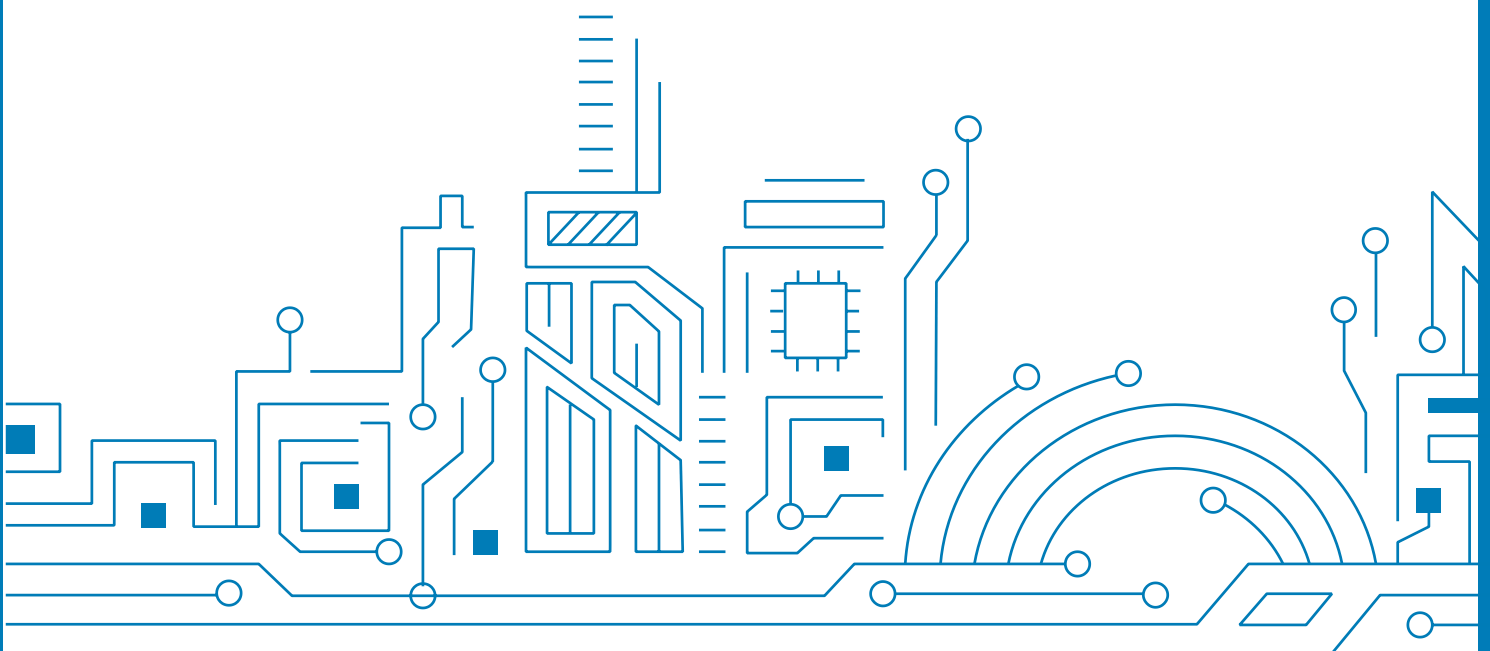


ALLYSTAR GNSS Receiver

NMEA Protocol Specification

V1.0



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1 NMEA MESSAGES

1.1 Background Information

NMEA messages sent from GNSS receiver follow the standard NMEA 0183 Version 3.01/4.00/4.10. For further information about NMEA messages, please visit <http://www.nmea.org/>

1.2 ALLYSTAR GNSS Receiver supported messages

ALLYSTAR GNSS receiver supports most of the general NMEA standard messages. They include GGA, GLL, GSA, GRS, GSV, RMC, VTG, ZDA, GST and TXT.

1.3 Setting message output rate

The default output is GGA, GSA, GSV and RMC in 1 second period. Message output rate for individual NMEA messages can be set through binary message CFG-MSG. Setting output rate to zero is equivalent to disable message output. The group ID for NMEA message is 0xF0. The following table describes the suitable sub ID to use:

Message	Sub ID	Description
GGA	0x00	Position fix information
GLL	0x01	Latitude/Longitude data
GSA	0x02	GNSS Overall satellite data
GRS	0x03	GNSS range residuals
GSV	0x04	GNSS Detailed satellite data
RMC	0x05	Recommended minimal data for GNSS
VTG	0x06	Course over ground and ground speed
ZDA	0x07	Date and time
TXT	0x20	Antenna status message

2 NMEA MESSAGES FORMAT

NMEA is the standard of GNSS protocol. ALLYSTAR GNSS receiver supports several NMEA sentences: GGA, GSV, GSA, RMC, VTG, ZDA, GLL, GRS, GST and TXT. This data set includes the complete PVT (position, velocity, time) solution computed by the GNSS receiver.

Each sentence has a prefix beginning with a '\$' and ends with a carriage return/line feed sequence and can be no longer than 80 characters of visible text (plus the line terminators). There is a provision for a checksum at the end of each sentence which may or may not be checked by the unit that reads the data. The checksum field consists of a '*' and two hex digits representing an 8 bit exclusive OR of all characters between, but not including, the '\$' and '*'. A checksum is required on some sentences.

Different prefix indicates the global position satellite systems for sentences GRS, GSA and GSV:

- \$GP for GPS-QZSS-SBAS
- \$BD for BEIDOU-only
- \$GL for GLONASS-only
- \$GI for INSAT-only
- \$GA for GALILEO-only
- \$GN is for GNSS, combination of different global position satellite systems.

2.1 GGA - Global Positioning System Fix Data

ID	GGA (support NMEA version 3.01/4.00/4.01/4.10)	
Description	Time, position and fix related data for a GNSS receiver	
Format	\$GNGGA,hhmmss.fff,IIII.IIIII,a,yyyyy.yyyyy,a,x,xx,x.x,x,x,M,x.x,M,x.x,xxxx*hh<CR><LF>	
Content (Shown in sequence)	hhmmss.fff IIII.IIIII a yyyyy.yyyyy a x xx x.x x.x M x.x M x xxxx hh	HourMinuteSecond.fraction (UTC) Latitude (HD9300/HD9400 series IIII.IIIII) N or S (North or South) Longitude (HD9300/HD9400 series yyyyy.yyyyy) E or W (East or West) GNSS Quality Indicator - 0 - fix not available - 1 - GNSS fix - 2 - Differential GNSS fix (values above 2 are 2.3 features) - 3 = PPS fix - 4 = Real Time Kinematic - 5 = Float RTK - 6 = estimated (dead reckoning) - 7 = Manual input mode - 8 = Simulation mode Number of satellites in use (range: 00-40) Horizontal Dilution of Precision (meters) Antenna Altitude above/below mean-sea-level (geoid) (in meters) Units of antenna altitude, meters Geoidal separation, the difference between the WGS-84 earth ellipsoid and mean-sea-level (geoid), "-" means mean-sea-level below ellipsoid Units of geoidal separation, meters Age of differential GNSS data, time in seconds since Last SC104, type 1 or 9 update, null field when DGPS is not used Differential reference station ID, 0000-1023 Checksum
Example	\$GNGGA,175722.000,0045.94406,N,00028.67819,E,1,10,1.19,35.8,M,18.2,M,*,*50 \$GNGGA,071113.000,3957.7995312,N,11619.0286230,E,4,16,0.99,103.965,M,- 8.408,M,1.0,4042*40 (93series)	

ID	GSA
Example NMEA version 3.01	<pre> \$GNGSA,A,3,19,17,208,06,212,213,193,203,201,217,202,210,1.34,0.79,1.08*20 Note: SVID_GPS: 01~32 SVID_GLONASS: 65~96 SVID_GALILEO: 301~336 SVID_BEIDOU: 201~ 250 SVID_IRNSS: 901~918 SVID_QZSS: 193~199 SVID_SBAS: 40~54 </pre>
Example NMEA version 4.00	<pre> \$GPGSA,A,3,19,17,06,193,02,12,28,23,09,,,,,1.46,0.82,1.21,1*24 \$BDGSA,A,3,220,203,229,201,213,204,230,208,202,235,206,,1.25,0.69,1.05,4*30 \$GLGSA,A,3,88,65,87,72,79,78,81,,,,,,1.51,0.86,1.24,2*0D \$GAGSA,A,3,315,303,327,330,,,,,,1.25,0.69,1.05,3*00 \$GIGSA,A,3,904,907,903,909,902,905,,,,,,1.52,0.86,1.26,6*02 Note: SVID_GPS: 01~32 SVID_GLONASS: 65~96 SVID_GALILEO: 301~336 SVID_BEIDOU : 201~250 SVID_IRNSS: 901~918 SVID_QZSS: 193~199 SVID_SBAS: 40~54 ID System 1 GPS 2 GLONASS 3 GALILEO 4 BEIDOU 6 IRNSS </pre>
Example NMEA version 4.01	<pre> \$GNGSA,A,3,06,02,05,12,195,193,199,25,,,,,1.25,0.69,1.04*22 \$GNGSA,A,3,81,66,88,65,79,,,,,,1.25,0.69,1.04*14 \$GNGSA,A,3,315,303,327,330,,,,,,1.25,0.69,1.04*11 \$GNGSA,A,3,229,220,208,213,203,230,235,201,204,202,206,,1.25,0.69,1.04*26 Note: SVID_GPS: 01~32 SVID_GLONASS: 65~96 SVID_GALILEO: 301~336 SVID_BEIDOU : 201~250 SVID_IRNSS: 901~918 SVID_QZSS: 193~199 SVID_SBAS: 40~54 </pre>

ID	GSA											
Example NMEA version 4.10	\$GNGSA,A,3,19,17,06,193,02,12,28,23,09,,,,,1.48,0.83,1.22,1*36 (GPS)											
	\$GNGSA,A,3,81,88,66,65,79,,,,,,1.39,0.76,1.17,2*0B (GLONASS)											
	\$GNGSA,A,3,12,19,24,11,04,,,,,,1.48,0.86,1.21,3*0B(GALILEO)											
	\$GNGSA,A,3,08,12,13,03,01,17,02,10,04,05,07,,1.48,0.83,1.22,4*0B(BEIDOU)											
	\$GNGSA,A,3,04,07,03,09,05,02,,,,,,2.41,1.40,1.96,6*04 (IRNSS)											
	Note: SVID_GPS: 1~32											
	SVID_GLONASS: 65~96											
	SVID_GALILEO: 1~36											
	SVID_BEIDOU: 1~ 50											
	SVID_IRNSS: 1~18											
SVID_QZSS: 193~199												
SVID_SBAS: 40~54												
System ID Identification Table												
<table border="1"> <thead> <tr> <th data-bbox="466 763 502 801">ID</th> <th data-bbox="502 763 1445 801">System</th> </tr> </thead> <tbody> <tr> <td data-bbox="466 801 502 840">1</td> <td data-bbox="502 801 1445 840">GPS</td> </tr> <tr> <td data-bbox="466 840 502 878">2</td> <td data-bbox="502 840 1445 878">GLONASS</td> </tr> <tr> <td data-bbox="466 878 502 916">3</td> <td data-bbox="502 878 1445 916">GALILEO</td> </tr> <tr> <td data-bbox="466 916 502 954">4</td> <td data-bbox="502 916 1445 954">BEIDOU</td> </tr> <tr> <td data-bbox="466 954 502 992">6</td> <td data-bbox="502 954 1445 992">IRNSS</td> </tr> </tbody> </table>	ID	System	1	GPS	2	GLONASS	3	GALILEO	4	BEIDOU	6	IRNSS
ID	System											
1	GPS											
2	GLONASS											
3	GALILEO											
4	BEIDOU											
6	IRNSS											

2.3 GRS - GNSS Range Residuals

ID	GRS	
Description	GNSS Satellite Range Residuals information	
Format (In V3.01/4.01)	\$GNGRS,hhmmss.fff,m,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx*hh<CR><LF>	
Format (In V4.00)	\$GPGRS,hhmmss.fff,m,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx*hh<CR><LF> \$BDGRS,hhmmss.fff,m,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx*hh<CR><LF>	
Format (V4.10)	\$GNGRS,hhmmss.fff,m,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,h,h*hh<CR><LF>	
Content (Shown in sequence)	hhmmss.fff m xx xx xx xx xx xx xx xx xx xx xx xx xx h h hh	HourMinuteSecond. fraction (UTC) 0 = residuals were used to calculate the position given in the matching GGA or GNS sentence 1 = residuals were recomputed after the GGA or GNS position was computed Satellite 1 residual in meters Satellite 2 residual in meters Satellite 3 residual in meters Satellite 4 residual in meters Satellite 5 residual in meters Satellite 6 residual in meters Satellite 7 residual in meters Satellite 8 residual in meters Satellite 9 residual in meters Satellite 10 residual in meters Satellite 11 residual in meters Satellite 12 residual in meters (Order must match order of the satellite ID numbers in GSA) System ID Note: NMEA v4.10 and above only Signal ID Note: NMEA v4.10 and above only Checksum
Example NMEA version 3.01	\$GNGRS,020219.00,1,-2.3,0.5,0.2,0.8,-0.0,-0.4,0.4,5.8,2.4,-1.1,-0.4,-1.1*59	
Example NMEA version 4.00	\$GPGRS,020019.00,1,-2.5,0.8,-1.0,-0.2,0.3,0.4,-0.6,0.9,2.1,1.1,-0.8,*48 \$GLGRS,020019.00,1,6.4,2.6,-1.0,-4.3,-3.6,,,,,*5E \$GAGRS,020019.00,1,-0.3,-1.1,1.1,0.2,,,,,*54 \$BDGRS,020019.00,1,0.9,0.8,0.0,-0.0,-0.4,2.2,0.1,-0.8,-0.5,-1.0,-2.7,1.3*5A	
Example NMEA version 4.01	\$GNGRS,020059.00,1,-2.6,0.7,-0.3,-0.4,0.3,0.6,-0.6,0.2,2.4,2.6,-0.6,*5C \$GNGRS,020059.00,1,6.0,2.4,-1.2,-4.3,-2.8,,,,,*53 \$GNGRS,020059.00,1,-0.5,-0.9,1.0,0.5,,,,,*56 \$GNGRS,020059.00,1,0.8,0.8,0.0,-0.3,-0.9,2.3,-0.8,0.2,-0.6,-0.9,-2.3,1.6*56	
Example NMEA version 4.10	\$GNGRS,020707.00,1,-2.0,1.7,-0.3,0.3,0.4,-0.2,-0.2,-1.0,1.8,-0.9,2.3,,1.0*7A	

System ID (only for 4.10)	ID	System
	1	GPS
	2	GLONASS
	3	GALILEO
	4	BEIDOU
	6	IRNSS
Dual frequency Signal ID (only for 4.10)	SIGID_GPS_L1CA	(1)
	SIGID_GPS_L1P	(2)
	SIGID_GPS_L1M	(3)
	SIGID_GPS_L2CM	(5)
	SIGID_GPS_L2CL	(6)
	SIGID_GPS_L5I	(7)
	SIGID_GPS_L5Q	(8)
	SIGID_GPS_L1C	(9)
	SIGID_GPS_L6	(11)
	SIGID_GLN_G1CA	(1)
	SIGID_GLN_G2CA	(3)
	SIGID_GAL_E5A	(1)
	SIGID_GAL_E5B	(2)
	SIGID_GAL_L1A	(6)
	SIGID_GAL_L1BC	(7)
	SIGID_BDS_B1I	(1)
	SIGID_BDS_B2I	(2)
	SIGID_BDS_B3I	(3)
	SIGID_BDS_B2A	(4)
	SIGID_BDS_B1C	(9)
	SIGID_NAVIC	(1)
	All Signal	0

2.4 GSV - GNSS Satellites in View

ID	GSV	
Description	Number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value.	
Format (In V3.01)	\$GNGSV,x,x,x,x,x,x,x,...*hh<CR><LF>	
Format (In V4.00/V4.01)	\$GPGSV,x,x,x,x,x,x,x,...*hh<CR><LF> \$BDGSV,x,x,x,x,x,x,x,...*hh<CR><LF>	
Format (In V4.10)	\$GPGSV,x,x,x,x,x,x,x,...h*hh<CR><LF> \$BDGSV,x,x,x,x,x,x,x,...h*hh<CR><LF>	
Content (Shown in sequence)	x	Total number of GSV messages to be transmitted in this group
	x	Origin number of this GSV message within current group
	x	Total number of satellites in view (leading zeros sent)
	x	Satellite PRN number (leading zeros sent)
	x	Elevation in degrees (00-90) (leading zeros sent)
	x	Azimuth in degrees to true north (000-359) (leading zeros sent)
		SNR in dB (00-99) (leading zeros sent)
	x	More satellite info quadruples like 4-7n)

	h	Signal ID Note: NMEA v4.10 and above only
	hh	Checksum
Example NMEA version 3.01	<pre> \$GNGSV,6,1,24,19,73,351,51,17,69,86,54,208,68,358,49,6,65,298,55*5E \$GNGSV,6,2,24,212,64,331,51,213,60,305,50,193,56,134,48,203,44,190,45*6C \$GNGSV,6,3,24,53,38,212,46,201,37,145,44,217,35,140,43,50,35,139,39*6F \$GNGSV,6,2,23,193,59,133,46,88,55,351,47,65,55,127,49,319,43,114,36*65 \$GNGSV,6,4,22,909,19,255,40,16,25,216,39,50,35,139,38,905,17,189,37*69 Note: SVID_GPS: 01~32 SVID_GLONASS: 65~96 SVID_GALILEO: 301-336 SVID_BEIDOU: 201~ 250 SVID_IRNSS: 901~918 SVID_QZSS: 193~199 SVID_SBAS: 40~54 For more please see below in "Dual frequency Sat ID" </pre>	

Example NMEA version 4.00/4.01	<pre> \$GPGSV,3,2,12,53,38,212,46,50,35,139,42,41,32,226,42,28,25,173,44*77 \$GPGSV,3,3,12,2,22,264,42,12,21,318,43,23,17,93,42,9,12,126,37*43 \$BDGSV,3,1,12,216,79,57,44,237,67,249,44,220,53,301,44,870,53,301,44*57 \$GLGSV,2,2,08,79,24,299,45,78,22,254,49,81,18,303,45,66,10,181,44*6F \$GAGSV,2,1,05,12,69,355,46,19,42,115,42,24,30,246,45,11,27,290,40*60 \$GIGSV,2,1,06,904,67,205,47,907,45,158,45,903,34,227,44,909,20,257,40*63 Note: SVID_GPS: 01~32 SVID_GLONASS: 65~96 SVID_GALILEO: 301-336 SVID_BEIDOU: 201~250 SVID_IRNSS: 901~918 SVID_QZSS: 193~199 SVID_SBAS: 40~54 For more please see below in "Dual frequency Sat ID" </pre>
Example NMEA version 4.10	<pre> \$GPGSV,3,2,11,19,32,147,42,41,32,226,42,12,27,254,43,25,19,296,39,1*66 \$GPGSV,3,4,10,25,17,310,40,8*5C \$BDGSV,4,4,16,10,18,213,35,1*4C \$BDGSV,4,5,16,29,83,343,45,20,76,109,45,30,38,124,42,4*40 \$GLGSV,2,1,06,81,48,335,48,88,61,73,43,66,53,182,38,65,52,44,37,1*73 \$GAGSV,2,1,06,15,78,354,48,8,33,201,42,13,28,311,41,5,31,47,27,6*40 \$GAGSV,2,2,06,15,78,354,46,13,28,311,41,2*75 \$GIGSV,2,1,07,5,75,208,46,7,39,160,43,3,30,225,42,9,14,254,39,1*7D Note: SVID_GPS: 01~32 SVID_GLONASS: 65~96 SVID_GALILEO: 01~36 SVID_BEIDOU: 01~50 SVID_IRNSS: 01~18 SVID_QZSS: 193~199 SVID_SBAS: 40~54 For signal ID, please see below "Multi-frequency Signal ID" </pre>

Dual frequency SAT ID (only for 3.01/4.00/4.01)	GN_NMEA_IDBASE_SBAS	(87) 127~141
	GN_NMEA_IDBASE_GPS	(0) 01~32
	GN_NMEA_IDBASE_GPSL1C	(GN_NMEA_IDBASE_GPS + 400) 401~432
	GN_NMEA_IDBASE_GPSL2CM	(GN_NMEA_IDBASE_GPS + 500) 501~532
	GN_NMEA_IDBASE_GPSL5	(GN_NMEA_IDBASE_GPS + 650) 651~682
	GN_NMEA_IDBASE_GLONASS	(64) 65~96
	GN_NMEA_IDBASE_GLNG2	(GN_NMEA_IDBASE_GLONASS + 500) 565~596
	GN_NMEA_IDBASE_BEIDOU	(200) 201~ 250
	GN_NMEA_IDBASE_BDSB1C	(GN_NMEA_IDBASE_BEIDOU + 400) 601~650
	GN_NMEA_IDBASE_BDSB2I	(GN_NMEA_IDBASE_BEIDOU + 500) 701~750
	GN_NMEA_IDBASE_BDSB3I	(GN_NMEA_IDBASE_BEIDOU + 600) 801~850
	GN_NMEA_IDBASE_BDSB2A	(GN_NMEA_IDBASE_BEIDOU + 650) 851~900
	GN_NMEA_IDBASE_GALILEO	(300) 301-336
	GN_NMEA_IDBASE_GALE5A	(GN_NMEA_IDBASE_GALILEO + 650) 951~986
	GN_NMEA_IDBASE_QZSS	(192) 193~199
GN_NMEA_IDBASE_QZSSL5	(GN_NMEA_IDBASE_QZSS+ 650) 843~849	
GN_NMEA_IDBASE_IRNSSL5	(GN_NMEA_IDBASE_GPS + 900) 901~917	
Multi-frequency Signal ID	SIGID_GPS_L1CA	(1)
	SIGID_GPS_L1P	(2)
	SIGID_GPS_L1M	(3)
	SIGID_GPS_L2CM	(5)
	SIGID_GPS_L2CL	(6)
	SIGID_GPS_L5I	(7)
	SIGID_GPS_L5Q	(8)
	SIGID_GPS_L1C	(9)
	SIGID_GPS_L6	(11)
	SIGID_GLN_G1CA	(1)
	SIGID_GLN_G2CA	(3)
	SIGID_GAL_E5A	(1)
	SIGID_GAL_E5B	(2)
	SIGID_GAL_L1A	(6)
	SIGID_GAL_L1BC	(7)
	SIGID_BDS_B1I	(1)
	SIGID_BDS_B2I	(2)
	SIGID_BDS_B3I	(3)
	SIGID_BDS_B2A	(4)
	SIGID_BDS_B1C	(9)
SIGID_NAVIC	(1)	
All Signal	0	

2.5 RMC - Recommended Minimum Specific GNSS Data

ID	RMC	
Description	Time, date, position, course and speed data provided by a GNSS navigation receiver.	
Format	\$GNRMC,hhmmss.fff,A,IIII.IIIII,a,yyyyy.yyyyy,a,x.x,x.x,ddmmyy,x.x,a,a*hh<CR><LF>	
Content (Shown in sequence)	hhmmss.fff A IIII.IIIII a yyyyy.yyyyy a x.x x.x ddmmyy x.x a a a hh	HourMinuteSecond. fraction (UTC) Status, V=Navigation receiver warning A=Valid Latitude (HD9300/HD9400 series IIII.IIIII) N or S Longitude (HD9300/HD9400 series yyyyy.yyyyyy) E or W Speed over ground, knot Degrees to true north Date Magnetic variation Degrees E/W Mode Indicator: V = Invalid, A= Autonomous and D =Differential, F = Float RTK, P = Precise and R=Real Time Kinematic navStatus Note: NMEA v4.10 and above only Checksum
Example 3.01/4.00/4.01	\$GNRMC,115332.000,A,4006.20852,N,11628.14483,E,0.000,0.50,041215,,,A*48	
Example NMEA version 4.10	\$GNRMC,115522.000,A,4006.20885,N,11628.14498,E,0.000,0.50,041215,,,A,S*30	

2.6 VTG - Course over Ground and Ground Speed

ID	VTG (support NMEA version 3.01/4.00/4.10)	
Description	The actual course and speed relative to the ground	
Format	\$GNVTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>	
Content (Shown in sequence)	x.x	Track Degrees
	T	True
	x.x	Magnetic Degrees
	M	Magnetic
	x.x	Speed Knots
	N	Knots
	x.x	Speed Kilometers Per Hour
	K	Kilometers Per Hour
	A	Mode Indicator: V = Invalid, A= Autonomous and D =Differential
	hh	Checksum
Example	\$GNVTG,0.50,T,,M,0.000,N,0.000,K,A*26	

2.7 ZDA - Time & Date

ID	ZDA (support NMEA version 4.10/3.01/4.00)	
Description	Time & Date - UTC, day, month, year and local time zone	
Format	\$GNZDA,hhmmss.fff,dd,mm,yyyy,xx,yy*hh<CR><LF>	
Content (Shown in sequence)	hhmmss.fff	HourMinuteSecond. fraction (UTC)
	dd	Day
	mm	Month
	yyyy	Year
	xx	Local zone hours -13..13
	yy	Local zone minutes 0..59
	hh	Checksum
Example	\$GNZDA,072319.000,14,10,2015,-7,45*5F	

2.8 GLL - Geographic Position - Latitude/Longitude

ID	GLL(support NMEA version 4.10/3.01/4.00)	
Description	Latitude and Longitude of vessel position, time of position fix and status.	
Format support	\$GNGLL,IIII.IIIII,a,yyyyy.yyyyy,a,hhmmss.fff,A,a*hh<CR><LF>	
Content (Shown in sequence)	IIII.IIIII a yyyyy.yyyyy a hhmmss.fff A a hh	Latitude (HD9300/HD9400 series IIII.IIIII) N or S (North or South) Longitude (HD9300/HD9400 series yyyyy.yyyyy) E or W (East or West) HourMinuteSecond.fraction (UTC) Status A - Data Valid, V - Data Invalid Mode Indicator: V = Invalid, A= Autonomous and D =Differential Checksum
Example	\$GNGLL,2225.56149,N,11412.68190,E,074822.001,A,A*44	

2.9 GST- GNSS Pseudorange Error Statistics

ID	GST	
Description	Reports statistical information on the quality of the position solution.	
Format support	\$GPGST,hhmmss.fff,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh<CR><LF> \$GNGST,hhmmss.fff,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>	
Content (Shown in sequence)	hhmmss.fff x.x x.x x.x x.x x.x x.x hh	HourMinuteSecond. fraction (UTC) RMS value of the standard deviation of the Standard deviation of semi-major axis Standard deviation of semi-minor axis Orientation of semi-major axis Standard deviation of latitude error Standard deviation of longitude error Standard deviation of altitude error Checksum
Example	\$GPGST,082356.00,1.8,,,,1.7,1.3,2.2*7E	

2.10 TXT - system or user defined message

ID	TXT(support NMEA version 4.10/3.01/4.00)	
Description	System or user defined message	
Format support	\$GNTXT,xx,xx,xx,ccc*hh<CR><LF>	
Content (Shown in sequence)	xx xx xx ccc hh	total number \$xxTXT in the current period subsequent ID, counting from 01, 02 and so on message of system first starting ALLYSTAR or ANT_OK or customer flag Checksum

Example	\$GNTXT,02,01,01,ALLYSTAR*5F (after hardware reset) \$GNTXT,02,01,02,ALLYSTAR*5C (after reset by start command)
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2.11 BAS Description

There are several compatible SBAS systems available or in development all around the world:

- WAAS (Wide Area Augmentation System) for North America has been in operation since 2003.
- MSAS (Multi-Functional Satellite Augmentation System) for Asia has been in operation since 2007.
- EGNOS (European Geostationary Navigation Overlay Service) has been in operation since 2009.
- GAGAN (GPS Aided Geo Augmented Navigation)
- SDCM (Difference correction and monitoring system)

The following table shows the PRN value in ALLYSTAR NMEA protocol.

NMEA Version	WAAS		EGNOS		GAGAN		MSAS		SDCM	
	ORIGINAL-PRN	AS PRN	ORIGINAL-PRN	AS PRN	ORIGINAL-PRN	AS PRN	ORIGINAL-PRN	AS PRN	ORIGINAL-PRN	AS PRN
3.01	135	48	120	33	127	40	129	42	140	53
	138	51	124	37	128	41	137	50	125	38
	133	46	126	39	-	-	-	-	-	-
	-	-	136	49	-	-	-	-	-	-
4.00	135	135	120	120	127	127	129	129	140	140
	138	138	124	124	128	128	137	137	125	125
	133	133	126	126	-	-	-	-	-	-
	-	-	136	136	-	-	-	-	-	-
4.10	135	48	120	33	127	40	129	42	140	53
	138	51	124	37	128	41	137	50	125	38
	133	46	126	39	-	-	-	-	-	-
	-	-	136	49	-	-	-	-	-	-

* In NMEA V3.01 and 4.10 the SBAS PRN offset value set with -87, and in the V4.00 the SBAS PRN offset value set with 0.



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