CHAPTER 10

Appendix

DATA FILE TYPES

There are a few different formats in which HYPACK® stores data.

File Extension	Purpose
*.ADCP	Water current data from and ADCP device saved together with position and depth data from HYPACK® SURVEY to the HYPACK® custom format.
RAW	**Raw files** are the data files that result from the SURVEY or DREDGEPACK® program. Every time you go “On Line”, a new “Raw” data file is created. They are ASCII format files that contain the header information and time-series information for each survey device. By default, they have the extension “*.RAW” and, in a standard HYPACK® project, are stored in the \HYPACK 2013\Project\Raw directory. You may choose a naming format or an alternate directory (or both) in the SURVEY program under OPTIONS-PROGRAM INFORMATION. A list of individual data files is provided in a Catalog (*.LOG) file. You can quickly draw or process a group of files by specifying the *.LOG name, instead of entering the name of each data file. RAW format files are read through the SINGLE BEAM EDITOR where they are merged with Tide and other corrections and are written as Edited All format files
ALL	ALL format files are ASCII files created in SINGLE BEAM EDITOR from Raw single beam data. They contain the position information, raw depths, time, correction and raw position data for every sounding. HYPACK® creates an ALL format file for every survey line.
*.HS2	Multibeam survey data files, edited in the HYSWEEP® EDITOR. This is a binary format

File Extension	Purpose
HS2x format:	64-bit HS2 files. They load faster than HS2 files and save the original data from all devices versus only from the selected ones as in the 32-bit files. HS2x supports up to 10,000 beams/ping. HS2x files also include Total Vertical Uncertainty (TVU) and Total Horizontal Uncertainty (THU) data.
***.HSX**	HYSWEEP® SURVEY Raw data files. They are read and edited in the HYSWEEP® EDITOR. Edited data files of multibeam and multiple transducer data are stored in a binary format (HYPACK® “HS2” Format) or the ASCII XYZ format.
***r.000**	Water current data from and ADCP device saved to RD Instruments' format.
***.SEGY**	Sub-bottom profile data. This is binary data which SURVEY records, in tandem, with a HYPACK® Raw file. They are processed together in the SUB-BOTTOM PROCESSOR where you can digitize the depth layers of the SEGY files and save them to HYPACK® ALL2 format files.
***.SWP**	Sweep Format File: This is a binary file of edited multibeam or multiple transducer data. It is created in the HYSWEEP® EDITOR program and can be read into the MAPPER program.
***.XYZ**	HYPACK® can create ASCII XYZ format files in the MAPPER, SORT and EXPORT programs. XYZ files can be read and displayed in the Main window. They can be used as input in the EXPORT, MAPPER, SORT and TIN MODEL programs and can be plotted in HYPLOT. These are ASCII format XYZ files that must be named with a *.XYZ extension in order for HYPACK® to recognize them.

PROJECT FILE TYPES

HYPACK® has many types. Once you become experienced with the package, it will not be so overwhelming. The following gives a listing of file types and a brief description of each.

File Extension	Useage
***.3DM**	**3D Terrain Viewer movie file.** It contains information that, together with the corresponding XYZ data file, can replay a set of views recorded through the 3D Terrain Viewer program.
***.3DV**	**3D Terrain Viewer initialization file.**

File Extension	Useage
*.3OD	**3D Object Design File** created in the 3D SHAPE EDITOR, contains all of the information about all of the objects, their properties, etc. needed to create the *.VES file. To modify your *.VES file, you must re-open its *.30D file in the 3D SHAPE EDITOR, make your changes and export a new *.VES file.
*.BRD	**Border Files (*.BRD):** A user-defined listing of XY positions that defines an area in your project area. Border files are created in the BORDER EDITOR and saved to your project directory. They have several uses: • To clip survey lines and XYZ data files to fit within a coastline or unorthometric survey area in HYPACK®. • To clip data and track lines in the SINGLE BEAM EDITOR. • To edit defined areas in a matrix in SURVEY or DREDGEPACK® . • Define areas in the HYSWEEP® EDITOR where search and filter options will or will not be applied. • To limit areas where volumes are calculated in TIN MODEL or CROSS SECTIONS AND VOLUMES. • To clip TIN models.
*.CAP	**BSB version 4 charts.** These are updated and encrypted charts. HYPACK® checks for their licensing verification before it can display these charts.
*.CHN	**Advanced Channel File (*.CHN):** A channel design file contains a description of the geometry of an area. It is created in the ADVANCED CHANNEL DESIGN program and can be used in the TIN MODEL program to calculate the volume between a surveyed surface and the channel surface. A channel file can be displayed in DREDGEPACK® and MATRIX 3DTV to guide your data collection or in the HYSWEEP® EDITOR to guide the editing process.
*.COB	**Cross Section Object File** contains the text, pipeline and polyline information for a cross section graph in CROSS SECTIONS AND VOLUMES and ADCP PROFILER.
*.CSS	**Cross Section Session File** contains a list of files used in the CROSS SECTIONS AND VOLUMES program.
*.DCT	**Data Corrections Table** information used in the Sounding Adjustment program to correct Sound Velocity Correction Values. The program adds the "fixed" corrections (not interpolated values) to the current sound velocity values in edited All format data.
*.DEP	**Digitized Depth File:** A file of event marks versus depths. It is created in the ECHOGRAM digitizing program and can be used to merge depths with positions in the SINGLE BEAM EDITOR.
*.DG2	**HYPACK® chart digitized in the DG2 EDITOR.** This format replaces the DGW format with improved chart symbols and attributes available to describe your project area.

File Extension	Useage
*.DGN	**Microstation design files version 7** can be imported into the CHANNEL CONDITION REPORTER to define the channel and the BOAT SHAPE EDITOR to convert it to an SHP file. DGN files can be plotted in HYPLOT and converted to S57 files in the ENC EDITOR and converted to LNW files using the HYPACK® DGN to LNW conversion utility.. The EXPORT program can reformat HYPACK® data to DGN format. HYPACK® does not support Microstation V8 files.
*.DGW	**Digitized Shoreline File:** (Old Style) This is a leftover from the HYPACK® DOS days. It is a format that contains shoreline and a few simple hydrographic features. You can draw them to the screen in the Main window and SURVEY program and can plot them in the HYPLOT program.
*.DIG	A **Digitized Shoreline Format** file created in the old SHORE MANUAL program. These files can be displayed in the HYPACK® for use with the Editor programs in the Preparations menu. They can also be displayed in SURVEY and DREDGEPACK® and can be plotted on the Smooth Sheet in the HYPLOT program.
*.DXF	**Drawing Exchange Format:** This format is a popular CAD format, used by many CAD packages. HYPACK® can display DXF version 12 or 13 background chart files in the DESIGN and SURVEY programs and boat shapes in SURVEY and DREDGEPACK®. DXF channel files may be used by the INTERSECTOR and LNW GENERATOR to create 3-dimensional survey lines. DXF information can be imported into S57 charts in the ENC EDITOR and some DXF features may be plotted in the HYPLOT program. Several HYPACK® programs can export data to DXF format, including the REFORMAT, MAPPER, CROSS SECTIONS AND VOLUMES, and TIN MODEL programs.
*.KAP	**BSB ver. 3 background charts.** These are unencrypted and can simply be loaded to HYPACK®. (See Also “CAP” files.)
*.KTD	**Kinematic Tidal Datum Files (*.KTD)** are used in the SURVEY program when determining real time water levels using an RTK GPS system. Created in the KTD EDITOR, they provide information regarding the separation between the reference ellipsoid surface and the local chart datum for a large geographic area.
*.LLS	**Combined Latitude/Longitude Shift file** used in the CORPSCON method of computing datum transformations.
*.LNW	**Planned survey lines (*.LNW)** are used to define where you want your vessel to go. The line file contains the grid coordinates and names for each planned line in your survey area and can also contain cross section template information. Line Files are typically created in either the LINE EDITOR or the CHANNEL DESIGN program.

File Extension	Useage
*.LOG	**Catalog Files:** These files are simply ASCII lists that contain the names of data files. Almost all programs can read a Catalog File for data input.
*.MTB	**Matrix Backup** file is a binary record of the matrix of the same root name at the time of backup. It is generated by the Matrix Backup feature in SURVEY or DREDGEPACK®.
*.MTD	Matrix Database file is used in the MATRIX REPORTER to generate graphical displays of your project area where each day’s
*.MTX	**Matrix files (*MTX)** are gridded rectangular areas. You can fill the cells with depth information from your echosounder or dredge cutting tool in real time during data collection, or in post-processing. Empty Matrix files are typically created in the MATRIX EDITOR and are saved to the project directory.
*.PLN	**Channel Plan Files (*.PLN)** are used in the creation of 3-dimensional Planned Line Files. They are created in the CHANNEL DESIGN program and saved to your project directory. Channel Plan Files contain grid coordinates for the channel center line, left-toe and right-toe lines, and turning basins. A PLN file can also be displayed in the DREDGEPACK® profile window.
*.PLT	**Plotting Sheet Files (*.PLT)** contain origin coordinates, scale, rotation, and sheet dimensions for plotting on smooth sheets. These files are typically created in the PLOTTING SHEET EDITOR and saved with the .PLT extension to your project file. They are used by HYPLOT to define the area to be plotted.
*.RXW:	**Seabed Identification Square** in HYPACK® version 4.3 and earlier: A Seabed Identification Square is created in the SEABED STATISTICS program and used to display statistical data regarding the E1 and E2 data in All format files that contain such data. (This requires specialized echosounder equipment.) RXW format has been replaced by *.SIX files.
*.SHP	**Boat Shape File;** A Boat Shape File is created in the BOAT SHAPE EDITOR program. It can by used to display the real time boat shape in the SURVEY program. **Line and polyline shape files** available from ArcView and ArcInfo. They can be displayed in your project as background files.

File Extension	Useage
*.SIX	**Seabed ID Square file** (version 4.3A replacing *.RXW files) created in the SEABED STATISTICS program then used by the SeabedID.dll to assign seabed ID numbers to each sounding during Survey. (This requires specialized equipment.) SEABED MAPPER reads these numbers and displays a matrix coded with Seabed ID colors and export an XYZ ID file. The EXPORT TO CAD program can also create XYZ ID files. If you have created the TIN Model using an XYZ-ID Input File, TIN MODEL will save the Seabed ID information in the Survey Depth memory of the output matrix. Depth information will be stored in the Dredge Depth memory. Seabed ID matrix files can be displayed using Seabed ID colors.
*.SWP	**Sweep Format File:** This is an old binary file of edited multibeam or multiple transducer data. It was created in the old HYSWEEP® EDITOR program and can be read into the MAPPER or current the HYSWEEP® EDITOR programs. Support for SWP files was discontinued beginning with HYPACK 2013.
*.TDX	**Tide Table File:** This contains a list of times and tide correction heights, as entered by the user in the MANUAL TIDES program.
*.TGT	**Target Files (*.TGT)** contain name and position information for a series of objects. You can create a target file manually, using the TARGET EDITOR then import it into the SURVEY program. This enables you to navigate *to* pre-determined locations or *away* from areas dangerous for navigation. You can also mark targets at points of interest in SURVEY or DREDGEPACK® and save them to a target file. They can be displayed in the 3D Terrain Viewer, plotted in the HYPLOT program and exported to DXF or DGN formats using EXPORT. Target display settings are defined in the HYPACK® control panel and in SURVEY and DREDGEPACK® through the target properties and parameters.
*.TID	**Tide Correction Files (*.TID)** are created in the HARMONIC TIDES and MANUAL TIDES programs. They contain corresponding tide and time information that can be used in the SINGLE BEAM EDITOR or the HYSWEEP® EDITOR to apply water level corrections to your sounding data. For each day included in the file, there is one correction value for every minute in the 24 hr. period for a total of 1,440 records per day. A multiday file marks the beginning of each day with its date.
*.TIN	**TIN File:** This contains the information needed to quickly create a TIN surface model. TIN Files can only be created and read by the TIN MODEL program.

File Extension	Useage
*.TMP and *.TPL	**Template Files (*.TPL)** created in the Template Editor of CROSS SECTIONS AND VOLUMES or the LINE EDITOR, contain the channel cross-section design information. They can be displayed in the Profile windows in SURVEY or DREDGEPACK® or used in the CROSS SECTIONS & VOLUMES program. TMP files have been discontinued to avoid confusion with Windows temporary files.
*.VEL	**Sound Velocity Corrections** files are generated in the SOUND VELOCITY program and contain depth vs sound velocity data. They are used to correct soundings for variations of sound in the water column. In most shallow-water, small-boat surveys, the echosounder is calibrated for the range of soundings encountered and no sound velocity corrections are needed. For multibeam surveys and deep-water surveys, sound velocity corrections are used to provide more accurate soundings. Typically, you will perform one or more sound velocity casts in your project area and import the data to the SOUND VELOCITY program which generates the sound velocity corrections (*.VEL) file
*.VES	**Vessel File:** A 3-dimensional vessel file exported from the 3D SHAPE EDITOR and imported to the 3D TERRAIN VIEWER. It allows you to display a custom, 3-dimensional boat shape that mirrors the actual survey boat or dredge that you use while gathering data.
*.VOL	**Volumes Report i**nformation created in CROSS SECTIONS AND VOLUMES.
*.ZEL	The **zone edge listing (*.ZEL)** file is an ASCII text file that contains a listing of where each line crosses each zone boundary and each inflection point of the model within a zone boundary. CROSS SECTIONS AND VOLUMES reads the ZEL file for the template information and generates volume quantities based on that listing.

FILE FORMAT DESCRIPTIONS

Often, when you are checking your data or troubleshooting a problem, it is useful to open files in a text editor and examine the data. Of course, this is only helpful if you understand how the data is formatted.

NOTE: Text editors can read only data stored in ASCII text. Some of the HYPACK® survey data types are in binary format and can only be read by the HYPACK® program designed for this purpose.

Raw Data Format

Data collected by the HYPACK® SURVEY program is recorded in Raw format, one file per planned survey line. Raw files are recorded as text, allowing them to be loaded into any text editor that reads large files.

When inspecting raw files, notice the format is not tabular. That is, there is not a record for each sounding containing depth, position, tide corrections, etc. Instead, there are separate records for each device measurement and the measurements are correlated through time tags.

Every raw file contains two sections:

- **Header**, written when data logging starts
- **Data**, written as data is collected. Each record starts with a three character tag.

Header Strings in the Raw Format

DEV Strings

TABLE 10-1. Device Information

Format	DEV dn dc "Device Name"	
Where:	dn:	device number
	dc:	device capabilities: A bit-coded field. Definitions in the following table.
Sample Line	`DEV 0 100 "GPS"`	

TABLE 10-2. Bit Definitions for the Device Capabilities

Bit	Mask	Meaning
0	1	Device provides Range/Range positions
1	2	Device provides Range/Azimuth positions
2	4	Device provides Lat/Long (e.g. GPS)
3	8	Device provides grid positions XY
4	16	Device provides echo soundings
5	32	Device provides heading
6	64	Device provides ship speed
7	128	Hypack clock is synched to device clock
8	256	Device provides tides
9	512	Device provides heave, pitch and roll
10	1024	Device is an ROV
11	2048	Device is a Left/Right Indicator

Bit	Mask	Meaning
12	4096	Device accepts annotation strings
13	8192	Device accepts output from Hypack
14	16384	xxx
15	32768	Device has extended capabilities

DTM Strings

TABLE 10-3. Datum Transformation Parameters

Format	DTM X Y Z Rx Ry Rz	
Where:	X:	Delta X
	Y:	Delta Y
	Z:	Delta Z
	Rx:	Delta rotation on X axis
	Ry:	Delta rotation on Y axis
	Rz:	Delta rotation on Z axis
	S	Delta scale
Sample Line	`DEV 0 100 "GPS"`	

ELL Strings

TABLE 10-4. Ellipsoid Information

Format	ELL e a f	
Where:	e:	Ellipsoid
	a:	Semi-Major Axis
	f:	Flattening
Sample Line	`WGS-84 6378137.000 298.257223563`	

EOH Strings

The **End of Header** tag indicates end of the header in each file. It has no data itself. All subsequent lines are recorded data strings.

EOL Strings

The **End of Line** tag indicates end of planned line information. It has no data itself.

FIL Strings

TABLE 10-5. File Information

Format	FIL e l	
Where	e	extension
	l	LNW file
Sample Line	`FIL "RAW" "C:\Hypack\Projects\03007NovaSB\Interse ctionfull..lnw"`	

GEO STRINGS

TABLE 10-6. Geoid Information

Format	GEO O G	
Where	O	Orthometric Height Correction
	G	Geoid
Sample Line		

HSP STRINGS

TABLE 10-7. HYSWEEP® Multiscan Survey Parameters

Format	HSP p1 p2 p3 p4 p5 p6 p7 p8 p9 p10 p11	
Where	p1	minimum depth
	p2:	maximum depth
	p3:	port side offset limit
	p4:	starboard side offset limit
	p5:	port side beam angle limit
	p6:	starboard side beam angle limit
	p7:	high beam quality; codes >= this are good
	p8:	low beam quality: codes < this are bad
	p9:	sonar range setting
	p10	towfish layback
	P11:	work units: 0=meters, 1=us foot, 2=int'l foot
Sample Line	`HSP 5.0 45.0 160.0 150.0 60 60 3 1 328.0 0.0 1`	

HVU STRINGS

TABLE 10-8. Horizontal and Vertical Units

Format	HVU h v	
Where	**h:**	Multiplier to convert horizontal survey unit to meters
	v:	Multiplier to convert vertical survey unit to meters

NOTE: Vertical survey units are always the same as horizontal survey units. Though the capability to use different survey units in each direction appears to be implemented in the GEODETIC PARAMETERS program, it is not recognized in SURVEY or DREDGEPACK®.

INF Strings

TABLE 10-9. General Project Information

Format	INF "surveyor" "boat" "project" "area" tc dc sv	
Where:	tc:	initial tide correction
	dc:	initial draft correction
	sv:	sound velocity
Sample Line	`INF "steve" "LCH 19" "mcmillen" "617.6 to 618.2" -0.7 0 1500.0`	

LBP Strings

TABLE 10-10. Planned Line Begin Point.

Format		LBP x y
Where	x	x grid position
	y	y grid position
Sample Line		LBP 5567222.42 3771640.72

LIN Strings

TABLE 10-11. Planned Line Data follows

Format		LIN nw
Where	nw	Number of waypoints
Sample Line		LIN 5

LNN Strings

TABLE 10-12. Planned Line Name

Format		LNN text
Where	text	line name or number
Sample Line		LNN 14

OFF Strings

TABLE 10-13. Device Offsets

Format	OFF dn n1 n2 n3 n4 n5 n6 n7	
Where	dn:	device number
	n1:	starboard, port offset. Positive starboard.
	n2	forward, aft offset. Positive forward
	n3	height (antenna) or depth (transducer draft) offset. Always positive.
	n4	yaw rotation angle. Positive for clockwise rotation.
	n5	roll rotation angle. Port side up is positive.
	n6	pitch rotation angle. Bow up is positive.

Format	OFF dn n1 n2 n3 n4 n5 n6 n7	
	n7	device latency in seconds.
Sample Line	OFF 0 0 0 13.35 0 0 0 0.86	

PRD Strings

Private Device Data has multiple formats depending on the type of device generating the data.

TABLE 10-14. PRD - Multiple Transducer Offset

Format	PRD dn OFF n1 n2 n3	
Where	dn:	device number
	n1:	transducer starboard offset
	n2:	transducer forward offset
	n3:	transducer depth offset (draft)
Sample Line	PRD 1 OFF -25.60 0.00 0.40	

TABLE 10-15. PRD - Odom Echoscan II Multibeam Identifier

Format	PRD dn ECHOSCN2 n1 n2	
Where	dn:	device number
	n1:	Not used
	n2:	Beam width
Sample Line	PRD 1 ECHOSCN2 -43.5 3.0	

TABLE 10-16. PRD - Reson Seabat 9001 Multibeam Identifier

Format	PRD dn sb n1 n2	
Where	dn:	device number
	sb:	SEABAT = 9001, SEA9003 , SEA8101
	n1:	Not used
	n2:	Beam width
Sample Line	PRD 1 SEABAT -44.2 1.5	

PRI Strings

TABLE 10-17. Primary Navigation Device

Format		PRI dn
Where	dn	device number
Sample Line		PRI 0

PRO Strings

TABLE 10-18. Projection Information

Format	PRO P RLon S RLat NPar SPar FE FN	
Where:	**P**	Projection
	RLon	Reference Longitude
	S	Scale
	RLat	Reference Latitude
	NPar	North Parallel in radians
	SPar	South Parallel in radians
	FE	False Easting
	FN	False Northing
Sample Line	`PRO TME xxxxx -111.000000 0.999600 0.000000 0.000000 0.000000 500000.0000 0.0000`	

PTS Strings

TABLE 10-19. Planned Line Waypoint

Format		PTS x y
Where	**x**	waypoint easting in survey units
	y	waypoint northing in survey units
Sample Line		PTS 5569134.63 3774182.61

SVC Strings

TABLE 10-20. Sound Velocity Correction

Format		SVC bd ed sv
Where	**bd**	layer begin depth in survey units, referenced to water surface
	ed	layer end depth in survey units
	sv	layer sound velocity in meters/second
Sample Line		SVC 0.0 1.0 1481.66

Normally, there will be many of these records contained in the file header. One for each layer (velocity zone) measured by the sound velocity profiler.

SYN Strings

TABLE 10-21. Time Synchronization Status

Format	SYN dn t n rt vt vs se fa pa	
Where	dn	device number
	t	time tag in sec. after midnight

Format	SYN dn t n rt vt vs se fa pa	
	n	number of values to follow
	rt	reference time used for last synchronization in millisec past midnight
	vt	Veritime at last synchronization in millisec. past midnight
	vs	Veritime status
	se	Filtered Synchronizatin error in msec
	fa	Frequency Adjustment factor in msec. indicates how fast or slow the computer clock is compared to reference clock.[a]
	pa	Phase adjustment factor in microsec/sec. indicates if computer clock is advanced or retarded compared to reference clock.[a]
Sample Line	`SYN 1 29253.002 6 29253003.000 29253002.958 34.000 0.000 -22.295 2.577`	

a. This value varies due to the normal instability of the computer clock and the measurement noise of the VERITIME process.

TND STRINGS

***TABLE 10-22.** Survey Time and Date*

Format		TND t d
Where	**t**	time string
	d	date string
Sample Line		TND 15:54:33 08/28/95

USR

***TABLE 10-23.** User Information*

Format	USR u r l k	
Where	u	User name
	r	Reseller
	l	License Type
	k	Key Number
Sample Line		

DATA STRINGS IN THE HYPACK® RAW FORMAT

FIX STRINGS

TABLE 10-24. Fix (Event) Mark

Format	**FIX v t n x y**	
Where	v	always 99
	t	time in sec. after midnight
	n:	FIX format version number. Always 2nd record in file
	x	X coordinate
	y	Y coordinate
Sample Line	`FIX 99 55990.660 5 455481.304 4942151.350`	

HCP STRINGS

TABLE 10-25. Heave Compensation

Format	**HCP dn t h r p**	
Where	dn:	device number
	t	time tag (seconds past midnight)
	h	heave in meters
	r	roll in degrees (+ port side up)
	p	pitch in degrees (+ bow up)
Sample Line	`HCP 2 57273.81 0 3.61 0`	

EC1 STRINGS

TABLE 10-26. Echo Sounding (single frequency)

Format	**EC1 dn t rd**	
Where	dn	device number
	t	time tag (seconds past midnight)
	rd	raw depth
	vn:	HSX format version number. Always 2nd record in file
Sample Line	`EC1 0 48077.365 3.20`	

EC2 STRINGS

TABLE 10-27. Echo Sounding (dual frequency)

Format	**EC2 dn t rd1 rd2**	
Where	dn	device number
	t	time tag (seconds past midnight)

Format	EC2 dn t rd1 rd2	
	rd1	raw depth 1
	rd2	raw depth 2
Sample Line	`EC2 0 48077.365 3.20 3.15`	

ECM STRINGS

TABLE 10-28. Echo Soundings (multiple transducer system)

Format	ECM dn t n rd1 rd2 … rdn	
Where	dn	device number
	t	time tag (seconds past midnight)
	rd1	raw depth 1
	rd2	raw depth 2
	rdn	Raw depth, transducer n
Sample Line	`ECM 1 57274.82 9 11 10.8 10.7 11.4 11.8 13 15.1 15.5 15.6`	

GYR STRINGS

TABLE 10-29. Gyro Data (Heading)

Format	GYR dn t h	
Where	dn	device number
	t	time tag (seconds past midnight)
	h	ship heading angle
Sample Line	`GYR 0 57274.04 193`	

KTC STRINGS

Values used to calculate RTK tide corrections.

TABLE 10-30. Kinematic Tide Components

Format	KTC dn t n Wht Lht U K A D T	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values
	Wht	WGS84 Ellipsoid Height
	Lht	Local Ellipsoid Height
	U	Undulation
	K	K value
	A	Antenna Offset

Format	KTC dn t n Wht Lht U K A D T	
	D	Draft Correction
	T	Final Tide
Sample Line	KTC 0 34721.842 7 -28.360 -28.360 -29.994 0.585 0.000 0.100 2.318	

POS Strings

TABLE 10-31. Position

Format	POS dn t x y	
Where	dn	device number
	t	time tag (seconds past midnight)
	x	easting
	y	northing
Sample Line	POS 0 57274.04 5569070.02 3774080.46	

ROX Strings

TABLE 10-32. Roxann data

Format	ROX dn t n e1 e2	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow (always 2)
	e1	roxann e1 measurement
	e2	roxann e2 measurement
Sample Line	ROX 2 48077.474 2 0.03 0.13	

SB2 Strings

TABLE 10-33. Multibeam data

Format	SB2 dn t n sv r1 r2 r3 … rn q1 q2 … qn	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow. Depends on device type
	sv	sound velocity from device
	r1-n	ranges in device units
	q1-n	quality codes (0 to 3 range, 0=bad). Packed 4 per number
Sample Lines		

Format	SB2 dn t n sv r1 r2 r3 … rn q1 q2 … qn
Echoscan II	`SB2 1 48077.474 39 1500.00 19.50 19.31 …`
Seabat 9001	`SB2 1 48077.474 76 1500.00 19.50 19.31 …`
Seabat 9003	`SB2 1 48077.474 51 1500.00 19.50 19.31 …`
Seabat 8101 using 101 beams	`SB2 1 48077.474 51 1500.00 19.50 19.31 …`

RAW STRINGS

TABLE 10-34. Position Information

Format	RAW dn t n lat long alt utc	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow
	lat	raw latitude X 100
	long	raw longitude X 100
	alt	antenna altitude above ellipsoid (meters)
	utc	GPS time
Sample Line	`RAW 0 33643.186 4 442442.89400 -831890.22200 177.86000 132459.00000`	

QUA STRINGS

TABLE 10-35. Position Quality Information

Format	QUA dn t n m h sat mode	
Where	dn	device number
	t	time tag (seconds past midnight)
	n	number of values to follow
	m	10 minus HDOP
	h	HDOP
	sat	number of satellites

Format	QUA dn t n m h sat mode	
	mode	GPS mode (NMEA 0183 standard values) 0 = fix not available or invalid 1 = GPS fix 2 = Differential GPS fix 3 = GPS PPS Mode fix 4 = RTK fix 5 = RTK Float
	The following 3 values are decoded from GST message:	
	sigman	standard deviation of latitude error (meters)
	sigmae	standard deviation of longitude error (meters)
	semimaj	Standard deviation of semi-major axis of error ellipsis (meters)
	Remaining values are present only if synchronizing computer clock with GPS clock:	
	ref	reference time at last sync (milliseconds since midnight)
	var	computer clock at last sync (milliseconds since midnight)
	syna	computer clock frequency adjustment factor (microseconds per sec)
	syne	filtered synchronization error (milliseconds)
	syns	synchronization status. Binary code with the following bits (other bits are not meaningful) 1 = not in sync 2 = low accuracy synchronization 4 = high accuracy synchronization 8 = synchronization failure
	synb	computer clock phase adjustment status
Sample Line	`QUA 0 33643.186 4 8.000 2.000 7.000 2.000`	

FXX Strings

TABLE 10-36. Precision Shot Record

Format	FXX dn t sn sx sy dl dbl hdg spd	
Where	dn	device number
	t	time tag (seconds past midnight)
	sn	shot_number
	sx	shot_x
	sy	shot_y
	dl	depth
	dbl	shot_dbl
	hdg	shot_hdg
	spd	shot_spd

CAP Strings

TABLE 10-37. String Capture record

Format	CAP dn t data	
Where	dn	device number
	t	time tag (seconds past midnight)
	data	ASCII string of data as it is read from device

RMB Strings

TABLE 10-38. Raw Multibeam data

Format	RMB t st sf bd n sv pn sonar range power gain GainMode	
Where	**dn**	device number
	t	time tag (seconds past midnight)
	st	Sonar type (See MBI)
	sf	Sonar flags (See MBI)
	Bd	Available beam data (See MBI)
	n	Number of beams to follow
	sv	Sound velocity in M/sec
	pn	Ping number (or 0 if not tracked)
	sonar	sonar ID (Optional.)
	range	sonar range setting if known. 0 if unknown (Optional)
	power	sonar power setting (Optional)
	gain	sonar gain setting (Optional)

Format	RMB t st sf bd n sv pn sonar range power gain GainMode	
	gain mode	additional gain information(Optional)
Sample Lines		**Seabat 9001 storing slant ranges, quality codes and sounding flags:** RMB 1 27244.135 1 0 E0 1500.00 0 60 19.50 19.31 18.60 1.66 18.47 … (60 slant ranges in survey units) 3 3 3 0 3 … (60 quality codes) 0 0 0 1 0 … (60 sounding flags) **Multiple transducer storing 8 raw depths:** RMB 1 27244.135 4 0 0 1500.00 0 60 31.44 33.01 32.83 32.80 … (8 raw depths in survey units) **Dual-head Seabeam SB1185 storing range, beam pitch and roll angles, ping delay times, beam quality code and sounding flags:** RMB 1 27244.135 2 5 D2 1500.00 0 108 93.18 88.30 84.74 80.46 … (108 slant ranges in working units) -69.72 -68.53 -67.36 -66.15 … (108 beam roll angles in degrees) 0 0 0 67 … (108 ping delay times in msecs) 7 7 7 7 … (108 beam quality codes) 0 0 0 0 … (108 sounding flags)

Immediately following the RMB record is a record containing slant ranges (multibeam) or raw depths (multiple transducer). Following the ranges are 0 to n additional records depending on the bd (beam data) field.

RSS

TABLE 10-39. *Raw Sidescan*

Format	RSS dn t sf np ns sv pn alt sr amin amax bs freq	
Where	**dn**	device number
	t	time tag (seconds past midnight
	sf	sonar flags (bit coded hexadecimal) 0100 – amplitude is bit-shifted into byte storage
	np	number of samples, port transducer (down-sampled to 2048 max

Format	RSS dn t sf np ns sv pn alt sr amin amax bs freq	
	ns	number of samples, starboard transducer (down-sampled to 2048 max
	sv	sound velocity in m/sec
	pn	ping number (or 0 if not tracked
	alt	altitude in survey units
	sr	sample rate (samples per second after down-sample)
	amin	amplitude minimum
	amax	amplitude maximum
	bs	Bit shift for byte recording
	freq	frequency (0 or 1 for simultaneous dual frequency operation)
Sample Line		RSS 3 61323.082 100 341 341 1460.00 0 10.75 4983.47 0 4096 4 109 97 84 95 120 111 … (341 port samples) 106 93 163 106 114 127 … (341 starboard samples)

Immediately following the RSS record are two records containing port and starboard amplitude samples.

DFT Strings

TABLE 10-40. Draft Format

Format	DFT 99 t d	
Where	99	"device number" always 99
	t	time tag in sec. after midnight
	d	draft correction
Sample Line	`DFT 99 78741.428 0.400`	

TID Strings

TABLE 10-41. Tide Correction

Format	dn t dc	
Where	dn	device number or 99
	t	time tag (seconds past midnight)
	dc	draft correction
Sample Line	`TID 99 57273.814 -1.30`	

HYPACK® ALL 2 FORMAT

The All2 format file has two parts:

- The **header** contains information about your project and hardware configuration.
- The **data records** follow the header. They are the result of merging the records the raw data based on the time-tags.

ALL 2 HEADER

The header section will be a duplication of the header from the RAW data file. Additional records may be added by various processing programs.

NOTE: The paths of files will not be written, provided the file is located in the expected default directory. This is being done to ease the transfer of projects between computers. For example, if someone copies a project from Drive C: on their computer to Drive D: on another computer, all of the associated files will not be found if the path has been included.]

TABLE 10-42. *All 2 Header Format*

Line	Description
FTP ALL 2	The first record located at the top of the header. It is used to identify the file as being an updated ALL format file.
VER “Survey 6.2.1.9”	Version information from the SURVEY program.
RDF “095_1303.RAW”	Name of raw data file of original data. The assumed default path is the Raw directory of the current project.
TFN “NB_Nov11_2004.TID”	Name of tide correction file used to edit data. The assumed default path is the current project directory.
SVF “C:\SVFiles\NV_Nov11_2004.VEL”	Name of sound velocity correction file used to generate sound velocity corrections. The assumed default path is the current project directory.
KEI “3k5*32L02”	Encrypted key number of dongle used to collect data. If we can also encrypt the company name from the dongle, it should be included.
KEO “9hU@uA3l”	Encrypted key number of dongle last used to process data. If we can also encrypt the company name from the dongle, it should be included

Line	Description
`INF "Pat Sanders" "USNS Lollipop" "Job" "Headquarters" "Upper bay" -9.86 1.00 1500`	Survey Information Line: The first four items are from SURVEY's Project Information window. • Project Name • Job Name • Area Name • Boat Name • Surveyor Name • Initial Tide Correction at Start-of-Line • Initial Draft Correction at Start-of-Line • Roxann Sound Velocity from Navigation Parameters window.
`ELL "WGS-84" 6378137.000 298.257223563`	This is the Ellipsoid information. The name of the ellipsoid is followed by the semi-major axis (a) in meters and the flattening (f). Note that the name of the ellipsoid is not enclosed in quotation marks in the RAW format
`PRU "Feet" or PRU "Meters" or`	Work units for project Fe = False Easting Fn = False Northing Hu = Conversion factor from Horizontal Unit to meters Vu = Conversion factor from Vertical Unit to meters Id = Projection ID. (See Table 10-43 on page 27) P1-P5 = Relevant Attributes. Unused parameters are always 0
`DTM 9.90 -130.42 -199.07 2.11360 -1.33940 -4.39090 58.33700 "CONUS.LLS"`	Datum Transformation Record. DTM <dx><dy><dz><drx><dry><drz><dscale> <lls_file>. The default location of the LLS file is the \HYPACK\DATUM directory. If 'lls_file' is not null dx, dy, dz, drx, dry, drz and dscale should be all 0. • dX • dY • dZ • rX (in seconds of arc) • rY (in seconds of arc) • rZ (in seconds of arc) • dScale (in ppm)

Line	Description
TND “10:56:40” “10/02/2003”	Time and Date Record Time of Start Line from Raw Datafile Date of Start Line from Raw Datafile
DTE “15:05:40” “11/	
DEV 0 4 "GPS Test" 49156 “c:\hypack\devices\gps.dll 3.2”	Device Record • Device ID • Number of values to follow • Device Name • Device ID Type • Device Driver (with version number)
OFF 0 -6.00 -20.00 0.00 0.00 0.00 0.00 0.00	Device Offset Record • Device ID • Starboard (+) Offset (Grid Units) • Forward(+) Offset (Grid Units) • Height Offset (Grid Units) • Yaw (Degrees: Positive clockwise) • Roll (Degrees:Positive portside upward) • Pitch (Degrees: Positive nose up) • Latency (Seconds) Time of transmission of measurement minus time of measurement.
PRI 0	Primary Navigation System. The label is followed by the device number of the primary navigation system.
LLS “C:\HYPACK 2013\Datum\conus.lls”	Datum Shift File. Blank if not present.
DVE “Elevation” 1000.00	Depth versus Elevation Record “Depth” or “Elevation” as defined in GEODETIC PARAMETERS Chart Datum Level from GEODETIC PARAMETERS
GEO 0.00 “G2003u05.geo”	Geoid Model File. Blank if not present. The default location of the ‘geo’ file is the \HYPACK\Datum directory. GEO <h_corr> <geo_file> Where 'h_corr' is orthometric height correction in meters.
PRD 0 “KTD C:\HYPACK\CHEAT.KTD”	‘From KINEMATIC.DLL The default location of the KTD file is the current project directory.

Line	Description
PRD 1 OFF 3.00 -1.30 0.70 0.00 -10.00 0.00 PRD 1 OFF 3.00 0.00 0.70 0.00 0.00 0.00 PRD 1 OFF 0.00 0.00 0.65 0.00 0.00 0.00 PRD 1 OFF 0.00 -1.40 0.65 0.00 10.00 0.00	'From Knudsen Multiple Transducer Driver Proprietary Device Record. Each device driver is capable of writing a PRD record. The first entry after the label is the device number and then whatever the device wants to write.
PLF "E:\HYPACK\PROJECTS\CCSGA\SIDESCAN.LNW"	Planned line filename. This will replace the older 'FIL' record from the RAW data format. *FIL "RAW" "e:\hypack\projects\cssga\sidescan.lnw"*. If there is no planned line being used, the program will write a blank text field after the PLF, **PLF ""** . The default directory for the LNW file is the current project directory.
LIN 2	Waypoints in Planned Line. This record will be immediately followed by the X-Y listing for each waypoint in the data file.
PTS 1007957.44 760823.55	A waypoint record. The X (Easting) and Y (Northing) follow the PTS label. There is one record for each waypoint.
LBP 1005616.80 759784.28	Line Beginning Point. This lists the first waypoint, based on the direction that the line was surveyed.
LNN 9	Line Name Record. The name or number of the planned line.
LTP 63.000000 21.000000	Line Template Point. Eleven LTP points follow the LNN record for lines that were created in CHANNEL DESIGN. This provides distance and depth information (distance from the line origin) that is used to reconstruct the channel template.
EOL	End of Line Information
REC 38	Number of fields in each record. This will be used to denote how many fields are contained in each data record. The last field (38^{th} in this example) will be a checksum for the record.
EOH ff	End of Header Record. After the EOH will be the two character checksum for the header information.

TABLE 10-43. Projections: IDs and Properties

Projection	ID/Properties
Lambert Conformal Conical	id = LCC p1 = central meridian p2 = reference latitude p3 = scale factor p4 = North parallel p5 = South parallel
Mercator	id = MER p1 = Central Meridian p2 = Reference Latitude
Transverse Mercator	id = TME p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor
Oblique Stereographic	id = OST p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor
Oblique Cylindrical **(Swiss and EOV systems)**	id = OCY p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor
Hotine Oblique Mercator	id = HOM p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor p4 = Azimuth of Skew
Rectified Skew Orthomorphic	id = RSO p1 = Central Meridian p2 = Reference Latitude p3 = Scale Factor p4 = Azimuth of Skew
Azimuthal Equidistant	id = AZD p1 = Central Meridian p2 = Reference Latitude
CMAP Mercator	id = CME, (no parameters)

Projection	ID/Properties
Albers Equal Area	id = ALA p1 = central meridian p2 = reference latitude p3 = North parallel p4 = South parallel
Cassini-Soldner	id = CAS p1 = Central Meridian p2 = Reference Latitude

All 2 Data Records

The data records proceed immediately after the CR-LF of the EOH record.

Each record will be comma delimited and contain the following fields. If no value exists for a field, it will be left unfilled (no zero).

TABLE 10-44. *All 2 Format Data Records - Field Definitions*

Field	Item
1	Last Event Number
2	X (Easting)
3	Y (Northing)
4	Time of Sounding (hh:mm:ss.sss)
5	High Frequency Depth (Depth 1)
6	High Frequency Flag: • 0 = Valid (Not modified) • 1 = Valid (Modified) • 2 = Deleted
7	High Frequency SV Correction
8	Low Frequency Depth (Depth 2)
9	Low Frequency Flag (same scheme as 5)
10	Low Frequency SV Correction
11	Tide Correction
12	Draft Correction
13	Heave Correction
14	Raw Heave (meters or feet)

Field	Item
15	Raw Roll (decimal degrees)
16	Raw Pitch (decimal degrees)
17	WGS84 Lat: SDDMM.MMMMMMMM
18	WGS84 Long: SDDDMM.MMMMMMMM
19	WGS84 Ellipsoid Height
20	GPS Status Code (e.g.: 2=Diff)
21	GPS HDOP/PDOP
22	GPS Number of Satellites
23	GPS Standard Error X
24	GPS Standard Error Y
25	GPS Standard Error Z
26	Vessel Heading
27	Vessel Course Made Good
28	Vessel XTE (=0 if no planned line)
29	Vessel DBL (=0 if no planned line)
30	Vessel Speed (knots)
31	Seabed E1
32	Seabed E2
33	Seabed ID
34	Seabed ID Color Code
35	Height of Ellipsoid Above Chart Datum
36	Height of Ellipsoid Above Geoid
37	Total Positioning Error
38	Record Checksum: The last two characters in each Data Record (followed by CHR$(13)+CHR$(10)). It will be recomputed anytime a Data Record is written by a HYPACK program.

TARGET FILE (*.TGT) FORMAT

A space delimited list of target properties as follows.:

String Values	Definition
GPT	Tag begins each string
Name	Target Name. Editable through the Target Editor or Survey's Target Properties. Defaults: • In the Target Editor, numbered in order of creation • In Survey, time created.
Easting	X Position Coordinate
Northing	Y Position Coordinate
Depth	Water depth at the target location
Lat	Latitude
Lon	Longitude
Time	Time target was created
Date	Date target was created
Distance **SBearing**	Targets marked during Survey with the target icon or F5 key are marked at the location of the tracking point. You can shift its position by specifying distance and bearing from its original position.
Code	Target type: 0 = Default value 1 = Water's Edge
Event	If the target is marked during SURVEY, this is the latest event number. Otherwise, this value will be 0.
Quality	Confidence Code for Target Classification. Otherwise, value is always '0'.
Notes	User notes entered in the Target Properties dialog, in SIDE SCAN TARGETING AND MOSAICKING during targeting, or in TARGET VIEWER
Extra	S57 symbol assigned to that target position.

String Values	Definition
Angle	The angle of the alarm flag from the target when displaying it in Survey/DREDGEPACK®.
Sample Line	GPT "TGTName" 654901.61 283947.17 1.20 **32.48255317 -133.32768112** 17:31:29 1/29/2007 1.30 1.40 5 6 7.00 "notes" "SY(ACHARE02,0)" 90.00

Values are set in the TARGET EDITOR or in the Target Properties dialog in SURVEY.

More Information
• "Creating a New Target File" on page 2-236
• "Target Properties in Survey" on page 3-56

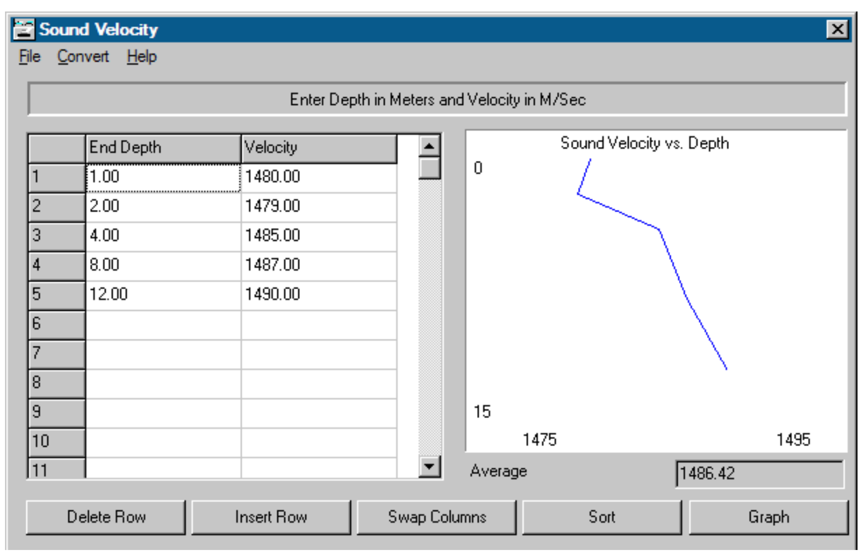
SOUND VELOCITY CORRECTIONS FILE (*.VEL)

The first line is "FTP NEW 2" followed by End Depth and Sound Velocity pairs.

Example:

```
FTP NEW 2
1.00 1480.00
2.00 1479.00
4.00 1485.00
8.00 1487.00
12.00 1490.00
```

FIGURE 10-1. *VEL file in the SOUND VELOCITY Program*



Planned Line Files (*.LNW)

The first line is always: After that, each line is described as follows:

Description	Definition
LNS n	Always the first line. n = number of lines in the file.
LIN n	n = number of waypoints in the line.
PTS X Y	One record for each waypoint where X and Y are the waypoint projection grid coordinates.
LNN *LineName*	*LineName* defaults to consecutive numbers, but may be edited in the LINE EDITOR.
EOL	End of Line

Example:

```
LNS 10
LIN 2
PTS 618379.72 668369.24
PTS 618307.74 668206.38
LNN 1
EOL
LIN 2
PTS 618338.57 668387.43
PTS 618266.58 668224.58
LNN 2
EOL…
```

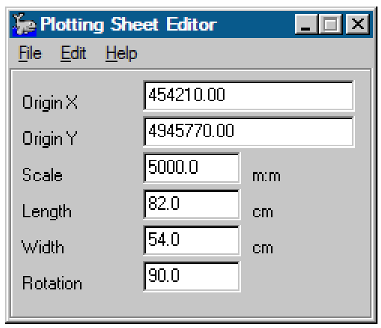
Plotting Sheet Files (*.PLT)

An ASCII text file listing information entered in the PLOTTING SHEET EDITOR, one item per line as follows:

TABLE 10-45. *PLT Field Definitions*

Description	Sample File
• FileName	HAL.PLT
• HPG/L	HPG/L
• Length	82.00
• Width	54.00
• Origin X	454210.00
• Origin Y	4945770.00
• Scale	5000.00
• Rotation	90.00
• 1.00	1.00
• 20.00	20.00
• 2.00	2.00
• 90.00	90.00

FIGURE 10-2. Example Displayed in the PLOTTING SHEET EDITOR



MATRIX FILES (*MTX)

An ASCII file describes the matrix. Each file begins with a header which includes only the information you see in the MATRIX EDITOR.

TABLE 10-46. MTX Format

Description	Sample file
Corner X	454387.68
Corner Y	4945260.49
Length	3443.62
Width	285.21
Cell Length	10
Cell Width	10
Rotation	72
Matrix Type	1
Where	0=SURVEY 1=DREDGEPACK® 2=HYSWEEP® 3=SeabedID

If the matrix is empty, it contains only header data.

If the matrix contains sounding data, the header will be followed by depth records as follows:

CellNumber DepthAsSurveyed DepthAsDredged

Look at the following examples:

TABLE 10-47. Matrix Format Examples:

HYPACK® SURVEY Data Only or Seabed ID Matrix	`2422 65`
	`2423 71.5`
	`2079 62.8`
	`2080 69.1`
	`2424 71.5…`

Dredge and Survey Data:	`5021 14.55 14.20`
	`5022 14.51 14.20`
	`5023 14.76 14.55`
	`5024 14.57 14.57`
	`5025 14.52 14.52`
	`5026 14.19 14.19`

HYSWEEP® Matrix	`5107 102.03 102.43 204.46 2 43925700`
	`5108 102.10 102.82 204.92 2 43925700`
	`5109 102.33 102.89 205.22 2 43925700`
	`5110 102.39 102.69 307.77 3 44451813`

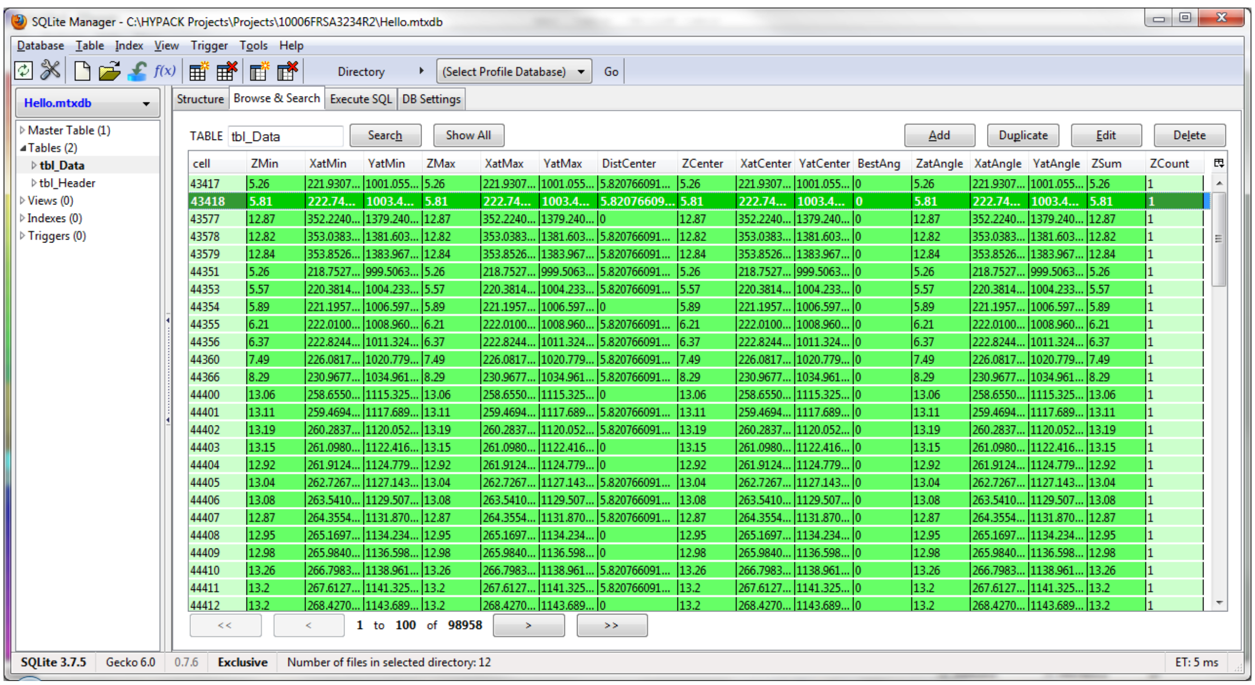
- The **HYPACK® SURVEY Data Only** matrix has two columns. The third column is created only if the matrix is opened for use in the DREDGEPACK® program. The **Seabed ID matrix** looks the same, but the second column stores the Seabed ID instead of depths.

- The **Dredge and Survey Data** matrix contains the third column with the dredge depths. The first three cells listed have had material removed by the dredge so the depth values are different. The last three cells have not been dredged and their depth values are the same.
- The **HYSWEEP® Matrix** records Cell Number, Minimum Depth, Maximum Depth, Sum of all depths, number of depths in the cell, time stamp (msec after midnight).

Matrix Database (*.MTXDB)

One of the output format options in MAPPER is a database (*..mtxdb). This is an SQLite database. SQLite (www.sqlite.org) a free, open-source database program that is becoming widely used. If you know SQL (Structured Query Language) and one of the free tools available to view and query SQLite databases, you can use the database generated for you (and by you) in MAPPER to extract more extensive information (eg X-Y-Zmin-Zmax-Zaverage file for example) from the data set than the MAPPER interface provides.

***FIGURE 10-3.** A Firefox Web Browser add-in called SQLite Manager with an .mtxdb file.*



The tables that make up a Matrix Database are tbl_Header and tbl_Data.

The **header table** contains all of the information about the structure of the matrix file. The columns in the table are:

- **id**: Unique ID of the row. Since the table only contains one row, this record has the id of 1.

- **x_ref:** X reference point of the matrix corner.
- **y_ref:** Y reference point of the matrix corner.
- **mtx_width:** The X width of the matrix.
- **mtx_length:** The Y length of the matrix.
- **cell_width:** The cell width of the cells in the matrix.
- **cell_length:** The cell length of the cells in the matrix.
- **rotation:** The rotation of the matrix.
- **type:** The type of matrix (HYPACK® or HYSWEEP®).

This data should be familiar if you have ever looked at the header of a matrix (*.MTX) file.

The **data table** stores a lot of information for each record. If you have used the MAPPER program in the past, you know that some of the data selection choices are things like minimum, maximum, range, average, etc. Each record in the data table contains all of those data options. The columns in this table are:

- **cell**: The cell number in the matrix.
- **ZMin:** The minimum Z value in that cell.
- **XatMin:** The X value (relative to the matrix reference point – all X and Y values are saved this way) at the minimum Z.
- **YatMin:** The Y value at the minimum Z.
- **ZMax:** The maximum Z value.
- **XatMax:** The X value at the maximum Z.
- **YatMax:** The Y value at the maximum Z.
- **DistCenter:** The field is saved to keep track of the XY value nearest to the cell center.
- **ZCenter:** The Z value nearest to the cell center.
- **XatCenter:** The X value for the sounding nearest to the cell center.
- **YatCenter:** The Y value for the sounding nearest to the cell center.
- **BestAng:** For .swp and .hs2 files to keep the sounding closest to the best given angle.
- **ZatAngle:** The Z value at the best angle.
- **XatAngle:** The Y value at the best angle.
- **YatAngle:** The Y value at the best angle.
- **ZSum:** The sum of all Z values to hit that cell.
- **ZCount:** The number of Z values to hit that cell.

The one piece of data that would difficult to retrieve would be the X and Y at cell center (or corners). The SQLite engine does not provide trigonometric functions to factor in the rotation. It could be extracted with a 0 rotation matrix however.

Border Files (*.BRD)

Border files contain only a list of coordinate pairs for each waypoint in the border. HYPACK® uses all but the last point to create a polygon, then determines if the last point falls inside or outside the defined area.

Example:

```
10.58 55.25
11.64 73.36
34.63 77.93
38.74 58.75
10.58 55.25
24.43 65.91
```

Channel Plan Files (*.PLN)

Channel Plan files have two sections:

- From the top to the '[Geometry]' label, we list all of the data and settings that you have entered to the CHANNEL DESIGN tabs. The information for each tab has a label preceding it in square brackets (for example '[Center]').
- The [Geometry] section contains channel waypoints that have been calculated by CHANNEL DESIGN. Most of them will be the same as in the upper portion. However, if the ends of the toes and center line are not even, CHANNEL DESIGN adjusts the toes to be square with the center line and records the adjusted waypoints in this section.

When the PLN file is displayed in the HYPACK® window, the calculated points will be used to draw the channel, while the original points will be marked with small squares.

Example:

```
[General]
Version=3
DepthMode=1
Arc=0
LeftLevel=0.00
RightLevel=0.00
LeftExt=0.00
RightExt=0.00
Spacing=100.00
Corner=0
Smart=1
NameFormat=0
HandleSize=0.00
[Center]
NoPoints=5
450.00 0.00 20.00 0.00 0.00
```

```
480.00 700.00 20.00 700.64 0.00
450.00 1800.00 20.00 1801.05 0.00
820.00 2520.00 20.00 2610.56 0.00
820.00 3999.00 20.00 4089.56 0.00
[LeftToe]
Shift=0.00
NoPoints=8
350.00 0.00 3.00:1.00 0.00
350.00 100.00 3.00:1.00 0.00
300.00 500.00 3.00:1.00 0.00
300.00 800.00 3.00:1.00 0.00
300.00 1600.00 3.00:1.00 0.00
300.00 1800.00 3.00:1.00 0.00
650.00 2550.00 3.00:1.00 0.00
650.00 4001.00 1.00:1.00 0.00
[RightToe]
Shift=0.00
NoPoints=8
550.00 0.00 2.00:1.00 0.00
600.00 100.00 2.00:1.00 0.00
600.00 500.00 2.00:1.00 0.00
700.00 700.00 2.00:1.00 0.00
700.00 1300.00 2.00:1.00 0.00
800.00 1800.00 2.00:1.00 0.00
950.00 2450.00 2.00:1.00 0.00
950.00 3999.10 1.00:1.00 0.00
[LeftBasins]
NoBasins=1
[Basin]
Level=16.00
NoPoints=4
300.00 800.00 3.00:1.00 0.00
100.00 1000.00 3.00:1.00 0.00
100.00 1400.00 3.00:1.00 0.00
300.00 1600.00 3.00:1.00 0.00
[RightBasins]
NoBasins=0
[Geometry]
NoPoly=7
Name=Center
NoPoints=5
450.00 0.00 20.00
480.00 700.00 20.00
450.00 1800.00 20.00
820.00 2520.00 20.00
820.00 3999.00 20.00
Name=LeftToe
NoPoints=8
```

```
350.00 4.29 20.00
350.00 100.00 20.00
300.00 500.00 20.00
300.00 800.00 20.00
300.00 1600.00 20.00
300.00 1800.00 20.00
650.00 2550.00 20.00
650.00 3999.00 20.00
Name=RightToe
NoPoints=8
547.90 -4.20 20.00
600.00 100.00 20.00
600.00 500.00 20.00
700.00 700.00 20.00
700.00 1300.00 20.00
800.00 1800.00 20.00
950.00 2450.00 20.00
950.00 3999.00 20.00
Name=LeftTop
NoPoints=10
290.00 6.86 0.00
290.00 96.26 0.00
240.00 496.26 0.00
240.00 776.23 0.00
52.00 980.98 0.00
52.00 1419.02 0.00
240.00 1623.77 0.00
240.00 1813.31 0.00
590.00 2563.31 0.00
590.00 3999.00 0.00
Name=RightTop
NoPoints=8
591.69 -6.07 0.00
640.00 90.56 0.00
640.00 490.56 0.00
740.00 690.56 0.00
740.00 1296.04 0.00
839.11 1791.58 0.00
990.00 2445.44 0.00
990.00 3999.00 0.00
Name=LeftBasinIn0
NoPoints=2
288.00 800.00 16.00
288.00 1600.00 16.00
Name=LeftBasinOut0
NoPoints=4
288.00 800.00 16.00
100.00 1000.00 16.00
```

```
100.00 1400.00 16.00
288.00 1600.00 16.00
MinArc=0.00
```

CHANNEL TEMPLATE FILES (*.TPL)

A Channel Template file begins with the header that designates the format in which it is constructed. The most recent TPL format begins “FTP NEW”.

Following the header, there are from 4 to 21 lines that define the channel.

Format	LTP dbl dep	
Where	LTP	Tag
	dbl	Distance from the beginning of the survey line.
	dep	Depth
Sample Line	LTP 251.87 58.00	

Beware!

BEWARE! Take care that the calculation method you are using supports the number of template points you are creating. For example, the Standard Hypack method is the only method that supports 21 points.

Example:

```
FTP NEW
LTP -400.0000 0.0000
LTP -350.0000 10.0000
LTP -300.0000 25.0000
LTP -250.0000 49.0000
LTP 0.0000 49.0000
LTP 250.0000 49.0000
LTP 300.0000 25.0000
LTP 350.0000 10.0000
LTP 400.0000 0.0000
```

ADVANCED CHANNEL FILES (*.CHN)

A Channel File is composed of a series lists which each begin with the list name and the number of items in the list. CHN files may not include all of the data, depending on how they were generated.

- **Nodes:** The Nodes list begins with the heading (ex. NODES 159), followed by the node data. One node is defined in each line, and each line contains the X, Y, Z and ID of the node.

- **Faces:** The Faces section begins with the heading (ex FACES 169), then describes the faces of the channel through space delimited lists of node IDs, one line per face.
- **Segments** lists each pair of nodes that are connected to form the edge of one or more faces.
- **Labels** are a complete list of the nodes Program-generated nodes have numeric labels begin with and underscore (ex _35).
- **Zones**: Describes each zone with name, color identification, number of faces, a list of face numbers where the numbers are assigned based on the order in which the faces are described in the Faces list.

These lists are followed by an Elevation mulitiplier which indicates whether the CHN was generated in depth or elevation mode, and the data from the Center Line, Left Toe, Right Toe, Left Basin, and Right Basin tabs.

Sample File:

```
NODES         8
916761.84 260215.20 49.00 0
916784.66 259715.72 49.00 1
919768.64 260352.08 49.00 2
919791.46 259852.60 49.00 3
916789.12 259617.82 0.00 4
919795.92 259754.70 0.00 5
919764.18 260449.98 0.00 6
916757.38 260313.10 0.00 7
FACES 3
0 1 3 2 0
4 5 3 1 4
6 7 0 2 6
SEGMENTS 10
1 0
3 1
2 3
0 2
5 4
3 5
4 1
7 6
0 7
6 2
LABELS 8
2
3
92
93
5_
6_
7_
```

```
8_
ZONES 3
LeftSlope
255
1
2
Center
65280
1
0
RightSlope
16711680
1
1
```

HSX FORMAT – HYSWEEP® TEXT (ASCII) LOGGING

HYSWEEP® survey has a Text logging option (HSX format), allowing raw data to be stored in a format that can be inspected and modified by most editing program (Windows Wordpad for example). Easy inspection of files is the advantage of text logging - the disadvantage is larger files and slower load time. If file size and load time are important to you, it is best to choose the HYSWEEP® binary format (HS2).

HSX files are generally compatible with HYPACK® SURVEY raw format, allowing HYPACK® programs (HYPACK®, HYPLOT, etc.) to work with HSX files. The differences involve logging and processing of multibeam data, which is by the HYSWEEP® extensions to HYPACK®.

Each file contains two sections; a header, which is written when data logging starts, and a data section, which is written as data is collected. Most records starts with a three character tag.

HSX HEADER STRINGS

The header is a section of data at the beginning of each data file. It contains project information which is read in post-processing.

DEV STRINGS

FIGURE 10-1. HYPACK® *Device Information*

Format		**DEV dn dc "name"**
Where	**dn**	device number
	dc	Device capabilities (bit code) • 1, 2, 4, 8 – Position • 16 – depth • 32 – heading • 512 – MRU • 32768 – extended capabilities
	name	Device Name
Sample Line (GPS positions, speed and heading)		DEV 0 100 "GPS"

DV2 Strings

TABLE 10-1. Hysweep Device Information

Format		DV2 dn dc tf en
Where	**dn**	device number
	dc	HYSWEEP Device capabilities (bit code): • 0001 - Multibeam Sonar • 0002 - Multiple Transducer sonar • 0004 - GPS (Boat Position) • 0008 - Sidescan Sonar • 0010 - Single Beam Echosounder • 0020 - Gyro (boat heading) • 0040 - Tide • 0200 - MRU (heave, pitch and roll compensation)
	tf	1 if device is mounted on a tow fish
	en	1 if device is enabled
Sample Line		DV2 0 1 0 1

EOH Strings

The **End of Header** tag indicates end of the header in each file. It has no data itself. All subsequent lines are recorded data strings.

EOL Strings

The **End of Line** tag indicates end of planned line information. It has no data itself.

FTP Strings

The **File Type** (HYPACK® File Identifier) identifies HYPACK® 8.9 raw file. It is always 1st record in file.

Sample Line: FTP NEW 2

HSP Strings

TABLE 10-2. HYSWEEP® SURVEY Parameters

Format	HSP p1 p2 p3 p4 p5 p6 p7 p8 p9 p10 p11 p12	
Where	**P1**	minimum depth (survey units)
	P2	maximum depth (survey units)
	P3	port side offset limit (survey units)
	P4	starboard side offset limit (survey units)
	P5	port side beam angle limit (degrees)
	P6	starboard side beam angle limit (degrees)
	P7	high beam quality; codes >= this are good
	P8	low beam quality: codes < this are bad
	P9	sonar range setting (survey units)

Format	HSP p1 p2 p3 p4 p5 p6 p7 p8 p9 p10 p11 p12	
	P10	towfish layback (survey units)
	P11	survey units: 0=meters, 1=us foot, 2=int'l foot
	P12	sonar id for advanced processing (See "HYSWEEP® Sonar ID Numbers,")
Sample Line		HSP 5.0 45.0 160.0 150.0 60 60 3 1 328.0 0.0 1

TABLE 10-3. *HYSWEEP® Sonar ID Numbers*

Sonar	ID Number
*Not Specified	0
Reson Seabat 8101 - 150 Deg	1
Atlas Fansweep 20	2
Benthos C3D	3
CMAX CM-2	4
EdgeTech 272	5
EdgeTech 4100	6
EdgeTech 4125	7
EdgeTech 4150	8
EdgeTech 4200	9
EdgeTech 4300	10
GeoAcoustics GeoSwath	11
Imagenex Sportscan	12
Imagenex Yellowfin	13
Klein 595	14
Klein 2000	15
Klein 3000	16
Klein 3900	17
Klein 5000	18
Odom CV3	19
Odom Echoscan 2	20
Odom ES3	21
Reson Seabat 7125	22
Reson Seabat 8111	23

Sonar	ID Number
Reson Seabat 8124	24
Reson Seabat 8125	25
Reson Seabat 9001	26
Reson Seabat 9003	27
SEA Swathplus	28
Seabeam 2100	29
Seabeam SB1185	30
Simrad EA400	31
Simrad EM102	32
Simrad EM1002	33
Simrad EM2000	34
Simrad EM3000	35
Simrad EM3000D	36
Simrad EM3002	37
Simrad EM3002D	38
Reson Seabat 8101 - 210 Deg	39
Imagenex Delta T	40
Atlas Hydrosweep MD2	41
Simrad SM2000	42
Simrad EM710	43
Simrad EM302	44

HSX STRINGS

TABLE 10-4. *HSX File Identifier*

Format		HSX vn
Where	**vn**	HSX format version number.
		Always 2nd record in file. **HSX Format Versions:** • 29-Mar-2000:0 HYPACK® Max 0.4 • 11-Sep-2000: 1 HYPACK® Max 0.5 • 18-Jun-2001: 2 HYPACK® Max 0.5B • 05-Jun-2003: 3 HYPACK® Max 2.12A, Remove TFP (tow fish position) records
Sample Line		HSX 0

INF STRINGS

TABLE 10-5. General Project Information

Format	INF "surveyor" "boat" "project" "area" tc dc sv	
Where:	tc:	initial tide correction
	dc:	initial draft correction
	sv:	sound velocity
Sample Line	`INF "steve" "LCH 19" "mcmillen" "617.6 to 618.2" -0.7 0 1500.0`	

LBP STRINGS

TABLE 10-6. Planned Line Begin Point.

Format		LBP x y
Where	x	x grid position
	y	y grid position
Sample Line		LBP 5567222.42 3771640.72

LIN STRINGS

TABLE 10-7. Planned Line Data follows

Format		LIN nw
Where	nw	Number of waypoints
Sample Line		LIN 5

LNN STRINGS

TABLE 10-8. Planned Line Name

Format		LNN text
Where	text	line name or number
Sample Line		LNN 14

MBI STRINGS

TABLE 10-9. Multibeam / Multiple Transducer Device information

Format		MBI dn st sf bd n1 n2 fa al
Where	dn	device number
	st	sonar type code • 0 – invalid • 1 – fixed beam roll angles (e.g., Reson Seabat) • 2 – variable beam roll angles (e.g., Seabeam SB1185) • 3 – beam info in spherical coordinates (e.g., Simrad EM3000) • 4 – multiple transducer (e.g., Odom Miniscan)
	sf	sonar flags (bit coded hexadecimal) • 0001– roll corrected by sonar • 0002– pitch corrected by sonar • 0004– dual head • 0008–heading corrected by sonar (ver 1) • 0010 – medium depth: slant ranges recorded to 1 dm res. (version 2) • 0020 – deep water: slant ranges divided by 1 m resolution (ver 2) • 0040 - SVP corrected by sonar (ver 5) • 0080 - topographic device; upgoing beams accepted. (ver 6)

Format		MBI dn st sf bd n1 n2 fa al
	bd	beam data (bit coded hexadecimal) • 0001 – beam ranges are available (survey units) • 0002 – sounding point easting available (survey units) • 0004 – point northing available (survey units) • 0008 – point corrected depth available (survey units) • 0010 – along track distance available (survey units) • 0020 – across track distance available (survey units) • 0040 – beam pitch angles available (degrees, TSS convention) • 0080 – beam roll angles available (degrees, TSS convention) • 0100 – beam takeoff angles available (degrees from vertical) • 0200 – beam direction angles available (degrees from forward) • 0400 – ping delay times included (milliseconds) • 0800 – beam intensity data available • 1000 – beam quality codes (from sonar unit) available • 2000 – sounding flags included • 4000 - spare • 8000 - spare
	n1	number of beams, head 1 (multibeam) or number of transducers (multitransducer)
	n2	number of beams, head 2 (multibeam)
	fa	first beam angle is for sonar type = fixed angle (degrees, TSS convention)
	ai	angle increment is for sonar type = fixed angle (degrees, TSS convention)
Sample Line		MBI 1 1 0 1801 60 0 44.250 -1.500

0F2 Strings

TABLE 10-10. Device Offsets

Format		OF2 dn on n1 n2 n3 n4 n5 n6 n7
Where	dn	device number
	on	offset number • 0 – position antenna offsets • 1 – gyro heading offset • 2 – MRU device offsets • 3 – Sonar head 1 / Transducer 1 offsets • 4 – Sonar head 2 / Transducer 2 offsets • 131 – Transducer 128 offsets
	n1	Starboard / port mounting offset. Positive starboard
	n2	Forward / aft mounting offset. Positive forward
	n3	Vertical mounting offset. Positive downward from waterline
	n4	Yaw rotation angle. Positive for clockwise rotation
	n5	Roll rotation angle. Port side up is positive
	n6	Pitch rotation angle. Bow up is positive
	n7	Device latency in seconds
Sample Line		OF2 0 3 6.2 –1.3 6.1 2.15 -0.27 1.00 0.000

PRI Strings

TABLE 10-11. Primary Navigation Device

Format		PRI dn
Where	dn	device number
Sample Line		PRI 0

PTS Strings

TABLE 10-12. Planned Line Waypoint

Format		PTS x y
Where	x	waypoint easting in survey units
	y	waypoint northing in survey units
Sample Line		PTS 5569134.63 3774182.61

SSI Strings

TABLE 10-13. Sidescan Device Information

Format		SSI dn sf np ns
Where	dn	device number
	sf	sonar flags (bit coded hexadecimal) 0100 – amplitude is bit-shifted into byte storage
	np	number of samples per ping, port transducer
	ns	number of samples per ping, starboard transducer
Sample Line		SSI 1 256 1024 1024

SVC Strings

TABLE 10-14. Sound Velocity Correction

Format		SVC bd ed sv
Where	bd	layer begin depth in survey units, referenced to water surface
	ed	layer end depth in survey units
	sv	layer sound velocity in meters/second
Sample Line		SVC 0.0 1.0 1481.66

Normally, there will be many of these records contained in the file header. One for each layer (velocity zone) measured by the sound velocity profiler.

TND Strings

TABLE 10-15. Survey Time and Date

Format		TND t d
Where	t	time string
	d	date string
Sample Line		TND 15:54:33 08/28/95

HSX Data Strings

CAB Strings

TABLE 10-16. Cable Out

Format		CAB dn t n c l sf sd sa wd
Where	dn	device number or 99
	t	time tag (seconds past midnight)

Format		CAB dn t n c l sf sd sa wd
	n	number of values to follow
	c	cable out
	l	layback
	sf	slope factor
	sd	sensor depth
	sa	sensor altitude
	wd	water depth
Sample Line		`CAB 1 48738.528 6 100.000 64.503 0.645 0.000 63.500 63.500`

DFT Strings

TABLE 10-17. Dynamic Draft (Squat) Correction

Format		DFT dn t dc
Where	dn	device number or 99
	t	time tag (seconds past midnight)
	dc	draft correction
Sample Line		`DFT 99 57273.81 -0.30`

FIX Strings

TABLE 10-18. Fix (Event) Mark

Format		FIX dn t n
Where	dn	device number or 99
	t	time tag (seconds past midnight)
	n	event number
Sample Line		`FIX 99 57273.81 15`

GPS Strings

TABLE 10-19. GPS measurements

Format		GPS dn t cog sog hdop mode nsats
Where	dn	device number
	t	time tag (seconds past midnight)
	COG	Course Over Ground (degrees)
	SOG	Speed Over Ground (knots)
	HDOP	GPS HDOP

Format		GPS dn t cog sog hdop mode nsats
	Mode	GPS mode • 0 : unknown • 1: stand alone • 2: differential • 3: RTK
	NSats	Number of Satellites
Sample Line		`GPS 0 57274.044 124.4 5.66 2.1 2 4`

GYR STRINGS

TABLE 10-20. Gyro Data (Heading)

Format		GYR dn t h
Where	dn	device number
	t	time tag (seconds past midnight)
	h	vessel heading angle
Sample Line		`GYR 0 57274.04 193.71`

HCP STRINGS

TABLE 10-21. Heave Compensation

Format		HCP dn t h r p
Where	dn	device number
	t	time tag (seconds past midnight)
	h	heave in meters
	r	roll in degrees (+ port side up)
	p	pitch in degrees (+ bow up)
Sample Line		`HCP 2 57273.81 0 3.61 0`

POS STRINGS

TABLE 10-22. Position

Format		POS dn t x y
Where	dn	device number
	t	time tag (seconds past midnight
	x	easting
	y	northing
Sample Line		`POS 0 57274.042 5569070.02 3774080.46`

PSA STRINGS

TABLE 10-23. Pitch Stabilization Angle

Format		**PSA dn t pn a0 a1**
Where	**dn**	device number
	t	time tag (seconds past midnight
	pn	ping number
	a0	projector (head 0) pitch angle
	a1	projector (head 1) pitch angle
Sample Line		

NOTE: PSA records are recorded only when pitch stabilization is active. They immediately precede corresponding RMB records.

RMB STRINGS

TABLE 10-24. Raw Multibeam Data

Format	**RMB t st sf bd n sv pn sonar range power gain GainMode**	
Where	**dn**	device number
	t	time tag (seconds past midnight)
	st	Sonar type
	sf	Sonar flags
	Bd	Available beam data
	n	Number of beams to follow
	sv	Sound velocity in M/sec
	pn	Ping number (or 0 if not tracked)
Immediately following the RMB record is a record containing slant ranges (multibeam) or raw depths (multiple transducer). Following the ranges are 0 to n additional records depending on the bd (beam data) field.		
Sample Lines	**Seabat 9001 storing slant ranges, quality codes and sounding flags:** `RMB 1 27244.135 1 0 E0 1500.00 0 60` `19.50 19.31 18.60 1.66 18.47` … (60 slant ranges in survey units) `3 3 3 0 3` … (60 quality codes) `0 0 0 1 0` … (60 sounding flags)	

Format	RMB t st sf bd n sv pn sonar range power gain GainMode
	Multiple transducer storing 8 raw depths: `RMB 1 27244.135 4 0 0 1500.00 0 60` `31.44 33.01 32.83 32.80 …` (8 raw depths in survey units)
	Dual-head Seabeam SB1185 storing range, beam pitch and roll angles, ping delay times, beam quality code and sounding flags: `RMB 1 27244.135 2 5 D2 1500.00 0 108` `93.18 88.30 84.74 80.46` … (108 slant ranges in working units) `-69.72 -68.53 -67.36 -66.15` … (108 beam roll angles in degrees) `0 0 0 67 …` (108 ping delay times in msecs) `7 7 7 7` … (108 beam quality codes) `0 0 0 0` … (108 sounding flags)

Sonar Type Codes

- 0 – invalid
- 1 – fixed beam roll angles (e.g., Reson Seabat)
- 2 – variable beam roll angles (e.g., Seabeam SB1185)
- 3 – beam info in spherical coordinates (e.g., Simrad EM3000)
- 4 – multiple transducer (e.g., Odom Miniscan)

Sonar Type Flags

- 0001– roll corrected by sonar
- 0002– pitch corrected by sonar
- 0004– dual head
- 0008–heading corrected by sonar (ver 1)
- 0010 – medium depth: slant ranges recorded to 1 dm res. (version 2)
- 0020 – deep water: slant ranges divided by 1 m resolution (ver 2)
- 0040 - SVP corrected by sonar (ver 5)
- 0080 - topographic device; upgoing beams accepted. (ver 6)

Beam Data

- 0001 – beam ranges are available (survey units)
- 0002 – sounding point easting available (survey units)
- 0004 – point northing available (survey units)
- 0008 – point corrected depth available (survey units)
- 0010 – along track distance available (survey units)
- 0020 – across track distance available (survey units)

- 0040 – beam pitch angles available (degrees, TSS convention)
- 0080 – beam roll angles available (degrees, TSS convention)
- 0100 – beam takeoff angles available (degrees from vertical)
- 0200 – beam direction angles available (degrees from forward)
- 0400 – ping delay times included (milliseconds)
- 0800 – beam intensity data available
- 1000 – beam quality codes (from sonar unit) available
- 2000 – sounding flags included
- 4000 - spare
- 8000 - spare

RSS STRINGS

TABLE 10-25. Raw Sidescan

Format	RSS dn t sf np ns sv pn alt sr amin amax bs freq	
Where	dn	device number
	t	time tag (seconds past midnight)
	sf	sonar flags (bit coded hexadecimal) 0100 – amplitude is bit-shifted into byte storage
	np	number of samples, port transducer (down-sampled to 2048 max)
	ns	number of samples, starboard transducer (down-sampled to 2048 max)
	sv	sound velocity in m/sec
	pn	ping number (or 0 if not tracked)
	alt	altitude in survey units
	sr	sample rate (samples per second after down-sample)
	amin	amplitude minimum
	amax	amplitude maximum
	bs	Bit shift for byte recording
	freq	frequency (0 for single frequency or 1 for simultaneous dual frequency operation)
Sample Line		RSS 3 61323.082 100 341 341 1460.00 0 10.75 4983.47 0 4096 4 109 97 84 95 120 111 … (341 port samples) 106 93 163 106 114 127 … (341 starboard samples)

Immediately following the RSS record are two records containing port and starboard amplitude samples.

SNR Strings

TABLE 10-26. Sonar Runtime Settings

Format		TID dn t tc
Where	dn	device number or 99
	t	time tag (seconds past midnight
	pn	ping number (0 if not tracked)
	sonar	sonar ID (See "HYSWEEP® Sonar ID Numbers,")
	ns	Number of setting to follow
	s	up to 12 settings
Sample Line		SNR 1 65751.781 218 9 5 100 107 11400 12600 8

Five optional fields are included at the end of RMB records giving sonar range, power and gain settings. These settings are defined differently depending on sonar model and manufacturer.

TABLE 10-27. For Seabat 81XX Serial and 81XX Network Drivers:

Sonar ID	1, 23, 24, 25, 39
P0	Sonar range setting in meters.
P1	power setting, 0 - 8
P2	gain setting, 1 – 45
P3	gain modes: bit 0 = TVG on/off, bit 1 = auto gain on/off.

TABLE 10-28. For Seabat 7XXX Drivers (7125, 7101, 7150, 7111):

Sonar ID	22, 53, 60, 62
P0	Sonar range selection in meters.
P1	Transmit power selection in dBs relative to 1 uPa
P2	Receiver gain selection in 0.1 dBs
P3	Transmitter frequency in KHz.
P4	Transmit pulse width in microseconds.

TABLE 10-29. For EdgeTech 4200 Driver

Sonar ID	7-10
P0	Pulse power setting, 0 to 100 percent.

P1	ADC Gain factor.
P2	Start Frequency in 10 * Hz.
P3	End Frequency in 10 * Hz.
P4	Sweep length in milliseconds.

SVM STRINGS

TABLE 10-30. Other Towfish Sensor Data

Format		SVM dn t p fdep temp sal sv
Where	**dn**	device number or 99
	t	time tag (seconds past midnight
	p	pressure in decibars
	fdep	towfish depth in survey units
	temp	temperature in Celsius degrees
	sal	salinity in PSU
	sv	sound velocity in m/sec
Sample Line		

NOTE: If any value is absent, it is logged as ‘0’.

TID STRINGS

TABLE 10-31. Tide Correction

Format	dn t dc	
Where	dn	device number or 99
	t	time tag (seconds past midnight)
	dc	draft correction
Sample Line	`TID 99 57273.814 -1.30`	