the physical environment are encouraged if available and might include sound velocity at transducer, sea state, turbidity etc.

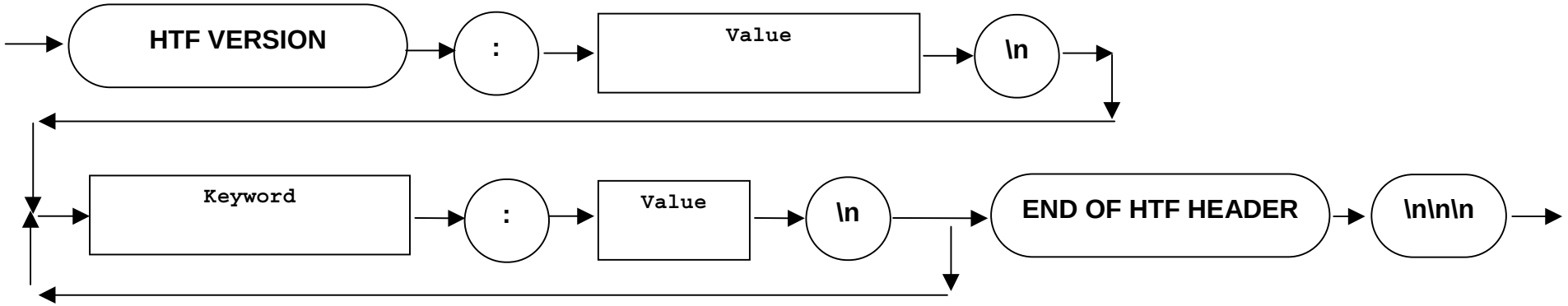
- Additional fields to describe the positional offset of sounding positions from that of the survey vessel including vessel attitude, across track offsets (port to starboard-), along track (aft- to forward), layback etc.

2. Appendix A – Syntax Diagrams

2.1. HTF File

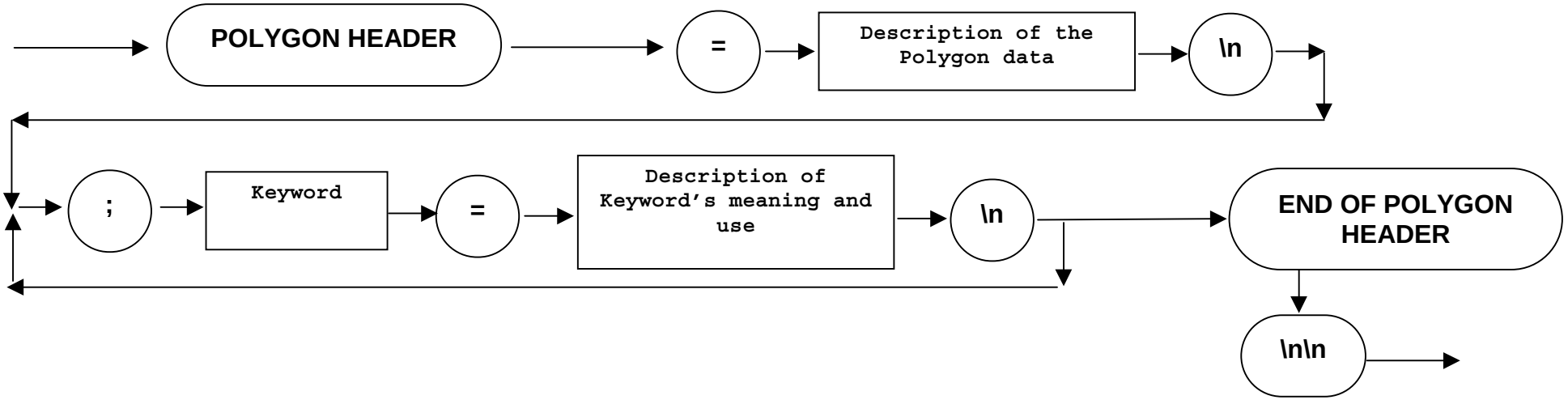


2.2. HTF Header

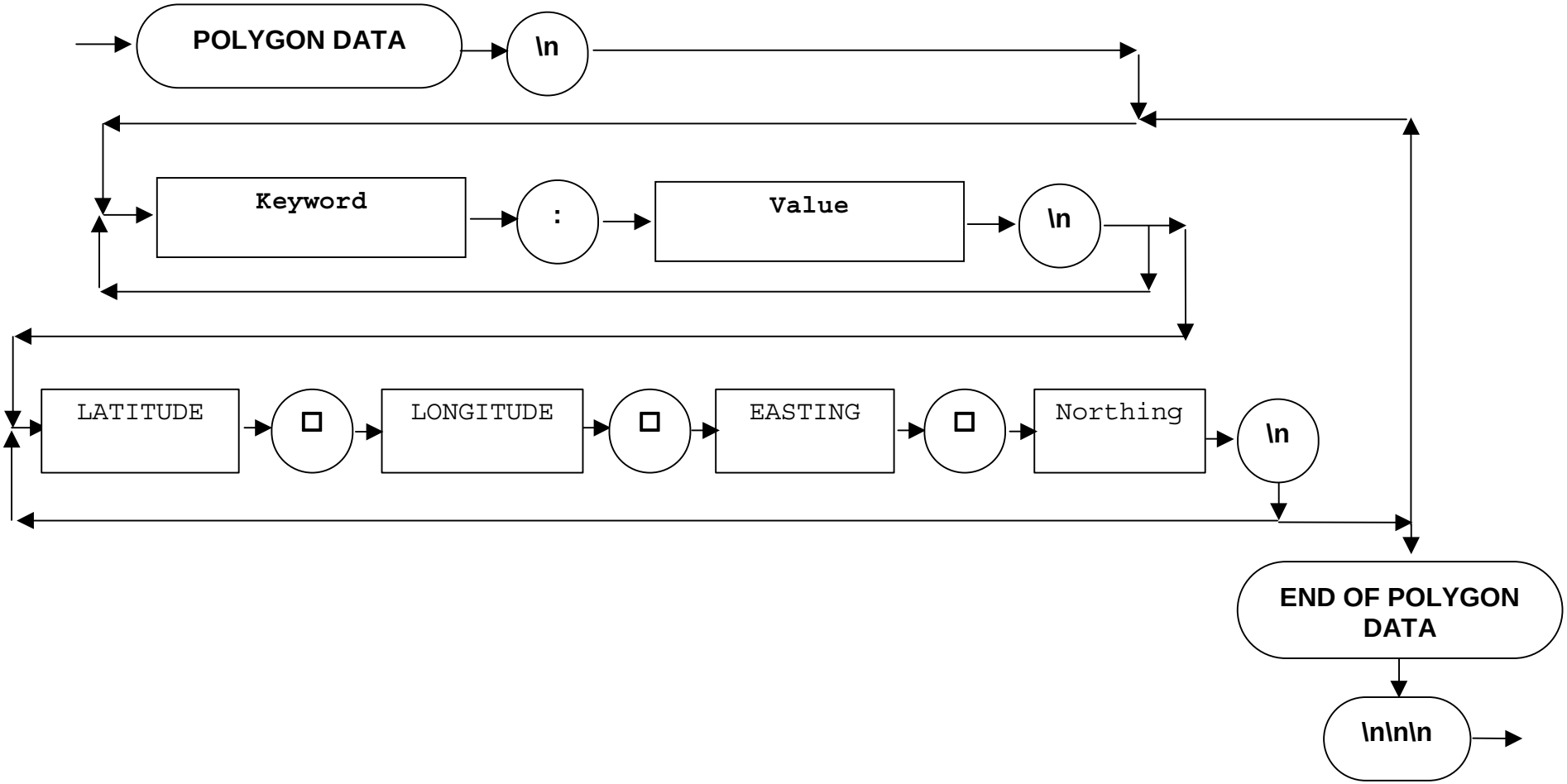


2.3. Polygon Description

2.4.

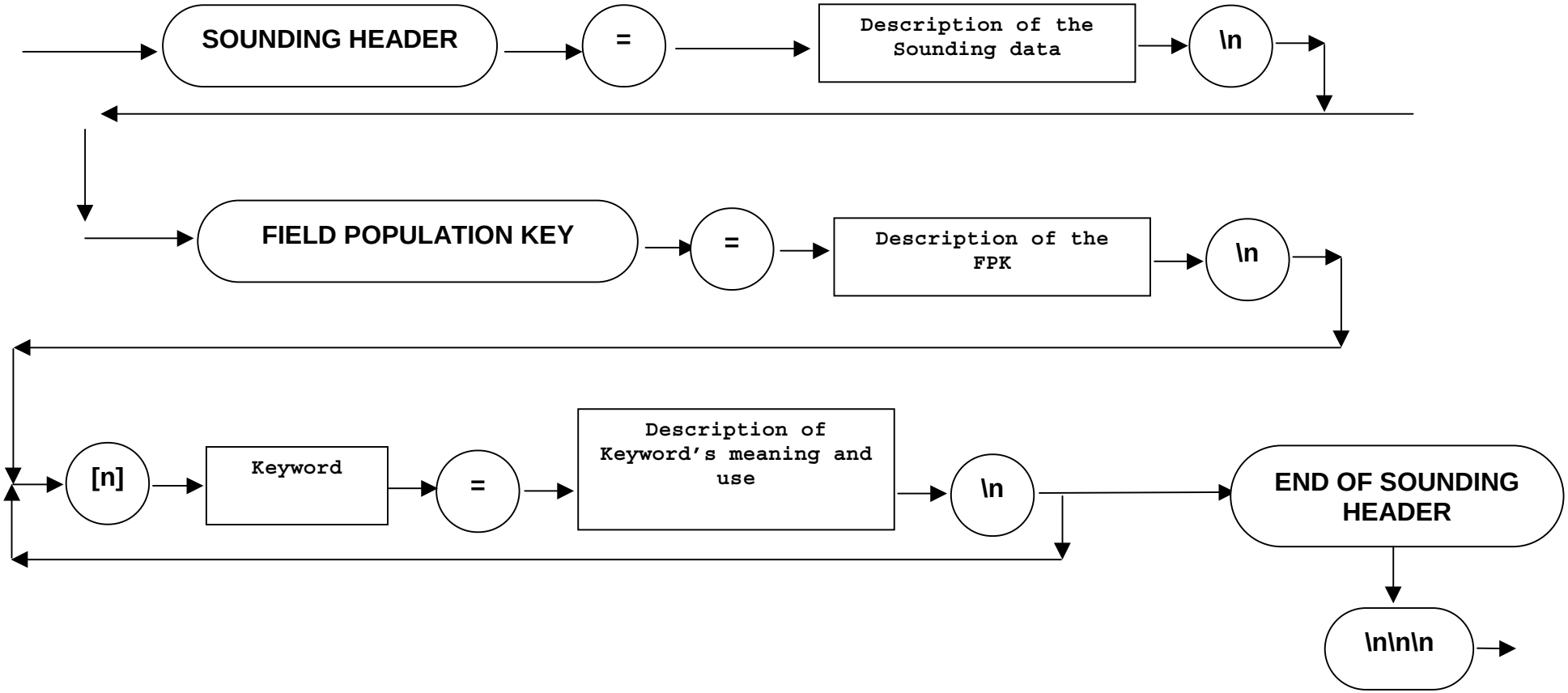


Polygon Data



Note: □ denotes the space character.

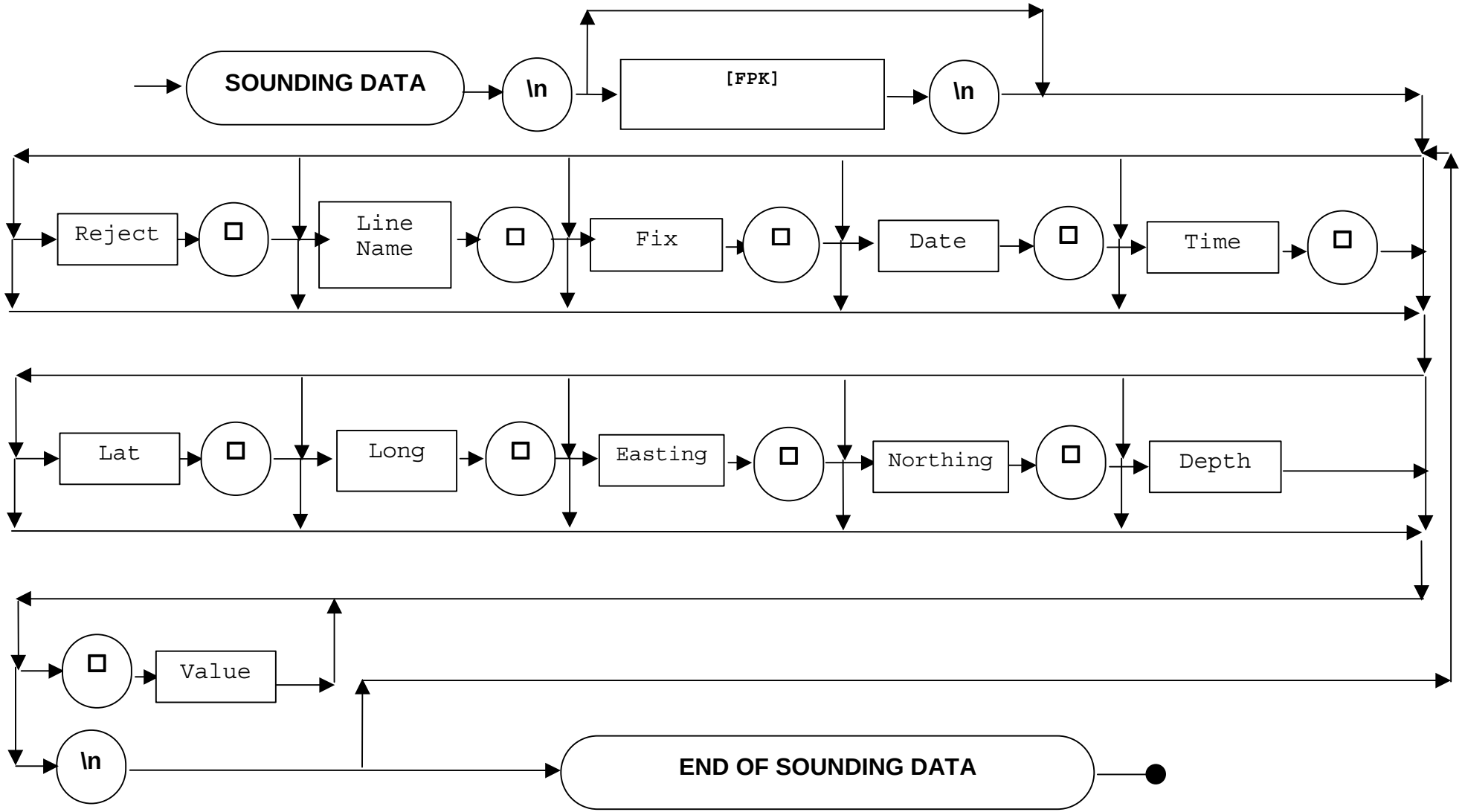
2.5. Sounding Description



[n] = number indicating respective position within the Field Population Key (FPK)

2.6. Sounding Data

Note: □ denotes the space character. Only shown first 10 explicit HTF sounding values; all others are referred to by generic "value" term.



3. Appendix B – Configuration Example

```
HTF HEADER                                  Example
END OF HTF HEADER



POLYGON HEADER                              Seafloor Coverage
END OF POLYGON HEADER

POLYGON DATA                                Polygon 1 – 100%, PA +\-10, DA +\-0.3
END OF POLYGON DATA


POLYGON DATA                                Polygon 2 – Not Full, PA +\-20, DA +\-0.5
END OF POLYGON DATA


POLYGON DATA                                Polygon 3– Not Full, PA +\-50, DA +\-1.0
END OF POLYGON DATA



POLYGON HEADER                              Seafloor Classification
END OF POLYGON HEADER

POLYGON DATA                                Polygon 4 - Sand
END OF POLYGON DATA


POLYGON DATA                                Polygon 5 - Rock
END OF POLYGON DATA



POLYGON HEADER                              Sounding Bin\Cell Size
END OF POLYGON HEADER

POLYGON DATA                                Polygon 6 – 30m * 30m
END OF POLYGON DATA



SOUNDING HEADER
END OF SOUNDING HEADER

SOUNDING DATA
END OF SOUNDING DATA
```

4. Appendix C – HTF Example

```
HTF HEADER
HTF VERSION: 2.02
COPYRIGHT INFORMATION: COMMONWEALTH OF AUSTRALIA
DATA USAGE RESTRICTIONS: THIS DATA IS NOT TO BE USED FOR NAVIGATION PURPOSES
CLASSIFICATION OF DATA: UNCLASSIFIED
DATA CUSTODIAN: HYDROGRAPHIC SERVICE RAN
HTF CREATION ROUTINE - NAME & VERSION: AHO - HTF TEST DATA SET 1
LOGGING SYSTEM - NAME & VERSION: ADAS VERSION 6
PROCESSING SYSTEM  - NAME & VERSION: GASS VERSION 9.0 TO 9.4
DATE OF HTF FILE CREATION: 19990921
HTF SOUNDING DATA VOLUME NUMBER: 1
TOTAL HTF VOLUMES FOR THIS SURVEY: 1
SURVEY IDENTIFICATION: HI222
REPORT OF SURVEY DATE: 19960701
GENERAL LOCALITY: TORRES STRAIT
SURVEY TITLE: TORRES STRAIT
SURVEY PLATFORM: LADS
SURVEYOR: CMDR M.J. SINCLAIR
UTC START DATE: 19950622
UTC END DATE: 19951128
GEODETIC DATUM: WGS84
COORDINATE SYSTEM: GEOGRAPHIC
SW LATITUDE: -9.606387
SW LONGITUDE: 142.333504
NE LATITUDE: -9.812025
NE LONGITUDE: 143.116320
GRID REFERENCE SYSTEM: UTM
GRID ZONE: 54
CENTRAL MERIDIAN: 141
SW GRID COORDINATE -  EASTING: 646331.1
SW GRID COORDINATE - NORTHING: 8937822.1
NE GRID COORDINATE -  EASTING: 732121.3
NE GRID COORDINATE - NORTHING: 8914639.8
NUMBER OF POSITIONING SYSTEMS (PS): 1
PS 01: ROCKWELL-COLLINS 3A GPS
PS 01 MODE: ENCRYPTED PRECISE (P) CODE
SOUNDING DATUM: LAT
TOTAL SOUNDINGS: 995855
TOTAL VALID SOUNDINGS: 995855
NUMBER OF DEPTH SOUNDERS (DS): 1
DS 01: LASER (Red/Green)
DS 01 MODE: MANUAL TUNING OF THE LASER BY THE OPERATORS WAS USED THROUGHOUT THE SURVEY
NUMBER OF TIDAL STATIONS (TS): 5
TS 01: YAM ISLAND
TS 01 LOCATION: -9.9 142.783333
TS 01 METHOD: OBSERVED TIDES (LAT 1.66M BELOW MSL)
```

```
TS 02: PHIPI REEF
TS 02 LOCATION: -9.6 142.533333
TS 02 METHOD: PREDICTED TIDES - CORRECTED BY C-O FROM YAM ISLAND (LAT 1.94 M BELOW MSL)
TS 03: COCONUT ISLAND
TS 03 LOCATION: -10.05 143.0666666
TS 03 METHOD: PREDICTED (CORRECTED BY C-O FROM YAM) (LAT 1.97 M BELOW MSL)
TS 04: ZAGAI ISLAND
TS 04 LOCATION: -9.866666 142.883333
TS 04 METHOD: PREDICTED - CORRECTED BY C-O FROM YAM (LAT 1.61 M BELOW MSL)
TS 05: UN-NAMED CAY
TS 05 LOCATION: -9.35 143.333333
TS 05 METHOD: PREDICTED - CORRECTED BY C-O FROM YAM (LAT 1.94 M BELOW MSL)
SCALE: 1 to 25000
DATA DENSITY: 30m x 30m swath 250m wide
;IT SHOULD BE NOTED THAT DEPTHS SHOALER THAN 2 METRES ARE ONLY CONSIDERED TO BE APPROXIMATE.
;SHEET NO / TAPE ID F222.001 001, JD/DATE PROCESSED 160/08JUN96, GASS VERSION E9.4/006
;SHEET NO / TAPE ID F222.002 002, JD/DATE PROCESSED 160/08JUN96, GASS VERSION E9.4/006
;SHEET NO / TAPE ID F222.003 003, JD/DATE PROCESSED 160/08JUN96, GASS VERSION E9.4/006
;SHEET NO / TAPE ID F222.004 004, JD/DATE PROCESSED 160/08JUN96, GASS VERSION E9.4/006
;SHEET NO / TAPE ID F222.005 005, JD/DATE PROCESSED 161/09JUN96, GASS VERSION E9.4/006
;As there is only one position and one sounding system we are not including them in the sounding data; excluded by FPK
END OF HTF HEADER



POLYGON HEADER = The fields within the Polygon Data record are as listed in this header, each polygon or single line is separated by two new
lines, each point separated by a new line, each field separated by a space.
POLYGON DESCRIPTION = Defines the polygons of each region of similar survey criteria or theme.
POLYGON IDENTIFIER = Unique polygon identifier for this transmittal.
SEAFLOOR COVERAGE = All significant seafloor features detected (full ensonification/sweep) or full coverage not achieved and uncharted
features may exist.
POSITION ACCURACY = +/- NNN.n metres at 95% CI (2.45) with respect to the given datum.
DEPTH ACCURACY = +/- NN.n metres at 95% CI (2.00) at critical depths.
LATITUDE = Latitude of a point on the perimeter bounding data of similar seafloor coverage +/- NN.nnnnnnn
LONGITUDE = Longitude of a point on the perimeter bounding data of similar seafloor coverage +/- NNN.nnnnnnn
EASTING = Easting Grid Coordinate in metres of a point on the perimeter bounding data of similar seafloor coverage NNNNNNN.nn
NORTHING = Northings Grid Coordinate in metres of a point on the perimeter bounding data of similar seafloor coverage NNNNNNNN.nn
END OF POLYGON HEADER

POLYGON DATA
POLYGON DESCRIPTION: SURVEY CATEGORY
POLYGON IDENTIFIER: 1
SEAFLOOR COVERAGE: FULL SEAFLOOR COVERAGE WAS NOT ACHIEVED
POSITION ACCURACY: 20.0
DEPTH ACCURACY: 0.7
-9.619514 142.327759 645694.9 8936372.8
-9.620525 142.492691 663796.1 8936186.5
-9.620525 142.492691 663796.1 8936186.5
```

```
-9.603324 142.492691 663804.4 8938088.9
-9.602312 142.506866 665360.7 8938194.0
-9.618502 142.507874 665463.5 8936402.9
-9.618502 142.659653 682122.9 8936326.0
-9.603324 142.657623 681908.2 8938005.8
-9.603324 142.673813 683685.3 8937997.2
-9.619514 142.673813 683676.6 8936206.5
-9.618502 142.826599 700448.4 8936232.8
-9.603324 142.826599 700457.4 8937911.7
-9.603324 142.839767 701902.9 8937904.0
-9.618502 142.841782 702115.1 8936223.9
-9.618502 142.993561 718777.3 8936130.7
-9.602312 142.993561 718787.7 8937921.7
-9.603324 143.006714 720231.1 8937801.3
-9.618502 143.006714 720221.3 8936122.2
-9.618502 143.121048 732773.9 8936046.6
-9.774327 143.121048 732666.4 8918807.2
-9.774327 143.006714 720119.6 8918883.9
-9.811766 143.006714 720094.9 8914742.2
-9.811766 142.995590 718874.4 8914749.5
-9.774327 142.995590 718898.9 8918891.2
-9.774327 142.839767 701800.7 8918988.4
-9.812778 142.839767 701777.4 8914735.1
-9.812778 142.827621 700444.9 8914742.3
-9.774327 142.827621 700468.0 8918995.6
-9.774327 142.672806 683481.8 8919083.7
-9.812778 142.673813 683571.2 8914830.2
-9.814801 142.659653 682016.7 8914614.2
-9.774327 142.659653 682038.8 8919090.9
-9.774327 142.506866 665276.5 8919169.5
-9.813789 142.506866 665257.0 8914805.1
-9.813789 142.493713 663814.2 8914811.5
-9.775339 142.493713 663833.0 8919064.0
-9.775339 142.327759 645627.6 8919140.1
-9.619514 142.327759 645694.9 8936372.8
END OF POLYGON DATA
```

SOUNDING HEADER = The fields within the Sounding Data record are listed in this sub-header, each field is separated by a space, each sounding point separated by a new line. All fields not populated contain the asterisk (ASCII #42) character.
FIELD POPULATION KEY = Defines the fields in the Sounding Data record that will be populated (with sounding data or an *) and those fields that have been excluded from the whole dataset
[01] REJECTED SOUNDING = if 0 sounding is valid or if 1 the sounding has been rejected (flagged).
[02] LINE NAME = Survey line name/number as a unique identifer within the survey.
[03] FIX NUMBER = Sequential sounding fix number, unique within the survey.
[04] UTC DATE = UTC date for the sounding CCYYMMDD
[05] UTC TIME = UTC time for the sounding HHMMSS.ss

```
[06] LATITUDE = Latitude position of the sounding +/-NN.nnnnnnn (degrees of arc, south is negative).
[07] LONGITUDE = Longitude position of the sounding +/-NNN.nnnnnnn (degrees of arc, west is negative).
[08] EASTING = Grid coordinate position of the sounding in metres NNNNNNN.nn
[09] NORTHING = Grid coordinate position of the sounding in metres NNNNNNN.nn
[10] DEPTH = Reduced sounding value in metres with corrections applied as indicated in the relevant fields, soundings are positive and drying heights
are negative +/-NNNN.nn metres.
[11] POSITIONING SENSOR = Indicate position system number populated in the HTF header record.
[12] DEPTH SENSOR = Indicate depth sounder system number populated in the HTF header record.
[13] TPE POSITION = Total propagated error of the horizontal component for the sounding.
[14] TPE DEPTH = Total propagated error of the vertical component for the sounding.
[15] NBA FLAG = No Bottom at Flag, if 0 not NBA depth or if 1 Depth is NBA, deeper water probably exists.
[16] TIDE = Value of the tidal correction applied +/- NN.nn metres.
[17] DEEP WATER CORRECTION = Value of the deep water sounding velocity applied +/- NN.nn metres.
[18] VERTICAL BIAS CORRECTION = Value of the vertical bias applied +/- NN.nn metres. eg transducer depth correction
[19] SOUND VELOCITY = Measured sound velocity used to process sounding in metres per second.
[20] PLOTTED SOUNDING = If 0 then the reduced depth did not appear on the original fairsheet or if 1 then the reduced depth appeared on the original
fairsheet.
;Additional Fields recorded in LADS FSD data that we are preserving in HTF
[21] ROW = LADS row number
[22] COL = LADS column number
[23] SOUNDING ID = LADS sounding id
END OF SOUNDING HEADER

SOUNDING DATA
[01111111110000110101111]
RUN-322_FRAME-508 1 19950622 063021.00 -09.7674230 142.4272000 656540.0 8919971.1 10.43 0 1.32 0.54 0 14 4 1
RUN-322_FRAME-508 2 19950622 063021.00 -09.7693310 142.4272160 656540.9 8919760.0 7.41 0 1.32 0.38 0 14 22 2
RUN-322_FRAME-509 3 19950622 063022.00 -09.7681560 142.4271200 656530.9 8919890.0 7.39 0 1.32 0.52 0 1 11 3
RUN-322_FRAME-509 4 19950622 063022.00 -09.7678580 142.4270240 656520.5 8919923.0 9.96 0 1.32 0.62 0 2 8 4
RUN-322_FRAME-509 5 19950622 063022.00 -09.7685900 142.4270240 656520.2 8919842.1 7.51 0 1.32 0.51 0 2 15 5
RUN-322_FRAME-509 6 19950622 063022.00 -09.7690150 142.4270240 656520.0 8919795.1 6.89 0 1.32 0.44 0 2 19 6
RUN-322_FRAME-509 7 19950622 063022.00 -09.7673250 142.4268160 656497.9 8919982.1 7.84 0 1.32 0.41 0 4 3 7
RUN-322_FRAME-509 8 19950622 063022.00 -09.7693320 142.4268320 656498.8 8919760.1 6.56 0 1.32 0.35 0 4 22 8
RUN-322_FRAME-509 9 19950622 063022.00 -09.7676320 142.4267200 656487.3 8919948.2 6.93 0 1.32 0.44 0 5 6 9
RUN-322_FRAME-509 10 19950622 063022.00 -09.7680490 142.4267200 656487.1 8919902.0 9.56 0 1.32 0.62 0 5 10 10
RUN-322_FRAME-509 11 19950622 063022.00 -09.7688890 142.4267200 656486.7 8919809.1 6.52 0 1.32 0.44 0 5 18 11
RUN-322_FRAME-509 12 19950622 063022.00 -09.7685920 142.4266240 656476.3 8919842.0 8.78 0 1.32 0.58 0 6 15 12
RUN-322_FRAME-509 13 19950622 063023.00 -09.7672090 142.4264160 656454.1 8919995.1 10.83 0 1.32 0.47 0 8 2 13
RUN-322_FRAME-509 14 19950622 063023.00 -09.7681670 142.4264160 656453.7 8919889.1 7.44 0 1.32 0.52 0 8 11 14
RUN-322_FRAME-509 15 19950622 063023.00 -09.7690170 142.4264320 656455.0 8919795.1 6.41 0 1.32 0.41 0 8 19 15
RUN-322_FRAME-509 16 19950622 063023.00 -09.7677340 142.4263360 656445.1 8919937.1 9.34 0 1.32 0.57 0 9 7 16
RUN-322_FRAME-509 17 19950622 063023.00 -09.7686830 142.4263200 656442.9 8919832.1 7.42 0 1.32 0.50 0 9 16 17
RUN-322_FRAME-509 18 19950622 063023.00 -09.7693170 142.4263360 656444.3 8919762.0 6.78 0 1.32 0.36 0 9 22 18
RUN-322_FRAME-509 19 19950622 063023.00 -09.7671650 142.4261120 656420.8 8920000.1 6.88 0 1.32 0.31 1 11 2 19
RUN-322_FRAME-509 20 19950622 063023.00 -09.7683760 142.4261280 656422.0 8919866.2 7.12 0 1.32 0.51 0 11 13 20
RUN-322_FRAME-509 21 19950622 063023.00 -09.7690010 142.4261120 656419.9 8919797.0 5.47 0 1.32 0.37 0 11 19 21
RUN-322_FRAME-509 22 19950622 063023.00 -09.7675360 142.4260160 656410.1 8919959.1 8.40 0 1.32 0.49 0 12 5 22
RUN-322_FRAME-509 23 19950622 063023.00 -09.7679620 142.4260160 656409.9 8919912.0 9.09 0 1.32 0.59 0 12 9 23
```

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RUN-322_FRAME-509 24 19950622 063023.00 -09.7686940 142.4260320 656411.3 8919831.0 7.11 0 1.32 0.48 0 12 16 24
RUN-322_FRAME-509 25 19950622 063023.00 -09.7693260 142.4260320 656411.0 8919761.1 5.05 0 1.32 0.29 1 12 22 25
RUN-322_FRAME-509 26 19950622 063023.00 -09.7672120 142.4258080 656387.4 8919995.0 10.66 0 1.32 0.46 0 14 2 26
RUN-322_FRAME-510 27 19950622 063024.00 -09.7677360 142.4257280 656378.4 8919937.1 6.92 0 1.32 0.45 0 1 7 27
RUN-322_FRAME-510 28 19950622 063024.00 -09.7681620 142.4257280 656378.2 8919890.0 9.02 0 1.32 0.60 0 1 11 28
RUN-322_FRAME-510 29 19950622 063024.00 -09.7687850 142.4257280 656377.9 8919821.1 5.76 0 1.32 0.41 0 1 17 29
RUN-322_FRAME-510 30 19950622 063024.00 -09.7694190 142.4257280 656377.6 8919751.0 4.30 0 1.32 0.23 0 1 23 30
RUN-322_FRAME-510 31 19950622 063024.00 -09.7684870 142.4256160 656365.7 8919854.1 8.23 0 1.32 0.56 0 2 14 31
RUN-322_FRAME-510 32 19950622 063024.00 -09.7691120 142.4256160 656365.5 8919785.0 4.92 0 1.32 0.33 0 2 20 32
RUN-322_FRAME-510 33 19950622 063024.00 -09.7674300 142.4254080 656343.4 8919971.1 7.03 0 1.32 0.41 0 4 4 33
RUN-322_FRAME-510 34 19950622 063024.00 -09.7680640 142.4254080 656343.1 8919901.0 4.83 0 1.32 0.37 0 4 10 34
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RUN-784_FRAME-64 981 19951128 065418.00 -09.6299360 143.0486080 724813.1 8934830.1 6.74 0 2.37 0.45 0 5 4 981
RUN-784_FRAME-64 982 19951128 065418.00 -09.6303610 143.0486080 724812.9 8934783.1 6.75 0 2.37 0.53 0 5 8 982
RUN-784_FRAME-64 983 19951128 065418.00 -09.6316440 143.0486080 724812.0 8934641.1 7.06 0 2.37 0.49 0 5 20 983
RUN-784_FRAME-64 984 19951128 065418.00 -09.6307950 143.0485120 724802.0 8934735.1 6.71 0 2.37 0.56 0 6 12 984
RUN-784_FRAME-64 985 19951128 065418.00 -09.6313110 143.0484160 724791.2 8934678.1 6.66 0 2.37 0.52 0 7 17 985
RUN-784_FRAME-64 986 19951128 065419.00 -09.6318000 143.0483200 724780.3 8934624.1 4.00 1 2.37 1.25 0 8 21 986
RUN-784_FRAME-64 987 19951128 065419.00 -09.6302460 143.0482240 724770.8 8934796.1 6.90 0 2.37 0.52 0 9 7 987
RUN-784_FRAME-64 988 19951128 065419.00 -09.6308970 143.0482240 724770.3 8934724.0 45.21 0 2.37 1.60 1 9 13 988
RUN-784_FRAME-64 989 19951128 065419.00 -09.6298220 143.0481120 724758.8 8934843.0 7.14 0 2.37 0.44 0 10 3 989
RUN-784_FRAME-64 990 19951128 065419.00 -09.6315670 143.0480160 724747.1 8934650.1 41.24 0 2.37 1.40 1 11 19 990
RUN-784_FRAME-64 991 19951128 065419.00 -09.6319730 143.0480160 724746.8 8934605.1 6.71 0 2.37 0.37 0 11 23 991
RUN-784_FRAME-64 992 19951128 065419.00 -09.6312240 143.0479200 724736.8 8934688.1 6.87 0 2.37 0.54 0 12 16 992
RUN-784_FRAME-64 993 19951128 065419.00 -09.6297510 143.0478080 724725.4 8934851.1 41.94 0 2.37 1.15 1 13 3 993
RUN-784_FRAME-64 994 19951128 065419.00 -09.6302390 143.0478240 724726.9 8934797.1 6.73 0 2.37 0.51 0 13 7 994
RUN-784_FRAME-64 995 19951128 065419.00 -09.6306920 143.0477120 724714.3 8934747.0 6.82 0 2.37 0.56 0 14 11 995
END OF SOUNDING DATA
```

5. Appendix D – Total Propagated Error

The term *Total Propagated Error* (TPE) essentially means that all the uncertainties of the measured quantities have been propagated through the equation that is used to derive the measurement of interest. That is, a rigorous error analysis has been performed. TPE are calculated at a certain confidence value — generally either

a) one standard deviation which implies 68% confidence in one dimension (eg depth), 39% in two dimensions (eg position) or 20% in three dimensions (eg volume) or,
b) 95% confidence which implies 1.96 standard deviations in one dimension, 2.45 standard deviations in two dimensions and 2.79 standard deviations in three dimensions.

An Example. Two measurements of distance are made to determine the area of a rectangular field. Assuming that all the errors (uncertainties) are random and independent they are combined using

$$\sigma_{\text{TPE}}^{\ 2} = \quad \sigma_i^{\ 2}$$

A = area. x = breadth y = length.

Error in x is Δx. Error in y is Δy. (one standard deviation)

Using $A = xy$,

the error in A due to the error in x is

$\partial A_x = y\partial x$. Thus $\sigma_x = y\Delta x$.

The error in A due to the error in y is

$\partial A_y = x\partial y$. Thus $\sigma_y = x\Delta y$.

From which we derive the

$$\text{TPE} = \sqrt{(y\Delta x)^2 + (x\Delta y)^2} \text{ at 39\% probability}$$

$$= 2.45\sqrt{(y\Delta x)^2 + (x\Delta y)^2} \text{ at 95\% probability}$$