

# *Navigation Data Formats*

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# 1 Navigation Data Formats

The following navigation formats are a subset of those supported by SonarWiz, for providing position information during sidescan, sub-bottom, bathymetric, or magnetometry survey (real-time data acquisition).

## 1.1 C & C Technologies Custom Interface

This is a space delimited string with the following fields.

**Example sentence:**

```
00016 10:46:10.18 06/08/1998 3012.0388 09200.0426 0170212.47 545341.94 143.3 00.0 0000.00 000000.00
0000000 0000000
```

Field #	Field Name	Sample	Description
1	Event	16	Event Number
2	Time	46:10.2	Time of Day
3	Date	6/8/1998	Date
4	LatX10	3012.0388	Latitude Deg X 10
5	LonX10	9200.0426	Longitude Deg X 10
6	Northing	170212.47	Northing Units
7	Easting	545341.94	Easting Units
8	Heading	143.3	Heading degrees
9	Speed	0	Speed Knots
10	Not Used	0	Unknown

11	Not Used	0	Unknown
12	Not Used	0	Unknown
13	Not Used	0	Unknown

**1.2 Fugro Starfix.NAV SSS**

SonarWiz supports a custom navigation interface to the Fugro Geoservices Starfix.NAV application. Starfix.NAV controls the logging, eventing and navigation information in SonarWiz.MAP. Each field is comma delimited.

**Example sentence:**

27,02,2002,00,42,14.49,+3337163.15,+0388738.75,+3337190.48,+0388674.25,292.00,292.96,+070.05,+004.51,0000000,+004.51,+1000.00,+000.00,+149.00,1,test\_line

**1.3 Fugro Starfix.NAV SBP**

SonarWiz supports a custom navigation interface to the Fugro Geoservices Starfix.NAV application. Starfix.NAV controls the logging, eventing and navigation information in SonarWiz.MAP. Each field is comma delimited.

**Example sentence:**

27,02,2002,01,10,3.37,+00033372.99,+0000003884.54,+00033373.23,+0000003883.97,+00033373.17,+0000003884.13,+292.00,00000003,+0000.00,0,0,0,+0000.00,+0179.00,1,+065.30,test\_line

**1.4 GeoNav Marine Systems – EZNav Custom Interface**

The following describes the interface protocol between the GeoNav/EZNav system and SonarWiz. The communication is single direction in the first instance, but can be expanded to bi-directional to send target information from the sonar system to the positioning system. The protocol is based on NMEA 183. Baud rate would be 9600 or 19200 with no handshake. There are 4 groups of messages, those sent once per second, the start of line message, the event message, and the end of line message.

**Every Second**

GPGGA – ship position

GPVTG – ship velocity

These can be in either WGS84 or Local Datum

**Example sentence:**

\$GPGGA,073721,2842.48951,N,09056.15433,W,2,8,1.8,4.4,M,14.5,M,3.,100\*49

\$GPVTG,180.7,T,,M,4.52,N,,K\*73

**Optional messages**

PFGGA – fish position

PFVTG – fish velocity

HEHDT – ship heading

DPDPT – ship water depth

PGSEN – sensor data

The PF sender ID indicates fish position & velocity

**Example**

\$PFGGA,073721,2842.61848,N,09056.16348,W,2,8,1.8,4.4,M,14.5,M,3.,100\*42 \$PFVTG,2.0,T,,M,4.52,N,,K\*7E

HDT and DPT are standard NMEA

**Example**

\$HEHDT,180.0,T\*26

\$SDDPT,45.4,0,,\*7C

The PGSEN sentences has the following data fields

\$PGSEN, wire out, Mag1, Mag2, Mag Fish Lat, Mag Fish Lon

The PGSEN allows the nav to send wire out data for the sonar fish, and also magnetometer data, mLat, mLon defines the position of the Magnetometer in whatever the specified datum is.

### Example

\$PGSEN,1000.766,2999.197,1999.017,2842.58301,N,09056.15387,W\*59 If only wire out \$PGSEN,1000.766, , , , , \*59

### At Start of Line

PGSOL – start of line message,

\$PGSOL, Time, Date, Line Name, Re-shoot, length, bearing, Position Datum

**Example** - Numeric Line name ( 15 ), Null re-shoot code

\$PGSOL,072252,100703,15, ,883.9,180.2,NAD 1927 (NADCON CONUS)\*41

**Example** – Alpha Numeric Line Name , AA as re-shoot code

\$PGSOL,073448,100703,L17Text,AA,4480.6,180.2,NAD 1927 (NADCON CONUS)\*A

### At Event

PGEVT – event message \$PGEVT, time, line name, event

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VSS\_DB3: \$/SonarWiz\_6/UserDocs

\$PGEVT,072400,15,10\*78 \$PGEVT,073528,L17Text,10AA\*1

Note: Event string includes re-shoot code

### **At End Of Line**

PGEOL – end of line message

\$PGEOL, time, Line Name, status

Status indicates if the line has been accepted for storage.

Status =1 good line

Status = -1 line to be re-shot

Status =0 line to be run ( this should not be seen here )

### **Example**

\$PGEOL,072531,15,1\*4A

or

\$PGEOL,073724,L17Text,-1\*13

## **1.5 Geowork Trimble Hydro PRO**

SonarWiz supports a custom navigation interface to the Trimble Hydro PRO system as configured by Geowork. Each field is space delimited.

### **Example sentence:**

SETU001 33 20.42 500154 700157 500153 700160 222.00

### 1.6 Hypack Delph.DLL

The Hypack Delph.DLL output format sample is shown below. Each field is space delimited.

**Example sentence:**

23/8/2014 12:00:18.00 7 000000 +37.00010995 -122.00013740 +37.00013194 -122.00016488 5.0 10.0 2.0 2.5 2.5 45.0 1 line-0001

Format:

Field #	Field Name	Sample	Description
1	Date	23/08/2014	DD/MM/YYYY
2	Time	12:00:18.00	HH:MM:SS.ss 24-hr time
3	Line Number	7	Line number
4	Event Number	000000	System event number
5	Fish Latitude	+37.00010995	Fish latitude in decimal degrees + = N, - = S DDD.dddd format
6	Fish Longitude	-122.00013740	Fish longitude in decimal degrees + = E, - = W DDD.dddd format
7	Ship Latitude	+37.00013194	Ship latitude in decimal degrees + = N, - = S DDD.dddd format
8	Ship Longitude	-122.00016488	Fish longitude in decimal degrees + = E, - = W DDD.dddd format
9	Fish Height	5.0	Towfish altitude in meters
10	Water Depth	10.0	Water depth at ship in meters
11	Cable Out	2.0	Cable payout in meters
12	Fish Speed	2.5	Towfish speed made good
13	Ship Speed	2.5	Ship speed
14	Ship Heading	45.0	Ship heading in degrees true
15	Online Flag	1	0=Offline 1=Online
16	Filename	line-0001	When Online flag is 1 then Filename will contain the current filename to use. Otherwise this



			field will be empty.
--	--	--	----------------------

Sample file *nav\_hypackDelphDLL.txt* available for comparison to your data format. This file has been used in simulation with SonarWiz 5 V5.07.0002 in a real-time simulation for SysInfo presentation testing.

**Online Flag information:** when the online flag switch goes from 0 to 1 then the current file if any will be closed and the file specified in the datagram will be started. When the online flag changes from 1 to 0, recording will stop.

**1.7 HYPACK Shared Memory Interface**

The Coastal Oceanographics HYPACK Surveyor product is capable of creating a shared memory address space that is populated with the current navigation and survey parameters. SonarWiz.MAP can utilize this interface only when Hypack is running on the same physical computer as SonarWiz.MAP. The table below lists the variables that SonarWiz.MAP utilizes from the Hypack Shared Memory interface.

**1.8 LinkQuest TrackLink LQF format**

The following describes the interface protocol between the LinkQuest USBL LQF format and SonarWiz. The communication is single direction from the LinkQuest system to SonarWiz. This interface provides geodetic position of both the ship and the tracked towfish.

**Example sentence: (line terminated with CRLF)**

*1,02/18/05,13:22:01, 4250.5622,-14718.5026, 4250.5660,-14718.5099,115.7,207.4*

Field #	Field Name	Sample	Description
1	Target #	1	Target ID (not used)
2	Date	2/18/05	Date

3	Time	13:22 :01	Time of Day
4	Ship Lat DDMM.mmmm	4250.5622	Ship Position (NMEA-like format 4250.5685N)
5	Ship Lon DDDMM.mmmm	-14718.5026	Ship Longitude (NMEA-like format 14718.4974W)
6	Fish Lat DDMM.mmmm	4250.5660	Towfish Position (NMEA-like format 4250.5627N)
7	Fish Lon DDDMM.mmmm	-14718.5099	Ship Longitude (NMEA-like format 147 18.5035W)
8	Ship Heading	115.7	Ship Heading in degrees
9	Towfish depth delow sea surface	207.4	Towfish depth below sea surface in meters.

**Reference:***Kevin Zhao**LinkQuest Inc.**6339 Nancy Ridge Drive**San Diego, CA 92121**Phone: (858) 623-9916 ext. 10*Rev 5, 5/22/2017 [support@chesapeakeotech.com](mailto:support@chesapeakeotech.com) 650-967-2045

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VSS\_DB3: \$/SonarWiz\_6/UserDocs

**Extended Data Example:**

1,02/24/05,11:25:12, 4250.5685,-14718.4974, 4250.5627,-14718.5035, 72.0, 207.4  
 1,02/24/05,11:25:17, 4250.5693,-14718.4974, 4250.5642,-14718.5036,157.7, 202.9  
 1,02/24/05,11:25:22, 4250.5700,-14718.4966, 4250.5655,-14718.5026,129.4, 203.5  
 1,02/24/05,11:25:27, 4250.5702,-14718.4957, 4250.5663,-14718.5021, 60.0, 204.8  
 1,02/24/05,11:26:13, 4250.5584,-14718.5071, 4250.5527,-14718.5134,112.2, 199.2  
 1,02/24/05,11:26:17, 4250.5594,-14718.5066, 4250.5535,-14718.5131,125.1, 198.7  
 1,02/24/05,11:26:18, 4250.5594,-14718.5058, 4250.5536,-14718.5118,160.0, 199.2

**1.9 NUWC Custom Navigation Interface**

The following describes the interface protocol between the customized Naval Underwater Weapons Center navigation interface from their navigation system to SonarWiz. The communication is single direction from the NUWC navigation system to SonarWiz.

**Format:**

LINE, FIX#, DATE ,PPS TIME ,PC TIME ,fish lat ,fish lon ,fspd,fcmg ,vessel lat ,vessel lon ,vspd,vcmg ,vgyro ,along,xte

**Example sentence:**

Baseline,9354,10/12/04,21:32:47.0,21:32:01.3,41.2353962,-124.4426066,2.31,139.70,41.2350498,-124.4423460,2.73,134.51,144.50,2659.94,199.26<CRLF>

Field #	Field Name	Sample	Description
1	Line	Baseline	Line name
2	Fix #	9354	Sequential fix number

3	Date	10/12/2004	MM/DD/YY
4	PPS Time	32:47.0	PC Clock Time
5	PC Time	32:01.3	GPS PPS Time
6	Fish Lat	41.2353962	Fish Latitude DD.dddddd
7	Fish Lon	-124.4426066	Fish Longitude DDD.dddddd
8	Fish Speed	2.31	Fish Speed in Knots
9	Fish CMG	139.7	Fish CMG degrees
10	Ship Lat	41.2350498	Ship Latitude DD.dddddd
11	Ship Lon	-124.442346	Ship Longitude DDD.dddddd
12	Ship Speed	2.73	Ship Speed in Knots

13	Ship CMG	134.51	Ship CMG in degrees
14	Ship heading	144.5	Ship Heading degrees True
15	Along Track Distance	2659.94	Along track distance in meters relative to current survey line.
16	Cross Track Error	199.26	Cross track distance in meters relative to current survey line.

**1.10 Subsea 7 Custom Navigation Interface ‘ABDMYHISNEGOvyx?>’**

SonarWiz supports a custom navigation interface for SubSea7 (formerly known as Consub DSND) based on a previous navigation template developed for a competing sonar data acquisition system Isis.

**Example sentence:**

28/11/2002 14:35:09 07549968.16 692274.33 092.00 00007 002.0 07549968.16 692274.33 51.0 178.0

Field #	Field Name	Sample	Description
1	Day	28	Day of Month
2	Month	11	Month of Year
3	Year	2002	Calendar Year
4	Hour	14	Hour of Day
5	Minute	35	Minute of Hour

6	Second	9	Second of Minute
7	Fish Northing	7549968.16	UTM Meters
8	Fish Easting	692274.33	UTM Meters
9	Vessel Heading	92	In degrees
10	Fix Number	7	Event Number
11	Fish Speed	2	Knots
12	Vessel Northing	7549968.16	UTM Meters
13	Vessel Easting	692274.33	UTM Meters
14	Vessel to Fish Slant Range	51	Meters
15	Vessel to Fish Bearing	178	Degrees

### 1.11 Standard NMEA-0183 Messages Supported

#### 1.11.1 GGA - Global Positioning System Fix Data

**Example sentence:**

GGA,123519,4807.038,N,01131.324,E,1,08,0.9,545.4,M,46.9,M, , \*42

Value	Field description
123519	Fix taken at 12:35:19 UTC
4807.038,N	Latitude 48 deg 07.038' N
01131.324,E	Longitude 11 deg 31.324' E
1	Fix quality: 0 = invalid

1 = GPS fix  
 2 = DGPS fix  
 08 Number of satellites being tracked  
 0.9 Horizontal dilution of position  
 545.4,M Altitude, Metres, above mean sea level  
 46.9,M Height of geoid (mean sea level) above WGS84 ellipsoid  
 (empty field) time in seconds since last DGPS update  
 (empty field) DGPS station ID number

### 1.11.2 GLL - Geographic position, Latitude and Longitude

#### Example sentence:

GLL,4916.45,N,12311.12,W,225444,A

Value	Field description
4916.46,N	Latitude 49 deg. 16.45 min. North
12311.12,W	Longitude 123 deg. 11.12 min. West
225444	Fix taken at 22:54:44 UTC
A	Data valid

### 1.11.3 RMC - Recommended minimum specific GPS/Transit data

#### Example sentence:

RMC,225446,A,4916.45,N,12311.12,W,000.5,054.7,191194,020.3,E\*68

Value	Field description
225446	Time of fix 22:54:46 UTC
A	Navigation receiver warning A = OK, V = warning
4916.45,N	Latitude 49 deg. 16.45 min North
12311.12,W	Longitude 123 deg. 11.12 min West
000.5	Speed over ground, Knots
054.7	Course Made Good, True
191194	Date of fix 19 November 1994
020.3,E	Magnetic variation 20.3 deg East
*68	mandatory checksum

### 1.11.4 VHW - Water speed and heading

**Example sentence:**

VHW,259.,T,237.,M,05.00,N,09.26,K

Value	Field description
259.,T	Heading 259 deg. True
237.,M	Heading 237 deg. Magnetic
05.00,N	Speed 5 knots through the water
09.26,K	Speed 9.26 KPH

### 1.11.5 VTG - Track made good and ground speed

**Example sentence:**

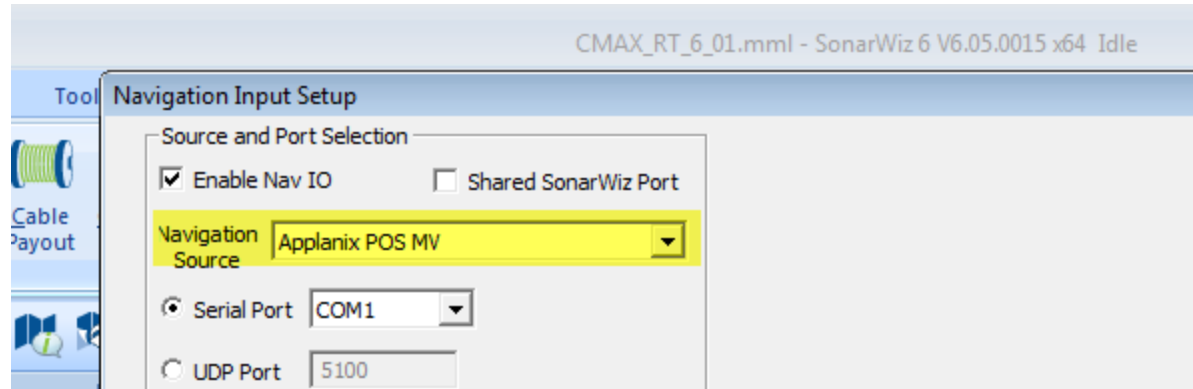
VTG,054.7,T,034.4,M,005.5,N,010.2,K

Value	Field description
054.7,T	True track made good
034.4,M	Magnetic track made good
005.5,N	Ground speed, knots
010.2,K	Ground speed, Kilometers per hour

### 1.12 Applanix POS MV Format - options

SonarWiz and our servers that talk to the Applanix sensors process **\$GRP 102** messages... like when you select this choice in the SonarWiz NAV dialog:





If you do not need all that data recorded, but just need position of heading data, Applanix POS MV does support a variety of NMEA-0183 type messages too, like RMC, GGA, HDT, VTG, and these may be selected as output options on the POS MV, with corresponding input parsing formats selected in SonarWiz (specify which types of NMEA-0183 to parse).

The \$GRP 102 message format is defined in the Applanix POS MV document "Applanix POS MV V4 Use ICD" (User Manual) number "PUBS-ICD-000551 Rev 2". The output sentence-rate options are 1-200 Hz. For sub-bottom position / heave-sensor input, and sidescan position data recording, we recommend 4 Hz input rate, which is fast enough, and leaves lots of real-time bandwidth for other data recording.

Group	Contents	Display Port Output Rate (Hz)		Real-Time Data Port Output Rate (Hz)		Logging Data Port Output Rate (Hz)	
		Standby	Navigate	Standby	Navigate	Standby	Navigate
102	Sensor 1 position, velocity, attitude, heave & dynamics	-	1	-	1-200	-	1-200

For bathymetry data, you record and parse this data directly in the real-time server itself, not via the main SonarWiz NAVIGATION dialog, and 10-20 Hz is the fastest we recommend for sentence rate.

For bathymetry real-time servers, or for the main SonarWiz NAVIGATION dialog choice "Applanix POS MV", the user should configure their Applanix POS MV to output \$GRP 102 type sentences on your high-speed UDP REAL-TIME DATA PORT (see Applanix reference, section 3.2.1).

On the SonarWiz PC, verify your Applanix POS MV output data by using the MTTTY.exe (serial port test) for COM PORT, or UDP Sniffer, for UDP port, to be sure your data are reaching the specific COM or UDP port to which you are sending it (e.g. make sure you are in NAVIGATE transmit mode, not STANDBY, on the Applanix POS MV). If you are sending ok, then closing the MTTTY.exe should allow SonarWiz to receive and parse the same data. The COM port will be locked for access by MTTTY.exe if you had used a serial port, but both UDP Sniffer and SonarWiz may access a UDP port in parallel.

## 2 Document Versions

Rev 5, 5/22/2017 - Applanix POS MV navigation format section added

Rev 4, 1/22/2015 - Main User Guide navigation format sections added

Rev 3, 11/14/2014 - Online Flag control of Hypack Delph DLL explained in more detail.

Rev 2, 8/12/2014 -0 Section 1.1 validation testing performed with NMEAWiz sending in from file, using nav\_hypackDelphDLL.txt into a real-time simulations sidescan recording.