

Sentence Description

NMEA-0183 Protocol

Approved Sentences are those of which formats are defined and fixed within the NMEA 0183 standard. Any portion within an approved sentences format is NOT user-definable. Approved sentences generally are in the following form:

Sentences	Descriptions
GGA	Standard output message for detailed position information
GLL	Older message for simple position information only
GSA	List of satellites used in solution
GSV	Detailed satellites information including signal strengths
RMC	Combination message of position and velocity
VTC	Standard output message for velocity
ZDA	Date / Time
DTM	Datum

NMEA 0183 Format was defined by the National Marine Electronics Association (NMEA), Standard for Interfacing Marine Electronic Devices, with Version 2.30 on March 1 1998.

\$GPGSA (out) – Positioning status

Example

\$GPGSA	,A	,3	,01	,02	,03	,02.00	,03.00	,04.00	*hh	CR LF
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Field# 1 2 3 4 5 6..... 15 16 17 18

#.	Description	Range	[Bytes]
1.	Operational Mode	M or A “M”: 2D-only Mode “A”: 2D/3D Auto-switching Mode	[1]
2.	Mode	1-3 “1”: Fix not available “2”: 2D-positioning “3”: 3D-positioning	[1]
3-14.	Satellite Numbers used for positioning	01-32	[2] or [0]
	Note: A null field is output unless a satellite is available.		
15.	PDOP	n/a	[5]
	Note: “00.00” is output unless 3D-positioning is performed.		
16.	HDOP	n/a	[5]
	Note: “00.00” is output while positioning is interrupted.		
17.	VDOP	n/a	[5]
	Note: “00.00” is output unless 3D-positioning is performed.		
18.	Checksum		[2]

Interpreting Example

2D/3D Auto-switching Mode

3D-Positioning

Satellites used: 01,02,03...

PDOP: 2.00

HDOP: 3.00

VDOP: 4.00

\$GPRMC (out) – UTC, position, course, speed, etc.

Example

\$GPRMC	,123456	,A	,3444.1234,N	,13521.4567,E	,005.6.....	,123.5	,020197
Field#	1	2	3 4	5 6	7	8	9
,001.0,W	,A	*07	CRLF				
	10	11	12	13			

#.	Description	Range	[Bytes]
1.	UTC: Time		
	“12”: hh	00-23	[2]
	“34”: mm	00-59	[2]
	“56”: ss	00-59	[2]
2.	Status	A or V “A”: Data valid (Stand-alone or DGPS) “V”: Navigation receiver warning	[1]
3-4.	Latitude		
	“34”: degree	00-90	[2]
	“44”: minute (integer)	00-59	[2]
	“1234”: minute (fraction)	0000-9999	[4]
	“N”: North/South	N or S	[1]
5-6	Longitude		
	“135”: degree	000-180	[3]
	“21”: Minute (integer)	00-59	[2]
	“4567”: Minute (fraction)	0000-9999	[4]
	“E”: East/West	E or W	[1]
7.	Speed (kts)	000.0-999.9	[5]
	Note: A null field is output unless speed information is available.		
8.	True Course (degree)		
	“123.5”	000.0-359.9	[5]
	Note: A null field is output unless true course information is available.		
9.	UTC: Date		
	“02”: DD	01-31	[2]
	“01”: MM	01-12	[2]
	“97”: YY	97-40 (1997-2040)	[2]
10-11	Magnetic Deviation (degree)		
	“001.0”	000.0-180.0	[5]
	“W”	W or E “W”: West (MAG = TRUE-DEV) “E”: East (MAG = TRUE+DEV)	[1]
12	Positioning System Mode Indication	A: Autonomous mode D: Differential mode N: Data not valid	[1]
13.	Checksum		[2]
	8 bits data between “\$” and “*” (excluding “\$” and “*”) are XORed, and the result is converted to 2 bytes of hexadecimal letters. Only RMC sentences are transmitted with checksum. All other output sentences do not include checksum fields.		

Interpreting Example

UTC Time 12:34:56

Positioning

34 deg 44.1234 min N

135 deg 21.4567 min E

Speed: 5.6 kts

True Course: 123.5 degrees

UTC Data Jan 2, 1995

Magnetic Deviation: 1.0 degree, West

\$GPGLL (out) – Position, UTC, etc.

Example

\$GPGLL	,3444.1234,N	,03521.0000,E	,123456	,A	,A	*43	CR LF
Field#	1	2	3 4	5	6	7	8

#	Description	Range	[Bytes]
1-2.	Latitude		
	“34”: degree	00-90	[2]
	“44”: minute (integer)	00-59	[2]
	“1234”: minute (fraction)	0000-9999	[4]
	“N”: North/South	N or S	[1]
3-4.	Longitude		
	“035”: degree	000-180	[3]
	“21”: Minute (integer)	00-59	[2]
	“0000”: Minute (fraction)	0000-9999	[4]
	“E”: East/West	E or W	[1]
5.	UTC		
	“12”: hh	00-23	[2]
	“34”: mm	00-59	[2]
	“56”: ss	00-59	[2]
6	Status	A or V	[1]
		“A”: Data Valid (Stand-alone or DGPS)	
		“V”: Navigation receiver warning	
7.	Position System Mode Indication	000.0-999.9	[1]
		A: Autonomous mode D: Differential mode N: Data not valid	
8.	Checksum		

Interpreting Example

34 deg 44.1234 min N
 35 deg 21.0000 min E
 UTC: 12:34:56
 Status: Positioning

\$GPGGA (out) – Position, altitude, UTC, etc.

Example

\$GPGGA	,123456	,3444.0000,N	,13521.0000,E	,1	,04	,02.00	,000123.0
Field#	1	2 3	4 5	6	7	8	9
,M	,0036.0	,M	,13	,0001	*076	CR LF	
10	11	12	13	14	15		

#.	Description	Range	[Bytes]
1.	UTC		
	“12”: hh	00-23	[2]
	“34”: mm	00-59	[2]
	“56”: ss	00-59	[2]
2-3.	Latitude		
	“34”: degree	00-90	[2]
	“44”: minute (integer)	00-59	[2]
	“1234”: minute (fraction)	0000-9999	[4]
	“N”: North/South	N or S	[1]
4-5	Longitude		
	“135”: degree	000-180	[3]
	“21”: Minute (integer)	00-59	[2]
	“0000”: Minute (fraction)	0000-9999	[4]
	“E”: East/West	E or W	[1]
6.	GPS Quality Indication	0-2	[1]
		“0”: Fix not available or invalid.	
		“1”: GPS. SPS fix valid	
		“2”: DGPS. SPS fix valid.	
7.	No. of satellites used for positioning	00-12	[2]
8.	DOP (2D: HDOP 3D: PDOP)	n/a	[5]
Note: “00.00” is output while positioning is interrupted.			
9.	Altitude	-00999.9 to 017999.9	[8]
10.	Unit for Altitude	M	[1]
11.	Geoide Altitude	-999.9 to 9999.9	[6]
12.	Unit for Geoide Altitude	M	[1]
13.	DGPS Data Time	00-99	[2]
		This value indicates the time elapsed since the last RTCM-SC104 TYPE 1 or 9 data is updated.	
		Unless DGPS mode is selected, a null field is output.	
14.	DGPS Station ID	0000-1023	[4]
		Unless DGPS mode is selected, a null field is output.	
15.	Checksum		[2]

Interpreting Example

UTC 12:34:56
 34 deg 44.0000 min N
 135 deg 21.0000 min E

Status: Stand-alone GPS
No. of satellites: 4 satellites
DOP: 2.00
Altitude: 123.0 meters high
Geoide Altitude: 36.0 meters high
DGPS Data Time: 13
DGPS Station ID: 0001

\$GPVTG (out) – Course and speed

Example

\$GPVTG	,012.3,T	,001.1,M	,001.2,N	,0002.2,K	,A	*10	CR LF
Field#	1 2	3 4	6	7 8	9	10	

#.	Description	Range	[Bytes]
1-2.	True Course		
	“012.3”	000.0-359.9	[5] (degree)
	“T” (meaning TRUE)	T	[1] (n/a)
Note: A null field is output unless true course information is available.			
3-4.	Magnetic Course		
	“001.1”	000.0-359.9	[5] (degree)
	“N” (meaning MAGNETIC)	M	[1] (n/a)
Note: A null field is output unless magnetic course information is available.			
5-6.	Speed (kts)		
	“001.2”	000.0-999.9	[5] (kts)
	“N” (meaning kNot)	N	[1] (n/a)
Note: A null field is output unless speed course information is available.			
7-8.	Speed (km/h)		
	“0002.2”	0000.0-9999.9	[6] (km/h)
	“K” (meaning Km/h)	K	[1] (n/a)
Note: A null field is output unless speed course information is available.			
9.	Positioning System Mode Indicator	A: Autonomous mode [1] D: Differential mode N: Data not valid	
10.	Checksum		[2]

\$GPZDA (out) – Date/Time

Example

\$GPZDA	,123456	,01	,02	,1997	,+09	,00	*6B	CR LF
Field#	1	2	3	4	5	6	7	

#	Description	Range	[Bytes]
1.	UTC: Time		
	“12”: hh	00-23	[2]
	“34”: mm	00-59	[2]
	“56”: ss	00-59	[2]
2.	UTC: Day of Month		
	“01”: DD	01-31	[2]
3.	UTC: Month		
	“02”: MM	01-12	[2]
4.	UTC: Year		
	“1997”: YYYY	1997-2040	[4]
5.	Local Zone Time (Hour)		
	“+09”: hh	-13...+00...+13	[3]
		(-/+ : East/west of date line)	
6.	Local Zone Time (Minute)		
	“00”: mm	00 to 59	[2]
	Note: Local zone time setting is used for calculating local time when outputting &PFEC, GPast: (Local Time) = (UTC) – (Local Zone Time)		
7.	Checksum		[2]

8. Checksum

Interpreting Example

February 1, 1997
 12:34:56
 Local Zone Time: +09:00

\$GPGSV (out) – Satellite details

Example

\$GPGSV	,2	,1	,06	,01	,05	,234	,56	,04	,11	,223	,44	,01	,75
Field#	1	2	3	4	5	6	7	8	9	10	11	12	13
,088	,32	,01	,42	,234	,48	*75	CR LF						
14	15	16	17	18	19	20							

#	Description	Range	[Bytes]
1.	Total No. of Messages	1-3	[1] (n/a)
2.	No. of Messages	1-3	[1] (n/a)
3.	No. of satellites in line-of-site (with elevation angle higher than 5 degrees only)	00-12	[2] (n/a)
4.	1 st Sat. SV#	01-32	[2]
5.	1 st Sat. Elevation Angle (degree)	05-90	[2]
6.	1 st Sat. Bearing Angle (degree)	000-359	[3]
7.	1 st Sat. SNR (Signal/Noise Ratio) C/No (dBHz)	00-99	[2]
8-11.	2 nd Sat. Details		[9]
12-15.	3 rd Sat. Details		[9]
16-19.	4 th Sat. Details		[9]
20.	Checksum		[2]

In this sentence, a maximum of four satellite details is indicated per each output. Five or more satellite details are output in the 2nd or 3rd messages. When there is only one to three satellite details, the checksum <CR><LF> is issued immediately after Sat. SV#, Sat. Elevation Angle, Sat. Bearing Angle and SNR.

\$GPD TM (out) – Datum & Set DGPS parameter

Example

\$GPD TM	,TOY	,M	,00.1697	,S	,00.1234	,E	„W84	*05	CR LF
Field#	1	2	3	4	5	6	7 8	9	

#.	Description	Range	[Bytes]
1.	Local datum code		[3]
2.	Local datum sub code		[1]
3.	Latitude offset (minute)		[7]
4.	Latitude offset mark (N: +, S: -)		[1]
5.	Longitude offset (minute)		[7]
6.	Longitude offset mark (N: +, S: -)		[1]
7.	Altitude offset (m)	Always null	
8.	Datum	Always “W84”	[3]
9.	Checksum		[2]

Interpreting Example

Datum 172