V34
Software User Guide

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APPLICABILITY TABLE

PRODUCTS

- SL869T3-I

SOFTWARE

- V34-0.0.1-NVC-4.5.11.10EB-B04
- V34-0.0.4-NVC-4.5.12.4-003210

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1. INTRODUCTION

1.1. Scope

This document describes the serial communication interface for GNSS receiver modules which operate using V34 firmware. These modules support navigation using the Indian Regional Navigation Satellite System (IRNSS), which is also known by the operational name NavIC.

1.2. Audience

This document is intended for public distribution to potential customers who are evaluating one of the GNSS modules listed in the Applicability Table on page 4, which uses V34 firmware. It can also be used by customers who are developing application software for a Host Processor contained within their product that incorporates one of the listed modules.

1.3. Contact Information, Support

For general contact, technical support services, technical questions and report documentation errors contact Telit Technical Support at:

- TS-EMEA@telit.com
- TS-AMERICAS@telit.com
- TS-APAC@telit.com

Alternatively, use:

http://www.telit.com/support-training

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Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

[1] NMEA-0183 Standard for Interfacing Marine Electronic Devices Version 3.01
[2] Telit SL869T3-I Product User Guide, 1VV0301546
[3] Telit SL869T3-I Evaluation Kit User Guide, 1VV0301561
[4] Telit V34 Software Authorized User Guide, 1VV0301592

2. COMMUNICATION INTERFACE

The serial communication interface between the GNSS receiver module and the host processor is based on the NMEA-0183 protocol standard specified by the National Marine Electronics Association (NMEA). This is an ASCII-based standard that is widely used in the GPS/GNSS industry for serial communication with GNSS receivers (Reference [1]).

This document does not describe the NMEA 0183 standard, however an overview of NMEA messages format is provided in **Appendix A – Standard NMEA Messages Format**.

This document makes use of STMicroelectronics specific terminology which may differ from the one used in the NMEA-0183 protocol standard specification.

2.1. Serial Communication

Serial communication with the GNSS receiver is primarily conducted over the serial port. There is no hardware flow control. The default port settings are:

- 9600 Baud
- Eight data bits
- No parity bits
- One stop bit

Note that some Firmware variants may have a different default data rate than 9600 baud.

2.2. Talker ID

Standard sentences as defined in the NMEA-0183 protocol begin with the “$” character followed by an NMEA talker ID. Version 3.01 of the protocol defines “GP” as the talker ID for GPS, “GL” as the talker ID for GLONASS, and “GN” as the talker ID indicating a span of multiple global navigation satellite systems (GNSS). Additionally, the V34 firmware has incorporated talker IDs for the other constellations into the standard message format. These talker IDs are “BD” indicating BEIDOU, “GA” indicating GALILEO, QZ for Quasi-Zenith Satellite System (QZSS), and “IR” indicating NavIC/IRNSS.

2.3. Proprietary NMEA Message Format

In addition to the use of standard NMEA sentences, GNSS receiver modules that use V34 firmware communicate with the host processor using STMicroelectronics proprietary sentences.

These sentences also begin with the “$” character, followed by the proprietary “P” character, which is then followed by the the three-character Manufacturer’s Mnemonic Code registered by STMicroelectronics with the NMEA, and which is “STM”. Thus, the proprietary address field of the sentence is of the form:

$PSTMxxx

where *xxx...* represents additional characters that serve as a proprietary Sentence Identifier. The address field can be followed by one or more data fields that conform to the NMEA 0183 data format protocol.

The sentence length for STMicroelectronics proprietary NMEA messages may be greater than the maximum length defined by the NMEA 0183 standard, which is 82 characters.

Section 4 of this document describes STMicroelectronics Proprietary NMEA Messages that can be used to control the receiver and output extra information beyond the NMEA-0183 standard definition.

2.4. Checksums

The NMEA standard specifies a two-character checksum field that follows a '*' delimiting character (asterisk) placed at the end of the address and data fields. V34 firmware includes checksums on all output messages. Checksums on input commands are verified by V34 firmware, but they are not required on the commands presented in this document, except for the $PSTMEPHEM command.

3. NMEA OUTPUT MESSAGES

V34 firmware outputs a set of standard NMEA messages which have formats that are compatible with the NMEA sentences in version 3.01 of the NMEA-0183 Interface Standard.

Additionally, the Beidou and Galileo GNSS constellations are incorporated into these standard message formats by the introduction of a 'BD' Talker Identifier and a 'GA" Talker Identifier, respectively.

Satellite IDs used by V34 firmware for the Galileo and Beidou constellations, as well as IDs for, QZSS and SBAS satellites, are specified in Appendix B – Satellite ID Mapping in this guide.

Note that satellite IDs for GPS, GLONASS and SBAS satellites are as specified in the NMEA Interface Standard.

3.1. Standard NMEA Output Messages

Standard NMEA messages described in this section are output by default by stock V34 firmware. Other standard NMEA messages available for output are described in [4]. Please contact Telit Technical Support for further information.

3.1.1. GGA – Global Positioning System Fix Data

This message provides time, position, and fix status data. The talker ID is always 'GP' for this message. If the module is operating in multi-constellation mode, the HDOP value in the message is for the combined GNSS constellation geometry.

An example of this message is:

*$GPGGA,002153.000,3342.6618,N,11751.3858,W,1,10,1.2,27.0,M,-34.2,M,,*5E <CR><LF>*

Field	Example	Description
Talker ID	GP	
Sentence ID	GGA	Global Positioning System Fix Data
UTC Time	002153.000	hhmmss.sss (hours,minutes,seconds)
Latitude	3342.6618	ddmm.mmmm (degrees and minutes)
N/S Indicator	N	N = North, S = South
Longitude	11751.3858	dddmm.mmmm (degrees and minutes)
E/W Indicator	W	E = East, W = West
Position Fix Indicator	1	0 = Fix not available or invalid 1 = GPS Standard Positioning Service (SPS) Mode, fix valid 2 = Differential GPS (DGPS) SPS Mode, fix valid
Satellites Used	10	Total number of satellites in use in fix
HDOP	1.2	Horizontal Dilution of Precision
MSL Altitude	27.0	Antenna altitude above/below Mean Sea Level (MSL) geoid surface

Units	M	M = Meters
Geoidal Separation	-34.2	Geoid-to-ellipsoid separation Ellipsoid altitude: Geoid MSL altitude – Geoid Separation
Units	M	M = Meters
Age of Differential Data		Null field
Diff. Ref. Station ID		Null field

Table 1 GGA – Global Positioning System Fix Data Message Structure

3.1.2. GSA – GNSS DOP and Active Satellites

This message reports Dilution of Precision (DOP) values and the ID numbers of the active satellites used in the position fix. At least one of these messages is output for each enabled GNSS constellation. See Appendix B regarding the range of satellite IDs used for each constellation.

If the module is using a single constellation, the talker ID reflects that constellation. If the module is operating in multi-constellation mode, the talker ID is 'GN', and all the messages contain DOP values for the combined GNSS constellation geometry.

The maximum number of satellites reported in a single message is 12. If the number of satellites used from a given constellation exceeds 12, a second message is output listing the additional satellites.

An example of this message is:

*$GNGSA,A,3,07,02,26,27,09,04,15,,,,,1.8,1.0,1.5*2D<CR><LF>*

Field	Example	Description
Talker ID	GN	Navigation System GP = GPS GL = GLONASS BD = BEIDOU GA = GALILEO IR = NAVIC/IRNSS GN = Global Navigation/Multi-constellation
Sentence ID	GSA	GNSS DOP and Active Satellites
Mode 1	A	A = Automatic, allowed to automatically switch 2D/3D
Mode 2	3	1 = Fix not available 2 = 2D (<4SV s used) 3 = 3D (>3 SV s used)
Satellite Used [1]	07	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [2]	02	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)

Satellite Used [3]	26	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [4]	27	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [5]	09	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [6]	04	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [7]	15	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [8]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [9]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [10]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [11]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
Satellite Used [12]	-	Satellite ID used in the solution – Range varies by constellation (see Appendix B – Satellite ID Mapping)
PDOP	1.8	Position Dilution of Precision
HDOP	1.0	Horizontal Dilution of Precision
VDOP	1.5	Vertical Dilution of Precision

Table 2 GSA – GNSS DOP and Active Satellites Message Structure

3.1.3. GSV – GNSS Satellites in View

This message provides the number of Space Vehicle (SV) satellites in view, and the satellite ID number, elevation, azimuth and Signal to Noise (SNR) value for each SV in view. A message is output for each enabled GNSS constellation. Additionally, each message can consist of multiple sentences, with four satellites maximum per sentence. The talker ID of the message always reflects the constellation for which the visible satellite information as being reported.

An example of messages reporting the GPS satellites in view is:

*$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71<CR><LF>*
*$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41<CR><LF>*

An example of messages reporting the NavIC (IRNSS) satellites in view is:

*$IRGSV,2,1,07,805,62,070,44,803,56,174,44,804,46,112,44,801,39,213,44*7A*
*$IRGSV,2,2,07,806,28,247,44,807,25,111,44,802,14,206,44,,,,*75*

Field	Example	Description

Talker ID	GP	Navigation System GP = GPS GL = GLONASS BD = BEIDOU GA = GALILEO IR = NAVIC/IRNSS QZ = QZSS GN = Global Navigation/Multi-constellation
Sentence ID	GSV	GNSS Satellites in View
Number of Messages	2	Total number of GSV messages to be sent in this group
Message Number	1	Message number in this group of GSV messages
Satellite in View	07	Total number of satellites in view
Satellite ID1	07	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation1	79	Elevation angle in degrees, 0-90
Azimuth1	048	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR1	42	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID2	02	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation2	51	Elevation angle in degrees, 0-90
Azimuth2	062	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR2	43	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID3	26	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation3	36	Elevation angle in degrees, 0-90
Azimuth3	256	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR3	42	SNR (C/No), 00-99 dB-Hz, null while not tracking
Satellite ID4	27	Range varies by constellation (see Appendix B – Satellite ID Mapping)
Elevation4	27	Elevation angle in degrees, 0-90
Azimuth4	138	Azimuth angle in degrees, True, 000-359 clockwise from true North
SNR4	42	SNR (C/No), 00-99 dB-Hz, null while not tracking

Table 3 GSV – GNSS Satellites in View Message Structure

3.1.4. RMC – Recommended Minimum Specific GNSS Data

This message provides time, date, position, course and speed data from navigational fixes made by the GNSS receiver module. The talker ID is always 'GP' for this message.

An example of this message is:

*$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598,,,A*7D<CR><LF>*

Field	Example	Description
Talker ID	GP	
Sentence ID	RMC	Recommended Minimum Specific GNSS Data
UTC Time	161229.487	hhmmss.sss (hours,minutes,seconds)
Status	A	A = Data valid V = Data not valid
Latitude	3723.2475	ddmm.mmmm (degrees and minutes)
N/S Indicator	N	N = North, S = South
Longitude	12158.3416	dddmm.mmmm (degrees and minutes)
E/W Indicator	W	E = East, W = West
Speed Over Ground	0.13	Knots
Course Over Ground	309.62	True, degrees
Date	120598	ddmmyy (day, month, year)
Magnetic Variation		Null field
Magnetic E/W Indicator		Null field
Mode	A	A = Autonomous mode D = Differential mode N = Data not valid

Table 4 RMC – Recommended Minimum Specific GNSS Data Message Structure

4. Proprietary NMEA MESSAGES

V34 firmware responds to commands that are formatted as proprietary NMEA messages and sent to the GNSS module.

4.1. PSTMGETSWVER – Poll SW Version

The PSTMGETSWVER command is used to poll the firmware version information. Version information includes the Telit firmware version string, as well as versions of the ST Microelectronics libraries embedded within the firmware application.

4.1.1. Input Message

Synopsis:

$PSTMGETSWVER,<Id><CR><LF>

Example:

$PSTMGETSWVER,255<CR><LF>

Parameter	Example	Description
Message Header	PSTMGETSWVER	Poll SW Version
Mask	255	Integer 0 – GNSS Library 1 – Operating Kernel 2 – Application Layer (SDK) 8 – STAGPS Library 255 – All version strings

Table 5 PSTMGETSWVER – Poll SW Version

4.1.2. Output Message

If the command is successful, the module responds with the requested firmware version string(s). The Telit version string is reported in a standard NMEA GPTXT message as shown in the example below:

*$GPTXT,Telit V34-0.0.1-NVC-4.X.11A5-N115-A01V*60*

ST Microelectronics component version information is reported in a proprietary NMEA sentence, as illustrated below:

*$PSTMVER,GNSSLIB_8.4.13.20.10_EB_ARM*32*

4.2. PSTMINITGPS – GPS Initialize

The PSTMINITGPS command is used to initialize position and GPS time in the receiver module. It is typically only used for test purposes or for aiding satellite acquisitions in very harsh RF signal environments.

4.2.1. Input Message

Synopsis:

$PSTMINITGPS,<Lat>,<LatRef>,<Lon>,<LonRef>,<Alt>,<Day>,<Month>,<Year>,<Hour>,<Minute>,<Second><CR><LF>

Example:

$PSTMINITGPS,4811.365,N,01154.123,E,0530,23,02,2018,09,44,12

Field	Example	Description
Message Header	PSTMINITGPS	GPS Initialize
Lat	4811.365	Latitude - DDMM.MMM (DegreesMinutes.FractionalMinute)
LatRef	N	Latitude direction - 'N' or 'S' (North or South)
Lon	01154.123	Longitude - DDDMM.MMM (DegreesMinutes.FractionalMinute)
LonRef	E	Longitude direction - 'E' or 'W' (East or West)
Alt	0530	WGS-84 altitude in meters - dddd – Decimal, 4 digits (-1500 to 100000)
Day	23	Day of month - dd – Decimal, 2 digits (01 to 31)
Month	02	Month - mm – Decimal, 2 digits (01 to 12)
Year	2018	Year - yyyy – Decimal, 4 digits (1994 - …)
Hour	09	Hour - HH – Decimal, 2 digits (00 to 23)
Minute	44	Minute - MM – Decimal, 2 digits (00 to 59)
Second	12	Second - SS – Decimal, 2 digits (00 to 59)

Table 6 PSTMINITGPS – GPS Initialize Message Structure

The provided date must be no earlier than September 3rd, 2017. Date/time data will be ignored by the module if it already has an estimate of time. Likewise, the position data will be ignored by the module if it already has an estimate position. If the data is accepted, it will be reflected in the output messages, for example $GPGGA.

4.2.2. Output Message

If the command is successful, the module responds with the message:

$PSTMINITGPSOK<CR><LF>

The $PSTMINITGPS command is ignored by the module if any of the input parameters are out of range or if the command is otherwise formatted incorrectly, and the module will respond with the message:

*$PSTMINITGPSERROR*1C<CR><LF>*

4.3. PSTMINITTIME – Time Initialize

The PSTMINITTIME command may be used to initialize GPS time in the receiver. It is typically only used for test purposes or for aiding satellite acquisitions in very harsh RF signal environments.

4.3.1. Input Message

Synopsis:

$PSTMINITTIME,<Day>,<Month>,<Year>,<Hour>,<Minute>,<Second><CR>LF>

Example:

$PSTMINITTIME,23,02,2018,09,44,12

Field	Example	Description
Message Header	PSTMINITTIME	Time Initialize
Day	23	Day of month - dd – Decimal, 2 digits (01 to 31)
Month	02	Month - mm – Decimal, 2 digits (01 to 12)
Year	2018	Year - yyyy – Decimal, 4 digits (1994 - …)
Hour	09	Hour - HH – Decimal, 2 digits (00 to 23)
Minute	44	Minute - MM – Decimal, 2 digits (00 to 59)
Second	12	Second - SS – Decimal, 2 digits (00 to 59)

Table 7 PSTMINITTIME – Time Initialize Message Structure

The provided date must be no earlier than September 3rd, 2017. The input time will be ignored by the module if it already has an estimate of time. If the data is accepted, it will be reflected in the output messages, for example $GPGGA.

4.3.2. Output Message

If the command is successful, the module responds with the message:

*$PSTMINITTIMEOK*11<CR><LF>*

The $PSTMINITTIME command is ignored by the module if any of the input parameters are out of range or if the command is otherwise formatted incorrectly, and the module will respond with the message:

*$PSTMINITTIMEERROR*4D<CR><LF>*

4.4. PSTMCLREPHS – Clear Ephemeris

The PSTMCLREPHS command allows the user to clear all ephemeris data from battery-backed RAM and erase all ephemeris stored in non-volatile backup memory. It is typically used to force the module to collect the most recent satellite ephemeris data, or to prepare the module to be loaded with ephemeris data over the serial port. There are no parameters, and there is no response message to this command.

4.4.1. Input Message

Synopsis:

$PSTMCLREPHS<CR><LF>

Following an ephemeris data deletion, the module stops producing position fixes using tracked satellites for which it had ephemeris. Note however that this command does not clear predicted ephemeris associated with the STAGPS feature. Thus, if the module had been navigating using predicted ephemeris for a tracked satellite (because broadcast ephemeris had not yet been collected), then the module continues to use that satellite.

Typically, the module falls out of navigation after the execution of an $PSTMCLREPHS command due to an insufficient number of satellites used. The module will produce position fixes after it has re-collected ephemeris from a sufficient number of satellites.

4.5. PSTMDUMPEPHEMS – Dump Ephemeris

The PSTMDUMPEPHEMS command is used to request that the module outputs all ephemeris data stored in backup memory. There are no parameters.

4.5.1. Input Message

Synopsis:

$PSTMDUMPEPHEMS<CR><LF>

The module responds with a series of $PSTMEPHEM messages, each containing the ephemeris data for one satellite. Each of these messages has the same format as the $PSTMEPHEM command described in the next section. Checksums are included in $PSTMEPHEM when it is a message, but they are not required when $PSTMEPHEM is used as a command.

The module echoes the command once all the response messages have been output.

The $PSTMEPHEM response messages do not block regularly scheduled periodic output messages, and therefore they are not guaranteed to be output all in sequence. The $PSTMNMEAONOFF command can be used to temporarily disable periodic output so that the response messages can be captured as one sequence and then be re-used as a source of $PSTMEPHEM load ephemeris commands.

4.6. PSTMEPHEM – Load Ephemeris

The PSTMEPHEM command allows the user to load ephemeris data for a satellite into battery-backed RAM and non-volatile backup memory. It has the same ID and data structure as when it is output as a message.

4.6.1. Input Message

Synopsis:

$PSTMEPHEM,<SatId>,<Size>,<Byte1>……<ByteN><checksum><CR><LF>*

Example:

$PSTMEPHEM,3,64,8f06786978691313132001009ba4ff009af9e5178c12aafaba006e00fc3700001f7eea25cab5b60780b00da183d906cb6048efd545e6e12ff7002d0012c0c003

Field	Example	Description
Message Header	PSTMEPHEM	Load Ephemeris
SatId	3	Satellite ID - ii – Decimal, 2 digits (GPS PRN number, range 1 to 32)
Size	64	Number of ephemeris data bytes in the command - nn - Decimal, 2 digits
Byte1… ByteN	8f06786978691313132001009ba4ff009af9e5178c12aafaba006e00fc3700001f7eea25cab5b607800b00da183d906cb6048efd545e6e12ff7002d0012c0c003	N ephemeris data bytes - bb – Hexadecimal, 2 digits

Table 8 PSTMEPHEM – Load Ephemeris Message Structure

Note also that the ephemeris data bytes are input as a single parameter and are not delimited by commas.

4.6.2. Output Message

If the command is successful, the module responds with the message:

*$PSTMEPHEMOK*48*

If the module detects a problem with data, for example an insufficient number of data bytes, and the command fails to execute, the module responds with the message:

*$PSTMEPHEMERROR*17*

This command has the same format as the $PSTMEPHEM message that is output in response to the $PSTMDUMPEPHEMS command described in the previous section.

4.7. PSTMNMEAONOFF – Enable/Disable NMEA

The PSTMNMEAONOFF command can be used to switch the periodic NMEA output on and off. It does not affect command responses. The parameter is optional. If the parameter is not provided, the NMEA output is toggled on or off. There is no response message to this command.

4.7.1. Input Message

Synopsis:

$PSTMNMEAONOFF[,<OnOff]<CR><LF>

Example:

$PSTMNMEAONOFF,0

Field	Example	Description
Message Header	PSTMNMEAONOFF	Enable/Disable NMEA
OnOff	0	One-digit decimal 0 – NMEA output will be disabled 1 – NMEA output will be enabled

Table 9 PSTMNMEAONOFF – Enable/Disable NMEA Message Structure

4.8. PSTMCOLD – Cold Start

The PSTMCOLD command can be used to cause the module to perform a cold start. There is no response message to this command.

4.8.1. Input Message

Synopsis:

$PSTMCOLD,[<Mask>]<CR><LF>

Example:

$PSTMCOLD,15<CR><LF>

Parameter	Example	Description
Message Header	PSTMCOLD	Cold Start
Mask	15	Optional configuration parameter in the form of a bit mask expressed as an integer. It is used to specify data to be invalidated for the cold start. Bit definitions: bit 0 – clear almanac bit 1 – clear ephemeris bit 2 – clear position bit 3 – clear time

Table 10 PSTMCOLD – Cold Start Message Structure

If the mask parameter is not provided, the default cold start configuration, bitmap 0xE (clear ephemeris, position and time), is used. This is equivalent to an input parameter of 14 and is the most common definition of a cold start used in the industry.

In response to this message the module will restart the GNSS engine.

The PSTMCOLD command does not necessarily replicate an operational cold start, which occurs when the module is powered up from an off state (both main power and Vbatt are removed). In this case the module uses stored position, time, date and ephemeris from non-volatile memory as its initial data.

4.9. PSTMWARM – Warm Start

The PSTMWARM command causes the module to perform a warm start. A warm start is defined as one in which position and time are known from previous operation of the GNSS module, but ephemeris is invalid. There are no parameters, and there is no response message to this command.

4.9.1. Input Message

Synopsis:

$PSTMWARM<CR><LF>

In response to this message the module will restart the GNSS engine.

4.10. PSTMHOT – Hot Start

The PSTMHOT command causes the module to perform a hot start. A hot start is defined as one in which position and time are known and ephemeris is valid from previous operation of the GNSS module. There are no parameters, and there is no response message to this command.

4.10.1. Input Message

Synopsis:

$PSTMHOT<CR><LF>

In response to this message the module will restart the GNSS engine.

4.11. PSTMSRR – System Reset

The PSTMSRR command allows the user to execute a system reset and reboot the GNSS firmware on the module. There are no parameters, and there is no response message to this command.

4.11.1. Input Message

Synopsis:

$PSTMSRR<CR><LF>

The module does not echo the $PSTMSRR command.

4.12. PSTMGPSRESET – GPS Reset

The PSTMGPSRESET command is used to restart the GNSS receiver engine without rebooting the GNSS module firmware. There are no parameters for this command, and there is no response message to this command.

4.12.1. Input Message

Synopsis:

$PSTMGPSRESET<CR><LF>

4.13. PSTMSBASONOFF – Enable/Disable SBAS

The PSTMSBASONOFF command can be used to toggle the SBAS differential GPS feature on and off. By default, the SBAS feature is on (enabled) whenever the module is reset. When SBAS is on (enabled), the module searches for SBAS satellites based on its position. If the module successfully acquires a satellite, it obtains and uses differential GPS corrections

transmitted by the satellite. The satellite ID of the acquired SBAS satellite appears in the GPGSV messages. For SBAS satellites, the ID is the satellite PRN minus an offset of 87.

4.13.1. Input Message

Synopsis:

$PSTMSBASONOFF<CR><LF>

There is no response message associated with this command.

4.14. PSTMSETCONSTMASK – Set GNSS Constellation Mask

The PSTMSETCONSTMASK command selects the GNSS constellations to be used by the GNSS module for navigation. The selected constellations are specified using a bit mask.

Note that the GLONASS, Beidou and NavIC constellations cannot be combined with each other.

4.14.1. Input Message

Synopsis:

$PSTMSETCONSTMASK,<Constellation_Mask><CR><LF>

Example:

$PSTMSETCONSTMASK,1025<CR><LF>

Parameter	Example	Description
Message Header	PSTMSETCONSTMASK	Set GNSS Constellation Mask
Constellation_Mask	1025	Bit mask expressed as an integer, where each bit is used to enable/disable a specific constellation independently. bit 0 – GPS bit 1 – GLONASS bit 2 – QZSS bit 3 – GALILEO bit 7 – BEIDOU bit 10 – NavIC (IRNSS) Other bits are reserved and should be set to 0.

Table 11 PSTMSETCONSTMASK – Set GNSS Constellation Mask Message Structure

4.14.2. Output Message

If the command is successful, the module responds with a message echoing the specified mask, and the new constellation mask remains in effect until a system reset is performed on the module:

$PSTMSETCONSTMASKOK,<Constellation_Mask><checksum><CR><LF>*

If the input parameter for the command is missing or is not a valid value, the module responds with the following message:

*$PSTMSETCONSTMASKERROR*51<CR><LF>*

4.15. PSTMFORCESTANDBY – Force Standby

The PSTMFORCESTANDBY command is used to put the module in a very low power Standby state for a specified length of time. After the specified time has elapsed, the module returns to its previous operational mode.

4.15.1. Input Message

Synopsis:

$PSTMFORCESTANDBY,<Duration><CR><LF>

where Duration is an unsigned integer value specifying the Standby mode time period in seconds, ranging from 1 to 65535 seconds (~18.2 hours).

4.15.2. Output Message

If the command is successful, the module responds with the following message and enters Standby mode:

*$PSTMFORCESTANDBYOK*14<CR><LF>*

If the input parameter is missing or contains invalid characters, the module responds with the following message:

*$PSTMFORCESTANDBYERROR*48<CR><LF>*

Caution

1. If the command is successful, note that the module could enter Standby mode before issuing the OK response message and/or command echo.
2. Numerical command parameter values outside the specified range should be avoided.

4.16. PSTMNOTCH – Set Adaptive Notch Filter

The PSTMNOTCH command can be used to control the operational mode of the Adaptive Notch Filter within the GLONASS/Beidou/NavIC RF path for purposes of detecting and mitigating narrow-band interfering signals. There is no response message for this command.

The Adaptive Notch Filter (ANF) is not currently recommended to be used with NavIC/IRNSS signals and is therefore disabled by default whenever the module is powered on or is given a system reset. However, it is recommended to enable the ANF when either GLONASS or Beidou signals are being used.

4.16.1. Input Message

Synopsis:

$PSTMNOTCH,1,<OnOff><CR><LF>

Example:

$PSTMNOTCH,1,2<CR><LF>

Field	Example	Description
Message Header	PSTMNOTCH	Enable/disable Adaptive Notch Filter
RF Path	1	Must be set to 1
OnOff	2	One-digit decimal 0 – Disable notch filter 2 – Enable notch filter

Table 12 PSTMNOTCH – Set Adaptive Notch Filter

5. APPENDIX A – STANDARD NMEA MESSAGES FORMAT

Serial communication between the Host Processor and the GNSS module is accomplished using messages following the NMEA 0183 standard. Standard NMEA messages output by the receiver are called “Sentences” and always start with an ASCII ‘$’ character (Hex value 0x24). All NMEA sentences also end or terminate with a two-character Carriage Return <CR> (ASCII hex value 0x0D) Line Feed <LF> (ASCII hex value 0xA) sequence.

After the starting ‘$’ character a NMEA sentence contains a two-character Talker Identifier which may have the values GP for GPS, IR for NAVIC (IRNSS), GL for GLONASS, BD for BEIDOU (COMPASS), GA for Galileo, or GN for Global Navigation. Global Navigation that can be a combination of the individual navigation systems (GPS and NAVIC, or GPS and GLONASS, etc.). The Talker Identifier indicates the GNSS system source of the information contained in the sentence. Following the Talker Identifier is a three-character Sentence Identifier. The Sentence Identifier indicates the type of the sentence. Each type is described in its own section in this document.

Following the Sentence Identifier is a sequence of Data Fields that are separated, or delimited, by commas. The number and meaning of the data fields, which are sometimes referred to as the Payload of the sentence, is determined by the sentence type. A specific data field might be omitted from a sentence, in which case that field is called a NULL field. A NULL field is still separated from the other fields by commas.

After the last data field appears, the ‘*’ character (ASCII hex value 0x2A) denotes the end of the data fields. Immediately following the ‘*’ character is a two-character hexadecimal checksum used to detect errors in the sentence that might have been introduced during serial transmission. The NMEA sentence checksum is computed by performing an 8-bit Exclusive OR (XOR) sum on all the characters in the sentence that appear after the ‘$’ character and before the ‘*’ character.

After the checksum appears the terminating <CR><LF> sequence.

The maximum length of a NMEA standard sentence is 82 characters, consisting of a maximum of 79 characters in the string between the starting ‘$’ character and the terminating <CR><LF>.

6. APPENDIX B – SATELLITE ID MAPPING

SATELLITE ID MAPPING

Value	Constellation	Description
1 to 32	GPS	PRN
33 to 51	SBAS	PRN - 87
65 to 92	GLONASS	Slot ID + 64
141 to 172	BEIDOU	PRN + 140
193 to 199	QZSS	PRN
301 to 330	Galileo	PRN + 300
801 to 814	NAVIC (IRNSS)	PRN + 800

Table 13 Satellite ID Mapping

7. GLOSSARY AND ACRONYMS

ASCII	American Standard Code for Information Interchange
BE	Broadcast Ephemeris
DGPS	Differential Global Positioning System
DOP	Dilution of Precision
NMEA	National Marine Electronics Association
PRN	Pseudo-Random Noise
SRAM	Static Random Access Memory
STAGPS	ST Assisted GPS
UTC	Co-ordinated Universal Time

8. DOCUMENT HISTORY

Revision	Date	Changes
0	2019-03-16	Initial draft
1	2019-09-11	Production release. Corrected broken reference. Added PSTMNOTCH command.

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