WinFrog Device Group:	**OUTPUT**
Device Name/Model:	**NMEAOUT**
Device Manufacturer:	**National Marine Electronics Association** PO Box 3435 New Bern NC 28564-3435, USA Tel: (252) 638-2626 Fax:(252) -638-4885 E-mail: nmea@coastalnet.com
Device Data String(s) Output to WinFrog:	N/A
WinFrog Data String(s) Output to Device:	$GPGGA(Position), $GPGLLv2.3(Position), $GPGLLv2.2(Position), $GPGLL(Position), $GPGLLprop(Position), $GPSLL(QCPosition), $GPVTG(Speed), $GPDBT(Depth), $GPDBS(Depth), $GPHDT(Heading), $HEHDT(Heading), $HCHDM(Heading), $GPXTE(XTrack), $GPAPB(Autopilot), $GPMWV(Wind), $GPZDA(Time), $PPRGA(Target), $PRAPC(Cable Model Data), $GPOSD(Own Ship Data) $--TLL or $--TML radar targets
WinFrog .raw Data Record Type(s):	N/A

DEVICE DESCRIPTION:

The NMEA 0183 Standard for Interfacing Marine Electronics Devices is a voluntary industry standard, first released in March of 1983. The NMEA 0183 Standard defines electrical signal requirements, data transmission protocol, timing and specific sentence formats for a serial data bus.

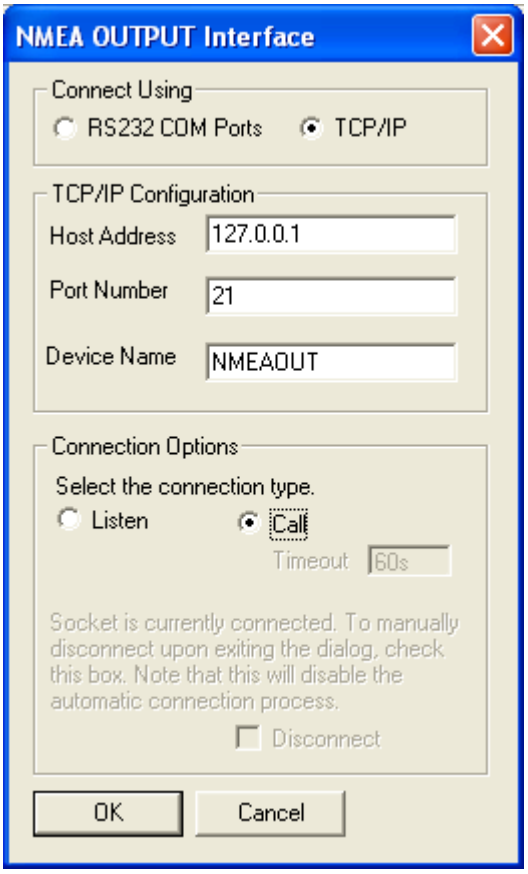
The Standard has been updated from time to time with the latest major release of July 2000, Version 3.00 and a minor release of version 3.01. The NMEA 0183 standard calls for data communication in the form of coded "sentences." Each sentence begins with the character "$" and ends with a carriage return and line feed (<CR><LF>). These last two characters are "control" characters and are not normally printed (for this reason they are shown enclosed in brackets). Between the beginning and end of each sentence are "fields" of data, each field separated by a comma. The first field in any sentence (field 0) begins with the two-letter talker mnemonic code ("talkers" are devices that send out information, "listeners" take it in) followed by the three-letter code for the sentence.

DEVICE CONFIGURATION INSTRUCTIONS:

WINFROG I/O DEVICES > EDIT I/O:

This device can supports communications with either an RS232 COM port or a TCP/IP port. When using the TCP/IP port this device can be configured to make the connection or listen for connections.

When adding the NMEA OUTPUT device, the following dialog appears in which you can select either RS232 or TCP/IP as the data communications protocol.



Connect Using:
Select either RS232 or TCP/IP as the data connection device. When you select RS232 and click OK, the standard Device I/O Parameters dialog opens in which you can select the Com port, baud rate, etc. Selecting TCP/IP enables the controls within this dialog pertaining to the connection settings.

TCP/IP Configuration:
If TCP/IP is selected, enter the IP address and port number of the target system/unit, and the name that WinFrog is to display for this device. Select whether WinFrog is to **Listen** (default) for a connection or initiate the connection with a **Call**. If Listen is selected, upon exiting this dialog with OK, WinFrog immediately starts listening for a

call from the respective device. If Call is selected, upon exiting this dialog with OK, WinFrog immediately attempts to make the connection. In either case, WinFrog monitors the status of the connection or lack thereof, and automatically listens or calls as required. The socket connection status is displayed in the I/O Device Window.

If in Call mode and connected when this dialog is opened, an option to manually disconnect is available at the bottom of the dialog. If this is selected, upon exiting with OK, the connection is disconnected and the automatic connection process is suspended. If it is desired to re-connect, this dialog must be re-accessed and the option to re-activate the automatic connection process is available at the bottom of the dialog. Checking this option and exiting with OK causes WinFrog to immediately attempt to automatically connect. It is important to note that if the automatic call process is suspended due to exiting WinFrog, the suspended state is not saved and WinFrog will immediately start automatically attempting to connect when initialized.

Note: The Timeout option for the Call mode is not enabled for this device.

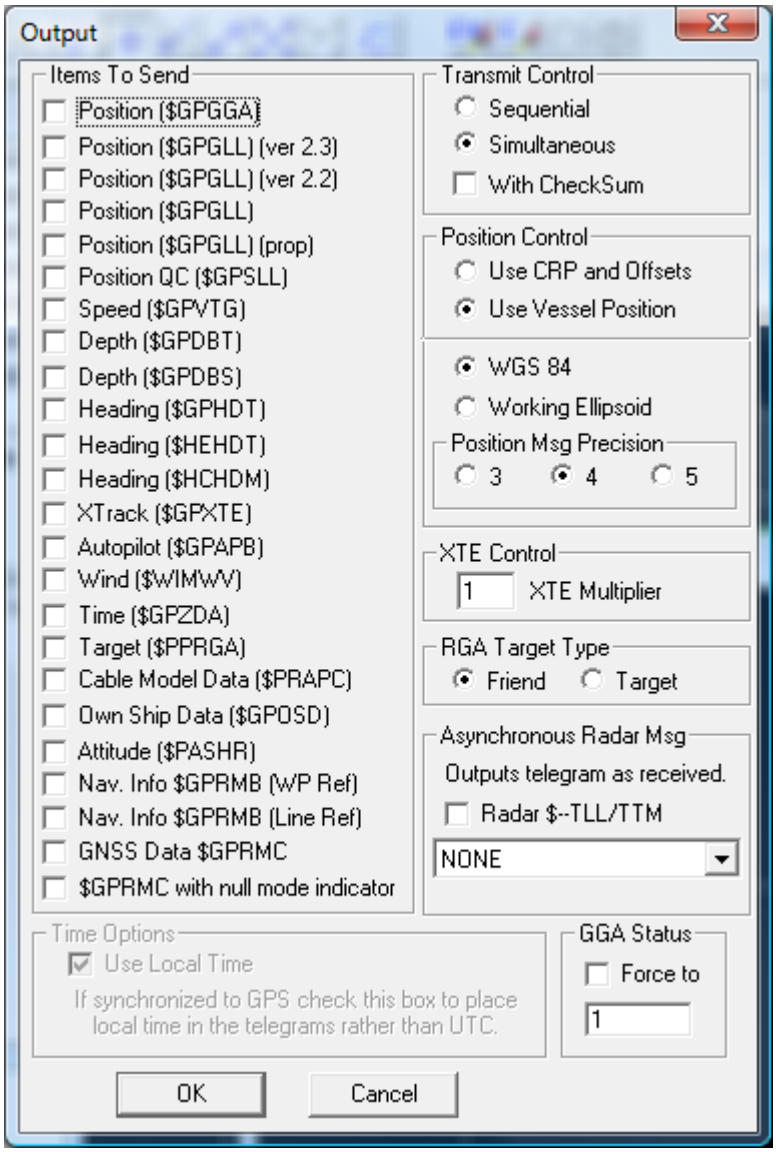
Serial Configuration:
If the RS-232 option is selected, click OK and the configuration proceeds with the standard serial communications configuration.

It should be noted that the NMEA format originally stated the following communication parameters, which WinFrog defaults to. However, most systems/units are now completely configurable.

Baud Rate 4800
Data Bits: 8
Stop Bits: 1
Parity: None

WINFROG I/O DEVICES > CONFIGURE DEVICE:

The NMEAOUT is added to WinFrog from the OUTPUT device types. The DATA OUTPUT data item is added along with the NMEAOUT device. The following dialog box appears for configuring output data via the *Configure > I/O Devices > Configuration* command (or under the *Configure Device* command that appears when you right-click in the I/O Devices Window).



The following items are configurable within this dialog box. These items must be configured for proper data output on the assigned port. You should note that the NMEA OUTPUT device could be added to the WinFrog Computer multiple times, for outputs on various ports.

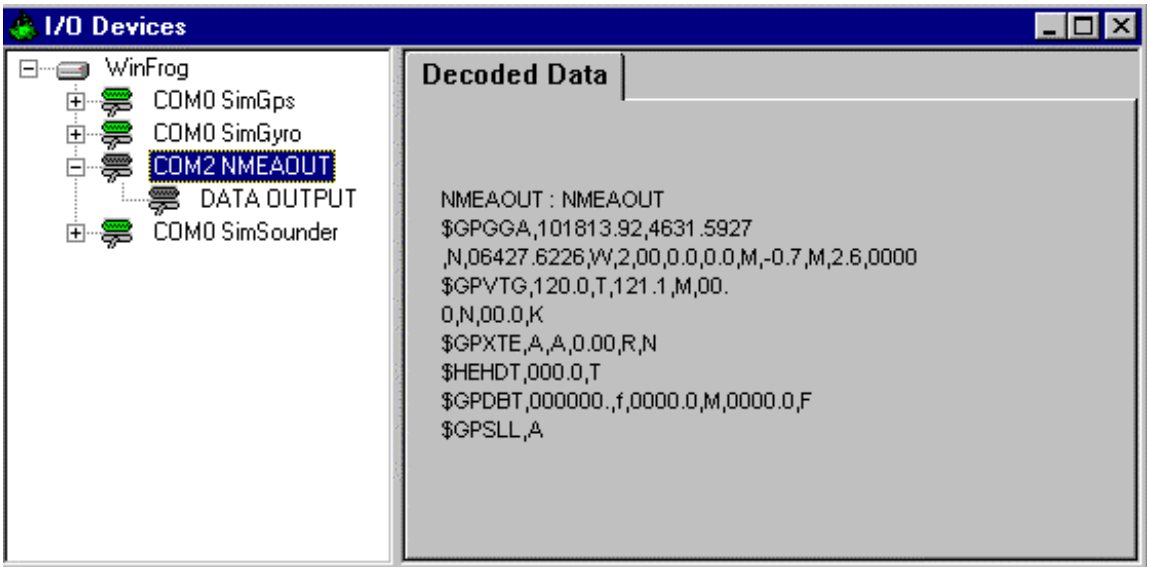
Items To Send:

There are several different NMEA data strings that can be output from the NMEA OUTPUT device. You can output either one or multiple data strings by checking off the items to send. Detail of each NMEA sting can be found in this document, in the section on Configuration Details. Most messages are formed for the vehicle that the DATA OUTPUT data item is attached to. The exceptions are the radar target messages. You need to select the source device for these messages. These messages are simply a copy of the received message, i.e. the messages that WinFrog receives into the NMEA radar device are then sent out the port selected for

this device. These messages, either TLL or TML, are sent when and as received from the other port.

Transmit Control:
The transmission of the NMEA data can be sent Sequentially (one at a time) or Simultaneous (all data at the same time). The I/O Devices Window (below) shows the data that is being output when the system is configured as shown in the NMEA Output Configuration dialog box above. Simulated devices are added only to show the data output.

Data can be output with or without a Check Sum. Some devices require a Check Sum to be inputted. The check sum adds the values for all the characters in the individual (NMEA) data strings being output, and checks the number for errors.



Position Control:
You can choose between **Use CRP and Offsets** or **Use Vessel Position**. The Vessel Position option will output the current vessel position as displayed in the Vehicle Text Box. The CRP and Offsets option will output the real-time coordinates of the CRP of the vessel after the offset is applied as shown in the Configure Output Offsets dialog box shown in the WINFROG VEHICLE TEXT WINDOW – CONFIGURE VEHICLE DEVICES > DEVICE > EDIT OPTIONS section.
The output position can be related either to the Working Ellipsoid or to WGS84.

The Position Msg Precision is the number of places on the right side of the decimal point, that the data will be outputted. For example the $GPGGA string is output in degrees-decimal-degrees. If the Position Msg Precision is set to 4, then the geographical coordinate output will have 4 digits for the decimal-degrees.

XTE Control:
The number entered in the XTE Multiplier box is used to multiply the magnitude of the cross track error of the vessel position, as output in the Xtrack ($GPXTE) data string. This number is displayed/output in nautical miles to two decimal places. Therefore, the distance of the vessel offline has to be at least nine meters before the output changes from zero (0.00) when the default multiplier of one is entered. By entering a multiplier of 1852 (approximate number of meters in a nautical mile), the Xtrack ($GPXTE) output will be converted to meters. This option is only used in line tracking mode. The $GPXTE string is explained in the section on Configuration Details, in this document.

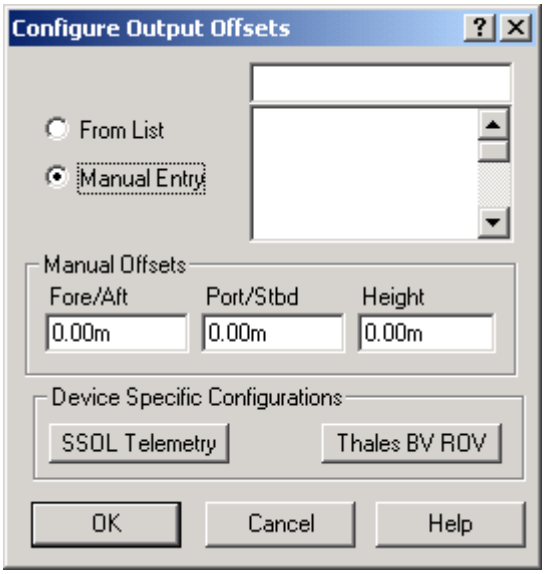
RGA Target Type:
This item was added for Military use only.

Time Options:
For those NMEA telegrams that contain time, NMEA specifies the time as UTC. If WinFrog is not synchronized to GPS time, then the time WinFrog places in the telegram will always be the WinFrog time. If WinFrog is synchronized to UTC then you have a choice and can output UTC or elect to output the WinFrog local time, which would be UTC plus whatever zone offset was included in the time synchronization configuration. The cable data $PRAPC always uses the WinFrog time.

GGA Status:
When outputting the GGA telegram it uses the observed GGA status of the telegram used to position the selected vehicle. However, if that vehicle was not positioned using GPS (GGA telegram) the status will be 0. By checking the box and entering your own value you can override the default value. Note that if the vehicle does not have a valid position (coordinates are yellow with an asterisk) this driver will still output 0 for the status.

WINFROG VEHICLE > CONFIGURE VEHICLE DEVICES > DEVICE DATA ITEM > EDIT:

The NMEA, DATA OUTPUT is added to the vehicles' device list and must be edited to suit the application. The data item can be added to multiple vehicles (e.g. primary and secondary positioning vehicles), with the output. When the DATA OUTPUT item is edited from the Configure Vehicle Devices dialog box, the Configure Output Offsets dialog box appears. The content of the dialog box is based on the offsets attached to the vehicle in question.

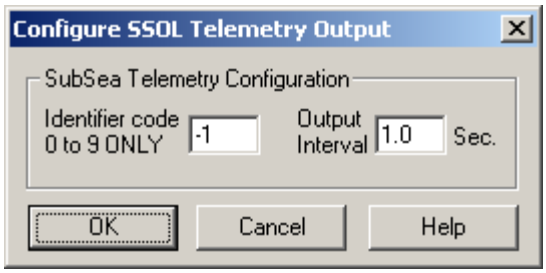


Configure Output Offsets:
Once added, the offset to use can either be taken from the list of vessel offsets or the Manual Entry radio button can be selected and the offset entered under Manual Offsets. This dialog box and the entries will only apply if the **Use CRP and Offset** option is selected in the Position Control of the NMEA Output Configuration dialog box. Again this position output is the CRP with the selected or entered offset applied and not (automatically) the vehicle's offset tracking position.

Device Specific Configurations:
Under the Device Specific Configurations section, there are two buttons that access dialog boxes, SSOL Telemetry and Thales BV ROV. These dialog boxes are only to be modified for specific applications. You should not modify these items unless you are completely familiar with the outcome.

SSOL Telemetry:
This configuration is specifically designed for the SubSea Telemetry system. The output format was later adapted by other companies, specifically those working in the North Sea area. Some of the NMEA output strings can be modified by configuring this item, when using 'non intelligent' radios for one-way transmission of data.

Identifier Code:
IF YOU CHOSE NOT TO USE THIS OPTION, THE IDENTIFIER CODE SHOULD BE LEFT AT THE DEFAULT VALUE OF –1. Inputting values of 0 to 9 will result in a code being attached to the data string. The code ranges from 1 to 10, and refers to the vessel the data string transmission is intended.



The Output Interval can also be modified. This interval is dependant upon the complexity and speed of the systems being used, as well as the frequency requirement of the data.

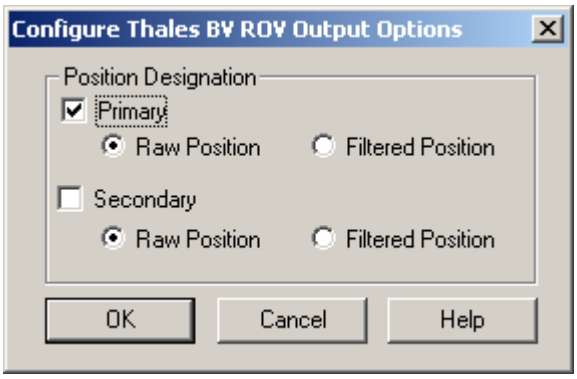
An example of this data string can be found in the section on Configuration Details.

Thales BV ROV:

This configuration is designed to output the Thales BV ROV Driver position to the ROV Data Logging software/system Thales BV ROV. This item is rarely used now that Multi ROV is the standard for Thales ROV operations.

The items to choose from in the configuration dialog box shown below are, for the most part, self-explanatory. The Position Designation can be chosen as Primary or Secondary, and the output data can be either the Raw Position or the Filtered Position as chosen in the Configure Vehicle-Devices dialog box.

This item should not be modified unless you are fully aware of the results.



This option can enable a configuration such as Filtered USBL from an ROV as Primary, and Filtered GPS from a ship as Secondary. Another option supported is the Filtered USBL for an ROV as Primary, and the Raw USBL for the same as Secondary. For the latter configuration, it is important that the DATA OUTPUT device be added to only one vehicle, or that neither the Primary nor Secondary is selected on any vehicle other than the ROV.

CONFIGURATION DETAILS:

The following are NMEA strings supported by this device:

GGA - Global Positioning System Fix Data:

$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,Mx.x,xxxx*hh<CR><LF>
$--GGA,123519,4807.038,N,01131.324,E,1,08,0.9,545.4,M,46.9,M, , *42

Where:

123519	Fix taken at 12:35:19 UTC	
4807.038,N	Latitude 48Deg. 07.038 min N	
01131.324,E	Longitude 11Deg 31.324 min E	
1	Fix quality: 0 = invalid	3=GPS PPS Mode,fix valid
	1 = GPS fix	99= Simulator Mode
	2 = DGPS fix	10= Simulator Mode Edit
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	

ZDA-Time and Date

$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh<CR><LF>

Where:

hhmmss.ss	UTC
xx	Day (01 to 31) UTC
xx	Month (01 to 12) UTC
xxxx	Year UTC
xx	Local zone hours (00 to ±13 hrs)
xx	Local zone minutes (00 to +59)

Note: Local time zone is the magnitude of hours plus the magnitude of minutes added, with the sigh of local zone hours, to local time to obtain UTC. Local zone is generally negative for East longitudes with local exceptions near the International Date Line.

Example: At Chatham Is. (New Zealand) at 12:30 PM local time on June 10,1995
$GPZDA,234500,09,06,1995,-12,45*6C<CR><LF>

In the Cook Islands at 1500 local time on June 10,1995:
$GPZDA,0130000,11,06,1995,10,30*4A<CR><LF>

DBS – Depth

$--DBS,xxxx.x,f,xxxx.x,M,xxx.x,F = depth below surface i.e. draught included

where: f = feet, M = metres, F = fathoms

All lines end with a (<CR>) carriage return and (<LF>) line feed, (End of sentence delimiter).

Proprietary sentences provide a means for manufacturers to use the sentence structure definitions of this standard to transfer data that does not fall within the scope of approved sentences.
A proprietary sentence contains, in the order shown,

"$"	Hex 24 – Start of sentence
"P"	Hex 50 – proprietary sentence ID
<aaa>	Manufacturer's Mnemonic code
[<valid characters>,"^,",]	Manufacturer's data
"*"<checksum field>	Checksum field
<CR><LF>	Hex 0D 0A – End of sentence

DBT - Depth

$--DBT,xxxx.x,f,xxxx.x,M,xxx.x,F = depth below transducer

where: f = feet, M = metres, F = fathoms

All lines end with a (<CR>) carriage return and (<LF>) line feed, (End of sentence delimiter).

Proprietary sentences provide a means for manufacturers to use the sentence structure definitions of this standard to transfer data that does not fall within the scope of approved sentences.
A proprietary sentence contains, in the order shown,

VTG - Track made good and ground speed

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

Where:

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

GLL - Geographic position, Latitude and Longitude:

$--GLL,llll,ll,a,yyyyy.yy,a,hhmmss.ss,A,a*hh<CR><LF>
GLL,4916.45,N,12311.12,W,225444,A

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 (V= Data invalid)
a	Mode Indicator

HEHDT – (Gyro North Seeking), Heading, True

$HEHDT,x.x,T*hh<CR><LF>

Where:

x.x	Heading
T	Degrees True

GPHDT – (GPS) Heading, Deviation, and Variation

$GPHDG,x.x,x.x,a,x.x,a*hh<CR><LF>

Where:

x.x	Magnetic sensor heading, degrees
x.x,a	Magnetic deviation, degrees E/W
x.x,a	Magnetic variation, degrees E/W

HCHDM – (Compass, Magnetic), Heading, Magnetic

$HCHDM,x.x,M*hh<CR><LF>

Where:

x.x	Heading
M	degrees Magnetic

GPXTE – (GPS), Cross Track Error, Measured

$GPXTE,A,A,x.x,a,N*hh<CR><LF>

Where:

A	Status
A	Status
x.x	Magnitude of Cross Track-Error
a	Direction of Steer, L/R
N	Units, nautical miles

GPMWV – (GPS), Wind Speed and Angle

$GPMWV, x.x,a,x.x,a,A*hh<CR><LF>

Where:

x.x	Wind angle,0 to359 degrees
a	Reference, R – Relative, T – True
x.x	Wind Speed
a	Wind speed units, K/M/N
A	Status, A – Data Valid

GPAPB – (GPS), Autopilot Sentence "B"

$GPAPB,A,A,x.x,a,N,A,A,x.x,a,c—c,x.x,a,x.x,a,*hh<CR><LF>

Where:

A	Status
A	Status
x.x	Magnitude of XTE
a	Direction to steer, L/R
N	XTE units, nautical miles
A	Status
A	Status
x.x,a	Bearing origin to destination, M/T
c—c	Destination waypoint ID
x.x,a	Bearing, Present position to destination, magnetic or True
x.x,a	Heading-to-steer to destination waypoint, magnetic or True

GPGLL (ver 2.3) – Geographic Position – Latitude/Longitude:

$--GLL,llll.ll,a,yyyyy.yy,b,hhmmss.ss,A,D*hh<CR><LF>

Where:

llll.ll	Latitude
a	North/South
yyyyy.yy	Longitude
b	East/West
hhmmss.ss	UTC of Position
A	Status: A= Data Valid; V= Data not valid
D	Status #2: N=Data not valid, A=Autonomous GPS data, S=Simulated GPS data, D=Differential GPS data.

GPGLL (ver 2.2) – Geographic Position – Latitude/Longitude:

Same as Ver 2.3 without the Status #2 item.

GPGLL – Geographic Position – Latitude/Longitude:

Same as Ver 2.3 without the UTC or status items.

GPGLL (prop) – Geographic Position – Latitude/Longitude:

Same as Ver 2.3 without the status items, and with the Line Tracking KP value added on the end of the string (or the last valid KP value.

GPSLL – Position QC:

$GPSLL,A

Where:

A	Status OK
V	Status Invalid

PPRGA – Target:

Data String not available.

GPOSD – Own Ship Data – Useful for but not limited to radar/APRA applications:

$--OSD,h.h,A,c.c,R,s.s,r,v.v,d.d,a*hh<CR><LF>

Where:

h.h	Heading, Degrees True
A	Heading Status: A=Data Valid, V=Data invalid
c.c	Vessel course, degrees true
R	Course Reference B//M/W/R/P[1]
s.s	Vessel Speed
R	Speed Reference B//M/W/R/P
v.v	Vessel Set, degrees true
d.d	Vessel Drift, (speed)
a	Speed units K/N/S[2]

1) Reference System:
B = Bottom Tracking Log
M = Manually Entered
W = Water Referenced
R = Radar Tracking (of fixed target)
P = Positioning system ground reference

2) Speed units
K = Kilometers / hour
N = Nautical Miles / hour
S = Statute Miles / hour

G2 – SSOL Telemetry Data – Specific Telemetry Applications:
The SubSea Telemetry Telegram is made up of two components – the position component and the heading component. The components follow the format of the NMEA GGA and HDT sentences. The two components are combined to make a single telegram. For any one update, there will be one such telegram generated for each vessel on the telemetry network, and data from many different vehicles can be routed to the one serial port. When WinFrog reads the telemetry telegrams, it checks the vessel id code, then updates the vessel with the position, heading and altitude information contained in the message.

The following is the telegram:

$G*code*,*time*,*lat*,**N**,*lon*,**W**,**99**,**00**,**0.0**,*altitude***M,,,00,0000***chksum1***$H***code*,*heading*,**T***chksum2*

Where:
Code is the vessel id (a number between 0 and 9)
Time is the time of the position, hhmmss
lat ,N is the latitude (ddmm.mmmm) N:North, S: South
lon,W is the longitude (dddmm.mmmm) E:East, W:West
99 is the quality index(normally just set to 99)
00 is the number of SVs used (normally set to 00)
0.0 is the HDOP (normally set to 0.0)
altitude,M is the altitude above MSL (m) (field can have varying number of characters)
,,, is the Altitude above ellipsoid (metres). These fields are left empty
00 is the age of differential data (set to 00)
0000 is the Differential reference station code (set to 0000)
*chksum1 is the checksum delimiter(*) and checksum.
$Hcode is a header and number between 0 and 9, representing the vessel id.
Heading is the heading in whole degrees (xxx)
T indicates True Heading as opposed to Magnetic.
*chksum2 is the checksum delimiter(*) and checksum.

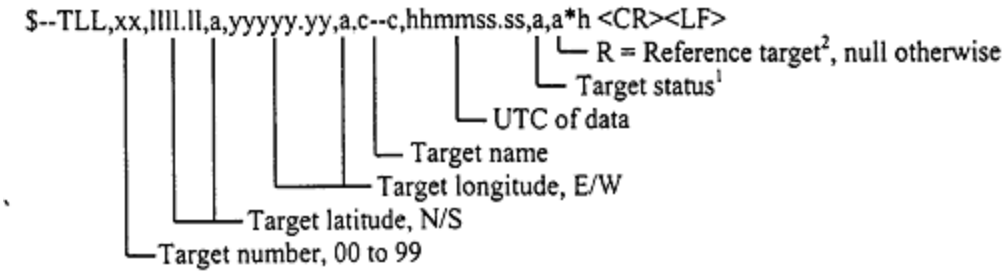
The checksums are the standard NMEA type,

$PRAPC – Cable Model Data – For the Thales Geosolutions Pacific Cable Model:

$PRAPC,time, latitude ,longitude, heading, depth, speed, cable count, cable tension, cable speed, tow cable count, tow cable tension, tow cable velocity

TLL - Target Latitude and Longitude

Target number, name, position and time tag for use in systems tracking targets.

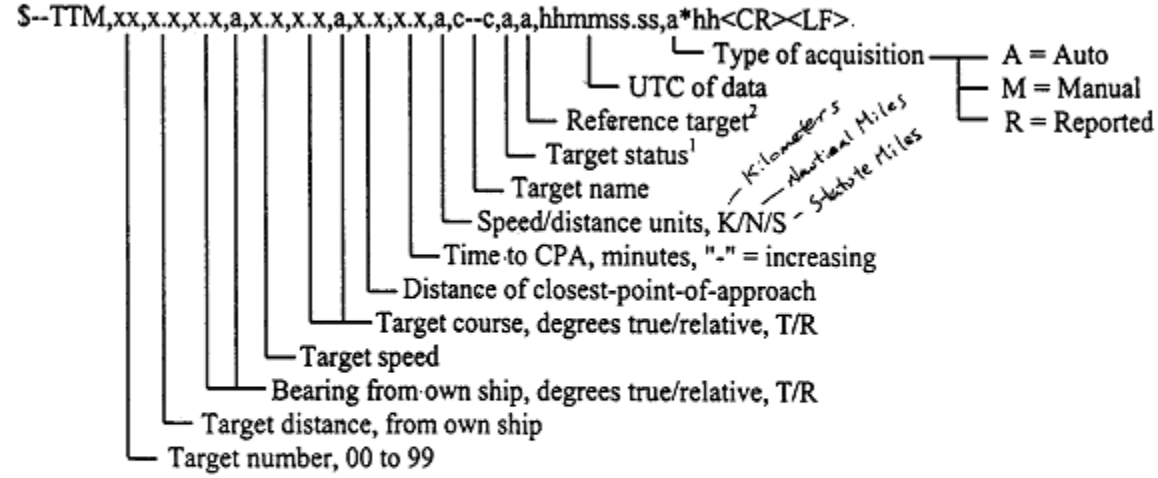


Notes

1) Target status: L = Lost, tracked target has been lost
Q = Query, target in the process of acquisition
T = Tracking

***TTM - Tracked Target Message**

Data associated with a tracked target relative to own ship's position.



Notes:

1) Target status: L = Lost, tracked target has been lost
Q = Query, target in the process of acquisition
T = Tracking

2) Reference Target: set to "R" if target is a reference used to determined own-ship position or velocity, null otherwise.