GPS/GLONASS
NV08C-RTK RECEIVERS

NMEA
PROTOCOL SPECIFICATION

Version 1.6

Revision History

Revision ID	Date	Description
0.1	December, 2014	First release of the document
0.2	January, 2015	$PNVGNME, $PNVGCFG messages added, $PNVGRTK message extended
0.3	February, 2015	$PNVGBSS, $PNVGTST messages added
1.0	March, 2015	$PNVGNME and $PNVGRZA messages description modified, $GPVTG, $GPZDA, $PNVGPPS and $PNVGIMU messages added, $PNVGRTK and $PNVGCFG messages extended
1.1	April, 2015	$GPVTG and $PNVGRTK messages extended $PNVGNME message description modified
1.2	April, 2015	$PNVGIDL message added
1.3	July, 2015	$PNVGBLS message added $PNVGRZB and $PNVGRTK messages extended
1.4	July, 2015	Removed 79-character limit for message length $PNVGBLS message description edited
1.5	March, 2016	$GPHDT, $PNVGVOG, $PNVGTME, $PNVGTMU, $PNVGTMC, $PNVGSDP, $PNVGSDV, $PNVGSDH messages added $PNVGBLS and $PNVGIMU messages extended by time tag $PNVGRTK message extended by RTCMRATE subcommand
1.6	May, 2017	$PNVGDOP and $PNVGBRS messages added $PNVGRTK message extended by ELMASKA, SNRMASKA, RTCMAGE, BASETH, BASENMEA, BASELINE subcommands List of saved parameters in $PNVGCFG message is extended

Contents

1 NMEA Protocol Overview

Communication with NV08C series receivers by means of NMEA messages are based on NMEA 0183 Version 4.00 specification. The NMEA 0183 protocol specification for Interfacing Marine Electronic Devices may be obtained from http://www.nmea.org.

The NMEA 0183 Protocol is a simple, yet comprehensive ASCII protocol which defines both the communication interface and the data format. The protocol was originally established to enable marine navigation equipment to share information. Since it is a well-established industry standard, NMEA 0183 has also gained popularity for use in applications other than marine electronics. This document provides an overview of the NMEA 0183 messages and describes both the standard and proprietary messages offered by the NV08C receiver series.

1.1 Serial Communication Port

Data transfers are performed via a RS-232C (COM) serial interface. The default COM-port settings for NMEA 0183 data transmission over a bidirectional serial RS-232C port are shown in the Table 1 below.

Table 1. Default COM-port settings for NMEA 0183 data transmissions

Start Bits	1
Data Bits	8
Parity	None (Disabled)
Flow control	None
Stop Bits	1

The transfer rate can be set in a range of 4,800 to 460,800 bits per second. By default the rate is set to 115,200 bits per second and can be changed by PNVGRZA NMEA message.

All transmitted data are represented by characters of the ASCII (ISO 8859-1) code.

The highest bit of the 8-bit sign is always transmitted as “0”.

1.2 NMEA Protocol Messages Format

There are two major types of NMEA messages supported by the NMEA protocol: Approved (Standard) messages and Proprietary (Additional) messages. Standard messages are defined by the NMEA standard while Proprietary messages are set by GNSS receiver manufacturers and are based on NMEA standard regulations. Standard messages are sent by a navigation receiver by default or as a reply to a Query message (Q). Proprietary messages may be defined as incoming (Input), outgoing (Output) or both.

The following drawing shows the structure of a NMEA protocol message:

NMEA Message Frame

$	Address,		{<value>}	*<checksum>	<CR><LF>
	← Checksum range →				
Start character	Address field. Divided into 2 fields		Data fields	Checksum field	End sequence
	Talker ID	Message ID			
1 character	Only Digits and uppercase letters. Address field shall not be a null field		Length may vary	3 characters	2 characters
"$" only (code 24h)	GP, GL, GN, GA or P for proprietary messages	See Messages Description below	Fields (even empty) are delimited by "," (code 2Ch)	Starts with "*" (code 2Ah). 2 ASCII characters representing hex number for checksum. Checksum is exclusive OR of all characters between "$" and "*"	<CR><LF> (codes 0Dh and 0Ah) only
EXAMPLE					
$	GP	VTG,	089.0,T,,,15.2,N,,	*7F	<CR><LF>
$GNGNS,122310.0,3722.425671,N,12258.856215,W,AA,15,0.9,1005.543,6.5,,*77<CR><LF>					

Address Fields

The Address field is divided into 2 fields. The first field of standard (output) messages must be 2 characters representing Taker ID: "GP" for GPS, "GL" – GLONASS, "GA" – GALILEO and "GN" for combined navigation solution (if information of more than one satellite navigation system is used for data generation). The second field of standard (output) messages must be 3 characters representing Message ID. Please refer to messages Message Description for further information regarding Talker ID and Message ID.

The first character of the Address field of Proprietary messages should be the character “P” followed by Sentence ID.

The query message address field consists of five characters and is used for the purpose of requesting transmission of a specific message(s). The first two characters are the Talker Identifier of the device requesting data, the next two characters are the Talker ID of the device being addressed (navigation receiver) and the final character is the query character “Q”.

Address field of the messages must contain only digits and uppercase letters and cannot be “null”.

Data fields

A data field consists of a string of valid characters (or no characters – null field) between two delimiters “,”. The string length may be fixed or variable. If a particular data field has zero length then only delimiter represents this field.

According to NMEA 0183 Latitude and Longitude are transmitted in the format Degrees, Minutes and (Decimal) Fractions of Minutes. Time is transmitted in the format Hours, Minutes, Seconds and (Decimal) Fractions of Seconds. Fractions are delimited by “.”. Both fractions and delimiter “.” Are optional.

Some (defined) fields are specified to contain pre-defined constants, most often alphabetic characters. Such fields are indicated in the NMEA standard by the presence of one or more valid characters. Excluded from the list of allowable characters are the following characters that are used to indicate field types: “A”, “a”, “c”, “hh”, “hhmmss.ss”, “llll.ll”, “x”, “yyyyy.yy”

Table 2. Message Data Fields Description

Field Type	Symbol	Definition
Status	A	Field length is one character. Position Fix Flag. Please refer to the Messages Description for further details.
Latitude	llll.lll	Fixed/variable length field. Degrees,Minutes,Decimal Fraction of Minutes – 2 digits for Degrees, 2 digits for Minutes and a variable number of digits for Decimal Fraction of Minutes. Leading zeros always included for Degrees and Minutes to maintain fixed length of the Degrees and Minutes fields. The decimal point and associated decimal-fraction are optional if full resolution is not required.
Longitude	yyyyy.yyy	Fixed/variable length field. Degrees,Minutes,Decimal Fraction of Minutes - 3 digits for Degrees, 2 digits for Minutes and a variable number of digits for Decimal Fraction of Minutes. Leading zeros always included for Degrees and Minutes to maintain fixed length of the Degrees and Minutes fields. The decimal point and associated decimal-fraction are optional if full resolution is not required.
Time	hhmmss.ss	Fixed/Variable length field: Hours,Minutes,Seconds, Decimal Fraction of Seconds – 2 digits for Hours, 2 digits for Minutes, 2 digits for Seconds and a variable number of digits for Decimal Fraction of Seconds. Leading zeros always included for Hours, Minutes and Seconds to maintain fixed length of the fields. The decimal point and associated

		decimal-fraction are optional if full resolution is not required.
Numeric Value Fields		
Variable length number	x.x	Variable length field for integer or fractional numbers. Leading and trailing zeroes are optional. The decimal point and associated decimal-fraction are optional if full resolution is not required (for example: 73.00 = 73.0 = 073.0 = 73). The specific use of this formatter and restrictions (for example; integer, range) is defined in the sentence definition.
Fixed length number	xx	Fixed length numbers, only decimal characters allowed
Fixed HEX	hh	Fixed length hexadecimal numbers only, Most significant bit (MSB) on the left
Variable HEX	h–h	Variable length hexadecimal numbers only, MSB on the left
Information Fields		
Fixed Alphabetic	aa	Fixed length field of upper-case or lower-case alphabetic characters
Variable length text	c–c	Variable length field of valid characters
Fixed length text	cc	Fixed length field of valid characters

Note 1 – Spaces may only be used in variable text fields.

Note 2 – A negative sign "-" (HEX 2D) is the first character in a Field if the value is negative. When it used, then this increments the specified size of fixed length fields by one. The sign is omitted if the value is positive.

Note 3 – Fixed length field definitions show the actual number of characters. For example: a field defined to have a fixed length of 5 HEX characters is represented as hhhhh between delimiters in a sentence definition.

Checksum

A checksum field is required and shall be transmitted in all sentences. The checksum field is the last field in a sentence and follows the checksum delimiter character "*".

The checksum is the 8-bit exclusive OR (no start or stop bits) of all characters in the sentence, including "," delimiters, between but not including the "$" and the "*" delimiters. The hexadecimal value of the most significant and least significant 4 bits of the result is converted to two ASCII characters (0-9, A-F (upper case)) for transmission. The most significant character is transmitted first.

2 NMEA Protocol Implementation

2.1 Data output cyclogram

Typically the receiver transmits messages each time it obtains the next navigation solution (each time new PVT is calculated). Data values of navigation solution corresponding to a time pulse N (see Figure 1) are sent in the *packet of* messages N approximately 100 ms after the time pulse. If a single output message is requested then the response message should appear in max 100 ms if no other messages are being transmitted at the same time.

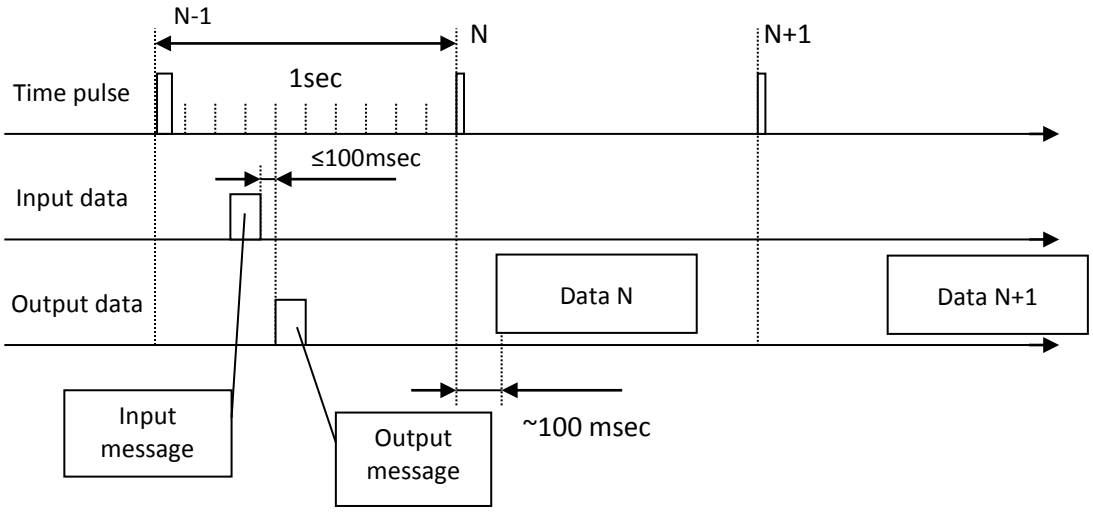


Figure 1. Data output cyclogram

The messages are transmitted in the same sequence as they were requested. The maximum number of output messages is 20. To avoid data omission the requested data rate shall match the communication channel and receiver capabilities.

If a port communication protocol change or rate change is requested (by a PNVGRZA – COM Port Setting message) then a PNVGRZA response message with new settings will be generated by a receiver. This PNVGRZA response message has no priority and will be sent in the same order as the messages were requested. The receiver will change the settings within 100 msec after the PNVGRZA output message is generated.

2.2 Geodetic Datum reference

The NV08C-RTK receiver provides data in WGS 84. Other local Geodetic Datum may be available in future.

2.3 Talker ID

According to the NMEA 0183 protocol, the Talker ID serves to define the navigation system(s) used for the reported position coordinates. If only GPS, GLONASS, GALILEO etc. are used for the reported position solution the Talker ID is GP, GL, GA etc. and the errors pertain to the individual system. If satellites from multiple systems are used to obtain the reported position solution, the Talker ID is GN and the errors pertain to the combined solution.

To allow customers to use software developed for interfacing GPS-only receivers a Compatibility mode is included in the communication protocol. In this mode the Talker ID of GGA and RMC messages is set to "GP" regardless of which system satellites are used for the reported position. The Compatibility mode may be enabled or disabled by using a $PNVGNME message.

2.4 Specific Output Data Attributes

The accuracy of output data (number of decimal digits after fixed point in fractional numbers) for Latitude, Longitude and Time can be set by using a $PNVGNME message.

The GGA message (Time, position and fix related data for a GPS receiver) transmits combined positioning data obtained by multiple navigation systems (GNSS), as opposed to the NMEA 0183 standard which specifies only GPS as a source for data calculation.

2.5 Navigation Receiver Default Settings

- Local geodetic datum – WGS 84
- Time – UTC
- Altitude – re: mean-sea-level (geoid)

2.6 Supported NMEA Messages Overview

NMEA messages supported by NV08C series receivers are listed in Table 3.

Table 3. Supported NMEA messages

Message ID	Reference	Message Description	Message Type
Standard (Approved messages)			
GGA	3.1	GGA – Global Positioning System Fix Data	Output
GSA	3.2	GSA – GNSS DOP and Active Satellites	Output
GSV	3.3	GSV – GNSS Satellites In View	Output
RMC	3.4	RMC – Recommended Minimum Specific GNSS Data	Output
VTG	3.5	VTG – Course over Ground & Ground Speed	Output
ZDA	3.6	ZDA – Time & Date	Output
HDT	3.7	HDT – True Heading	Output
Q	3.8	Q – Query Message	Query
Proprietary messages			
PNVGVER	4.1	PNVGVER – Receiver and FW information	Input/Output
PNVGNME	4.2	PNVGNME – Setting of NMEA Communication Parameters	Input/Output
PNVGRST	4.3	PNVGRST – Force Receiver Reset	Input
PNVGRZA	4.4	PNVGRZA – COM Port Setting	Input/Output
PNVGRZB	4.5	PNVGRZB – Extended Query Message	Input/Output
PNVGBSS	4.6	PNVGBSS – Base Station Statistics	Output
PNVGTST	4.7	PNVGTST – Test Results	Output
PNVGCFG	4.8	PNVGCFG – Save/Erase RTK Engine and Communication Ports settings	Input/Output
PNVGPPS	4.9	PNVGPPS – Time Pulse Settings	Input/Output
PNVGIMU	4.10	PNVGIMU – Attitude and NED-acceleration from IMU (MEMS)	Output
PNVGBRS	4.11	PNVGBRS – Base-to-Rover relative position and status	Output
PNVGBLS	4.12	PNVGBLS – Base-line State & Heading	Output
PNVGVOG	4.13	PNVGVOG – Velocity over Ground	Output
PNVGRTK	4.14	PNVGRTK – Setting of RTK Engine parameters	Input/Output
PNVGIDL	4.15	PNVGIDL – List of Known Base Stations	Input/Output
PNVGTME	4.16	PNVGTME – TOW-time of Time Mark Event	Output
PNVGTMU	4.17	PNVGTMU – UTC-time of Time Mark Event	Output
PNVGTMC	4.18	PNVGTMC – Global Positioning System Fix Data at Time Mark Event	Output
PNVGSDP	4.19	PNVGSDP – Standard deviation (rms) of Position	Output
PNVGSDV	4.20	PNVGSDV – Standard deviation (rms) of Velocity	Output

Message ID	Reference	Message Description	Message Type
PNVGSDH	4.21	PNVGSDH – Standard deviation (rms) of Heading	Output
PNVGDOP	4.22	PNVGDOP – DOPs for calculated position	Output

3 Standard (Approved) Messages

3.1 GGA – Global Positioning System Fix Data

Message Description

The GGA message outputs time, position and fix related data. The fix is based on all available GNSS. This message is similar to the NMEA GNS message.

Message Format

$ aa GGA ,hhmmss.s-s ,llll.l-l,a ,yyyyy.y-y,a ,x ,xx ,x.x ,x.x,M ,x.x,M ,x.x ,xxxx *hh <CR><LF>

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker ID (see chapter 2.3)
3	GGA	Message ID
4	hhmmss.s-s	Time of position fix
5	llll.l-l,a	Latitude, a a: N (North) or S (South)
6	yyyyy.y-y,a	Longitude, a a: E (East) or W (West)
7	x	Position Fix Flag 0 = Fix not available or invalid 1 = Position fix valid, autonomous mode 2 = Position fix valid, Differential mode 4 = Position fix valid, Real Time Kinematic 5 = Position fix valid, Float RTK 6 = Estimated data (extrapolation, dead reckoning)
8	xx	Number of satellites used in calculation
9	x.x	Horizontal dilution of precision (HDOP)
10	x.x,M	Altitude re: mean-sea-level (geoid), metres
11	x.x,M	Geoidal separation, metres Geoidal Separation: the difference between the WGS 84 earth ellipsoid surface and mean-sea-level (geoid)surface, "-" = mean-sea-level surface below WGS 84 ellipsoid surface.
12	x.x	Age of Differential GNSS data. Time interval in seconds between current time and reference time of the latest receiver RTCM message, null field when RTCM is not used.
13	xxxx	Differential reference station ID, 0000-1023. Null field when DGNSS is not used
14	*hh	Checksum indicator ("*", code 2Ah) and checksum
15	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

When Talker ID is always "GP".

```
$ GP GGA ,152835.00 ,5554.0114,N ,03732.5007,E ,1 ,13 ,00.8 ,170.4,M ,14.5,M  ,  , *5E <CR><LF>
1  2  3      4          5          6          7  8  9     10     11    12 13 14    15
```

When Talker ID depends on what systems are used to get navigation parameters:

GNSS fix:

```
$ GN GGA ,150947.00 ,5554.0083,N ,03732.502,E ,1 ,15 ,00.6 ,190.6,M ,14.5,M  ,  , *78 <CR><LF>
1  2  3      4          5          6          7  8  9     10     11    12 13 14    15
```

GPS only fix:

```
$ GP GGA ,151114.00 ,5554.0093,N ,03732.5027,E ,1 ,11 ,00.7 ,196.4,M ,14.5,M  ,  , *5E <CR><LF>
1  2  3      4          5          6          7  8  9     10     11    12 13 14    15
```

GLONASS only fix:

```
$ GL GGA ,150626.00 ,5554.0097,N ,03732.4979,E ,1 ,06 ,01.2 ,192.6,M ,14.5,M  ,  , *46 <CR><LF>
1  2  3      4          5          6          7  8  9     10     11    12 13 14    15
```

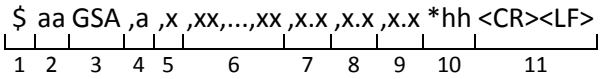
3.2 GSA – GNSS DOP and Active Satellites

Message Description

The GSA message contains the GNSS receiver's operating mode, satellites used for calculation of the PVT data transmitted by the GGA message and DOP values.

The GPS satellites are identified by their PRN, which range from 1 to 32. The WAAS system has numbers 33 to 64 to identify its satellites. The numbers 65 to 95 are used for GLONASS satellites (64 + satellite slot number).

Message Format

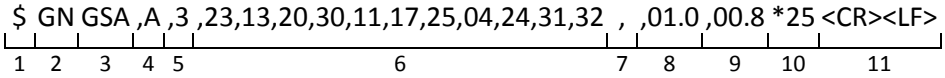


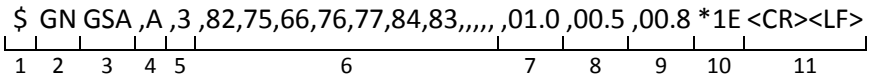
Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker ID "GN" = GNSS mode "GP" = GPS only mode "GL" = GLONASS only mode
3	GSA	Message ID
4	a	Mode: M = Manual, forced to operate in 3D mode A = Automatic switching between 2D and 3D modes
5	x	Current Mode: 1 = Fix not available 2 = 2D mode 3 = 3D mode
6	xx,...,xx	ID numbers of satellites used in solution - GPS from 1 to 32. - WAAS from 33 to 64. - GLONASS from 65 to 96.
7	x.x	Position dilution of precision (PDOP)
8	x.x	Horizontal dilution of precision (HDOP)
9	x.x	Vertical dilution of precision (VDOP)
10	*hh	Checksum indicator ("*", code 2Ah) and checksum
11	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

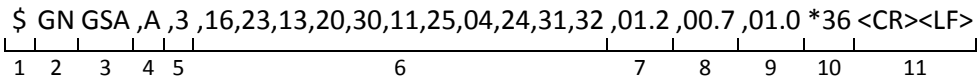
Examples

GNSS mode:

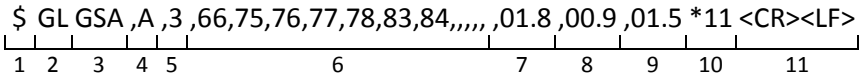




GPS only:



GLONASS only:



3.3 GSV – GNSS Satellites In View

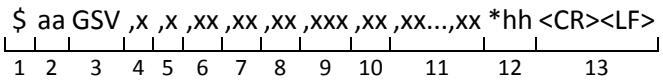
Message Description

The GSV message identifies the number of satellites (SV) in view, satellites' PRN numbers, elevation, azimuth and SNR value. One GSV message may contain data for one to four satellites. If more than 4 satellites are in view then additional GSV messages will be generated. Total number of messages being transmitted and the number of the current message are indicated in the first two fields of the message.

If multiple GPS, GLONASS, etc. satellites are in view, then separate GSV messages with Talker ID GP for GPS satellites in view, GL for GLONASS and GA for GALILEO satellites will be generated.

The GN Talker ID should not be used with this message.

Message Format

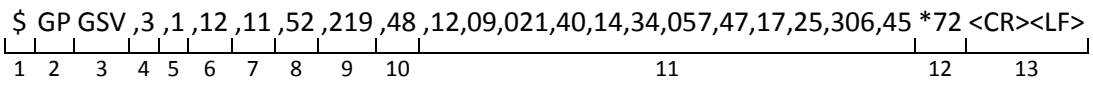


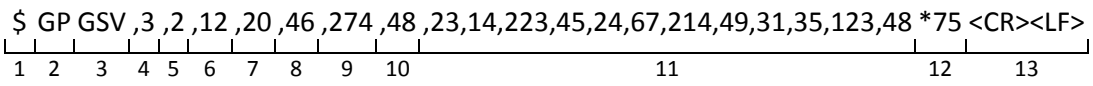
Message Fields

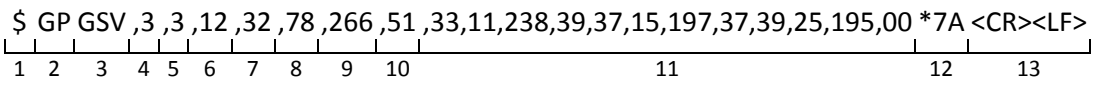
#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker ID "GP" = GPS satellites "GL" = GLONASS satellites "GA" = GALILEO satellites
3	GSV	Message ID
4	x	Total number of messages, 1 to 9
5	x	Message number, 1 to 9
6	xx	Total number of satellites in view
7	xx (xxx for GALILEO)	Satellite PRN number
8	xx	Elevation, degrees, 90° maximum
9	xxx	Azimuth, degrees True, 000°to 359°
10	xx	SNR 00-99 dBHz, null or blank when no tracking
11	xx,...,xx	PRN, elevation, azimuth and SNR for 2nd, 3rd and 4th SV
12	*hh	Checksum indicator ("*", code 2Ah) and checksum
13	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

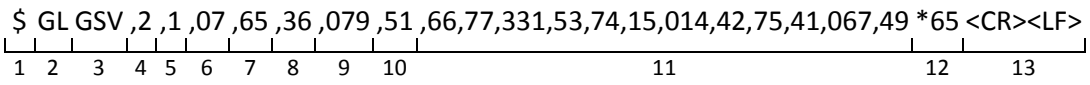
Examples

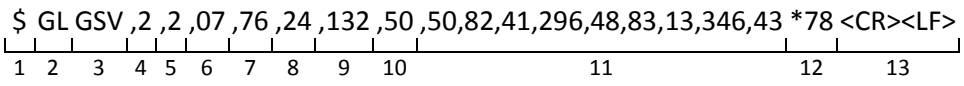
Data transmission for GPS + GLONASS + SBAS fix:









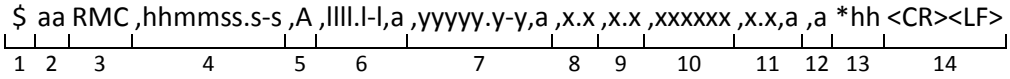


3.4 RMC – Recommended Minimum Specific GNSS Data

Message Description

The RMC message contains the time, date, position, course and speed data provided by the GNSS navigation receiver. A checksum is mandatory for this message and the transmission interval may not exceed 2 seconds. All data fields must be provided unless the data is temporarily unavailable. Null fields may be used when data is temporarily unavailable.

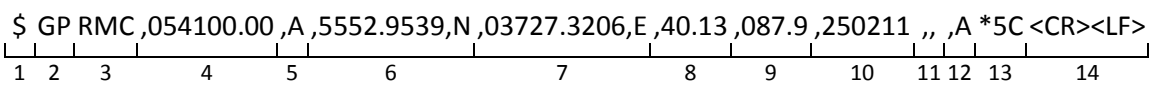
Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker ID (see 2.3)
3	RMC	Message ID
4	hhmmss.s-s	Time of position fix
5	A	Status A = Data valid V =Data not valid
6	llll.l-l,a	Latitude, a a: N (North) or S (South)
7	yyyyy.y-y,a	Longitude, a a: E (East) or W (West)
8	x.x	Speed over Ground (SoG), knots
9	x.x	Course over Ground (CoG), degrees True
10	xxxxxx	Date: ddmmyy (day/month/year)
11	x.x,a	Magnetic variation (in degrees), a a: E (East) or W (West) **Note** – The field is empty in the current protocol release.
12	a	Mode Indicator A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic E = Estimated (dead reckoning) mode N = Data not valid
13	*hh	Checksum indicator (“*”, code 2Ah) and checksum
14	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

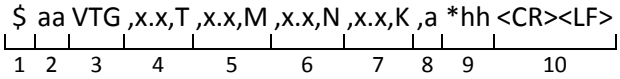


3.5 VTG – Course over Ground & Ground Speed

Message Description

The VTG message provides actual course (CoG) and speed (SoG) relative to the ground.

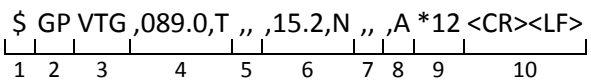
Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker ID (see 2.3)
3	VTG	Message ID
4	x.x,T	Course over Ground (CoG), degrees True
5	x.x,M	Course over Ground (CoG), degrees Magnetic **Note** – The field is empty in the current protocol release.
6	x.x,N	Speed over Ground (SoG), knots
7	x.x,K	Speed over Ground (SoG), km/hr
8	a	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic E = Estimated (dead reckoning) mode N = Data not valid
9	*hh	Checksum indicator (“*”, code 2Ah) and checksum
10	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples



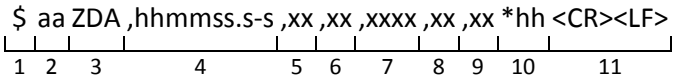
3.6 ZDA – Time & Date

Message Description

The ZDA message provides UTC, day, month, year and local time zone.

The Local time zone is presented by the number of hours and minutes that have to be added to local time in order to get the UTC time. Local zone is generally negative for East longitudes with local exceptions near the International Date Line.

Message Format

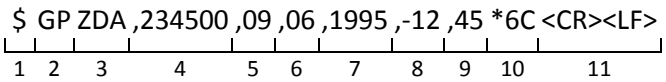


Message Fields

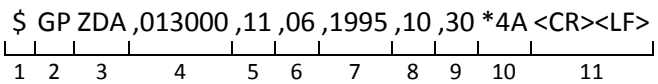
#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker ID (see 2.3)
3	ZDA	Message ID
4	hhmmss.s-s	Time
5	xx	Day, 01 to 31
6	xx	Month, 01 to 12
7	xxxx	Year
8	xx	Local zone hours, 00 to ±13 hrs
9	xx	Local zone minutes, 00 to +59
10	*hh	Checksum indicator (“*”, code 2Ah) and checksum
11	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

At Chatham Is., New Zealand at 12:30 (noon) local time on June 10, 1995:



In the Cook Islands at 15:00 local time on June 10, 1995:



3.7 HDT – True Heading

Message Description

The HDT message provides true heading in degrees.

Note – HDT message is supported by NV08C-RTK-A devices only.

Message Format

```
$ aa HDT ,x.x,T *hh <CR><LF>
1  2   3    4    5     6
```

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker ID (see 2.3)
3	HDT	Message ID
4	x.x,T	True Heading, degrees **Notes:** - True Heading can only be provided by NV08C-RTK-A devices - in case of no available True Heading this data filed is provided as blank
5	*hh	Checksum indicator (“*”, code 2Ah) and checksum
6	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

True Heading is available:

```
$ GP HDT ,32.48,T *38 <CR><LF>
1  2   3     4      10     11
```

True Heading is not available:

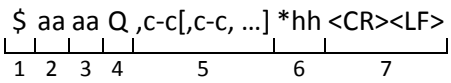
```
$ GP HDT ,,T *1B <CR><LF>
1  2   3   4  10     11
```

3.8 Q – Query Message

Message Description

The Q message is a query for a required standard (approved) or proprietary NMEA message.

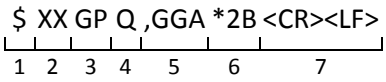
Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	aa	Talker Identifier of the device requesting data, might be any
3	aa	Talker ID (must be always “GP”)
4	Q	Message ID
5	c-c	ID of the requested NMEA message. For the standard messages – three characters of the message address (see NMEA message structure in Protocol Overview); for proprietary message – all 7 characters of the address.
6	*hh	Checksum indicator (“*”, code 2Ah) and checksum
7	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples



4 Proprietary Messages

4.1 PNVGVER – Receiver and FW information

Message Description

The PNVGVER message provides information on the manufacturer, receiver and FW version.

Message Format

$ PNVGVER ,c-c ,c-c ,xxxx *hh <CR><LF>

1 2 3 4 5 6 7

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGVER	Address field
3	c-c	Text field, Manufacturer's ID = **NVS**
4	c-c	Text field, Device ID = **RTK** (NV08C-RTK device) or **RTA** (NV08C-RTK-A device)
5	xxxx	RTK FW version
6	c-c	Text field, NV08C-CSM HW ID = **CSM24**
7	xxxx	CSM FW version
8	*hh	Checksum indicator ("*", code 2Ah) and checksum
9	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

$ PNVGVER ,NVS ,RTK ,0102 ,CSM24 ,P305 *5A <CR><LF>

1 2 3 4 5 6 7 8 9

Request message

$PNVGVER*4E<CR><LF>

4.2 PNVGNME – Setting of NMEA Communication Parameters

Message Description

The PNVGNME message sets NMEA communication parameters: time and position output resolution, Talker ID compatibility mode. As a reply to PNVGNME message the receiver sends the PNVGNME response message with new NMEA communication parameters and then switches to the new settings.

Message Format

$ PNVGNME, x [,x] [,x] *hh <CR><LF>

1 2 3 4 5 6 7

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGNME	Address field
3	x	Number of digits in fractional part of time output, permitted values 0 to 6 (2 by default)
4	x	Number of digits in fractional part of position output, permitted values 0 to 9 (7 by default)
5	x	Set compatibility mode for Talker ID (see Chapter 2.3): 0 – Talker ID for GGA and RMC always “GP” (by default) 1 – Compatibility mode Off. Talker ID as specified in messages description **Note** – The field is optional and can be omitted
6	*hh	Checksum indicator (“*”, code 2Ah) and checksum
7	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

$ PNVGNME ,2 ,7 ,0 *51 <CR><LF>

1 2 3 4 5 6 7

4.3 PNVGRST – Force Receiver Reset

Message Description

The PNVGRST message forces the receiver to reset.

Message Format

$ PNVGRST ,x *hh <CR><LF>

1 2 3 4 5

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGRST	Address field
3	x	Reset type: F – Keep user settings and Cold Start. W – Keep user settings and Warm restart
4	*hh	Checksum indicator (“*”, code 2Ah) and checksum
5	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

1. Cold Start with return to factory settings

$ PNVGRST ,F *30 <CR><LF>

1 2 3 4 5

2. Warm Start:

$ PNVGRST ,W *21 <CR><LF>

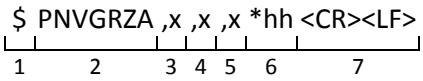
1 2 3 4 5

4.4 PNVGRZA – COM Port Setting

Message Description

The PNVGRZA message contains the receiver COM port settings: protocol NMEA/RTCM and baud rate. As a reply to PNVGRZA message the receiver sends the PNVGRZA response message with new COM port settings and then switches to the new settings.

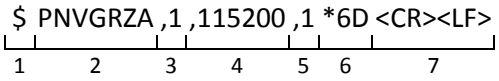
Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGRZA	Address field
3	x	COM port number to be set: 0 – current port 1 – COM1 (UART 1) 2 – COM2 (UART 2) 3 – USB
4	x	Port baud rate, in bauds from 4,800 to 460,800
5	x	Protocol type: 0 – disable 1 – NMEA 0183 7 – RTCM
6	*hh	Checksum indicator (“*”, code 2Ah) and checksum
7	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples



Response: $PNVGRZA,1,115200,1*6D<CR><LF>

4.5 PNVGRZB – Extended Query Message

Message Description

The PNVGRZB message sets a list of transmitted NMEA messages and output rates for the messages, or clears the earlier preset list.

Message Format

Message Format to clear the list of transmitted messages:

$ PNVGRZB *hh <CR><LF>

Message Format to add messages to be transmitted to the list:

$ PNVGRZB [,PORT,x] ,c-c ,x [,c-c,x…] *hh <CR><LF>

1 2 3 4 5 6 7 8

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGRZB	Address field
3	[PORT,x]	x defines the port number for the following settings 0 – current port; 1 – UART 1; 2 – UART 2; 3 – USB **Note** – The field is optional and can be omitted. If the field is omitted the setting are related to the current port
4	c-c	Addresses of the required messages (3 last characters for standard messages and all address field characters or 3 last characters for proprietary messages)
5	X	Message output rate in PVT update intervals **Note:** PVT update interval (in sec) is a value opposite to PVT update rate (in Hz) (see Message 4.14 PNVGRTK – Setting of RTK Engine parameters) Setting the output rate to 1 will request messages to output every time a new PVT is calculated. Setting the output rate to N will request messages to output one time after N times of PVT calculation.
6	[,c-c,x…]	When several messages are to be added to the list then the Fields 3 and 4 should be set for each of requested messages
7	*hh	Checksum indicator (“*”, code 2Ah) and checksum
8	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

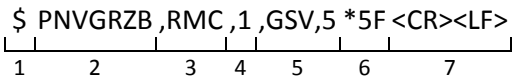
1. Delete all messages from the output list of the current port:

$PNVGRZB*45<CR><LF>

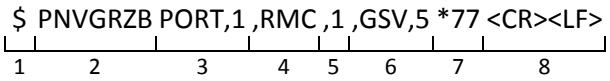
2. Delete all messages from the output list for UART2 port:

$PNVGRZB,PORT,2*6E<CR><LF>

3. Set output rate of RMC messages to 1 and GSV messages to 5 (GSV messages will be transmitted every fifth PVT calculation):



4. Set output rate of RMC messages to 1 and GSV messages to 5 (GSV messages will be transmitted every fifth PVT calculation) for UART1:

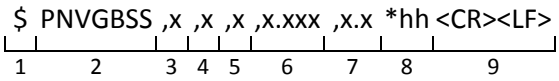


4.6 PNVGBSS – Base Station Statistics

Message Description

The PNVGBSS message provides the current status of data received from Base Station.

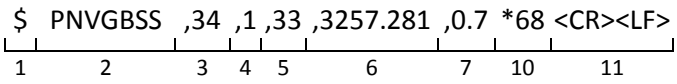
Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGBSS	Address field
3	x	Number of received RTCM messages
4	x	Number of RTCM messages received with errors
5	x	Number of RTCM messages received no errors
6	x.xxx	Current distance to Base Station, metres
7	x.x	RTCM Data Age. Time interval in seconds between current time and reference time of the latest receiver RTCM message. Supported values: 0…999.9 seconds In case of no RTCM messages are received after receiver restart this field is blank.
8	*hh	Checksum indicator (“*”, code 2Ah) and checksum
9	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples



4.7 PNVGTST – Test Results

Message Description

The PNVGTST message provides information on internal test results. The message is transmitted once the receiver starts and can be requested by a Q query message or PNVGRZB – Extended Query Message.

Message Format

$ PNVGTST ,sx ,cx [,sx,cx…] *hh <CR><LF>

1 2 3 4 5 6 7

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGTST	Address field
3	sx	Test name: ID – device ID ANT – antenna test
4	cx	Test result: ID: device ID (decimal number) ANT: 0 – active antenna is connected, 1 – no antenna, 2 – short circuit
5	[,sx,cx…]	[,sx,cx] fields are repeated for all the test listed in row #3
6	*hh	Checksum indicator (“*”, code 2Ah) and checksum
7	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Examples

$ PNVGTST ,ID ,268435534 ,ANT,0 *33 <CR><LF>

1 2 3 4 5 6 7

Test results requests:

Single request:

$GPGPQ,PNVGTST*21<CR><LF>

Request for periodical output of TST message:

$PNVGRZB,PNVGTST,10*18<CR><LF>

4.8 PNVGCFG – Save/Erase RTK Engine and Communication Ports settings

Message Description

The PNVGCFG message performs saving of the current RTK Engine and communication ports settings to FLASH memory and erasing of the previously saved settings (restore default settings).

The following settings will be saved/erased by sending of PNVGCFG message:

- current protocol (NMEA or RTCM), output message list and baud rates for all communication ports
- RTK mode (Autonomous, RTK Base, RTK Rover, RTK Base with automatic position averaging)
- RTK PVT rate
- used navigation system (GPS & GLONASS, GPS only, GLONASS only)
- GPS and GLONASS elevation and SNR mask
- differential age threshold
- coordinates of antenna phase center for Base mode, Station ID, RTCM rate, coordinates checking threshold and type of coordinates used for NMEA output
- time and mode of position averaging for RTK Base with automatic position averaging mode (see in Table 4 in 4.14 PNVGRTK – Setting of RTK Engine parameters)
- GLONASS Inter-Channel Bias value, calibration mode and time interval
- Secondary Filter settings: mode and transferring speed
- Delta-Phase Filter mode
- Baseline length for heading mode
- PPS settings
- Initial GPS Week Number for Cold Start
- List of known Base Stations

Message Format

$ PNVGCFG ,x *hh <CR><LF>
1 2 3 4 5

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGCFG	Address field
3	x	Saving / erasing of settings: W – save (write) settings to FLASH E – erase (restore default settings) R – erase and restart
4	*hh	Checksum indicator (“*”, code 2Ah) and checksum
5	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

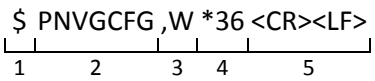
Response message

To confirm successful saving or erasing of the settings the receiver will reply by the response PNVGCFG message:

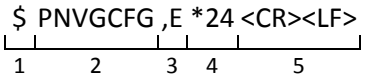
$ PNVGCFG ,OK *65 <CR><LF>
1 2 3 4 5

Examples

Save settings to FLASH memory:



Erase settings in FLASH memory:

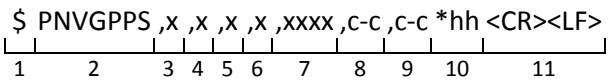


4.9 PNVGPPS – Time Pulse Settings

Message Description

The PNVGPPS message sets and confirms the Time pulse parameters.

Message Format

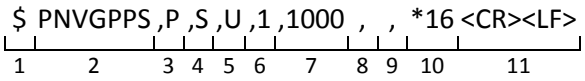


Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGPPS	Address field
3	x	Time pulse type: P (by default) – software-synchronized Time pulse (see parameter #5) A – hardware-synchronized Time pulse (aligned to internal timescale)
4	x	SW defined Time pulse parameters: I – interval Time pulse. Time pulse generated at PVT update rate S (by default) – 1PPS time pulse. One pulse per second is generated
5	x	1PPS Time pulse reference: U – UTC (by default) S – UTC(SU) G – GLONASS time N – GPS time This field is applicable for 1PPS Time pulse only.
6	x	Internal receiver timescale adjustment: 1 – On (by default). Internal receiver timescale is adjusted once the offset to UTC is higher than 1 millisecond 0 – Off (Not recommended)
7	xxxx	SW defined Time pulse duration in microseconds (1 to 1000 microseconds) (1000 by default)
8	x	PPS validity control. Allows PPS signal output only in case of valid navigation and availability of UTC parameters transmitted in navigation frame E – enabled, D – disabled (by default)
9	xxxx	Delay in antenna cable in nanoseconds (0 by default)
10	*hh	Checksum indicator (“*”, code 2Ah) and checksum
11	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

NOTE – If a parameter setting is not supposed to be changed by the PNVGPPS message then the corresponding field should be left empty. After changing of the settings a response PNVGPPS message will be generated.

Examples



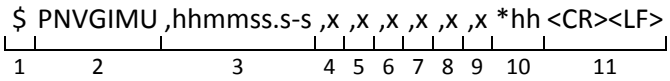
Response: $PNVGPPS,P,S,U,1,1000,D,0*62<CR><LF>

4.10 PNVGIMU – Attitude and NED-acceleration from IMU (MEMS)

Message Description

The PNVGIMU provides the current attitude (roll, pitch and yaw) and NED-acceleration (an, ae, ad).

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGIMU	Address field
3	hhmmss.s-s	Time of position fix
4	x	roll, degrees
5	x	pitch, degrees
6	x	yaw, degrees
7	x	an, m/s^2 (North)
8	x	ae, m/s^2 (East)
9	x	ad, m/s^2 (Down)
10	*hh	Checksum indicator (“*”, code 2Ah) and checksum
11	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

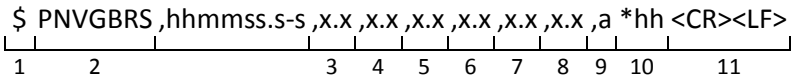
$PNVGIMU,145505.20,0.42,0.37,21.84,0.065,0.064,-0.201*7C

4.11 PNVGBRS – Base-to-Rover relative position and status

Message Description

The PNVGBRS provides current Base-to-Rover relative and angular position and status.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGBRS	Address field
3	hhmmss.s-s	Time of position (heading) fix
4	x.x	North-projection of Base-to-Rover base-line, m
5	x.x	East-projection of Base-to-Rover base-line, m
6	x.x	Vertical-projection of Base-to-Rover base-line, m
7	x.x	Base-to-Rover base-line length (Rover-to-Base distance), m
8	x.x	Base-to-Rover base-line course (angle between base-line vector and North direction), degrees
9	x.x	Base-to-Rover base-line pitch (angle between base-line vector and horizon), degrees
10	a	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic E = Estimated (dead reckoning) mode N = Data not valid
11	*hh	Checksum indicator (“*”, code 2Ah) and checksum
12	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

$PNVGBRS,091244.60,4604.566,-1242.064,-27.096,4769.223,344.90,-0.33,R*1A

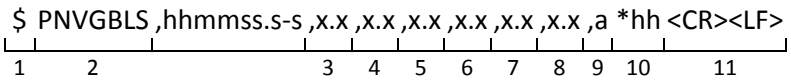
4.12 PNVGBLS – Base-line State & Heading

Message Description

The PNVGBLS provides current ANT1-ANT2 base-line state and heading parameters.

Note – PNVGBLS message is supported by NV08C-RTK-A devices only.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGBLS	Address field
3	hhmmss.s-s	Time of position (heading) fix
4	x.x	North-projection of ANT1-ANT2 base-line, m
5	x.x	East-projection of ANT1-ANT2 base-line, m
6	x.x	Vertical-projection of ANT1-ANT2 base-line, m
7	x.x	ANT1-ANT2 base-line length, m
8	x.x	ANT1-ANT2 base-line course (angle between base-line vector and North direction), degrees
9	x.x	ANT1-ANT2 base-line pitch (angle between base-line vector and horizon), degrees
10	a	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic (True Heading) E = Estimated (dead reckoning) mode N = Data not valid
11	*hh	Checksum indicator (“*”, code 2Ah) and checksum
12	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

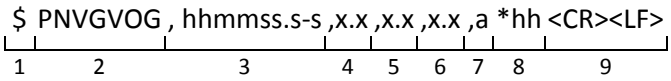
$PNVGBLS,145505.20,0.437,0.374,-0.040,0.576,40.61,-4.01,R*1A

4.13 PNVGVOG – Velocity over Ground

Message Description

The PNVGVOG provides current velocity over Ground.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGVOG	Address field
3	hhmmss.s-s	Time of position fix
4	x.x	North velocity, m/s
5	x.x	East velocity, m/s
6	x.x	Vertical velocity, m/s
7	a	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic E = Estimated (dead reckoning) mode N = Data not valid
8	*hh	Checksum indicator (“*”, code 2Ah) and checksum
9	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

$PNVGVOG,140327.80,1.437,5.374,-0.041,R*08

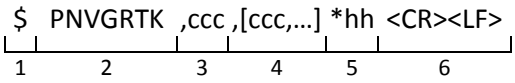
4.14 PNVGRTK – Setting of RTK Engine parameters

Message Description

The PNVGRTK message sets and requests the RTK Engine parameters: operation mode, used satellite systems, min satellite elevation angle, PVT update rate, min SNR etc.

The PNVGRTK message may set or request one or several parameters of RTK Engine settings. Parameters to be set or requested may be included in one PNVGRTK message in any combination. Parameters followed by a value will be interpreted as parameters to be set and parameters with omitted values – as requested parameters. Values of all parameters included in to the PNVGRTK query message will be present in the PNVGRTK response message.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGRTK	Address field
3	ccc	Parameter to be set/requested
4	[ccc,…]	Value(s) to be set/requested
5	*hh	Checksum indicator (“*”, code 2Ah) and checksum
6	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Supported parameters are listed in the Table below:

Table 4. Supported Parameters of RTK Engine

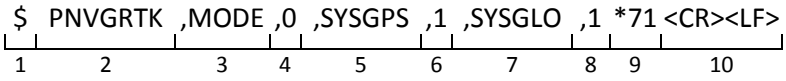
Parameter	Data Fields	Description
MODE	,x	Setting of operation mode: 0 – Autonomous Mode 1 – Base Station Mode 2 – RTK-Rover Mode (by default) 3 – Base Station Mode with automatic antenna position averaging 4 – RTK Rover + Heading Mode. NV08C-RTK-A only
PVTRATE	,x	PVT rate, Hz (1, 2, 5 by default, 10)
SYSGPS	,x	1 – GPS ON (by default), 0 – GPS OFF
SYSGLO	,x	1 – GLONASS ON (by default), 0 – GLONASS OFF
SYSSBAS	,x	1 – SBAS ON (by default), 0 – SBAS OFF
ELGPS	,x	GPS Elevation Mask for RTK mode, degrees (5 by default)
ELGLO	,x	GLONASS Elevation Mask for RTK mode, degrees (5 by default)
ELSBAS	,x	SBAS Elevation Mask for RTK mode, degrees (5 by default)

Parameter	Data Fields	Description
ELMASKA	,x	Elevation Mask for Autonomous mode, degrees (5 by default)
SNR	,x	SNR Mask for RTK mode, dB-Hz (33 by default)
SNRMASKA	,x	SNR Mask for Autonomous mode, dB-Hz (12 by default)
RTCMAGE	,x	Differential age threshold (max age of RTCM data to use for RTK), seconds (45 by default)
BASEID	,x	Station ID for Base mode, 0 - 4095 (2 by default)
RTCMRATE	,x	Rate of RTCM messages with raw data (#1002 and #1010): 0 – RTCM rate is the same as PVT rate 1 (by default), 2, 5, 10 – interval between RTCM messages, seconds
BASEXYZ	,x,x,x	Base Station Antenna Reference Point ECEF-X,Y,Z, m
BASEBLH	,B,L,H or ,NMEA	Base Station Antenna Reference Point. Two formats are supported: - B,L,H (radians for B and L, metres for H) - NMEA message format
BASETH	,x	BASE coordinates checking threshold, m (500 m by default) Note: if distance between BASE coordinates and current 3D-position in BASE mode exceeds thies threshold then RTCM output is stopped, current 3D-position is provided in NMEA messages and BSS message shows distance between BASE coordinates and current 3D-position
BASENMEA	,x	Type of coordinates used for NMEA output in BASE mode: 0 – BASE coordinates (by default) 1 – current 3D-coordinates
AVGTIME	,x	Antenna position averaging time for Base mode, minutes (30 by default)
AVGMODE	,x	Type of coordinates used for antenna position averaging: 0 (by default) – any valid coordinates, 1 – Fixed & Float, 2 – Fixed only
RAIM	,x	RAIM mode: 0 – OFF, 1 – ON (by default)
SFMODE	,x	Secondary filter mode: 0 (by default) – DISABLE: Output coordinates correspond to the current position type (3D/Float/Fix) with possible discontinuity in the position when the receiver transitions from one position type to another one 1 – RETAIN: Retain the relative offset of the position. There is no discontinuity in the position when the position type changes. Any offset in the position is maintained 2 – TRANSITION: The position will slowly transition to the new position type with the transferring speed specified by the Transfer Speed parameter. There is no discontinuity in the position when the position type changes. 3 – HYBRID: TRANSITION mode when changing from less accurate positioning type to more accurate position type. RETAIN mode

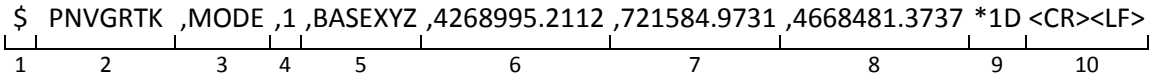
Parameter	Data Fields	Description
		when changing from more accurate positioning type to a less accurate positioning type.
SFTRS	,x	Transfer Speed for Secondary Filter, m/s (0.05 by default)
DPFMODE	,x	Delta-Phase Filter mode: 0 – OFF (by default), 1 – ON
VRSMODE	,x	VRS mode: 0 – OFF (by default), 1 – ON
ICBGLO	,x	GLONASS Inter-Channel Bias (0 by default). Value is defined as shift between phases of nearest GLONASS carriers in parts of phase cycle
ICBMODE	,x	GLONASS Inter-Channel Bias calibration mode: 0 – OFF (by default for RTK FW 0028 and earlier) 1 – initial calibration (one time calibration using GPS as reference) 2 – real-time recalibration (in parallel with GPS&GLONASS Fix, by default for RTK FW 0029)
ICBTIME	,x	GLONASS Inter-Channel Bias calibration interval (length of one step of calibration), seconds (20 by default)
ICBMBGLO	,x	GLONASS Inter-Channel Bias for moving-base mode (0 by default). Value is defined as shift between phases of nearest GLONASS carriers in parts of phase cycle
ICBMBMODE	,x	GLONASS Inter-Channel Bias calibration mode for moving-base mode: 0 – OFF (by default) 1 – initial calibration (one time calibration using GPS as reference) 2 – real-time recalibration (in parallel with GPS&GLONASS Fix)
ICBMBTIME	,x	GLONASS Inter-Channel Bias calibration interval for moving-base mode (length of one step of calibration), seconds (20 by default)
BASELINE	,x	ANT1-ANT2 base-line length for Heading mode, metres (0.0 by default which means base-line constrain is disable)
INITGPSWEEK	,x	Initial GPS Week Number for counting time in Cold Start mode (default value depends on RTK FW release date)

Examples

Turn on RTK-Rover GPS & GLONASS mode:



Turn on Base Station mode and Antenna Reference Point setting:



Response:

$PNVGRTK,MODE,1,BASEXYZ,4268995.2112,721584.9731,4668481.3737*1D

Setting of Antenna Reference Point for Base mode in BLH format:

$	PNVGRTK	,BASEBLH	,4720.9382274	,N	,00935.6386753	,E	,467.704	*07	<CR><LF>
1	2	3	4	5	6	7	8	9	10

Response:

$PNVGRTK,BASEBLH,0.8263954319,0.1674465031,467.7040*04

Request of current Antenna Reference Point settings:

$	PNVGRTK	,BASEXYZ	*20	<CR><LF>
1	2	3	9	10

Response:

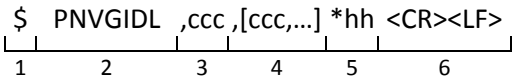
$PNVGRTK,BASEXYZ,4268995.2112,721584.9731,4668481.3737*2F

4.15 PNVGIDL – List of Known Base Stations

Message Description

The PNVGIDL message provides control of the known base stations' list. Each base station in the list is represented by two parameters: Station ID and GLONASS ICB (Inter-Channel Bias) value. Maximum number of the stored base stations is 32. By means of PNVGIDL message base stations may be added to or removed from the list and the receiver may be forced to accept base stations only from the list.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGIDL	Address field
3	ccc	Subcommand
4	[ccc,…]	Value(s) to be set/requested
5	*hh	Checksum indicator ("*", code 2Ah) and checksum
6	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

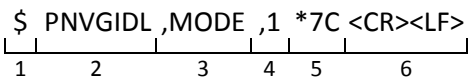
Supported subcommands are listed in the Table below:

Table 5. Supported Subcommands of $PNVGIDL message

Parameter	Data Fields	Description
MODE	,x	Setting of operation mode: 0 – the receiver may use any Base Station (by default) 1 – only Base Stations from the list are allowed
ADD	[,x[,x]]	Add Station to list: Optional parameters: 1th parameter – Station ID 2th parameter – GLONASS ICB value for the Station If both parameters are omitted the current Station ID and the current GLONASS ICB value will be added to the list. In case the GLONASS ICB is omitted the specified Station ID will be added to the list with current GLONASS ICB.
REMOVE	,x	Remove Base Station with specified ID from the list
CLEAR		Clear station list (remove all Base Stations from the list)
SHOW		Show Base Station list. The corresponding number of PNVGIDL response massages will be generated (see below)

Examples

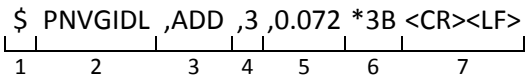
Turn on using of Station ID only from the list:



Response:

$PNVGIDL,MODE,1*7C

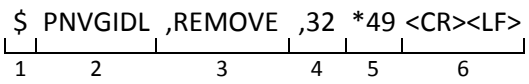
Add station with ID = 0003 and GLONASS ICB = 0.072 to the list:



Response:

$PNVGIDL,ADD,0003,0.0720*3B

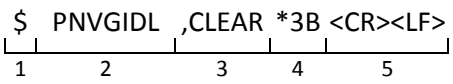
Remove station with ID = 0032 from the list:



Response:

$PNVGIDL,REMOVE,OK*4C

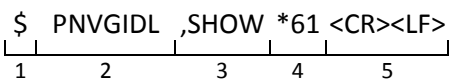
Clear the Base Station list (remove all stations from the list):



Response:

$PNVGIDL,CLEAR,OK*13

Show the current Base Station list:



Response:

$PNVGIDL,4,1,0001,0.0000*54

$PNVGIDL,4,2,0002,0.0020*56

$PNVGIDL,4,3,0032,0.0000*56

$PNVGIDL,4,4,0043,0.0720*52

There are 4 items in the list. The first parameter of the response message is the current length of the list; the second parameter is index of the item in the list; the third and the forth parameters are Station ID and GLONASS Inter-Channel Bias value for the Base Station.

4.16 PNVGTME – TOW-time of Time Mark Event

Message Description

The PNVGTME provides Time of Week (TOW) value of the leading edge of the detected mark input pulse.

Message Format

$ PNVGTME ,x ,x.x *hh <CR><LF>

1 2 3 4 5 6

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGTME	Address field
3	x	Time Mark Event Counter
4	x.x	Time of Week value of Time Mark Event, seconds
5	*hh	Checksum indicator (“*”, code 2Ah) and checksum
6	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

$PNVGTME,128,40327.564756284*49

4.17 PNVGTMU – UTC-time of Time Mark Event

Message Description

The PNVGTMU provides UTC time of the leading edge of the detected mark input pulse.

Message Format

$ PNVGTMU ,x ,hhmmss.s-s *hh <CR><LF>

1 2 3 4 5 6

Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGTMU	Address field
3	x	Time Mark Event Counter
4	hhmmss.s-s	UTC time of Time Mark Event, seconds
5	*hh	Checksum indicator (“*”, code 2Ah) and checksum
6	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

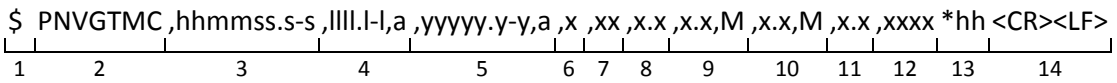
$PNVGTMU,128,081248.547824228*61

4.18 PNVGTMC – Global Positioning System Fix Data at Time Mark Event

Message Description

The PNVGTMC message outputs time, position and fix related data calculated at the time of the leading edge of the detected mark input pulse. The fix is based on all available GNSS. Data fields of this message are similar to the NMEA GGA message.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGTMC	Address field
3	hhmmss.s-s	Time of position fix (time position of Time Mark Event)
4	llll.l-l,a	Latitude, a a: N (North) or S (South)
5	yyyyy.y-y,a	Longitude, a a: E (East) or W (West)
6	x	Position Fix Flag: 0 = Fix not available or invalid 1 = Position fix valid, autonomous mode 2 = Position fix valid, Differential mode 4 = Position fix valid, Real Time Kinematic 5 = Position fix valid, Float RTK 6 = Estimated data (extrapolation, dead reckoning)
7	xx	Number of satellites used in calculation
8	x.x	Horizontal dilution of precision (HDOP)
9	x.x,M	Altitude re: mean-sea-level (geoid), metres
10	x.x,M	Geoidal separation, metres Geoidal Separation: the difference between the WGS 84 earth ellipsoid surface and mean-sea-level (geoid)surface, "-" = mean-sea-level surface below WGS 84 ellipsoid surface.
11	x.x	Age of Differential GNSS data. Time interval in seconds between current time and reference time of the latest receiver RTCM message, null field when RTCM is not used.
12	xxxx	Differential reference station ID, 0000-1023. Null field when DGNSS is not used
13	*hh	Checksum indicator (“*”, code 2Ah) and checksum
14	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

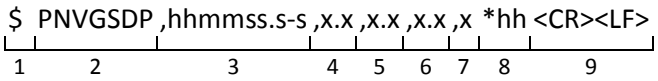
$PNVGTMC,145505.28,4724.5118287,N,00937.6956032,E,4,17,0.7,403.995,M,47.848,M,2.2,0002*4D

4.19 PNVGSDP – Standard deviation (rms) of Position

Message Description

The PNVGSDP message outputs time, standard deviation (rms) of calculated position and current Mode Indicator.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGSDP	Address field
3	hhmmss.s-s	Time of position fix
4	x.x	Standard deviation (rms) of Latitude, m
5	x.x	Standard deviation (rms) of Longitude, m
6	x.x	Standard deviation (rms) of Height, m
7	x	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic E = Estimated (dead reckoning) mode N = Data not valid
8	*hh	Checksum indicator (“*”, code 2Ah) and checksum
9	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

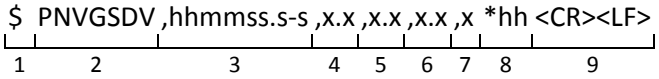
$PNVGSDP,151337.40,0.005,0.004,0.009,R*38

4.20 PNVGSDV – Standard deviation (rms) of Velocity

Message Description

The PNVGSDV message outputs time, standard deviation (rms) of calculated velocity and current Mode Indicator.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGSDV	Address field
3	hhmmss.s-s	Time of position fix
4	x.x	Standard deviation (rms) of North velocity, m/s
5	x.x	Standard deviation (rms) of East velocity, m/s
6	x.x	Standard deviation (rms) of Vertical velocity, m/s
7	x	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic E = Estimated (dead reckoning) mode N = Data not valid
8	*hh	Checksum indicator (“*”, code 2Ah) and checksum
9	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

$PNVGSDV,151337.40,0.087,0.077,0.118,R*31

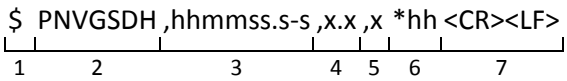
4.21 PNVGSDH – Standard deviation (rms) of Heading

Message Description

The PNVGSDH message outputs time, standard deviation (rms) of calculated heading and current Mode Indicator.

Note – PNVGSDH message is supported by NV08C-RTK-A devices only.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGSDH	Address field
3	hhmmss.s-s	Time of position fix
4	x.x	Standard deviation (rms) of Heading, degrees
5	x	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic (True Heading) E = Estimated (dead reckoning) mode N = Data not valid
6	*hh	Checksum indicator (“*”, code 2Ah) and checksum
7	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

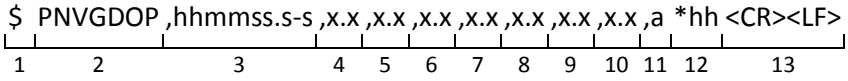
$PNVGSDH,151337.40,0.978,R*2E

4.22 PNVGDOP – DOPs for calculated position

Message Description

The PNVGDOP message outputs time, dilutions of precision (DOPs) of calculated position and current Mode Indicator.

Message Format



Message Fields

#	Field	Format
1	$	Start character (Code 24h)
2	PNVGSDH	Address field
3	hhmmss.s-s	Time of position fix
4	x.x	Geometric dilution of precision (GDOP)
5	x.x	Position dilution of precision (PDOP)
6	x.x	Horizontal dilution of precision (HDOP)
7	x.x	Vertical dilution of precision (VDOP)
8	x.x	Time dilution of precision (TDOP)
9	x.x	North dilution of precision (nDOP)
10	x.x	East dilution of precision (eDOP)
11	a	Mode Indicator: A = Autonomous mode D = Differential mode F = Float RTK R = Real Time Kinematic E = Estimated (dead reckoning) mode N = Data not valid
12	*hh	Checksum indicator (“*”, code 2Ah) and checksum
13	<CR><LF>	End of message indicator (codes 0Dh and 0Ah)

Example

$PNVGDOP,121707.80,1.06,0.94,0.59,0.73,0.50,0.41,0.42,R*14