

NMEA 0183

Standard For Interfacing Marine Electronic Devices

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Standard For Interfacing Marine Electronic Devices

- Support for data communication between electronic marine instruments, navigation equipment and communication equipment, when interconnected via an appropriate interface.
- One-way serial data transmission from a single talker to one or more listeners.
- Messages include information such as position, speed, course, depth, time, date...
- Maximum sentence length of 82 characters.
- Printable ASCII format.
- Limited error-checking capability.

Message Format

(for approved sentences)

\$ ← HEX 24 – Start of sentence
 <address field> ← Talker ID (2 chars) and Sentence formatter (3 chars)
 [,<data field>]
 ... Zero or more data fields (a null data field will have no chars)
 [,<data field>]
 * ← HEX 2A – Checksum delimiter
 <checksum field> ← 2 chars – hexadecimal value of the checksum: 8-bit exclusive OR of all chars between the \$ and the * (not including)
 <CR><LF> ← HEX 0D 0A – End of sentence

Talker IDs:
 GP – GPS
 GL – GLONASS
 GA – GALILEO
 GN – GNSS
 GB or BD – Beidou
 LC – Loran C
 EP – EPIRB
 ...

Examples:
 \$GPGGA,110259.400,3844.2235,N,00908.1875,W,1,3,3.71,99.5,M,50.7,M,,*72
 ...
 \$GPGGA,111508.400,3844.3285,N,00909.4698,W,2,8,0.97,82.3,M,50.7,M,0000,0000*7C

example of two null fields

NMEA Checksum

Example:

\$GPZDA,110259.200,25,09,2013,,*54<CR><LF>

```

message='$GPZDA,110259.200,25,09,2013,,*54'
str=strtok(message,'$*')
str=uint8(str)
chk=0
for i=1:size(str,2)
  chk=bitxor(chk,str(i))
end
chk=dec2hex(chk,2)
  
```

ASCII code → G P Z D A , 1 1 0 2 5 9 . 2 0 0 , 2 5 , 0 9 , 2 0 1 3 , , * 5 4 ,

```

71 XOR 80 = 23
23 XOR 90 = 77
77 XOR 68 = 09
...
84 XOR 44 = 120
120 XOR 44 = 84 = HEX 54
  
```

Matlab® code

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\$GPGGA

Global Positioning System Fix Data
Time, position and fix related data for a GPS receiver

Example:

\$GPGGA,111508.400,3844.3285,N,00909.4698,W,2,8,0.97,82.3,M,50.7,M,0000,0000*7C

111508.400	UTC of position (11h:15m:08.400s)
3844.3285,N	Latitude - N/S (38°44.3285'N)
00909.4698,W	Longitude - E/W (9°9.4698'W)
2	GPS quality indicator (shall not be a null field)
8	Number of satellites in use
0.97	Horizontal dilution of precision (HDOP)
82.3,M	Altitude (m) relative to mean-sea-level (geoid)
50.7,M	Geoid height (m) above WGS-84 ellipsoid
0000	Age (s) of differential GPS data
0000	DGPS station ID number (0000-1023)

GPS quality indicator:
 0 - Fix not available or invalid
 1 - GPS SPS Mode, fix valid
 2 - Differential GPS, SPS Mode, fix valid
 3 - GPS PPS Mode, fix valid
 4 - System used in RTK mode, with fixed integers
 5 - System used in Float RTK, with floating integers
 6 - Estimated (dead reckoning) mode
 7 - Manual input mode
 8 - Simulator mode

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\$GPGLL

Geographic Position - Latitude/Longitude
Latitude and Longitude of vessel position, time of position fix and status

Example:

\$GPGLL,3844.3285,N,00909.4698,W,111508.400,A,D*42

3844.3285,N	Latitude - N/S (38°44.3285'N)
00909.4698,W	Longitude - E/W (9°9.4698'W)
111508.400	UTC of position (11h:15m:08.400s)
A	Status (A=data valid; V=data not valid; not a null field)
D	Mode indicator (shall not be a null field)

Mode indicator:
 A - Autonomous mode
 D - Differential mode
 E - Estimated (dead reckoning) mode
 M - Manual input mode
 S - Simulator mode
 N - Data not valid
 Status = V for all modes except A and D.

Other examples:

\$GPGGA,110304.400,3844.2117,N,00908.1878,W,6**,2,99.99,99.8,M,50.7,M,,,*4B**

\$GPGLL,3844.2117,N,00908.1878,W,110304.400,V,E***52**

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\$GPGSA

GNSS DOP and Active Satellites

**GNSS receiver operating mode, satellites used in navigation solution
reported by the GGA, and DOP values**

Example:

\$GPGSA,A,3,21,31,29,18,06,27,19,22,,,1.26,0.97,0.81*08

A Mode: M = Manual – forced to operate in 2D or 3D mode
 A = Automatic – allowed to automatically switch 2D/3D)
 3 Mode: 1 = Fix not available
 2 = 2D
 3 = 3D
 21,31,29,18,06,27,19,22,,, ID numbers of satellites used in solution
 1.26 PDOP
 0.97 HDOP
 0.81 VDOP

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\$GPGSV

GNSS Satellites in View

**Number of satellites in view, satellite ID numbers,
elevation, azimuth, and SNR values**

Example:

\$GPGSV,4,1,14,21,62,081,27,16,52,319,23,06,46,277,27,33,44,190,40*77

4 Total number of messages (1-9)
 1 Message number (1-9)
 14 Total number of satellites in view
 (next, up to 4 satellites per sentence)
 21 Satellite ID number
 62 Satellite elevation angle (°; maximum: 90°)
 081 Satellite true azimuth (°; 000-359)
 27 SNR (C/No; 00-99dB-Hz; null when not tracking)
 16,52,319,23,06,46,277,27,33,44,190,40 (data for 3 more satellites)

Other examples:

\$GPGSV,4,2,14,27,36,268,20,31,36,188,43,03,23,270,23,18,16,122,29*77

\$GPGSV,4,3,14,29,14,063,22,19,06,253,22,22,05,155,29,25,04,119,28*75

\$GPGSV,4,4,14,13,04,313,,23,03,286,14*70

\$GP RMC

**Recommended Minimum Navigation Information
Time, date, position, course and speed data
provided by a GNSS navigation receiver**

Example:

\$GPRMC,111508.400,A,3844.3285,N,00909.4698,W,13.48,255.31,250913,,,D*47

111508.400	UTC of position (11h:15m:08.400s)
A	Status (A=data valid; V=data not valid; not a null field)
3844.3285,N	Latitude - N/S (38°44.3285'N)
00909.4698,W	Longitude - E/W (9°09.4698'W)
13.48	Speed over ground (knots)
255.31	True course over ground (°)
250913	Date (25 September 2013)
(2x empty fields)	Magnetic variation (°; E/W)
D	Mode indicator (shall not be a null field)

Mode indicator:
 A - Autonomous mode
 D - Differential mode
 E - Estimated (dead reckoning) mode
 M - Manual input mode
 S - Simulator mode
 N - Data not valid
 Status = V for all modes except A and D.

\$GP VTG

**Course Over Ground and Ground Speed
The actual course and speed relative to the ground**

Example:

\$GPVTG,255.31,T,,M,13.48,N,24.98,K,D*31

255.31,T	True course over ground (°)
(empty field),M	Magnetic course over ground (°)
13.48,N	Speed over ground (knots)
24.98,K	Speed over ground (km/h)
D	Mode indicator (shall not be a null field)

Mode indicator:
 A - Autonomous mode
 D - Differential mode
 E - Estimated (dead reckoning) mode
 M - Manual input mode
 S - Simulator mode
 N - Data not valid

\$GPZDA

Time and Date

UTC, day, month, year, and local time zone

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Example:

\$GPZDA,111508.400,25,09,2013,,*50

111508.400

UTC of position (11h:15m:08.400s)

25

UTC day (01 to 31)

09

UTC month (01 to 12)

2013

UTC year

(empty field)

Local zone hours (00 to ±13 hours; to be added to UTC)

(empty field)

Local zone minutes (00 to +59 minutes; to be added to UTC)

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GP – GPS
GL – GLONASS
GA – GALILEO
GN – GNSS
GB or BD - Beidou

UTC: 11:02:59.400 25-09-2013
Latitude: 38°44.2235'N
Longitude: 009°08.1875'W
Altitude: 99.5 M

11:02:59.400	\$GPGGA,110259.400,3844.2235,N,00908.1875,W,1,3,3.71,99.5,M,50.7,M,,*72
	\$GPGLL,3844.2235,N,00908.1875,W,110259.400,A,A*46
	\$GPGSA,A,2,21,25,29,,,.,.,.,.,.,3.84,3.71,1.00*07
	\$GPRMC,110259.400,A,3844.2235,N,00908.1875,W,1.15,158.87,250913,,,A*7B
	\$GPVTG,158.87,T,,M,1.15,N,2.13,K,A*3B
	\$GPZDA,110259.400,25,09,2013,,*52
11:02:59.600	\$GPGGA,110259.600,3844.2232,N,00908.1872,W,1,3,3.71,99.5,M,50.7,M,,*70
	\$GPGLL,3844.2232,N,00908.1872,W,110259.600,A,A*44
	\$GPGSA,A,2,21,25,29,,,.,.,.,.,.,3.84,3.71,1.00*07
	\$GPRMC,110259.600,A,3844.2232,N,00908.1872,W,1.39,160.29,250913,,,A*78
	\$GPVTG,160.29,T,,M,1.39,N,2.58,K,A*35
	\$GPZDA,110259.600,25,09,2013,,*50
11:02:59.800	\$GPGGA,110259.800,3844.2228,N,00908.1868,W,1,3,3.71,99.5,M,50.7,M,,*7E
	\$GPGLL,3844.2228,N,00908.1868,W,110259.800,A,A*4A
	\$GPGSA,A,2,21,25,29,,,.,.,.,.,.,3.84,3.71,1.00*07
	\$GPGSV,4,1,13,21,64,093,33,16,47,315,22,06,42,271,17,31,42,189,21*73
	\$GPGSV,4,2,13,27,32,263,19,29,19,060,32,03,19,266,22,18,12,126,18*7D
	\$GPGSV,4,3,13,25,08,116,25,23,05,291,,13,04,318,,19,02,249,*75
	\$GPGSV,4,4,13,22,01,158,*46
	\$GPRMC,110259.800,A,3844.2228,N,00908.1868,W,1.60,161.58,250913,,,A*7D
	\$GPVTG,161.58,T,,M,1.60,N,2.96,K,A*3C
	\$GPZDA,110259.800,25,09,2013,,*5E

More...

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