NMEA Output Description

The output protocol supports NMEA-0183 standard. The implemented messages include GGA, GLL, GSA, GSV, VTG, RMC, ZDA and GNS messages. The NMEA message output has the following sentence structure:

$aaccc,c–c*hh<CR><LF>

The detail of the sentence structure is explained in Table 1.

Table 1: The NMEA sentence structure

character	HEX	Description
"$"	24	Start of sentence.
aaccc		Address field. "aa" is the talker identifier. "ccc" identifies the sentence type.
","	2C	Field delimiter.
C–c		Data sentence block.
"*"	2A	Checksum delimiter.
Hh		Checksum field.
<CR><LF>	0D0A	Ending of sentence. (carriage return, line feed)

Checksum field is the 8-bit exclusive OR (no start or stop bits) of all characters in the sentence. Checksum consists of 2 characters and is represented as a hex number.

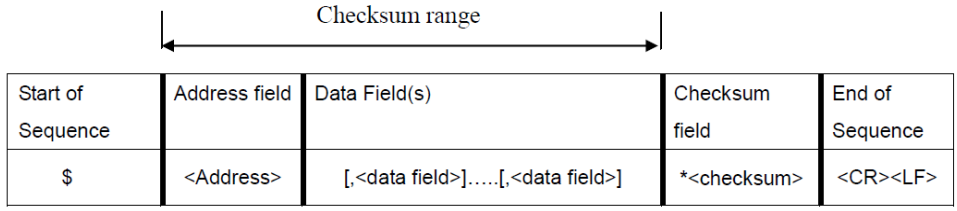

Table 2: Overview of SkyTraq receiver's NMEA messages for NavSpark

$GPGGA	Time, position, and fix related data of the receiver.
$GPGLL	Position, time and fix status.
$GPGSA	Used to represent the ID's of satellites which are used for position fix.
$GPGSV	Satellite information about elevation, azimuth and CNR
$GPRMC	Time, date, position, course and speed data.
$GPVTG	Course and speed relative to the ground.
$GPZDA	UTC, day, month and year and time zone.

Table 3: Overview of SkyTraq receiver's NMEA messages for NavSpark-BD

$GNGGA	Time, position, and fix related data of the receiver.
$GNGLL	Position, time and fix status.
$GNGSA **$GPGSA** **$BDGSA**	Used to represent the ID's of satellites which are used for position fix. When both GPS and Beidou satellites are used in position solution, a $GNGSA sentence is used for GPS satellites and another $GNGSA sentence is used for Beidou satellites. When only GPS satellites are used for position fix, a single $GPGSA sentence is output. When only Beidou satellites are used, a single $BDGSA sentence is output.
$GPGSV **$BDGSV**	Satellite information about elevation, azimuth and CNR, $GPGSV is used for GPS satellites, while $BDGSV is used for Beidou satellites
$GNRMC	Time, date, position, course and speed data.
$GNVTG	Course and speed relative to the ground.
$GNZDA	UTC, day, month and year and time zone.

Table 4: Overview of SkyTraq receiver's NMEA messages for NavSpark-GL

$GNGGA	Time, position, and fix related data of the receiver.
$GNGLL	Position, time and fix status.
$GNGSA **$GPGSA** **$GLGSA**	Used to represent the ID's of satellites which are used for position fix. When both GPS and GLONASS satellites are used in position solution, a $GNGSA sentence is used for GPS satellites and another $GNGSA sentence is used for GLONASS satellites. When only GPS satellites are used for position fix, a single $GPGSA sentence is output. When only GLONASS satellites are used, a single $GLGSA sentence is output.
$GPGSV **$GLGSV**	Satellite information about elevation, azimuth and CNR, $GPGSV is used for GPS satellites, while $GLGSV is used for GLONASS satellites
$GNRMC	Time, date, position, course and speed data.
$GNVTG	Course and speed relative to the ground.
$GNZDA	UTC, day, month and year and time zone.

The formats of the supported NMEA messages are described as follows:

GGA – Global Positioning System Fix Data

Time, position and fix related data for a GPS receiver.

Format:

$--GGA,hhmmss.ss,llll.lll,a,yyyyy.yyy,a,x,uu,v.v,w.w,M,x.x,M,,zzzz*hh<CR><LF>

Field	**Name**	**Description**
hhmmss.ss	UTC Time	UTC of position in hhmmss.sss format, (000000.000 ~ 235959.999)
llll.lll	Latitude	Latitude in ddmm.mmmm format. Leading zeros are inserted.
A	N/S Indicator	'N' = North, 'S' = South
yyyyy.yyy	Longitude	Longitude in dddmm.mmmm format. Leading zeros are inserted.
A	E/W Indicator	'E' = East, 'W' = West
x	GPS quality indicator	GPS quality indicator 0: position fix unavailable 1: valid position fix, SPS mode 2: valid position fix, differential GPS mode
uu	Satellites Used	Number of satellites in use, (00 ~ 24)
v.v	HDOP	Horizontal dilution of precision, (00.0 ~ 99.9)
w.w	Altitude	Mean sea level altitude (-9999.9 ~ 17999.9) in meter
x.x	Geoidal Separation	In meter
zzzz	DGPS Station ID	Differential reference station ID, 0000 ~ 1023 NULL when DGPS not used
hh	Checksum	

GLL – Geographic Position – Latitude/Longitude

Latitude and longitude of vessel position, time of position fix and status.

Format:

$--GLL,llll.lll,a,yyyyy.yyy,b,hhmmss.sss,A,a*hh<CR><LF>

Field	**Name**	**Description**
llll.lll	Latitude	Latitude in ddmm.mmmm format. Leading zeros are inserted.
A	N/S Indicator	'N' = North, 'S' = South
yyyyy.yyy	Longitude	Longitude in dddmm.mmmm format. Leading zeros are inserted.
B	E/W Indicator	'E' = East, 'W' = West
hhmmss.sss	UTC Time	UTC of position in hhmmss.sss format, (000000.000 ~ 235959.999)
A	Status	A= data valid, V= Data not valid
hh	Checksum	

GSA – GNSS DOP and Active Satellites

GPS receiver operating mode, satellites used in the navigation solution reported by the GGA or GNS sentence and DOP values.

Format:

$--GSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,u.u,v.v,z.z*hh<CR><LF>

Field	Name	Description
a	Mode	Mode 'M' = Manual, forced to operate in 2D or 3D mode 'A' = Automatic, allowed to automatically switch 2D/3D
x	Mode	Fix type 1 = Fix not available 2 = 2D 3 = 3D
xx's	Satellite ID	01 ~ 32 are for GPS; 33 ~ 64 are for SBAS (PRN minus 87); 65 ~ 96 are for GLONASS (64 plus slot numbers); 193 ~ 197 are for QZSS; 01 ~ 37 are for Beidou (BD PRN). GPS and Beidou satellites are differentiated by the GP and BD prefix. Maximally 12 satellites are included in each GSA sentence.
u.u	PDOP	Position dilution of precision (00.0 to 99.9)
v.v	HDOP	Horizontal dilution of precision (00.0 to 99.9)
z.z	VDOP	Vertical dilution of precision (00.0 to 99.9)
hh	Checksum	

GSV – GNSS Satellites in View

Number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value. Four satellites maximum per transmission.

Format:

$--GSV,x,u,xx,uu,vv,zzz,ss,uu,vv,zzz,ss,…,uu,vv,zzz,ss*hh<CR><LF>

Field	Name	Description
x	Number of message	Total number of GSV messages to be transmitted (1-3)
u	Sequence number	Sequence number of current GSV message
xx	Satellites in view	Total number of satellites in view (00 ~ 12)
uu	Satellite ID	01 ~ 32 are for GPS; 33 ~ 64 are for SBAS (PRN minus 87); 65 ~ 96 are for GLONASS (64 plus slot numbers); 193 ~ 197 are for QZSS; 01 ~ 37 are for Beidou (BD PRN). GPS and Beidou satellites are differentiated by the GP and BD prefix. Maximally 4 satellites are included in each GSV sentence.
Vv	Elevation	Satellite elevation in degrees, (00 ~ 90)
zzz	Azimuth	Satellite azimuth angle in degrees, (000 ~ 359)
ss	SNR	C/No in dB (00 ~ 99) Null when not tracking
hh	Checksum	

RMC – Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data provided by a GNSS navigation receiver.

Format:

$--RMC,hhmmss.sss,x,llll.lll,a,yyyyy.yyy,a,x.x,u.u,xxxxxx,,,v*hh<CR><LF>

Field	Name	Description
hhmmss.sss	UTC time	UTC time in hhmmss.sss format (000000.000 ~ 235959.999)
x	Status	Status 'V' = Navigation receiver warning 'A' = Data Valid
llll.lll	Latitude	Latitude in dddmm.mmmm format. Leading zeros are inserted.
A	N/S indicator	'N' = North; 'S' = South
yyyyy.yyy	Longitude	Longitude in dddmm.mmmm format. Leading zeros are inserted.
A	E/W Indicator	'E' = East; 'W' = West
x.x	Speed over ground	Speed over ground in knots (000.0 ~ 999.9)
u.u	Course over ground	Course over ground in degrees (000.0 ~ 359.9)
xxxxxx	UTC Date	UTC date of position fix, ddmmyy format
v	Mode indicator	Mode indicator 'N' = Data not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode
hh	checksum	

VTG – Course Over Ground and Ground Speed

The actual course and speed relative to the ground.

Format:

$--VTG,x.x,T,y.y,M,u.u,N,v.v,K,m*hh<CR><LF>

Field	Name	Description
x.x	Course	Course over ground, degrees True (000.0 ~ 359.9)
y.y	Course	Course over ground, degrees Magnetic (000.0 ~ 359.9)
u.u	Speed	Speed over ground in knots (000.0 ~ 999.9)
v.v	Speed	Speed over ground in kilometers per hour (0000.0 ~ 1800.0)
m	Mode	Mode indicator 'N' = not valid 'A' = Autonomous mode 'D' = Differential mode 'E' = Estimated (dead reckoning) mode
hh	Checksum	

ZDA – Time and Date

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

Format:

$--ZDA,hhmmss.sss,dd,mm,yyyy,xx,yy*hh<CR><LF>

Field	**Name**	**Description**
hhmmss.sss	UTC time	UTC time in hhmmss.sss format (000000.000 ~ 235959.999)
dd	UTC day	01 to 31
mm	UTC month	01 to 12
yyyy	UTC year	Four-digit year number
xx	Local zone hours	00 to +-13
yy	Local zone minutes	00 to +59
hh	Checksum	

Change Log

Ver 0.1, March 28, 2014

1. Initial release.