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1. Introduction

1.1 Document scope

This manual describes the NMEA protocol of the MTK GPS system or the Beidou + GPS dual GNSS system module.

1.2 Terminology abbreviation

Table 1. Terminology Abbreviation

Abbreviation	Terminology
PPS	Pulse Per Second
ASCII	American Standard Code for Information Interchange
DGPS	Differential Global Positioning System
NMEA	National Marine Electronics Association
SBAS	Satellite Based Augmentation System
SDK	Software Development Kit
SW	Software
SV	Space Vehicle
PDOP	Position Dilution Of Precision
HDOP	Horizontal Dilution Of Precision
VDOP	Vertical Dilution Of Precision
IRNSS	Indian Regional Navigation Satellite System
BDS	BeiDou Navigation Satellite System
GPS	Global Positioning System
GLONASS	Globalnaya Navigatsionnaya Sputnikovaya Sistema
GALILEO	Galileo Satellite Navigation System
GNSS	Global Navigation Satellite System

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RTC	Real Time Clock
SPS	Standard Positioning Service
CR	Carriage Return
LF	Line Feed
TCXO	Temperature Compensate X'tal (crystal) Oscillator
PPM	Parts Per Million

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2. Commands

ST NMEA proprietary command can modify the internal Teseo III status, if not explicitly declared, all modifications of the status of the parameters, are not saved in the backup memory. For this reason, any changes of the parameters are replaced by the previous values after system reset or system power cycling.

2.1 Software command list

Table 2. NMEA command list

Syntax	Description
GNSS management commands	
$PSTMINITGPS	Initialize GPS position and time
$PSTMINITTIME	Initialize time only
$PSTMINITFRQ	Initialize center frequency
$PSTMSETRANGE	Set the frequency range for satellite searching
$PSTMCLREPHS	Clear all ephemeris
$PSTMDUMPEPHEMS	Dump Ephemeris data
$PSTMEPHEM	Load Ephemeris data
$PSTMCLRALMS	Clear all almanacs
$PSTMDUMPALMANAC	Dump Almanacs data
$PSTMALMANAC	Load Almanacs data
$PSTMCOLD	Perform COLD start
$PSTMWARM	Perform WARM start
$PSTMHOT	Perform HOT start
$PSTMNMEAONOFF	Toggle ON/OFF the NMEA output
$PSTMDEBUGONOFF	Toggle ON/OFF the DEBUG output

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$PSTMSRR	System Reset
$PSTMGPSRESET	Reset the GPS engine
$PSTMGPSSUSPEND	Suspend GPS engine
$PSTMGPSRESTART	Restart GPS engine
$PSTMGNSSINV	Invalidate the GNSS fix status
$PSTMTIMEINV	Invalidate the GPS time
$PSTMGETSWVER	Provide the GPS library version string.
$PSTMNVMSWAP(1)	Execute a bank swap on the NVM GPS backup memory
$PSTMSBASONOFF	Enable/Disable the SBAS activity
$PSTMSBASSERVICE	Set the SBAS service
$PSTMSBASSAT	Set the SBAS satellite's ID
$PSTMSBASM	Send a SBAS frame
$PSTMRFTESTON	Enable the RF test mode
$PSTMRFTESTOFF	Disable the RF test mode
$PSTMGETALGO	Get FDE algorithm ON/OFF status
$PSTMSETALGO	Set FDE algorithm ON/OFF status
$PSTMGETRTCTIME	Get the current RTC time.
$PSTMDATUMSELECT	Set a geodetic local datum different from WGS84
$PSTMDATUMSETPARAM	Set parameters to local geodetic to WGS84 datum transformations
$PSTMENABLEPOSITIONHOLD	Set status and position for the Position Hold feature.
$PSTMSETCONSTMASK	Set GNSS constellation mask.
$PSTMNOTCH	Set the ANF operation mode.
$PSTMSQISET	
$PSTMSQIGET	
$PSTMSQIERASE	
$PSTMPPS	Command interface for Pulse Per Second management.

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$PSTMADCSTART	Start and Configure ADC
$PSTMADCREAD	Read ADC channels data
$PSTMLOWPOWERONOFF	
$PSTMCRCCHECK	
$PSTMSTBIN	
$PSTMNMEAREQUEST	
$PSTMFORCESTANDBY	
$PSTMIONOPARAMS	
$PSTMGALILEOGGTO	
$PSTMGALILEODUMPGGTO	
$PSTMSETTHTRK	
$PSTMSETTHPOS	
$PSTMIMUSELFTESTCMD	
$PSTMGETFLASHTYPE	
$PSTMFMWUPGRADE	
Configuration commands	
$PSTMSETPAR	Set System Parameter in the configuration data block.
$PSTMGETPAR	Get System Parameter from configuration data block.
$PSTMSAVEPAR	Save System Parameters in the GNSS backup memory.
$PSTMRESTOREPAR	Restore System Parameters (Factory Settings).
$PSTMCFGPORT	Char Port Configuration
$PSTMCFGANTSENS	Antenna Sensing Configuration
$PSTMCFGCLKS	Clock Mode and Speed Configuration
$PSTMCFGMSGL	Message List Configuration
$PSTMCFGGNSS	GNSS Algorithm Configuration
$PSTMCFGSBAS	SBAS Algorithm Configuration

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$PSTMCFGPPSGEN	PPS General Configuration
$PSTMCFGPPSSAT	PPS Satellite Related Configuration
$PSTMCFGPPSPUL	PPS Pulse Related Configuration
$PSTMCFGPOSHOLD	
$PSTMCFGTRAIM	Traim Configuration
$PSTMCFGSATCOMP	
$PSTMCFGLPA	
$PSTMCFGLPS	Low Power State Configuration
$PSTMCFGAGPS	Assisted GNSS Configuration
$PSTMCFGAJM	Anti-Jamming Configuration
$PSTMCFGODO	Odometer Configuration
$PSTMCFGLOG	Logger Configuration
$PSTMCFGGEOFENCE	Geofencing Configuration
$PSTMCFGGEOCIR	Geofencing Circle Configuration
$PSTMCFGCONST	
Datalogging commands	
$PSTMLOGCREATE	Creates and enable a new data log
$PSTMLOGSTART	Starts or restarts the current the data logging
$PSTMLOGSTOP	Stops the data logging
$PSTMLOGERASE	Erases the data log.
$PSTMLOGREQSTATUS	To get information about the datalog subsystem
$PSTMLOGREQQUERY	Triggers a query request to the ST GNSS Teseo
Geofence Commands	
$PSTMGEOFENCECFG	Configures the Geofence subsystem
$PSTMGEOFENCEREQ	To know internal Geofence subsystem status
Odomenter commands	

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$PSTMODOSTART	Enables and resets the Odometer subsystem
$PSTMODOSTOP	Stops the Odometer subsystem
$PSTMODORESET	Resets the Odometer subsystem
Autonomous AGNSS	
$PSTMSTAGPSONOFF	
$PSTMSTAGPSINVALIDATE	
$PSTMGETAGPSSTATUS	
$PSTMSTAGPSSETCONSTMASK	
Predictive AGNSS commands	
$PSTMSTAGPSSEEDBEGIN	
$PSTMSTAGPSBLKTYPE	
$PSTMSTAGPSSLOTFRQ	
$PSTMSTAGPSSEEDPKT	
$PSTMSTAGPSSEEDPROP	
Real Time AGNSS commands	
$PSTMSTAGPS8PASSGEN	

This command is supported only by platforms or system configurations where the GNSS backup memory is based on Flash NOR or SQI memories.

Warning: *The $PSTMSETPAR command allows the direct modification of the system parameters. Wrong Settings may degrade the GNSS system performance or even stop the system from working*

2.2 ST NMEA command specification

2.2.1 $PSTMINITGPS

Initialize GPS position and time using UTC format. This command must be issued after a cold reset or it fails. The date issued with parameters Day, Month and Year must be later than January 2015, this threshold can be changed using the configuration options (see STA80xx Firmware Configuration document).

Synopsis:

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$PSTMINITGPS,<Lat>,<LatRef>,<Lon>,<LonRef>,<Alt>,<Day>,<Month>,<Year>,<Hour>,<Minute>,<Second>*<checksum><cr><lf>

Arguments:

Table 3. $PSTMINITGPS field description

Parameter	Format	Description
Lat	DDMM.MMM	Latitude (Degree-Minute.Minute decimals)
LatRef	‘N’ or ‘S’	Latitude direction (North or South)
Lon	DDDMM.MMM	Longitude (Degree-Minute.Minute decimals)
LonRef	‘E’ or ‘W’	Longitude Direction (East or West)
Alt	dddd – Decimal,4 digits	Altitude in meters (-1500 to 100000)
Day	dd – Decimal, 2 digits	Day of month (01 to 31)
Month	mm – Decimal, 2 digits	Month (01 to 12)
Year	YYYY – Decimal, 4 digits	Year (2015 - …)
Hour	HH – Decimal, 2 digits	Hour (00 to 23)
Minute	MM – Decimal, 2 digits	Minute (00 to 59)
Second	SS – Decimal, 2 digits	Second (00 to 59)

Results:

The position and time will be initialized

In case of no errors, the $PSTMINITGPSOK message is returned

In case of errors, the error message $PSTMINITGPSERROR is returned

Example:

$PSTMINITGPS,4811.365,N,01164.123,E,0530,23,02,2015,09,44,12

2.2.2 $PSTMINITTIME

Initialize GPS time using UTC format. The date issued with parameters Day, Month and Year must be later than January 2015, this threshold can be changed using the configuration options (see STA80xx

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Firmware Configuration document).

Synopsis:

$PSTMINITTIME,<Day>,<Month>,<Year>,<Hour>,<Minute>,<Second>*<checksum><cr><lf>

Arguments:

Table 4. $PSTMINITTIME field description

Parameter	Format	Description
Day	dd – Decimal, 2 digits	Day of month (01 to 31)
Month	mm – Decimal, 2 digits	Month (01 to 12)
Year	YYYY – Decimal, 4 digits	Year (2015 - …)
Hour	HH – Decimal, 2 digits	Hour (00 to 23)
Minute	MM – Decimal, 2 digits	Minute (00 to 59)
Second	SS – Decimal, 2 digits	Second (00 to 59)

Results:

The position and time will be initialized

In case of no errors, the $PSTMINITTIMEOK message is returned

In case of errors, the error message $PSTMINITTIMEERROR is returned

Example:

$PSTMINITTIME,23,02,2015,09,44,12

2.2.3 $PSTMINITFRQ

Initialize the centre frequency. This command can be used to set the local oscillator frequency offset.

Synopsis:

$PSTMINITFRQ,<offset>*<checksum><cr><lf>

Arguments:

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Table 5. $PSTMINITFRQ field description

Parameter	Format	Description
offset	Decimal, 6 digits	Frequency offset in Hz

Results:

The center frequency will be initialized

Example:

$PSTMINITFRQ,-47000*<checksum><cr><lf>

2.2.4 $PSTMSETRANGE

Set the frequency range for satellite searching. The “min.” and “max.” values are used as offsets versus the centre frequency.

Synopsis:

$PSTMSETRANGE,<min>,<max>*<checksum><cr><lf>

Arguments:

Table 6. $PSTMSETRANGE field description

Parameter	Format	Description
min	Decimal, 6 digits	Lower limit range in Hz
max	Decimal, 6 digits	Upper limit range in Hz

Results:

In case of no errors, the $PSTMSETRANGEOK message is returned

In case of errors, the error message $PSTMSETRANGEERROR is returned

Example:

$PSTMSETRANGE,-57000,-37000*<checksum><cr><lf>

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2.2.5 $PSTMCLREPHS

Clear all ephemeris. This command erases all the ephemeris stored in the NVM backup memory.

Synopsis:

$PSTMCLREPHS*<checksum><cr><lf>

Arguments:

None.

Results:

All ephemeris, stored in the non-volatile backup memory (either Backup-SRAM or Flash), will be deleted.

No message will be sent as a reply.

Example:

$PSTMCLREPHS*<checksum><cr><lf>

2.2.6 $PSTMDUMPEPHEMS

This command sends out all ephemeris stored in the backup memory.

Synopsis:

$PSTMDUMPEPHEMS*<checksum><cr><lf>

Arguments:

None.

Results:

GNSS replies with the $PSTMEPHEM messages

Example:

$PSTMDUMPEPHEMS

$PSTMEPHEM,1,64,0f06bc34bc345f5f5f84f400dea4ff00f9f63c239f0a35f81400fbff33

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420000ee632f27698ef001afa50da16cfcfa22e0b65a3e7a3cee27d700f7ffc616fe03*57

$PSTMEPHEM,2,64,0f06bc34bc344f4f4f78110019a5ff00b004fa1d1e0e3f04c8ffcaff19
37000033515726556ba9048eae0da1b6c346bd8f985c93ade10c76db001d00f8c7c503*58

$PSTMEPHEM,4,64,0f06bb34bb344b4b4b98050038a4ff000005351e110eea041b00b8ffd0
37000020b84e26b5138b0425580ca16b211030e68b1a949cac9615f30066ffea92f603*06

$PSTMEPHEM,9,64,0f06bc34bc341818189c0a0069aaff005f06eb249a09ca0477ff6c00f7

2e00005131d827592b950a91010da1c7af88538e7ca1122fb9be3df4001300c4a0c203*52

2.2.7 $PSTMEPHEM

This command allows the user to load the ephemeris data into backup memory.

Synopsis:

$PSTMEPHEM,<sat_id>,<N>,<byte1>,...,<byteN>*<checksum><cr><lf>

Arguments:

Table 7. $PSTMEPHEM field description

Parameter	Format	Description
sat_id	Decimal, 2 digits	Satellite number
N	Decimal, 1 digit	Number of the ephemeris data bytes
byte1	Hexadecimal, 2 digits	First byte of the ephemeris data
byteN	Hexadecimal, 2 digits	Last byte of the ephemeris data

The N Bytes that are in the parameters are the dump of structures that contain all the information of the ephemeris.

Data format is constellation dependent.

Table 8. $PSTMEPHEM field description for GPS constellation

Bits	Structure Member	Description
16	week	Week number of the Issue of Data

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16	toe	Time of week for ephemeris epoch
16	toc	Time of week for clock epoch
8	iode1	Issue of data 1
8	iode2	Issue of data 2
10	iodc	Issue of data clock
14	i_dot	Rate of inclination angle.
8	RESERVED	
24	omega_dot	Rate of right ascension.
8	RESERVED	Must be 0.
16	crs	Amplitude of the sine harmonic correction to the orbit radius.
16	crc	Amplitude of the cosine harmonic correction to the orbit radius.
16	cus	Amplitude of the sine harmonic correction to the argument of latitude.
16	cuc	Amplitude of the cosine harmonic correction to the argument of latitude.
16	cis	Amplitude of the sine harmonic correction to the angle of inclination.
16	cic	Amplitude of the cosine harmonic correction to the angle of inclination.
16	motion_difference	Mean motion difference from computed value
16	RESERVED	Must be 0.
32	inclination	Inclination angle at reference time
32	e	Eccentricity.
32	root_A	Square root of major axis.
32	mean_anomaly	Mean anomaly at reference time.
32	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
32	perigee	Argument of perigee.
8	time_group_delay	Estimated group delay differential.
8	af2	Second order clock correction.

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16	af1	First order clock correction.
22	af0	Constant clock correction.
1	RESERVED	RESERVED for use by GNSS library – must be 1
1	RESERVED	RESERVED for use by GNSS library – must be 1
1	RESERVED	RESERVED for use by GNSS library – must be 1
1	available	Contains 1 if ephemeris is available, 0 if not
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy
1	RESERVED	Must be 0.
4	accuracy	Accuracy

Table 9. $PSTMEPHEM field description for GLONASS constellation

Bits	Structure Member	Description
16	week	Week number of the Issue of Data.
16	toe	Time of week for ephemeris epoch.
4	toe_lsb	Time of week for ephemeris epoch (LBS).
11	NA	Calendar day number within the four-year period since the beginning of last leap year (almanac).
7	tb	Time of ephemeris index.
2	M	Type of satellite 00=GLONASS 01=GLONASS-M.
2	P1	Time interval between two adjacent tb parameters.
1	P3	Number of satellites for which almanac is transmitted within this frame 0=4 1=5.
1	P2	Flag of oddness ("1") or evenness ("0") of the value of tb
1	P4	Flag to show that ephemeris parameters are present.
2	KP	Notification on forthcoming leap second correction of UTC
1	RESERVED	
27	xn	Satellite PZ-90 x coordinate at epoch tb.
5	xn_dot_dot	Satellite PZ-90 x velocity at epoch tb.

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24	xn_dot	Satellite PZ-90 x acceleration component at epoch tb.
5	n	Slot number (1…24).
3	Bn	Healthy flags.
27	yn	Satellite PZ-90 y coordinate at epoch tb.
5	yn_dot_dot	Satellite PZ-90 y acceleration component at epoch tb.
24	yn_dot	Satellite PZ-90 y velocity at epoch tb.
8	age_h	Age of predicted ephemeris (hours)
27	zn	Satellite PZ-90 z coordinate at epoch tb.
5	zn_dot_dot	Satellite PZ-90 z acceleration component at epoch tb.
24	zn_dot	Satellite PZ-90 z velocity at epoch tb.
8	RESERVED	Must be 0.
11	gamma_n	Satellite clock frequency drift at epoch tb.
5	E_n	Age of the ephemeris information.
4	freq_id	Frequency ID
12	RESERVED	
22	tau_n	Satellite clock correction at epoch tb.
10	RESERVED	Must be 0.
32	tau_c	GLONASS to UTC(SU) time correction.
22	tau_GPS	GLONASS to GPS system time correction.
10	RESERVED	
11	NT	Calendar day number of ephemeris within the four-year period since the beginning of last leap year.
5	N4	Four-year interval number starting from 1996.
12	tk	Satellite time referenced to the beginning of the frame.
4	FT	Predicted satellite user range accuracy at time tb
32	RESERVED	

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5	m_available	Must be 0x1F
1	nvm_reliable	Must be 1.
26	spare	
25	RESERVED	
1	available	Contains 1 if ephemeris is available, 0 if not.
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy.
1	RESERVED	Must be 0.
4	RESERVED	

Table 10. $PSTMEPHEM field description for Galileo constellation

Bits	**Structure Member**	**Description**
16	week	Week number of the Issue of Data
14	toe	Time of week for ephemeris epoch
2	RESERVED	
16	toc	Time of week for clock epoch
10	iod_nav	Issue of data
8	SISA	Signal In Space Accuracy
10	RESERVED	Must be 0.
10	BGD_E1_E5a	E1-E5a Broadcast Group Delay
10	BGD_E1_E5b	E1-E5b Broadcast Group Delay
2	E1BHS	E1-B Signal Health Status
32	inclination	Inclination angle at reference time
32	eccentricity	Eccentricity.
32	root_a	Square root of major axis.
32	mean_anomaly	Mean anomaly at reference time.
32	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.

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32	perigee	Argument of perigee.
14	i_dot	Rate of inclination angle.
1	available	Contains 1 if ephemeris is available, 0 if not
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy
16	motion_difference	Mean motion difference from computed value
16	crs	Amplitude of the sine harmonic correction to the orbit radius.
16	crc	Amplitude of the cosine harmonic correction to the orbit radius.
16	cus	Amplitude of the sine harmonic correction to the argument of latitude.
16	cuc	Amplitude of the cosine harmonic correction to the argument of latitude.
16	cis	Amplitude of the sine harmonic correction to the angle of inclination.
16	cic	Amplitude of the cosine harmonic correction to the angle of inclination.
24	omega_dot	Rate of right ascension.
6	SVID	Satellite Identification.
1	E1BDVS	E1-B Data Validity Status
1	RESERVED	Must be 0.
8	RESERVED	Must be 0.
16	RESERVED	Must be 0.
6	af2	Second order clock correction.
21	af1	First order clock correction.
5	word_available	Must be 0x1F.
31	af0	Constant clock correction.
1	RESERVED	
6	RESERVED	Must be 0
26	RESERVED	RESERVED for use by GNSS library – must be 1
1	RESERVED	Must be 0.

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Table 11. $PSTMEPHEM field description for BEIDOU constellation

Bits	Structure Member	Description
32	inclination	Inclination angle at reference time
32	eccentricity	Eccentricity.
32	root_a	Square root of major axis.
32	mean_anomaly	Mean anomaly at reference time.
32	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
32	perigee	Argument of perigee.
17	toe	Time of week for ephemeris epoch
10	time_group_delay	Estimated group delay differential.
5	aode	Issue of data, ephemeris
24	omega_dot	Rate of right ascension.
8	A0	Ionospheric Delay Model Parameter α0
24	af0	Constant clock correction.
8	A1	Ionospheric Delay Model Parameter α1
20	sow	Seconds of week
11	af2	Second order clock correction.
1	is_geo	1 for Geostationary satellites, otherwise 0
22	af1	First order clock correction.
10	subframe_avail	Must be 0x3FF.
16	motion_difference	Mean motion difference from computed value
8	A2	Ionospheric Delay Model Parameter α2
8	A3	Ionospheric Delay Model Parameter α3
18	crs	Amplitude of the sine harmonic correction to the orbit radius.
8	B2	Ionospheric Delay Model Parameter β2
4	urai	User range accuracy index

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2	RESERVED	Must be 0.
18	crc	Amplitude of the cosine harmonic correction to the orbit radius.
8	B3	Ionospheric Delay Model Parameter β3
5	aodc	Issue of data, clock
1	spare	
18	cus	Amplitude of the sine harmonic correction to the argument of latitude.
14	i_dot	Rate of inclination angle.
18	cuc	Amplitude of the cosine harmonic correction to the argument of latitude.
8	B0	Ionospheric Delay Model Parameter β0
6	spare	
18	cis	Amplitude of the sine harmonic correction to the angle of inclination.
8	B1	Ionospheric Delay Model Parameter β1
6	RESERVED	Must be 0.
18	cic	Amplitude of the cosine harmonic correction to the angle of inclination.
1	nvm_reliable	Must be 1.
11	RESERVED	Must be 0.
2	spare	
17	toc	Time of week for clock epoch
13	week	Week number of the Issue of Data
1	available	Contains 1 if ephemeris is available, 0 if not
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy

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Results:

The ephemeris will be stored into backup RAM

No message will be sent as a reply.

Example:

$PSTMEPHEM,12,64,0f06bc34bc3437373790f40045a7ff00fcf5d522480b4bf71b00fbff8
931000096126f271f869101c3870ca107afce79a763e13e360a1ce8e7003100380ff903*36

2.2.8 $PSTMCLRALMS

This command erases all the almanacs stored in the NVM backup memory.

Synopsis:

$PSTMCLRALMS*<checksum><cr><lf>

Arguments:

None.

Results:

All almanacs, stored in the non-volatile backup memory, will be deleted.

No message will be sent as a reply.

Example:

$PSTMCLRALMS*<checksum><cr><lf>

2.2.9 $PSTMDUMPALMANAC

Dump Almanac data. This command sends out all almanacs stored in the backup memory.

Synopsis:

$PSTMDUMPALMANAC*<checksum><cr><lf>

Arguments:

None.

Results:

GNSS replies with the $PSTMALMANAC messages

Example:

$PSTMDUMPALMANAC

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$PSTMALMANAC,1,32,011a06903f1f9f0d58fd0800d90ca1418713060099ee260034024200

b4ffff00*1a

$PSTMALMANAC,2,32,021a0690944b78fe37fd0800770da141ef0c5b0060487700989bd800 d8088000*1a

$PSTMALMANAC,3,32,031a06904f68a2f540fd0800f60ca141922a2c003cae27009496cf00 020a8000*15

$PSTMALMANAC,4,32,041a0690a94aeffd36fd0800390ca141afc95b00de7a1700dfc74e00 4ddebf00*13

$PSTMALMANAC,5,32,051a0690940eee0b5efd0800900ca141582b8600d3000b0060641200 e40f8000*14

2.2.10 $PSTMALMANAC

Load Almanacs data. This command allows the user to load the almanacs data into backup memory.

Synopsis:

$PSTMALMANAC,<sat_id>,<N>,<byte1>,...,<byteN>*<checksum><cr><lf>

Arguments:

Table 12. $PSTMALMANAC field description

Parameter	Format	Description
sat_id	Decimal, 2 digits	Satellite number
N	Decimal, 1 digit	Number of the almanac data bytes
byte1	Hexadecimal, 2 digits	First byte of the almanac data
byteN	Hexadecimal, 2 digits	Last byte of the almanac data
checksum	Hexadecimal, 2 digits	Checksum of the message bytes without* <checksum><cr><lf> characters.

The N Bytes that are in the parameters are the dump of a structures that contain all the information of the almanac.

Data format is constellation dependent.

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Table 13. $PSTMALMANAC field description for GPS constellation

Bits	Structure Member	Description
8	satid	The satellite number
16	week	The week number for the epoch
8	toa	Reference time almanac.
16	e	Eccentricity.
16	delta_i	Rate of inclination angle.
16	omega_dot	Rate of right ascension.
24	root_A	Square root of semi-major axis.
24	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
24	perigee	Argument of perigee.
24	mean_anomaly	Mean anomaly at reference time.
11	af0	Constant clock correction.
11	af1	First order clock correction.
1	health	Contains 1 if the satellite is unhealthy 0 if healthy.
1	available	Contains 1 if almanac is available 0 if not.

Table 14. $PSTMALMANAC field description for GLONASS constellation

Bits	Structure Member	Description
8	satid	The satellite number.
16	week	The week number for the epoch.
8	toa	Reference time almanac.
5	n_A	Slot number (1…24).
5	H_n_A	Carrier frequency channel number.
2	M_n_A	Type of satellite 00=GLONASS 01=GLONASS-M.
10	tau_n_A	Satellite clock correction.

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15	epsilon_n_A	Eccentricity.
21	t_lambda_n_A	Time of the first ascending node passage.
21	lambda_n_A	Longitude of ascending node of orbit plane at almanac epoch.
18	delta_i_n_A	Inclination angle correction to nominal value.
7	delta_T_n_dot_A	Draconian period rate of change.
22	delta_T_n_A	Draconian period correction.
16	omega_n_A	Argument of perigee.
1	health	Contains 1 if the satellite is unhealthy 0 if healthy.
1	available	Contains 1 if almanac is available 0 if not.
32	Tau_c	
11	NA	
5	N4	
16	Spare	

Table 15. $PSTMALMANAC field description for Galileo constellation

Bits	Structure Member	Description
16	satid	The satellite number
6	svid	Space Vehicle Identificator
16	week	The week number for the epoch
20	toa	Reference time almanac.
13	delta_a	Delta of semi-major axis.
11	e	Eccentricity.
16	perigee	Argument of perigee.
11	delta_i	Rate of inclination angle.
16	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
11	omega_dot	Rate of right ascension.

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16	mean_anomaly	Mean anomaly at reference time.
16	af0	Constant clock correction.
13	af1	First order clock correction.
2	E5b_HS	E5 Signal Health Status
2	E1B_HS	E1-B Signal Health Status
4	ioda_1	Issue of data Almanac 1
4	ioda_2	Issue of data Almanac 2
1	health	Contains 1 if the satellite is unhealthy 0 if healthy.
2	RESERVED	RESERVED for use by GNSS library
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy
1	available	Contains 1 if almanac is available 0 if not.

Results:

The almanac will be stored into backup memory

No message will be sent as a reply

Example:

$PSTMALMANAC,12,32,0c1a06907c1a971160fd0800fa0da141ae9f0600d912e9007566970
0490f8000*75

2.2.11 $PSTMCOLD

Perform a COLD start.

Synopsis:

$PSTMCOLD,<Mask>*<checksum><cr><lf>

Arguments:

Table 16. $PSTMCOLD field description

Parameter	Format	Description

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Mask	Integer	Optional parameter to invalidate time, position, ephemeris and almanac : 0x1 – clear almanac 0x2 – clear ephemeris 0x4 – clear position 0x8 – clear time

Results:

Coldstart initialization and system restart (a)

If Mask parameter is used, only the selected GPS data is invalidated for this actual Coldstart. Multiple selects are supported (i.e. 0xD).

If Mask parameter is not used, default is 0xE (clear ephemeris, time and position).

Example:

$PSTMCOLD,6

Note: *(a): The GPS engine will be reset. It is not a system reboot.*

2.2.12 $PSTMWARM

Perform a WARM start.

Synopsis:

$PSTMWARM*<checksum><cr><lf>

Arguments:

None.

Results:

Warm start initialization and system restart(b).

Example:

$PSTMWARM*<checksum><cr><lf>

Note: *(b): The GPS engine will be reset. It is not a system reboot.*

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2.2.13 $PSTMHOT

Perform an HOT start.

Synopsis:

$PSTMHOT*<checksum><cr><lf>

Arguments:

None.

Results:

The system restart(c).

Example:

$PSTMHOT*<checksum><cr><lf>

Note: *(c): The GPS engine will be reset. It is not a system reboot.*

2.2.14 $PSTMNMEAONOFF

Toggle NMEA output. This command switches ON or OFF the output NMEA messages.

Synopsis:

$PSTMNMEAONOFF,<on_off>*<checksum><cr><lf>

Arguments:

Table 17. $PSTMNMEAONOFF field description

Parameter	Format	Description
on_off(1)	Integer	0 = NMEA output is turned OFF 1 = NMEA output is turned ON

The "on_off" input parameter has been added starting from SW re. 7.1.9.29. For backward compatibility the old command syntax is still supported: sending $PSTMNMEAONOFF with no input parameter the NMEA ON/OFF status is toggled.

Results:

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NMEA output message is started or stopped according to the ‘on_off’ field value.

Example:

$PSTMNMEAONOFF,0*<checksum><cr><lf>

2.2.15 $PSTMDEBUGONOFF

Toggle DEBUG output. This command switches ON or OFF the output DEBUG sentences.

Synopsis:

$PSTMDEBUGONOFF,<on_off>*<checksum><cr><lf>

Arguments:

Table 18. $PSTMDEBUGONOFF field description

Parameter	Format	Description
on_off	Integer	0 = DEBUG output is turned OFF 1 = DEBUG output is turned ON

Results:

Debug output message is started or stopped according to the ‘on_off’ field value.

Example:

$PSTMDEBUGONOFF,0*<checksum><cr><lf>

2.2.16 $PSTMSRR

Executes a system reset. The GNSS firmware is rebooted.

Synopsis:

$PSTMSRR*<checksum><cr><lf>

Arguments:

None.

Results:

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The GNSS firmware reboots

No message will be sent as a reply

Example:

$PSTMSRR*<checksum><cr><lf>

2.2.17 $PSTMGPSRESET

Reset the GPS Teseo engine.

Synopsis:

$PSTMGPSRESET*<checksum><cr><lf>

Arguments:

None.

Results:

The GPS Teseo engine will be reset

No message will be sent as a reply

Note: *Using this command the GPS module won't reboot.*

Example:

$PSTMGPSRESET*<checksum><cr><lf>

2.2.18 $PSTMGPSSUSPEND

Suspend the GNSS Teseo engine.

Synopsis:

$PSTMGPSSUSPEND*<checksum><cr><lf>

Arguments:

None.

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Results:

The $PSTMGPSSUSPENDED message will be sent when GNSS Teseo III engine is suspended

Example:

$PSTMGPSSUSPEND*<checksum><cr><lf>

2.2.19 $PSTMGPSRESTART

Restart the GNSS Teseo engine.

Synopsis:

PSTMGPSRESTART*<checksum><cr><lf>

Arguments:

None.

Results:

The GNSS Teseo engine will be restarted

No message will be sent as a reply

Example:

$PSTMGPSRESTART*<checksum><cr><lf>

2.2.20 $PSTMGNSSINV

Invalidate the GNSS Fix Status.

Synopsis:

$PSTMGNSSINV,<invalid>*<checksum><cr><lf>

Arguments:

Table 19. $PSTMGNSSINV field description

Parameter	Format	Description

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invalid	Integer	Invalid flag allowing to change the GNSS Fix status 1: GNSS Fix status is set to NO_FIX 0: GNSS Fix Status unchanged

Results:

$PSTMGNSSINV,1 invalidates the GNSS Fix Status. A NO FIX status is so simulated.

$PSTMGNSSINV,0 allows to restore the real GNSS Fix status.

Example:

$PSTMGNSSINV,1*<checksum><cr><lf>

2.2.21 $PSTMTIMEINV

Invalidate the Real Time Clock (RTC).

Synopsis:

$PSTMTIMEINV*<checksum><cr><lf>

Arguments:

None.

Results:

The RTC time will be invalidated.

Example:

$PSTMTIMEINV*<checksum><cr><lf>

2.2.22 $PSTMGETSWVER

Get the version string of the libraries embedded in the software application.

Synopsis:

$PSTMGETSWVER,<id>*<checksum><cr><lf>

Arguments:

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Table 20. $PSTMGETSWVER field description

Parameter	Format	Description
id	Integer	Depending on the value of the <lib_id> parameter, the following version numbering is delivered by the command: 0 = GNSS Library Version 1 = OS20 Version 2 = SDK App Version 6 = Binary Image Version 7 = STA8088 HW version 11 = SW configuration ID 12 = Product ID 254 = configuration data block 255 = all versions strings (as reported at the NMEA startup).

Results:

GNSS replies with $PSTMVER message

2.2.23 $PSTMNVMSWAP(d)

Execute a bank swap on the NVM GPS backup memory.

Synopsis:

$PSTMNVMSWAP*<checksum><cr><lf>

Arguments:

None

Results:

The non-volatile backup memory banks will be swapped

Example:

$PSTMNVMSWAP*<checksum><cr><lf>

Note: *(d): This command is supported only by platforms or software configurations where the backup memory is based on Flash NOR or SQI memories.*

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2.2.24 $PSTMSBASONOFF

Suspend / resume the SBAS software execution.

Synopsis:

$PSTMSBASONOFF*<checksum><cr><lf>

Arguments:

None.

Results:

If SBAS was running it will be suspended, if it was suspended it will start to run.

Example:

$PSTMSBASONOFF*<checksum><cr><lf>

2.2.25 $PSTMSBASSERVICE

Change the SBAS service.

Synopsis:

$PSTMSBASSERVICE,<service>*<checksum><cr><lf>

Arguments:

Table 21. $PSTMBASSERVICE field description

Parameter	Format	Description
service	Integer	SBAS service 0 = WAAS 1 = EGNOS 2 = MSAS 3 = GAGAN 4 = SDCM 7 = OFF 15 = AUTO

Results:

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The SBAS engine will put in tracker all the satellites which correspond to the specified service.

With SBAS service OFF, no satellites are put in tracker. In that case, SBAS frames are to be provided to the SBAS engine through the $PSTMSBASM command

With SBAS AUTO, the SBAS engines automatically selects the appropriate SBAS service based on the computed user position latitude and longitude.

In case of no errors, the $PSTMSBASSERVICEOK message is returned

In case of errors, the error message $PSTMSBASSERVICEERROR is returned

Example:

$PSTMSBASSERVICE,15*<checksum><cr><lf>

2.2.26 $PSTMSBASSAT

Change the SBAS satellite.

Synopsis:

$PSTMSBASSAT,<prn>*<checksum><cr><lf>

Arguments:

Table 22. $PSTMSBASSAT field description

Parameter	Format	Description
prn	Decimal, 3 digit	Satellite PRN (Range: from 120 to 140)

Results:

Kept for compatibility. Set SBAS service AUTO

The preferred NMEA command is $PSTMSBASSERVICE

Example:

$PSTMSBASSAT,120*<checksum><cr><lf>

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2.2.27 $PSTMSBASM

Send a SBAS frame to the SBAS engine.

Synopsis:

$PSTMSBASM,<prn><sbas_frame>*<checksum><cr><lf>

Arguments:

Table 23. $PSTMSBASM field description

Parameter	Format	Description
prn	Decimal, 3 digits	Satellite PRN (Range: from 120 to 140)
sbas_frame	Hexadecimal, 64 digits	SBAS frame (250 bits + 6 padding)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes without* <checksum><cr><lf> characters

Results:

Sends the SBAS frame to the SBAS engine.

Note: *The SBAS service has to be set to OFF before sending SBAS frames so that no SBAS satellites are put in tracking.*

In case of no errors, the $PSTMSBASMOK message is returned

In case of errors, the error message $PSTMSBASMERROR is returned

Example:

$PSTMSBASM,123,536A481B40D8063829C12E08704B82DFFDFFEFFF7FFBFFDFFEF06E8037EFB440*6D

2.2.28 $PSTMRFTESTON

Enable the RF test mode for production line tests.

Synopsis:

$PSTMRFTESTON,<sat_id>*<checksum><cr><lf>

Arguments:

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Table 24. $PSTMRFTESTON field description

Parameter	Format	Description
sat_id	Decimal, 2 digits	Satellite number

Results:

The GPS engine will restart in the RF test modality. This RF test forces the GPS to acquire the process only on the provided satellite's id. It could be useful to reduce the RF testing time in the production line where generally a single channel simulator is present

Example:

$PSTMRFTESTON,24*<checksum><cr><lf>

2.2.29 $PSTMRFTESTOFF

Disable the RF test mode for production line tests.

Synopsis:

$PSTMRFTESTOFF*<checksum><cr><lf>

Arguments:

None.

Results:

The RF test modality will be disabled and the GPS engine will be restarted.

Note: *The RF test mode can be disabled also resetting the GPS module.*

Example:

$PSTMRFTESTOFF*<checksum><cr><lf>

2.2.30 $PSTMGETALGO

Get False Detection and Exclusion (FDE) algorithm ON/OFF status.

Synopsis:

$PSTMGETALGO,<algo_type>*<checksum><cr><lf>

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Arguments:

Table 25. $PSTMGETALGO field description

Parameter	Format	Description
algo_type	Decimal, 1 digit	1 = FDE algorithm on/off status is returned.

Results:

In case of no errors, the $PSTMGETALGOOK message is returned

In case of errors, the error message $PSTMGETALGOERROR is returned

Example:

$PSTMGETALGO,1*<checksum><cr><lf>

2.2.31 $PSTMSETALGO

Set False Detection and Exclusion (FDE) algorithm ON/OFF status.

Synopsis:

$PSTMSETALGO,<algo_type>,<algo_status>*<checksum><cr><lf>

Arguments:

Table 26. $PSTMSETALGO field description

Parameter	Format	Description
algo_type	Decimal, 1 digit	1 = FDE algorithm on/off status is returned.
algo_status	Decimal, 1 digit	0 = the algorithm is disabled. 1 = the algorithm is enabled.

Results:

In case of no errors, the $PSTMSETALGOOK message is returned

In case of errors, the error message $PSTMSETALGOERROR is returned

Example:

$PSTMSETALGO,1,0*<checksum><cr><lf>

2.2.32 $PSTMGETRTCTIME

Get the current RTC time.

Synopsis:

$PSTMGETRTCTIME*<checksum><cr><lf>

Arguments:

None.

Results:

System will send $PSTMGETRTCTIME message

Example:

$PSTMGETRTCTIME

2.2.33 $PSTMDATUMSELECT

Set a local geodetic datum different from WGS84 (default).

Synopsis:

$PSTMDATUMSELECT,<datum_type>*<checksum><cr><lf>

Arguments:

Table 27. $PSTMDATUMSELECT field description

Parameter	Format	Description
datum_type	Integer	The following datum are selectable: 0: WGS84 1: TOKYO MEAN 2: OSGB

Results:

In case of no errors, the $PSTMDATUMSELECTOK message is returned

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In case of errors, the error message $PSTMDATUMSELECTERROR is returned

Example:

$PSTMSELETDATUM,1*<checksum><cr><lf>

2.2.34 $PSTMDATUMSETPARAM

Set parameters to local geodetic to WGS84 datum transformations.

Synopsis:

$PSTMDATUMSETPARAM,<d_x>,<d_y>,<d_z>,<d_a>,<d_f>*<checksum><cr><lf>

Arguments:

Table 28. $PSTMDATUMSETPARAM field description

Parameter	**Format**	**Description**
d_x d_y d_z	Decimal	Shifts between centres of the local geodetic datum and WGS84 Ellipsoid
d_a	Decimal	Differences between the semi-major axis of the local geodetic datum ellipsoid and the WGS 84 ellipsoid, respectively (WGS 84 minus Local)
d_f	Decimal	Differences between flattening of the local geodetic datum ellipsoid and the WGS 84 ellipsoid, respectively (WGS 84 minus Local)

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Results:

In case of no errors, the $PSTMDATUMSETPARAMOK message is returned

In case of errors, the error message $PSTMDATUMSETPARAMERROR is returned

Example:

$PSTMDATUMSETPARAM,-375,111,-431,-573.60, -0.000011960023

2.2.35 $PSTMENABLEPOSITIONHOLD

Enable/disable and set position for the Position Hold feature.

Synopsis:

$PSTMENABLEPOSITIONHOLD,<on_off>,<Lat>,<LatRef>,<Lon>,<LonRef>,<Alt>*<checksum><cr><lf>

Arguments:

Table 29. $PSTMENABLEPOSITIONHOLD field description

Parameter	Format	Description
on_off	Decimal, 1 digit	Set the position hold enable/disable status: 0: disabled. 1: enabled.
Lat	DDMM.MMMMM	Latitude (Degree-Minute.Minute decimals)
LatRef	‘N’ or ‘S’	Latitude direction (North or South)
Lon	DDDMM.MMMMM	Longitude (Degree-Minute.Minute decimals)
LonRef	‘E’ or ‘W’	Longitude Direction (East or West)
Alt(1)	dddddd.dddd	Altitude in meters (-1500 to 100000)

The altitude value must be reported without any geoid correction. It means that if the altitude value is retrieved by the $GPGGA message it must be added to the geoid correction before using it in the $PSTMENABLEPOSITIONHOLD command. This limitation may be removed in the future releases.

Results:

In case of no errors, and position hold is enabled the $PSTMPOSITIONHOLDENABLED message is returned

In case of no errors, and position hold is disabled the $PSTMPOSITIONHOLDDISABLED message is returned

In case of error the error message $PSTMENABLEPOSITIONHOLDERROR is sent

Example:

$PSTMENABLEPOSITIONHOLD,1,4811.365,N,01164.123,E,0530.0

2.2.36 $PSTMSETCONSTMASK

Set the GNSS constellation mask. It allows switching the GNSS constellation at run-time.

Synopsis:

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$PSTMSETCONSTMASK,<constellation_mask>*<checksum><cr><lf>

Arguments:

Table 30. $PSTMSETCONSTMASK field description

Parameter	Format	Description
constellation mask	Decimal, 1 digit	It is a bit mask where each bit enable/disable a specific constellation independently by the others: bit 0: GPS constellation enabling/disabling bit 1: GLONASS constellation enabling/disabling bit 2: QZSS constellation enabling/disabling bit 3: GALILELO constellation enabling/disabling bit 7: BEIDOU constellation enabling/disabling

Results:

In case of no errors, the $PSTMSETCONSTMASKOK message is returned

In case of errors, the error message $PSTMSETCONSTMASKERROR is returned

Examples:

Enabling GPS only:

$PSTMSETCONSTMASK,1*<checksum><cr><lf>

Enabling GLONASS only:

$PSTMSETCONSTMASK,2*<checksum><cr><lf>

Enabling GPS and GLONASS:

$PSTMSETCONSTMASK,3*<checksum><cr><lf>

2.2.37 $PSTMNOTCH

This command set the Adaptive Notch Filter (ANF) operation mode

Synopsis:

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$PSTMNOTCH,<Sat_type>,<Mode>,<Frequency>,<kbw_gross>,<kbw_fine>,<threshold>*<checksum><cr><lf>

Arguments:

Table 31. $PSTMNOTCH field description

Parameter	Format	Description
Sat_type	Decimal, 1 digits [Mandatory]	Sat type ANF path [0 -> GPS; 1->GLONASS]
Mode	Decimal, 1 digits [Mandatory]	ANF operation mode [0, disable, 1always on, 2 Auto (suggested)]
Frequency	Decimal, 8 digits [Optional]	IF Frequency, at which Notch search starts 0-8MHz range GPS / 0-16MHz Range Glonass path.
kbw_gross	Decimal, 1 digit [Optional]	Scan Speed [4,5,6 are supported values, the bigger the slower]. 5 is default
kbw_fine	Decimal, 1 digit [Optional]	Bandwidth Removed [4,5,6 are supported values, the smaller the bigger]. 6 is default
threshold	Decimal, 5 digits [Optional]	Detection threshold to lock the Notch at a given frequency [Default values 3010 (GPS)/ 3556(GLONASS)]

The command can be issued in the following form:

Standard configuration (2 parameters only):

$PSTMNOTCH,<sat_type>,<mode>*<checksum><cr><lf>

Enhanced configuration (3 parameters):

$PSTMNOTCH,<sat_type>,<mode>,<frequency>*<checksum><cr><lf>

that accepts more the frequency parameter to start search for RFI. Full configuration (6 parameters):

$PSTMNOTCH,Sat_type,Mode,Frequency,kbw_gross,kbw_fine,threshold*<ch ecksum><cr><lf>

That allows completely tuning filter behaviour (speed / bandwidth / detection threshold)

Other configurations, with a different number of parameters and/or values out of specs are not supported and can result in not predictable behaviours.

Results:

This command set the ANF operation mode.

Example:

Standard Configuration

$PSTMNOTCH,0,0[GPS path, ANF disabled]

$PSTMNOTCH,0,1[GPS path, ANF set in always ON mode] [For Int. usage only]

$PSTMNOTCH,0,2

[GPS path, auto insertion mode, Initial Scan Frequency is set @ 4f0][***Default***]

$PSTMNOTCH,1,0[GLONASS path, ANF disabled]

$PSTMNOTCH,1,1[GLONASS path, always ON mode] [For Int.usage only]

$PSTMNOTCH,1,2

[GLONASS path, auto insertion mode, Initial Scan Frequency is set @ 8f0] [***Default***]

Extra supported Usages

$PSTMNOTCH,0,2,frequency

[GPS path, auto insertion mode, Initial Frequency is frequency (Hz)]

$PSTMNOTCH,1,2,frequency

[GLONASS path, auto insertion mode, Initial Frequency is frequency (Hz)]

$PSTMNOTCH,0,2,frequency, kbw_gross, kbw_fine, threshold

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[GPS path, auto insertion mode, Initial Scan Frequency (Hz), kbw_gross, kbw_fine, threshold]

$PSTMNOTCH,1,2,frequency, kbw_gross, kbw_fine, threshold

[GLONASS path, auto insertion mode, Initial Frequency (Hz), kbw_gross, kbw_fine, threshold]

Usage Note:

By Default the

$PSTMNOTCH,0,2 command (Notch enabled in Auto mode on GPS branch) corresponds to the explicit

PSTMNOTCH,0,2,4092000,5,6, 3010

$PSTMNOTCH,1,2 command (Notch enabled in Auto mode on Glonass Branch) corresponds to the explicit

PSTMNOTCH,1,2, 8184000,5,6, 3556

2.2.38 $PSTMSQISET

Sets 8 consecutive words into the SQI Data Storage Area starting from the specified address.

Synopsis:

$PSTMSQISET,<offset>,<word1>,...,<word8>*<checksum><cr><lf>

Arguments:

Table 32. $PSTMSQISET field description

Parameter	Format	Description
offset	Hexadecimal, 4 digits	Offset from the base address of the chosen sector
word1	Hexadecimal, 8 digits	32 bits-wide word
word8	Hexadecimal, 8 digits	32 bits-wide word

Results:

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In case of no errors, the $PSTMSQISETOK message is returned

In case of errors, the error message $PSTMSQISETERROR is returned

Example:

$PSTMSQISET,0xa0,0x11,0x22,0x33,0x44,0x55,0x66,0x77,0x88

the following 8 bytes (0x11, 0x22, 0x33, 0x44, 0x55, 0x66, 0x77, 0x88) are consecutively written in the SQI Data Storage Area, starting from offset 0xa0 (i.e. at address 0x300F00a0)

2.2.39 $PSTMSQIGET

Starting from the specified address, it gets 8 consecutive words from the SQI Data Storage Area.

Synopsis:

$PSTMSQIGET,<offset>*<checksum><cr><lf>

Arguments:

Table 33. $PSTMSQIGET field description

Parameter	Format	Description
offset	Hexadecimal, 4 digits	Offset from the base address of the chosen sector

Results:

In case of no errors, the $PSTMSQIGETOK message is returned

In case of errors, the error message $PSTMSQIGETERROR is returned

Example:

The following NMEA command gets the 8 consecutive words contained in the SQI Data Storage starting from offset 0xa0 (i.e. starting from destination address 0x300F00a0)

$PSTMSQIGET,0xa0

2.2.40 $PSTMSQIERASE

This NMEA command erases the sector (64kbytes wide) of the SQI Data Storage Area from 0x300F0000 to 0x300FFFFF.

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Synopsis:

$PSTMSQIERASE*<checksum><cr><lf>

Arguments:

None.

Results:

In case of no errors, the $PSTMSQIERASEOK message is returned

In case of errors, the error message $PSTMSQIERASEERROR is returned

Example:

The following NMEA command erases all the information inside the SQI Data Storage Area (from 0x300F0000 to 0x300FFFFF)

$PSTMSQIERASE

2.2.41 $PSTMPPS

Allow interfacing all parameters for Pulse Per Second management. This is a parametric command.

Synopsis:

$PSTMPPS,<cmd_mode>,<cmd_type>,<par_1>,...,<par_N>*<checksum><cr><lf>

Arguments:

Table 34. $PSTMPPS field description

Parameter	Format	Description
cmd_mode	Decimal, 1 digit	Select the command operation mode: 1 = GET operation (to get data from PPS manager) 2 = SET operation (to set data into PPS manager)
cmd_type	Decimal, 1 digit	1 = PPS_IF_ON_OFF_CMD 2 = PPS_IF_OUT_MODE_CMD 3 = PPS_IF_REFERENCE_CONSTELLATION_CMD

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		4 = PPS_IF_PULSE_DELAY_CMD 5 = PPS_IF_PULSE_DURATION_CMD 6 = PPS_IF_PULSE_POLARITY_CMD 7 = PPS_IF_PULSE_DATA_CMD 8 = PPS_IF_FIX_CONDITION_CMD 9 = PPS_IF_SAT_TRHESHOLD_CMD 10 = PPS_IF_ELEVATION_MASK_CMD 11 = PPS_IF_COSTELLATION_MASK_CMD 12 = PPS_IF_TIMING_DATA_CMD 13 = PPS_IF_POSITION_HOLD_DATA_CMD 14 = PPS_IF_AUTO_HOLD_SAMPLES_CMD 15 = PPS_IF_TRAIM_CMD 16 = PPS_IF_TRAIM_USED_CMD 17 = PPS_IF_TRAIM_RES_CMD 18 = PPS_IF_TRAIM_REMOVED_CMD 19 = PPS_IF_REFERENCE_TIME_CMD 20 = PPS_IF_CONSTELLATION_RF_DELAY_CMD
par_1 … par_N		Parameters list according to the command type specification (see below).

2.2.41.1 PPS Get PPS_IF_PULSE_DATA_CMD

Synopsis:

$PSTMPPS,1,7

2.2.41.2 PPS Get PPS_IF_TIMING_DATA_CMD

Synopsis:

$PSTMPPS,1,12

2.2.41.3 PPS Get PPS_IF_POSITION_HOLD_DATA_CMD

Synopsis:

$PSTMPPS,1,13

2.2.41.4 PPS Get PPS_IF_TRAIM_CMD

Synopsis:

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$PSTMPPS,1,15*<checksum><cr><lf>

2.2.41.5 PPS Get PPS_IF_TRAIM_USED_CMD

Synopsis:

$PSTMPPS,1,16*<checksum><cr><lf>

2.2.41.6 PPS Get PPS_IF_TRAIM_RES_CMD

Synopsis:

$PSTMPPS,1,17*<checksum><cr><lf>

2.2.41.7 PPS Get PPS_IF_TRAIM_REMOVED_CMD

Synopsis:

$PSTMPPS,1,18*<checksum><cr><lf>

2.2.41.8 PPS Set PPS_IF_ON_OFF_CMD

Synopsis:

$PSTMPPS,2,1,<on_off>*<checksum><cr><lf>

Arguments:

Table 35. $PSTMPPS field description on PPS_IF_ON_OFF_CMD

Parameter	Format	Description
on_off	Decimal, 1 digit	0 = PPS disabled. 1 = PPS enabled.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.9 PPS Set PPS_IF_OUT_MODE_CMD

Synopsis:

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$PSTMPPS,2,2,<out_mode>*<checksum><cr><lf>

Arguments:

Table 36. $PSTMPPS field description on PPS_IF_OUT_MODE_CMD

Parameter	Format	Description
out_mode	Decimal, 1 digit	0 = PPS always generated. 1 = PPS generated on even seconds. 2 = PPS generated on odd seconds.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.10 PPS Set PPS_IF_REFERENCE_TIME_CMD

Synopsis:

$PSTMPPS,2,19,<reference_time>*<checksum><cr><lf>

Arguments:

Table 37. $PSTMPPS field description on PPS_IF_REFERENCE_TIME_CMD

Parameter	Format	Description
reference_time	Decimal, 1 digit	0 = UTC 1 = GPS_UTC 2 = GLONASS_UTC 3 = UTC_SU 4 = GPS_UTC_FROM_GLONASS 5 =COMPASS_UTC 6 = UTC_NTSC 7 = GST 8 = UTC_GST 9 = GPS_FROM_GST ***Note:*** *UTC(SU) is the Soviet Union UTC, it is derived from GLONASS time applying the UTC delta time downloaded from GLONASS satellites.* *GPS_UTC_FROM_GLONASS is the GPS time derived from GLONASS time applying the GPS delta time downloaded from GLONASS satellites.* *If the software is configured to work in GLONASS only*

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		mode, UTC(SU) is identical to UTC and GPS_UTC_FROM_GLONASS is identical to GPS_UTC.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.11 PPS Set PPS_IF_PULSE_DELAY_CMD

Synopsis:

$PSTMPPS,2,4,<pulse_delay>*<checksum><cr><lf>

Arguments:

Table 38. $PSTMPPS field description on PPS_IF_PULSE_DELAY_CMD

Parameter	Format	Description
pulse_delay	Decimal	Pulse delay [ns]

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.12 PPS Set PPS_IF_CONSTELLATION_RF_DELAY_CMD

Synopsis:

$PSTMPPS,2,20,<sat_type><time_delay>*<checksum><cr><lf>

Arguments:

Table 39. $PSTMPPS field description on PPS_IF_CONSTELLATION_RF_DELAY_CMD

Parameter	Format	Description
sat_type	Decimal	Satellite constellation type:

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		0 = GPS 1 = GLONASS 3 = Galileo 7 = COMPASS
time_delay	Decimal	Time delay [ns]

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.13 PPS Set PPS_IF_PULSE_DURATION_CMD

Synopsis:

$PSTMPPS,2,5,<pulse_duration>*<checksum><cr><lf>

Arguments:

Table 40. $PSTMPPS field description on PPS_IF_PULSE_DURATION_CMD

Parameter	Format	Description
pulse_duration	Double	Pulse duration [s]

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.14 PPS Set PPS_IF_PULSE_POLARITY_CMD

Synopsis:

$PSTMPPS,2,6,<pulse_polarity>*<checksum><cr><lf>

Arguments:

Table 41. $PSTMPPS field description on PPS_IF_PULSE_POLAROTY_CMD

Parameter	Format	Description
pulse_polarity	Decimal, 1 digit	0 = not inverted

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		1 = inverted

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.15 PPS Set PPS_IF_PULSE_DATA_CMD

Synopsis:

$PSTMPPS,2,7,<out_mode>,<reference_time>,<pulse_delay>,<pulse_duration>,<pulse_polarity>*<checksum><cr><lf>

Arguments:

Table 42. $PSTMPPS field description on PPS_IF_PULSE_DATA_CMD

Parameter	Format	Description
out_mode	Decimal, 1 digit	0 = PPS always generated. 1 = PPS generated on even seconds. 2 = PPS generated on odd seconds.
reference_time	Decimal, 1 digit	0 = UTC 1 = GPS_UTC 2 = GLONASS_UTC 3 = UTC_SU(1) 4 = GPS_UTC_FROM_GLONASS(2) 5 = COMPASS_UTC 6 = UTC_NTSC 7 = GST 8 = UTC_GST 9 = GPS_FROM_GST
pulse_delay	Decimal	Pulse delay [ns]
pulse_duration	Double	Pulse duration [s]
pulse_polarity	Decimal, 1 digit	0 = not inverted. 1 = inverted.

1. UTC(SU) is the Soviet Union UTC. It is derived from GLONASS time applying the UTC delta time downloaded from GLONASS satellites.

2. GPS_UTC_FROM_GLONASS is the GPS time derived from GLONASS time applying the GPS delta time downloaded from GLONASS satellites.

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If the software is configured to work in GLONASS only mode, UTC(SU) is identical to UTC and GPS_UTC_FROM_GLONASS is identical to GPS_UTC.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.16 PPS Set PPS_IF_FIX_CONDITION_CMD

Synopsis:

$PSTMPPS,2,8,<fix_condition>*<checksum><cr><lf>

Arguments:

Table 43. $PSTMPPS field description on PPS_IF_FIX_CONDITION_CMD

Parameter	Format	Description
fix_condition	Decimal, 1 digit	1 = NOFIX. 2 = 2DFIX. 3 = 3DFIX.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.17 PPS Set PPS_IF_SAT_TRHESHOLD_CMD

Synopsis:

$PSTMPPS,2,9,<sat_th>*<checksum><cr><lf>

Arguments:

Table 44. $PSTMPPS field description on PPS_IF_SAT_TRHESHOLD_CMD

Parameter	Format	Description
sat_th	Decimal	Minimum number of satellites for the PPS generation.

Results:

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According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.18 PPS Set PPS_IF_ELEVATION_MASK_CMD

Synopsis:

$PSTMPPS,2,10,<elevation_mask>*<checksum><cr><lf>

Arguments:

Table 45. $PSTMPPS field description on PPS_IF_ELEVATION_MASK_CMD

Parameter	Format	Description
elevation_mask	Decimal	Minimum satellite elevation for satellite usage in timing filtering.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.19 PPS Set PPS_IF_CONSTELLATION_MASK_CMD

Synopsis:

$PSTMPPS,2,11,<constellation_mask>*<checksum><cr><lf>

Arguments:

Table 46. $PSTMPPS field description on PPS_IF_CONSTELLATION_MASK_CMD

Parameter	Format	Description
constellation_mask	Decimal (bit mask)	Satellite constellation selection for usage in timing filtering. bit0 = GPS bit1 = GLONASS bit7 = BEIDOU ***Note:*** *This parameter enables the usage of mixed constellations satellites in the timing filtering. If bit0 is enabled GPS satellites are used to correct the GLONASS reference time together with GLONASS satellites. If bit1 is enabled,*

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		GLONASS satellites are used to correct the GPS reference time together with the GPS satellites. When constellation mask is zero (default) only GPS sats are used to correct the GPS reference time and only GLONASS sats are used to correct the GLONASS reference time. *Same description is valid also for GPS and Beidou constellations enabling/disabling bit0 and bit7.*

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.20 PPS Set PPS_IF_TIMING_DATA_CMD

Synopsis:

$PSTMPPS,2,12,<fix_condition>,<sat_th>,<elevation_mask>,<constellation_mas>,<gsp_rf_delay>, <glonass_rf_delay>*<checksum><cr><lf>

Arguments:

Table 47. $PSTMPPS field description on PPS_IF_TIMING_DATA_CMD

Parameter	Format	Description
fix_condition	Decimal, 1 digit	1 = NOFIX. 2 = 2DFIX. 3 = 3DFIX.
sat_th	Decimal	Minimum number of satellites for the PPS generation.
elevation_mask	Decimal	Minimum satellite elevation for satellite usage in timing filtering.
constellation _mask	Decimal (bit mask)	Satellite constellation selection for usage in timing filtering. bit0 = GPS bit1 = GLONASS bit7 = BEIDOU

Table 48. $PSTMPPS field description on PPS_IF_TIMING_DATA_CMD

Parameter	Format	Description
gps_rf_delay	Decimal	GPS path RF delay [ns]

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glonass_rf_delay	Decimal	GLONASS path RF delay [ns]

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.21 PPS Set PPS_IF_POSITION_HOLD_DATA_CMD

Synopsis:

$PSTMPPS,2,13,<on_off>,<lat>,<lat_dir>,<lon>,<lon_dir>,<h_msl>*<checksum>< cr><lf>

Arguments:

Table 49. $PSTMPPS field description on PPS_IF_POSITION_HOLD_DATA_CMD

Parameter	Format	Description
on_off	Decimal, 1 digit	0 = Position Hold disabled. 1 = Position Hold enabled.
lat	DDmm.mmmmm	Position Hold position latitude.
lat_dir	"N" or "S"	North or South direction.
lon	DDDmm.mmmmm	Position Hold position longitude.
lon_dir	"E" or "W"	East or West direction.
h_msl	Double	Position Hold mean see level altitude.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.22 PPS Set PPS_IF_AUTO_HOLD_SAMPLES_CMD

Synopsis:

$PSTMPPS,2,14,<auto_ph_samples>*<checksum><cr><lf>

Arguments:

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Table 50. $PSTMPPS field description on PPS_IF_AUTO_HOLD_SAMPLES_CMD

Parameter	Format	Description
auto_ph_samples	Decimal, 1 digit	Number of position samples for the auto position algorithm. If the number of samples is set to “0” the auto position hold feature is disabled. The position average evaluation is restarted every time the command is executed.

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.41.23 PPS Set PPS_IF_TRAIM_CMD

Synopsis:

$PSTMPPS,2,15,<on_off>,<alarm>*<checksum><cr><lf>

Arguments:

Table 51. $PSTMPPS field description on PPS_IF_TRAIM_CMD

Parameter	Format	Description
on_off	Decimal, 1 digit	0 = TRAIM disabled. 1 = TRAIM enabled.
alarm	Double	TRAIM alarm [s] – scientific notation is allowed

Results:

According to the operation mode and to the command type, data is set into the PPS manager or it is retrieved from the PPS manager.

2.2.42 $PSTMADCSTART

Start the ADC. It enables the peripheral clock, configures the ADC wrapper registers and creates the handlers for each channel not masked.

This command has to be used only once, if the command is executed more than once, it does not have any effect on the system.

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Synopsis:

$PSTMADCSTART,<sel_line>,<adc_functional_mode>*<checksum><cr><lf>

Arguments:

Table 52. $PSTMADCSTART field description

Parameter	Format	Description
Sel_line	Decimal	It is a select line mask. This value sets the sel field of the ADC configuration register that controls which channels are masked. Allowed values: 0: 8 channels available (no channel masked) 1: 4 channels available (AIN0, AIN2, AIN4, AIN6; the other analogue data input are masked) 3: 2 channels available (AIN0, AIN4, others channels are masked) 7: 1 channel available (AIN0; all the others channels are masked)
adc_functional_mode	Decimal	It allows selecting ADC operating mode: 0: NO INTERRUPT mode 1: INTERRUPT mode It is an optional parameter. If not present by default the ADC operating mode will be NO INTERRUPT.

Results:

In case of no errors, the $PSTMADCSTARTOK message is returned

In case of errors, the error message $PSTMADCSTARTERROR is returned

Examples:

To observe all eight possible channels in NO INTERRUPT ADC operating mode:

$PSTMADCSTART,0*<checksum><cr><lf>

To observe only the channels AIN0, AIN2, AIN4 and AIN6 in NO INTERRUPT ADC operating mode:

$PSTMADCSTART,1*<checksum><cr><lf>

To observe only the channels AIN0 and AIN4 in NO INTERRUPT ADC operating mode:

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$PSTMADCSTART,3*<checksum><cr><lf>

To observe only one channel AIN0 in NO INTERRUPT ADC operating mode:

$PSTMADCSTART,7*<checksum><cr><lf>

To observe all eight possible channels in INTERRUPT ADC functional mode:

$PSTMADCSTART,0,1*<checksum><cr><lf>

To observe only one channel AIN0 in NO INTERRUPT ADC operating mode:

$PSTMADCSTART,7,0*<checksum><cr><lf>

2.2.43 $PSTMADCREAD

This NMEA command reads from the buffer the converted analogue input specified as parameter.

This command has to be used only after ADC is started, if the command is executed more than once, the system returns an error message. It is important that the selector line has the same value passed in the STARTADC NMEA command.

Synopsis:

$PSTMADCREAD,<sel_line>,<ain>*<checksum><cr><lf>

Arguments:

Table 53. $PSTMADCREAD field description

Parameter	**Format**	**Description**
Sel_line	Decimal, 1 digit	It is a select line mask. This value sets the sel field of the ADC cfg register that controls which channels are masked: 0: 8 channels available (no channel masked) 1: 4 channels available (AIN0, AIN2, AIN4, AIN6; the other analog data input are masked) 3: 2 channels available (AIN0, AIN4, others channels are masked) 7: 1 channel available (AIN0; all the others channels are masked). This value must have the same value passed as parameter in the ADCSTART NMEA command
ain	Decimal, 1 digit	Channel to be read. It has to be compatible to

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		the sel_line value: 0,…,7 if sel_line = 0; 0, 2, 4, 6 if sel_line = 1; 0, 4 if sel_line = 3; 0 if sel_line = 7

Results:

In case of no errors, the $PSTMADCREADOK message is returned

In case of errors, the error message $PSTMADCREADERROR is returned

Examples:

All the eight possible channels are available and the channel to be read is AIN5:

$PSTMADCREAD,0,5*<checksum><cr><lf>

Only AIN0, AIN2, AIN4 and AIN6 channels are available and the one to be read is AIN2:

$PSTMADCREAD,1,2*<checksum><cr><lf>

Only the channels AIN0 and AIN4 are available and the channel to be read is AIN4:

$PSTMADCREAD,3,4*<checksum><cr><lf>

Only one channel is available AIN0:

$PSTMADCREAD,7,0*<checksum><cr><lf>

Result Example for the last case:

$PSTMADCREAD,0,760*4f*<checksum><cr><lf>

2.2.44 $PSTMLOWPOWERONOFF

Allow setting the low power algorithm parameters at run-time.

Synopsis:

$PSTMLOWPOWERONOFF,<low power enable/disable>,<constellation mask>,

<EHPE threshold> ,<Max tracked sats>,<Switch constellation features >,<Duty Cycle enable/disable>, <Duty Cycle fix period>,<Periodic mode>,<Fix period>,<Number of fix>,<Ephemeris refresh>,<RTC refresh>,<No Fix timeout>,<No Fix timeout Off duration>*<checksum><cr><lf>

Arguments:

Table 54. $PSTMLOWPOWERONOFF field description

Parameter	Format	Description
low power enable/disable	Decimal, 1 digit	General Low Power features Enable/Disable 0: OFF, 1: ON
Adaptive mode settings		
Constellation mask	Decimal, 1 digit	Reserved, must be 1
EHPE threshold	Decimal, 3 digits	Reserved, must be 0
Max tracked sats	Decimal, 2 digits	Reserved, must be 0
Switch constellation features	Decimal, 1 digit	Reserved, must be 0
Cyclic mode settings		
Duty Cycle enable/disable	Decimal, 1 digit	Enable/Disable the Cyclic mode 0: OFF, 1: ON This parameter can only be enabled if “Periodic mode” parameter is 0
Duty Cycle fix period	Decimal, 1 digits	Time between 2 fixes Typical value: 1, 3, 5 The receiver provide a fix every fix period
Periodic mode settings		
Periodic mode	Decimal, 1 digit	Setup Active or Standby periodic mode 0: OFF 1: Active Periodic mode 3: Standby Periodic mode 7: Standby Periodic mode and FixOnDemand triggered by WakeUp pin. This parameter can only be different from 0 if “Duty Cycle enable/disable” parameter is 0.
FixPeriod	Decimal, 5 digits	Interval between two fixes [s]. 0 means no periodic fix is required.
FixOnTime	Decimal, 2 digits	Number of fixes reported for each interval
Ephemeris refresh	Decimal, 1 digit	Enable/Disable the refresh of ephemeris data 0: OFF, 1: ON
RTC calibration	Decimal, 1 digit	Enable/Disable the RTC calibration 0: OFF, 1: ON

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NoFixCnt	Decimal, 2 digits	Time to declare fix loss [s] in HOT conditions
NoFixOff	Decimal, 2 digits	Period of off period after a fix loss [s]. 0 means the counter is not active. The fix retry will be based on FixPeriod.

Results:

If the command is executed with success the following message is sent:

$PSTMLOWPOWERON,<EHPE threshold>,<Max tracked sats>,<Switch constellation features >, <Duty Cycle enable>, <Duty Cycle fix period>, <Periodic mode>,

<Fix period>, <Number of fix>, <Ephemeris refresh>, <RTC refresh>, <No Fix timeout>, <No Fix timeout Off duration>*<checksum><cr><lf>

Arguments:

Same description as reported in the previous table.

2.2.45 $PSTMCRCCHECK

Evaluates the Cyclic Redundancy Check (CRC-32bits) of the GNSS firmware and boot code memory areas and compare it with the factory stored CRC value.

Synopsis:

$PSTMCRCCHECK,<type>,<par1>,<par2>,<par3>*<checksum><cr><lf>

Arguments:

Table 55. $PSTMCRCCHECK command field description

Parameter	Format	Description
type	Decimal, 1 digit	Command configuration bitmask. Bit0: defines the meaning of input parameters (par1, par2 and par3) – 0 = input parameters represent the memory addresses where the value is stored. – 1 = input parameters represent the value for the CRC evaluation and compare. Bit1: indicates if boot code should be included or not in the CRC evaluation. – 0 = boot code is included – 1 = boot code is excluded by CRC

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		evaluation. Bit2: defines the response message format. – 0 = short response message – 1 = detailed response message
par1	Hexadecimal, 1 digit	GNSS firmware base address (it could be an address or a value according to bit0 of first parameter)
par2	Hexadecimal, 1 Digit	GNSS firmware size (it could be an address or a value according to bit0 of first parameter)
par3	Hexadecimal, 1 Digit	GNSS firmware stored CRC (it could be an address or a value according to bit0 of first parameter)

Results:

The $PSTMCRCCHECK message is returned

Examples:

Note: *All input parameters are optional. If command is sent with no input parameters the CRC evaluation and comparison is performed including the boot code area and using the default hard coded location to retrieve base address, size and stored CRC. In such case the command response will be:*

$PSTMCRCCHECK,<result><checksum><cr><lf>*

Note: *Response message may include or not details about boot code area according to bit1 status of first input parameter.*

2.2.46 $PSTMSTBIN

Switch NMEA port in/out interface to ST binary protocol (STBIN).

Synopsis:

$PSTMSTBIN*<checksum><cr><lf>

Arguments:

None.

Results:

The NMEA port can send messages and receive commands according to the STBIN protocol.

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Note: *To be used the STBIN needs to be enabled and configured (see firmware configuration documentation for details).*

2.2.47 $PSTMNMEAREQUEST

Send a set of NMEA messages according to the input message list as specified in the FW Configuration document.

Synopsis:

$PSTMNMEAREQUEST,<msglist_l>,<msglist_h>*<checksum><cr><lf>

Arguments:

Table 56. $PSTMNMEAREQUEST field description

Parameter	Format	Description
msglist_l	Hexadecimal, 1 Digit	First 32 bits of 64 bits message list (low). Each bit is used to enable/disable a specific message. 0 = disabled 1 = enabled
msglist_h	Hexadecimal, 1 Digit	Second 32 bits of 64 bits message list (high). Each bit is used to enable/disable a specific message. 0 = disabled 1 = enabled

Results:

A set of NMEA messages is sent according to the input message list.

Note: *The order of NMEA messages in the message list is the same as for the periodic NMEA output messages.*

2.2.48 $PSTMFORCESTANDBY

Force the platform to go in standby mode.

Note: *This command is not implemented in 3.7.x version of the software.*

Synopsis:

$PSTMFORCESTANDBY,<duration>*<checksum><cr><lf>

Arguments:

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Table 57. $PSTMFORCESTANDBY field description

Parameter	Format	Description
duration	Decimal, 5 digits	Duration of the standby time in seconds

Results:

In case of no errors, the $PSTMFORCESTANDBYOK message is returned

In case of errors, the error message $PSTMFORCESTANDBYERROR is returned

2.2.49 $PSTMIONOPARAMS

Uploads a specific iono packet into the Teseo NVM. The uploaded iono packet will be retained until a new iono packet for the same constellation is successfully uploaded or downloaded from the navigation message.

Note: *This command is not implemented in 3.x.y version of the software.*

Synopsis: when sat_type = 0

$PSTMIONOPARAMS,<sat_type=0>,1,<A0>,<A1>,<A2>,<A3>,<B0>,<B1>,<B2>,<B3>*<checksum><cr><lf>

Synopsis: when sat_type = 1

$PSTMIONOPARAMS,<sat_type=1>,1,<ai0>,<ai1>,<ai2>,<Region1>,<Region2>,<Region3>,<Region4>,<Region5>*<checksum><cr><lf>

Arguments:

Table 58. $PSTMIONOPARAMS field description

Parameter	Format	Description
sat_type	Decimal, 1 digits	1 is for GPS 3 is for Galileo 7 for BeiDou
A0,A1,A2, A3	Decimal, 3 digits	These parameters are used only if sat_type=1 or 7 Iono parameters, raw integer values as from Navigation Messages.
B0,B1,B2, B3	Decimal, 3 digits	These parameters are used only if sat_type=1 or 7

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		Iono parameters, raw integer values as from Navigation Messages.
ai0,ai1,ai2	Decimal, 3 digits	These parameters are used only if sat_type=3 Iono parameters, raw integer values as from Navigation Messages.
Region1, Region2, Region3, Region4, Region5	Binary	These parameters are used only if sat_type=3 Galileo iono regions

2.2.50 $PSTMGALILEOGGTO

This command programs the Galileo broadcast GGTO.

Note: *This command is not implemented in 3.x.y version of the software.*

Synopsis:

$PSTMGALILEOGGTO,<brd>,<WN0G>,<t0G>,<A0G>,<A1G>,<validity>*<checksum><cr>< lf>

Arguments:

Table 59. $PSTMGALILEOGGTO field description

Parameter	Format	Description
brd	Decimal, 1 digits	1=broadcast GGTO
WN0G	Decimal, 3 digits	Value for WN0G
t0G	Decimal, 5 digits	Value for t0G
A0G	Decimal, 5 digits	Value for A0G
A1G	Decimal, 5 digits	Value for A1G
validity	Binary	0=not valid, 1=valid

2.2.51 $PSTMGALILEODUMPGGTO

This command dumps the broadcast GGTO.

Note: *This command is not implemented in 3.x.y version of the software.*

Synopsis:

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$PSTMGALILEODUMPGGTO*<checksum><cr><lf>

Arguments:

No arguments.

Results:

If the command is executed with $PSTMGALILEODUMPGGTO, message is sent

2.2.52 $PSTMSETTHTRK

Configures the CN0 and Angle Elevation Mask thresholds for tracking. This command changes these parameters at run-time and no reset is required. In case of reset tracking CN0 and Angle Elevation Mask are restored to default value.

Synopsis:

$PSTMSETTHTRK,<cn0>,<el>*<checksum><cr><lf>

Arguments:

Table 60. $PSTMCFGSETTHTRK field description

Parameter	Format	Description
brd	Decimal, 1 digits	1=broadcast GGTO
WN0G	Decimal, 3 digits	Value for WN0G

Results:

In case of no errors, the $PSTMSETTHTRKOK message is returned

In case of errors, the error message $PSTMSETTHTRKERROR is returned

2.2.53 $PSTMSETTHPOS

Configures the CN0 and Angle Elevation Mask thresholds for positioning. This command changes these parameters at run-time and no reset is required. In case of reset positioning CN0 and Angle Elevation Mask are restored to default value.

Synopsis:

$PSTMSETTHPOS,<cn0>,<el>*<checksum><cr><lf>

Arguments:

Table 61. $PSTMCFGSETTHPOS field description

Parameter	Format	Description
cn0	Decimal	Positioning CN0 threshold as dB
el	Double	Positioning elevation mask angle as degree

Results:

In case of no errors, the $PSTMSETTHPOSOK message is returned

In case of errors, the error message $PSTMSETTHPOSERROR is returned

2.2.54 $PSTMIMUSELFTESTCMD

Execute a Self-Test Command in the mounted IMU. The IMU Category to test (accelerometer or gyroscope) is a command parameter.

Synopsis:

$PSTMIMUSELFTESTCMD,<IMU_Cat>*<checksum><cr><lf>

Arguments:

Table 62. $PSTMIMUSELFTESTCMD field description

Parameter	Format	Description
IMU_Cat	Decimal,1 digit	Indicates one of IMU types: 0 = accelerometer, 1 = gyroscope

Results:

In case of no error the $PSTMIMUSELFTESTCMDOK message is sent

In case of error the $PSTMIMUSELFTESTCMDOK message is sent

If the IMU doesn't support self-test the $PSTMIMUSELFTESTCMDERROR message is sent

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Example:

$PSTMIMUSELFTESTCMD,1*<checksum><cr><lf>

2.2.55 $PSTMGETFLASHTYPE

Returns the type of the flash memory in use.

Synopsis:

$PSTMGETFLASHTYPE*<checksum><cr><lf>

Arguments:

None

Results:

In case of no error the $PSTMGETFLASHTYPE message is sent

In case of error the $PSTMGETFLASHTYPEERROR message is sent

2.2.56 $PSTMFMWUPGRADE

This command starts the Firmware Update procedure over NMEA.

Synopsis:

$PSTMFMWUPGRADE*<checksum><cr><lf>

Arguments:

None

Results:

In case of no error the $PSTMFWUPGRADEOK message is sent

In case of error the $PSTMGETFLASHTYPEERROR message is sent

2.3 ST system configuration commands

The GNSS Software utilizes a “Configuration Data Block” that holds the working parameters for the system. The parameters can be set, read or store (in NVM) using the system configuration commands:

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$PSTMSETPAR, $PSTMGETPAR and $PSTMSAVEPAR. There is also a command to restore the factory setting parameters: $PSTMRESTOREPAR.

At run-time it could be possible to have up to three different configuration blocks:

Current configuration: it is placed in RAM memory and it includes the current configuration of each parameter. This configuration block can be modified with the $PSTMSETPAR command. The $PSTMSAVEPAR command stores the current configuration data block into the NVM memory. At startup the current configuration block is loaded from NVM (if a stored data block is available) or it is loaded from the default one embedded in the code (factory settings).

Default configuration: it is generally placed in the flash/rom memory. It includes the factory setting for each parameter. This configuration is used at system startup if there is no configuration data into the NVM memory.

NVM stored configuration: it is available in the NVM backup memory as soon as the $PSTMSAVEPAR command is executed. It includes all parameters modified and stored by the user. At system startup the SW configuration management checks if a valid configuration block is available in the NVM backup memory. In case the stored configuration is available, it will be used for system configuration. If not available the default setting will be used.

Note: *Other "Configuration Data Block" parameters not documented in this manual must be considered as RESERVED and must not be modified. Modifying any other parameter intentionally or unintentionally may stop the system from working and/or degrade the system performance.*

2.3.1 $PSTMSETPAR

This command sets the defined parameter (indicated by "ID") to the value provided as "param_value" in the commands parameter.

Synopsis:

$PSTMSETPAR,<ConfigBlock><ID>,<param_value>[,<mode>]*<checksum><cr><lf>

Arguments:

Table 63. $PSTMSETPAR field description

Parameter	Format	Description
ConfigBlock	Decimal,1 digit	Indicates one of the configuration blocks: 1=Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier (see Configuration Data Block as described in FW Configuration document)

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param_value	1 up to 80 bytes	Parameter to be set, see “Allowed values” as described in FW Configuration document.
mode	Decimal, 1 digit	This parameter is optional. It allows to perform bit-to-bit “OR” or “AND” operations between the selected parameter in the configuration block and the param_value in input. It has the following meaning: 0: the parameter in the configuration block is overwritten by the param_value. This is the default action as in the case mode is omitted. 1: the parameter in the configuration block is the result of bit-to-bit “OR” between old value and the param_value.This is useful for bit mask setting. 2: the parameter in the configuration block is the result of bit-to-bit “AND” between old value and NOT(param_value). This is useful for bit mask resettimg.

Results:

In case of no errors, the $PSTMSETPAROK message is returned

In case of errors, the error message $PSTMSETPARERROR is returned

Example:

Issuing the command:

$PSTMSETPAR,1121,10*<checksum><cr><lf>

You could have this answer:

$PSTMSETPAROK,1121*<checksum><cr><lf>

Note: *The configuration block parameter is ignored by the “SET” command because only the current configuration, stored in the RAM memory, can be written. It is used only to keep the same syntax as for the “GET” command. The configuration block stored in NVM will be overwritten by the current configuration after the $PSTMSAVEPAR command.*

Note: *There is no comma and no space between ConfigBlock and ID parameters.*

Note: *The input param_value must be expressed in hexadecimal format without “0x” prefix for any integer value except DOP configuration. It must be decimal for any not integer value and DOP setting.*

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2.3.2 $PSTMGETPAR

This command reads the defined parameter (indicated by “ID”) from the “Configuration Data Block” and returns it as a specific message.

Synopsis:

$PSTMGETPAR,<ConfigBlock><ID>*<checksum><cr><lf>

Arguments:

Table 64. $PSTMGETPAR field description

Parameter	Format	Description
ConfigBlock	Decima1, 1 digit	Indicates one of configuration blocks: 1 = Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier(see Configuration Data Block)

Results:

In case of no errors, $PSTMSETPAR message is sent

In case of errors, the error message $PSTMGETPARERROR is returned

Example:

Issuing the command:

$PSTMGETPAR,1403*<checksum><cr><lf>

You could have this answer:

$PSTMSET,1403,15,12,12,18*<checksum><cr><lf>

Note: *There is no comma and no space between ConfigBlock and ID parameters. Note:In case of no errors the answer is deliberately $PSTMSET and not $PSTMGET.*

Note: *If the parameter ID is “000” all the configuration block is printed out using one message for each parameter. The message syntax is the same as reported above.*

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2.3.3 $PSTMSAVEPAR

Save current configuration data block into the backup memory.

Synopsis:

$PSTMSAVEPAR*<checksum><cr><lf>

Arguments:

None.

Results:

The current configuration data block, including changed parameters, will be stored into the backup memory (NVM).

In case of no errors, the $PSTMSAVEPAROK message is returned

In case of errors, the error message $PSTMSAVEPARERROR is returned

Note: *The factory setting parameters can be restored using the $PSTMRESTOREPAR command.*

Example:

$PSTMSAVEPAR*<checksum><cr><lf>

2.3.4 $PSTMRESTOREPAR

Restore the factory setting parameters. The configuration data block stored in NVM, if present, will be invalidated. Any changed parameter will be lost.

Synopsis:

$PSTMRESTOREPAR*<checksum><cr><lf>

Arguments:

None.

Results:

The factory setting parameters will be restored and the configuration block in the backup memory will be lost. A system reboot is needed to complete the factory reset restoring and to get system working

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with default setting.

In case of no errors, the $PSTMRESTOREPAROK message is returned

In case of errors, the error message $PSTMRESTOREPARERROR is returned

Example:

$PSTMRESTOREPAR*<checksum><cr><lf>

2.3.5 $PSTMCFGPORT

Configure a general-purpose port for NMEA, STBIN, DEBUG or RTCM purpose.

Synopsis:

$PSTMCFGPORT,<port_type>,<protocol_type>,<par_1>,<par_2>,…,<par_N>*<checksum><cr><lf>

Arguments:

Table 65. $PSTMCFGPORT field description

Parameter	Format	Description
port_type	Decimal, 1 Digit	Select the port type: 0 = UART 1 = I2C 2 = SPI 3 = USB
protocol_type	Decimal, 1 Digit	Select the protocol type: 0 = NMEA 1 = STBin 2 = Debug 3 = RTCM
par_1 … par_N	Integer	Parameters list according to the command type Specification (see below).

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGPORTOK message is returned

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In case of errors, the error message $PSTMCFGPORTERROR is returned

2.3.6 $PSTMCFGPORT on UART

Arguments:

Table 66. $PSTMCFGPORT field description when port_type is UART

Parameter	Format	Description
portnumb	From 0 to 255	UART GPIO ID (Linearly addressed)
baudrate	Integer	The port baud rate. Allowed values are: 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400, 460800, 921600

2.3.7 $PSTMCFGPORT on I2C

Arguments:

Table 67. $PSTMCFGPORT field description when port_type is I2C

Parameter	Format	Description
slaveaddr	Hexadecimal, 2Bytes	The I2C slave address
mode	Decimal, 1 digit	0 = Speed mode STANDARD 1 = Speed mode FAST 2 = Speed mode HS

2.3.8 $PSTMCFGPORT on SPI

Still unused, placeholder for future development.

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2.3.9 $PSTMCFGPORT on USB

Arguments:

Table 68. $PSTMCFGPORT field description when port_type is USB

Parameter	Format	Description
dtefeat	Decimal, 1 digit	0 = Data Terminal Equipment is disabled. 1 = Data Terminal Equipment is enabled.
detfeat	Decimal, 1 digit	0 = Detect feature is disabled. 1 = Detect feature is enabled.
detgpioid	From 0 to 255	Detect GPIO ID (Linearly addressed)
detgpiocfg	Decimal, 1 digit	Detect GPIO configuration. Allowed values are: 0 = Default 1 = Alternate A 2 = Alternate B 3 = Alternate C

2.3.10 $PSTMCFGANTSENS

Configure the Antenna Sensing.

Synopsis:

$PSTMCFGANTSENS,<sens_type>,<periodicmsg>,<switchcap>,<switchgpioid>,<switchgpiocfg>,<par_1>,<par_2>,...,<par_N>*<checksum><cr><lf>

Arguments:

Table 69. $PSTMCFGANTSENS field description

Parameter	Format	Description
sens_type	Decimal, 1 Digit	Select the port type: 0 = OFF 1 = RF 2 = ADC 3 = GPIO
periodicmsg	Decimal, 1 digit	0 = Periodic antenna related messages are disabled. 1 = Periodic antenna related messages are enabled.

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switchcap	Decimal, 1 digit	0 = Antenna switching is disabled. 1 = Antenna switching is enabled.
switchgpioid	From 0 to 255	ANT_SWITCH_CTRL port ID (Linearly addressed): currently unused.
switchgpiocfg	Decimal, 1 digit	ANT_SWITCH_CTRL configuration: 0 = Default, 1 = Alternate A 2 = Alternate B 3 = Alternate C
par_1 … par_N	Integer	Parameters list according to the command type specification (see below).

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGANTSENSOK message is returned

In case of errors, the error message $PSTMCFGANTSENSERROR is returned

2.3.11 $PSTMCFGANTSENS on RF

No additional parameters are required when sensing type is RF.

2.3.12 $PSTMCFGANTSENS on ADC

Arguments:

Table 70. $PSTMCFGANTSENS field description on sensing on ADC

Parameter	Format	Description
chid	y combination with two bits high	ADC channel input mask. The bit position represents the ADC channel. The selected channel must have the corresponding bit enabled in the mask. Any combination of couples of channels is allowed only for STA8090EXG. For all other packages default value, must be used: 0x3.
clkdiv	From 0 to 255	Clk divisor factor to configure ADC sampling rate.
min_thr	Integer < 63	Minimum Threshold value (mV).

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max_thr	Integer > 210	Maximum Threshold value (mV).

2.3.13 $PSTMCFGANTSENS on GPIO

Arguments:

Table 71. $PSTMCFGANTSENS field description on sensing on GPIO

Parameter	Format	Description
digon_gpio_id	From 0 to 255	ANT_DIG_ON port ID (Linearly addressed): currently unused.
digon_gpio_cfg	Decimal, 1 digit	ANT_DIG_ON port configuration: 0 = Default, 1 = Alternate A 2 = Alternate B 3 = Alternate C
dig_short_gpio_id	From 0 to 255	EXT_ANT_DIG_SHORT port ID (Linearly addressed): currently unused.
dig_short_gpio_cfg	Decimal, 1 digit	EXT_ANT_DIG_SHORT port configuration: 0 = Default, 1= Alternate A 2 = Alternate B 3 = Alternate C
dig_open_gpio_id	From 0 to 255	EXT_ANT_DIG_OPEN port ID (Linearly addressed): currently unused.
dig_open_gpio_cfg	Decimal, 1 digit	EXT_ANT_DIG_OPEN port configuration: 0 = Default, 1 = Alternate A 2 = Alternate B 3 = Alternate C

2.3.14 $PSTMCFGANTSENS on OFF

Arguments:

No arguments

2.3.15 $PSTMCFGCLKS

Configure a clock source.

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Synopsis:

$PSTMCFGCLKS,<clkid>,<clksrc>,<clkdiv>*<checksum><cr><lf>

Arguments:

Table 72. $PSTMCFGCLKS field description

Parameter	Format	Description
clkid	Decimal, 1 digit	Clock identifier: 0 = CPU-clk … open to future development
clksrc	Decimal, 1 digit	Clock source selector: 0 = 192f0 1 = TCXO 2 = RTC 3 = RING Oscillator
clkdiv	Decimal, 1 digit	Clock divider: 0 = DIV 1 1 = DIV 2 2 = DIV 3 3 = DIV 4

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGCLKSOK message is returned

In case of errors, the error message $PSTMCFGCLKSERROR is returned

2.3.16 $PSTMCFGMSGL

Configure the Message List.

Synopsis:

$PSTMCFGMSGL,<listid>,<rate>,<listlow>,<listhigh>*<checksum><cr><lf>

Arguments:

Table 73. $PSTMCFGMSGL field description

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Parameter	Format	Description
listid	Decimal, 1 digit	List selector: 0 = NMEA list 0 1 = NMEA list 1 2 = NMEA list 2 3 = NMEA on Debug list 0 4 = NMEA on Debug list 1 5 = NMEA on Debug list 2 6 = STBin
rate	From 0 to 255	Message list rate scaler
listlow	Hexadecimal, 8 digits	Please refer to CDB 201 table in case of NMEA or 240 in case of STBin
listhigh	Hexadecimal, 8 digits	Please refer to CDB 228 table in case of NMEA or 241 in case of STBin

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGMSGLOK message is returned

In case of errors, the error message $PSTMCFGMSGLERROR is returned

2.3.17 $PSTMCFGGNSS

Configure the GNSS Algorithm.

Synopsis:

$PSTMCFGGNSS,<trkcn0>,<poscn0>,<trkmskang>,<posmskang>,<NCOcntr>,<NCOmin>,<NCOmax>*<checksum><cr><lf>

Arguments:

Table 74. $PSTMCFGGNSS field description

Parameter	Format	Description
trkcn0	From 0 to 255	Minimum CN0 [dB] at which satellite can be tracked
poscn0	From 0 to 255	Minimum CN0 [dB] at which satellite can be tracked for positioning solution

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trkmskang	From 0 to 255	Minimum elevation angle at which satellite can be tracked
posmskang	From 0 to 255	Minimum elevation angle at which satellite can be tracked for positioning solution
NCOcntr	From 0 to 255	NCO center value
NCOmin	From 0 to 255	NCO range minimum value
NCOmax	From 0 to 255	NCO range maximum value

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGGNSSOK message is returned

In case of errors, the error message $PSTMCFGGNSSERROR is returned

2.3.18 $PSTMCFGSBAS

Configure the SBAS Algorithm.

Synopsis:

$PSTMCFGSBAS,<enengine>,<enreport>,<enautosearch>,<numofsats>,<sat_1prnid>,<sat_1long>,<sat_1longsens>,<sat_1sbasserv>,<sat_1default>,...,<sat_Mprnid>,<sat_Mlong>,<sat_Mlongsens>,<sat_Msbasserv>,<sat_Mdefault>,<par_1>,<par_2>,...,<par_N>*<checksum><cr><lf>

Arguments:

Table 75. $PSTMCFGSBAS field description

Parameter	Format	Description
enengine	Decimal, 1 digit	Enable SBAS engine switch: 0 = Disabled 1 = Enabled
enreport	Decimal, 1 digit	Enable satellite report in GSV message: 0 = Disabled 1 = Enabled
enautosearch	Decimal, 1 digit	Enable autosearch switch:

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		0 = Disabled 1 = Enabled
autosearchmask	Hexadecimal, 8 digits	Allow enabling/disabling the SBAS satellites to be searched by the auto search procedure
dectimeout	From 0 to 255	The time the autosearch waits to try to decode the current PRN ***Note:*** *Expressed in seconds. This value is ignored if enautosearch is 0*
diftimeout	From 0 to 255	The time the autosearch waits before changing the prn when the current SBAS sat is not more decoded ***Note:*** *Expressed in seconds. This value is ignored if enautosearch is 0*
nextsattimeout	From 0 to 255	The time the autosearch waits to try to acquire and tracking new SBAS satellite using the searching channel ***Note:*** *Expressed in seconds. This value is ignored if enautosearch is 0*
nextsesstimeout	From 0 to 255	The time the autosearch waits before starting a new searching session using the searching channel ***Note:*** *Expressed in seconds. This value is ignored if enautosearch is 0*
numofsats (N)	From 0 to 255	Number of SBAS satellites. Note that following configuration settings will be repeated “numofsat” times
satN_prnid	Integer	SBAS PRN configuration for satellite 1
satN_long	From 0 to 255	Longitude for satellite 1
satN_longsens	Decimal, 1 digit	Longitude sense for satellite 1 0 = EAST 1 = WEST
satN_sbaserv	Decimal, 1 digit	SBAS service for satellite 1 0 = WAAS 1 = EGNOS 2 = MSAS 3 = GAGAN
satN_default	Decimal, 1 digit	Select if satellite 1 is default or not 0 = Not default 1 = Default

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Note, the last 5 parameters will be repeated N times, where N is the number of satellites user has chosen.

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGSBASOK message is returned

In case of errors, the error message $PSTMCFGSBASERROR is returned Parameters when auto-search is enabled.

Table 76. $PSTMCFGSBAS field description when auto-search is enabled

Parameter	Format	Description
Satellite-Enable- mask	Integer	Enable/disable satellites to be searched by the autosearch procedure.
Autosearch-decoding-timeout	Integer	Set the timeout the autosearch waits to try to decode the current PRN
Autosearch - differentialtimeout	Integer	Set the timeout the autosearch waits before changing the PRN when the current SBAS satellite is no more decoded
Autosearch-searching-timeout-next-satellite	Integer	Set the timeout the auto-search waits to try to acquire and tracking new SBAS satellite using the searching channel
Autosearch-searching-timeout-next-session	Integer	Set the timeout the auto-search waits before starting a new searching session using the searching channel

2.3.19 $PSTMCFGPPSGEN

Configure the PPS with general settings.

Synopsis:

$PSTMCFGPPSGEN,<enpps>,<genmode>,<ppsclock>,<reftime>*<checksum><cr><lf>

Arguments:

Table 77. $PSTMCFGPPSGEN field description

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Parameter	Format	Description
enpps	Decimal, 1 digit	Enable PPS engine switch 0 = Disabled 1 = Enabled
genmode	Decimal, 1 digit	Generation mode 0 = Every second 1 = Even seconds 2 = Odd seconds
ppsclock	Decimal, 1 digit	PPS clock 0 = 16 MHz 1 = 32 MHz 2 = 64 MHz
reftime	Decimal, 1 digit	Reference time 0 = UTC 1 = GPS time 2 = GLONASS time 3 = UTC (SU) 4 = GPS time from GLONASS time reference

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGPPSGENOK message is returned

In case of errors, the error message $PSTMCFGPPSGENERROR is returned

2.3.20 $PSTMCFGPPSSAT

Configure the PPS with satellite related configurations settings.

Synopsis:

$PSTMCFGPPSSAT,<enmix>,<fixcond>,<minsatnum>,<satelevmask>*<checksu m><cr><lf>

Arguments:

Table 78. $PSTMCFGPPSSAT field description

Parameter	Format	Description
enmix	Decimal, 1 digit	Enable Mixing

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		0 = Disabled 1 = GPS satellite enabled for GLONASS correction 2 = GLONASS satellite enabled for GPS correction
fixcond	Decimal, 1 digit	Fix condition 0 = No fix 1 = 2D fix 2 = 3D fix
minsatnum	From 0 to 255	Minimum number of satellites used for timing correction
satelevmask	From 0 to 255	Satellite elevation mask for time correction. It is the minimum satellite elevation angle to use the satellite for time correction

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGPPSSATOK message is returned

In case of errors, the error message $PSTMCFGPPSSATERROR is returned

2.3.21 $PSTMCFGPPSPUL

Configure the PPS with pulse related settings.

Synopsis:

$PSTMCFGPPSPUL,<enpolinv>,<pulsedur>,<delcorr>*<checksum><cr><lf>

Arguments:

Table 79. $PSTMCFGPPSPUL field description

Parameter	Format	Description
enpolinv	Decimal, 1 digit	Enable polarity inversion switch 0 = Disabled 1 = Enabled
pulsedur	Double	Allow setting the pulse duration of the PPS signal

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delcorr	Double	Allow setting a time correction to compensate any delay introduced on the Pulse Per Second (PPS) signal by cables and/or RF chain

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGPPSPULOK message is returned

In case of errors, the error message $PSTMCFGPPSPULERROR is returned

2.3.22 $PSTMCFGPOSHOLD

Configure the Position hold.

Synopsis:

$PSTMCFGPOSHOLD,<poshold>,<poshlat>,<poshlon>,<poshhei>*<checksum><cr><lf>

Arguments:

Table 80. $PSTMCFGPOSHOLD field description

Parameter	Format	Description
poshold	Decimal, 1 digit	Enable position hold switch 0 = Disabled 1 = Enabled Next parameter will be ignored when poshold is Disabled.
poshlat	Double	Set the position hold latitude
poshlon	Double	Set the position hold longitude
poshhei	Double	Set the position hold height

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGPOSHOLDOK message is returned

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In case of errors, the error message $PSTMCFGPOSHOLDERROR is returned

2.3.23 $PSTMCFGTRAIM

Configure the PPS with general settings.

Synopsis:

$PSTMCFGTRAIM,<entraim>,<threshold>*<checksum><cr><lf>

Arguments:

Table 81. $PSTMCFGTRAIM field description

Parameter	Format	Description
entraim	Decimal, 1 digit	Enable TRAIM switch 0 = Disabled 1 = Enabled
threshold	Double	Time error threshold for the satellites exclusion in the TRAIM algorithm

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGTRAIMOK message is returned

In case of errors, the error message $PSTMCFGTRAIMERROR is returned

2.3.24 $PSTMCFGSATCOMP

Configure the PPS with general settings.

Synopsis:

$PSTMCFGSATCOMP,<numofcomp>,<pathid1>,<comp1>,<pathid2>,<comp2>*<checksum><cr><lf>

Arguments:

Table 82. $PSTMCFGSATCOMP field description

Parameter	Format	Description

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numofcomp	Decimal	Number of RF path to compensate. Note that this affect next parameters. Next fields will be repeated "numofcomp" times
pathid	Decimal,1 Digit	Select the ID of the RF path to compensate 0 = GPS 1 = GLONASS
comp	Double	Time compensation value

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGSATCOMPOK message is returned

In case of errors, the error message $PSTMCFGSATCOMERROR is returned

2.3.25 $PSTMCFGLPA

Configure the Low Power Algorithm.

Synopsis:

$PSTMCFGLPA,<en_lpa>,<feat>,<fix_period>,<fix_on_time>,<no_fix_cnt>,<no_fix_cnt2>,<no_fix_off>,<adaptive_feat>,<adaptive_duty_cicle>,<ehpe_th>,<num_of_sat>,<duty_off>,<const_type>*<checksum><cr><lf>

Arguments:

Table 83. $PSTMCFGLPA field description

Parameter	Format	Description
en_lpa	unsigned, 1 bytes	Enable Low Power Algorithm 0 = LPA Disabled 1 = LPA Enabled.
feat	unsigned, 1 bytes	Low Power Algorithm feature 0 = Periodic mode disabled 1 = Active Periodic mode 2 = RESERVED 3 = Standby Periodic mode
fix_period	From 0 to 86400	Fix period in seconds. 0 means the Fix will be

		given only on WAKEUP pin activation. Value 0 is only valid in Standby Periodic mode. Default is 10.
fix_on_time	unsigned, 2 bytes	Number of fix reported every Fix wakeup. Default is 1
o_fix_cnt	unsigned, 2 bytes	Number of no-fixes in hot conditions, before to signal a fix loss event. Default is 8
no_fix_cnt2	unsigned, 2 bytes	Number of no-fixes in non-hot conditions, before signaling a fix loss event. Default is 60
no_fix_off	unsigned, 2 bytes	Off duration time after a fix loss event. Default is 180
adaptive_feat	unsigned, 1 bytes	Enable disable adaptive multi-constellation algorithm. 0 = Adaptive Algorithm Disabled 1 = Adaptive Algorithm Enabled Default is 0
adaptive_duty_cicle	unsigned, 1 bytes	Enable disable trimming of correlation time for each cycle. 0 = Adaptive Duty Cycle Disabled 1 = Adaptive Duty Cycle Enabled Default is 0
ehpe_th	unsigned, 1 bytes	EHPE average threshold. Default is 15
num_of_sat	unsigned, 1 bytes 0 to 32	Number of satellite used in Adaptive mode (first N with higher elevation) Default is 9
duty_off	unsigned, 2 bytes 100 to 740	Duty cycle OFF period length in ms; Default is 700
const_type	unsigned, 1 bytes	RESERVED, set it as 0

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Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGLPAOK message is returned

In case of errors, the error message $PSTMCFGLPAERROR is returned

2.3.26 $PSTMCFGLPS

Configure each pair PowerDomain-PowerState the system has to support.

Synopsis:

$PSTMCFGLPS,<numoflps>,<pd1>,<ps1>,<voltage1>,<pd2>,<ps2>,<voltage2>,...*<checksum><cr><lf>

Arguments:

Table 84. $PSTMCFGLPS field description

Parameter	Format	Description
numoflps	Decimal	The number of pair Power State – Power Domain to be configured. Note that next parameters will be repeated 'numodlps' times.
pd	Decimal, 1 digit	The Power Domain ID to configure: 0 = SMPS 1 = LDO1 2 = LDO2 3 = BKLDO
ps	Decimal, 1 digit	The Power State to configure 0 = Low Frequency 1 = High Frequency
voltage	Decimal, 1 digit	The pair voltage value which will be set 0 = OFF 1 = 1.0 V (means 1.8V if LDO is configured as 1.8 V, means ON if domain has ON/OFF only) 2 = 1.1 V (means 1.8V if LDO is configured as 1.8 V. RESERVED if domain has ON/OFF only) 3 = 1.2 V (means 1.8V if LDO is configured as 1.8 V. RESERVED if domain has ON/OFF only)

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGLPSOK message is returned

In case of errors, the error message $PSTMCFGLPSERROR is returned

2.3.27 $PSTMCFGAGPS

Configure the Assisted GPS.

Synopsis:

$PSTMCFGAGPS,<en_agps>*<checksum><cr><lf>

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Arguments:

Table 85. $PSTMCFGAGPS field description

Parameter	Format	Description
en_agps	Decimal	Enable/Disable AGPS engine 0 = AGPS Disables 1 = AGPS Enabled

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGAGPSOK message is returned

In case of errors, the error message $PSTMCFGAGPSERROR is returned

2.3.28 $PSTMCFGAJM

Configure the Anti-Jamming Algorithm.

Synopsis:

$PSTMCFGAJM,<gpsmode>,<glonassmode>*<checksum><cr><lf>

Arguments:

Table 86. $PSTMCFGAJM field description

Parameter	Format	Description
gpsmode	Decimal, 1 digit	Notch filter on GPS path: 0 = Disable 1 = Normal Mode 2 = Auto Mode
glonassmode	Decimal, 1 digit	Notch filter on GLONASS path: 0 = Disable 1 = Normal Mode 2 = Auto Mode

Results:

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One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGAJMOK message is returned

In case of errors, the error message $PSTMCFGAJMERROR is returned

2.3.29 $PSTMCFGODO

Configure the Odometer.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMCFGODO,<en>,<enmsg>,<alarm>*<checksum><cr><lf>

Arguments:

Table 87. $PSTMCFGODO field description

Parameter	Format	Description
en	Decimal, 1 digit	Enable/Disable the odometer: 0 = Odometer disabled 1 = Odometer enabled
enmsg	Decimal, 1 digit	Enable/Disable odometer related periodic messages: 0 = Periodic message disabled 1 = Periodic message enabled
alarm	0 to 65535	Distance travelled between two NMEA messages

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGODOOK message is returned

In case of errors, the error message $PSTMCFGODOERROR is returned

2.3.30 $PSTMCFGLOG

Configure the Data Logging.

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This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMCFGLOG,<en>,<circ>,<rectype>,<oneshot>,<rate>,<speed>,<dist>*<checksu m><cr><lf>

Arguments:

Table 88. $PSTMCFGLOG field description

Parameter	Format	Description
en	Decimal, 1 digit	Enable/Disable the log: 0 = Data-logging disabled 1 = Data-logging enabled
circ	Decimal, 1 digit	Enable/Disable circular mode: 0 = Circular mode disabled 1 = Circular mode enabled
rectype	Decimal, 1 digit	Record type 1 = Type 1 2 = Type 2 3 = Type 3
oneshot	Decimal, 1 digit	Enable/Disable one shot mode: 0 = One shot mode disabled 1 = One shot mode enabled
rate	0 to 255	Time interval in seconds between two consecutive logged records
speed	0 to 255	Minimum speed threshold (record is logged if the speed is above the threshold – 0 means the threshold is not used)
dist	0 to 65535	Distance threshold (record is logged if the distance from previous record is bigger than threshold – 0 means not used)

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGLOGOK message is returned

In case of errors, the error message $PSTMCFGLOGERROR is returned

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2.3.31 $PSTMCFGGEOFENCE

Allows to configure Geofencing feature enabling circles and choosing tolerance. This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMCFGGEOFENCE,<en>,<tol>*<checksum><cr><lf>

Arguments:

Table 89. $PSTMCFGGEOFENCE field description

Parameter	Format	Description
en	Decimal, 1 digit	Enable/Disable the geofencing: 0 = Geo fencing disabled 1 = Geo fencing enabled
tol	Decimal, 1 digit	Tolerance: 0 = none 1 = level 1 2 = level 2 3 = level 3

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGGEOFENCEOK message is returned

In case of errors, the error message $PSTMCFGGEOFENCEERROR is returned

2.3.32 $PSTMCFGGEOCIR

Allows to configure a circle of geofencing feature.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMCFGGEOCIR,<circleid>,<en>,<lat>,<lon>,<rad>*<checksum><cr><lf>

Arguments:

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Table 90. $PSTMCFGGEOCIR field description

Parameter	Format	Description
circleid	Decimal, 1 digit	The circle ID From 0 to 7
en	Boolean	Enable disable the circle 0 = Disable, 1 = Enable
lat	Double	N-th circle latitude
lon	Double	N-th circle longitude
rad	Double	N-th circle radius

Results:

One or more parameters of swconfig are set according to the command parameters. In case of no errors, the following message is returned

In case of no errors, the $PSTMCFGGEOCIROK message is returned

In case of errors, the error message $PSTMCFGGEOCIRERROR is returned

2.3.33 $PSTMCFGCONST

Allow enable/disable all the GNSS constellations.

Synopsis:

$PSTMCFGCONST,<gps>,<glonass>,<galileo>,<qzss>,<beidou<*<checksumn><cr><lf>

Arguments:

Table 91. $PSTMCFGCONST field description

Parameter	Format	Description
Gps	Decimal, 1 digit	Allowed values: Constellation disabled Constellation satellites only tracked Satellites constellation used in position evaluation
Gloanss	Decimal, 1 digit	Allowed values: Constellation disabled Constellation satellites only tracked Satellites constellation used in position evaluation

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Galileo	Decimal, 1 digit	Allowed values: Constellation disabled Constellation satellites only tracked Satellites constellation used in position evaluation
Qzss	Decimal, 1 digit	Allowed values: Constellation disabled Constellation satellites only tracked Satellites constellation used in position evaluation
Beidou	Decimal, 1 digit	Allowed values: Constellation disabled Constellation satellites only tracked Satellites constellation used in position evaluation

Results:

One or more parameters of swconfig are set according to the command parameters

In case of no errors, the $PSTMCFGCONSTOK message is returned

In case of errors, the $PSTMCFGCONSTERROR error message is returned

2.3.34 $PSTMCFGTHGNSS

Configures threshold related to GNSS algorithm.

Synopsis:

$PSTMCFGTHGNSS,<trkcn0>,<poscn0>,<trkmaskangle>,<posmaskangle>*<checksum>< cr><lf>

Arguments:

Table 92. $PSTMCFGTHGNSS field description

Parameter	Format	Description
trkcn0	Unsigned	Minimum CN0 for tracking purposes
poscn0	Unsigned	Minimum CN0 for positioning purposes
trkmaskangle	Unsigned	Minimum angle for tracking purposes
posmaskangle	Unsigned	Minimum angle for positioning purposes

Results:

If the command syntax is correct and parameters are correctly set, the device return the

$PSTMCFGTHGNSSOK confirmation message

In case of errors, the error message $PSTMCFGTHGNSSERROR is returned

2.3.35 $PSTMCFGTDATA

Configures data and time related parameters.

Synopsis:

$PSTMCFGTDATA,<gpsminweek>,<gps_max_week>,<fix_rate>,<utcdelta>*<checksum><cr><lf>

Arguments:

Table 93. $PSTMCFGTDATA field description

Parameter	Format	Description
gpsminweek	Unsigned	GPS minimum week number
gpsmaxweek	Unsigned	GPS maximum week number
fix_rate	Double	Fix rate
utc_delta	Unsigned	UTC delta time

Results:

If the command syntax is correct and parameters are correctly set, the device return the $PSTMCFGTDATAOK confirmation message

In case of errors, the $PSTMCFGTDATAERROR message, is returned

2.4 Datalogging NMEA commands

2.4.1 $PSTMLOGCREATE

This command creates and enables a new data log. In case a log is already there, this command erases the previous one.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMLOGCREATE,<cfg>,<min-rate>,<min-speed>,<min-position>,<log-mask>*<checksum>

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<cr><lf>

Arguments:

Table 94. $PSTMLOGCREATE field description

Parameter	**Format**	**Description**
cfg	Hexadecimal, 3 Digits	[24: 8]: gpio_id; [7:6]: gpio_af; [3:2]: … [1:1]: enable buffer-full GPIO alarm; [0:0]: enable-circular-buffer;
min-rate(1)	Unsigned	The rate to records a new entry
min-speed(2)	Unsigned	If the current speed is greater than the threshold then the position is logged (0 = not set)
min-position(3)	Unsigned	If the 3D position difference is greater than the threshold then the position is logged (0 = not set)
log-mask	Decimal, 1 digit	Which dataset is logged? See **Table 95: Data-log types description**

Table 95. Data-log types description

Type	**Size**	**Altitude**	**Odometer**	**Geo**	**Quality**	**Qual_idx**	**Fix**	**Speed**
1	12			X		X	X	
2	16	X		X	X		X	X
3	20	X	X	X	X		X	X

In LowPower mode min-rate, are not used. Entry-rate is the same as periodic-mode-rate.

In LowPower mode min-speed, are not used. Entry-rate is the same as periodic-mode-rate.

In LowPower mode min-position, are not used. Entry-rate is the same as periodic +-mode-rate.

Results:

In case of no errors, the $PSTMLOGCREATEOK message is returned

In case of errors, the error message $PSTMLOGCREATEERROR is returned

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2.4.2 $PSTMLOGSTART

This command starts or restarts the current the data logging.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMLOGSTART*<checksum><cr><lf>

Arguments:

No arguments

Results:

In case of no errors, the $PSTMLOGSTARTOK message is returned

In case of errors, the error message $PSTMLOGSTARTERROR is returned

2.4.3 $PSTMLOGSTOP

This command stops the data logging.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMLOGSTOP*<checksum><cr><lf>

Arguments:

No arguments

Results:

In case of no errors, the $PSTMLOGSTOPOK message is returned

In case of errors, the error message $PSTMLOGSTOPERROR is returned

2.4.4 $PSTMLOGERASE

This command erases the data log.

This command is implemented and supported only in Binary Image 4.5.8 and later.

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Synopsis:

$PSTMLOGERASE*<checksum><cr><lf>

Arguments:

No arguments

Results:

In case of no errors, the $PSTMLOGERASEOK message is returned

In case of errors, the error message $PSTMLOGERASEERROR is returned

2.4.5 $PSTMLOGREQSTATUS

Raised from the host to get information about the datalog subsystem.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMLOGREQSTATUS*<checksum><cr><lf>

Arguments:

No arguments

Results:

If logger has been created replies with the message $PSTMLOGSTATUS

Otherwise, the error message $PSTMLOGSTATUSERROR is returned

2.4.6 $PSTMLOGREQQUERY

This command triggers a query to fetch the data-log entries.

Host can specify the number of entries and from which entry the ST GNSS has to begin sending data.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMLOGREQQUERY,<start-timestamp>,<start-datestamp>,<numb-of-entries>*<checksum>

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<cr><lf>

Arguments:

Table 96. $PSTMLOGREQQUERY field description

Parameter	Format	Description
start-timestamp	Decimal, 6 Digits	The initial timestamp as hhmmss
start-datestamp	Decimal, 8 Digits	The initial date stamp as yyyyMMdd
numb-of-entries	Unsigned	Number of entries to print out

Results:

In case of no errors the message $PSTMLOGQUERY is sent

In case of errors, the error message $PSTMLOGQUERYERROR is returned

2.5 Geofencing NMEA commands

2.5.1 $PSTMGEOFENCECFG

This command configures the Geofence subsystem.

Each $PSTMGEOFENCECFG command can configure only one circle, if more circles are needed the Host has to raise more $PSTMGEOFENCECFG commands.

Geofencing subsystem is able to manage only one GPIO, therefore when more than a circle is configured to trigger a GPIO alarm, all the configurations have to specify the same GPIO with the same GPIO configuration.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMGEOFENCECFG,<id>,<en>,<tol>,<lat>,<lon>,<rad>*<checksum><cr><lf>

Arguments:

Table 97. $PSTMGEOFENCECFG field description

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Parameter	Format	Description
id	Decimal, 1 digit	Circle identifier
en	Decimal, 1 digit	Circle enabler: 0 = Circle not valid 1 = Circle enabled
tol	Decimal, 1 digit	Sigma tolerance 1 = 68% 2 = 95% 3 = 99%
lat	Double	Latitude as Decimal Degrees
lon	Double	Longitude as Decimal Degrees
rad	Double	Radius as meters

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Results:

In case of no errors, the $PSTMGEOFENCECFGOK message is returned

In case of errors, the error message $PSTMGEOFENCECFGERROR is returned

2.5.2 $PSTMGEOFENCEREQ

This command forces the GNSS Teseo III to send a $PSTMGEOFENCESTATUS message to know the internal Geofence subsystem status.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMGEOFENCEREQ*<checksum><cr><lf>

Arguments:

No Arguments

Results:

In case of no errors, the Teseo III replies with the $PSTMGEOFENCESTATUS message

In case of errors, the error message $PSTMGEOFENCEREQERROR is returned

2.6 Odometer NMEA commands

2.6.1 $PSTMODOSTART

This command enables and resets the Odometer subsystem which begins evaluating the ground distance from the current resolved position.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMODOSTART*<checksum><cr><lf>

Arguments:

No arguments.

Results:

In case of no errors, the $PSTMODOSTARTOK message is returned

In case of errors, the error message $PSTMODOSTARTERROR is returned

2.6.2 $PSTMODOSTOP

This command stops the Odometer subsystem.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMODOSTOP*<checksum><cr><lf>

Arguments:

No arguments

Results:

In case of no errors, the $PSTMODOSTOPOK message is returned

In case of errors, the error message $PSTMODOSTOPERROR is returned

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2.6.3 $PSTMODORESET

This command resets the Odometer subsystem.

This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMODORESET,<odo_mask>*<checksum><cr><lf>

Arguments:

Table 98. $PSTMODORESET field description

Parameter	Format	Description
odo_mask	Decimal	The odometers to be reset: 0 = none 1 = Odo-A 2 = Odo-B 3 = Odo-A and Odo-B 4 = Odo-Tot 5 = Odo-A and Odo-Tot 6 = Odo-B and Odo-Tot 7 = Odo-A, Odo-B and Odo-Tot

Results:

In case of no errors, the $PSTMODORESETOK message is returned

In case of errors, the error message $PSTMODORESETERROR is returned

2.6.4 $PSTMODOREQ

This command requires the Odometer status. The Odometer must be enabled otherwise the request will be rejected with error.

The Odometer must be enabled otherwise the request will be rejected with error. This command is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMODOREQ*<checksum><cr><lf>

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Arguments:

No arguments

Results:

In case of no errors, this replies with a $PSTMODO message.

In case of errors, the error message $PSTMODOREQERROR is returned

2.7 Autonomous AGNSS NMEA commands

2.7.1 $PSTMSTAGPSONOFF

The command turns ON/OFF the STAGPS™ engine; it affects both autonomous and server ased solutions.

Synopsis:

$PSTMSTAGPSONOFF,<param>*<checksum><cr><lf>

Arguments:

Table 99. $PSTMSTAGPSPONOFF field description

Parameter	Format	Description
param	Decimal, 1 digits	ON/OFF status: 0: the STAGPS™ engine is suspended. 1: the STAGPS™ engine is started

Results:

According to the command parameter, the STAGPS™ engine is started or suspended. One of the following messages is sent:

$PSTMPOLSTARTED if the engine has been started

$PSTMPOLSUSPENDED if the engine has been suspended

$PSTMPOLONOFFERROR in case of error

2.7.2 $PSTMSTAGPSINVALIDATE

The command clears data stored in the STAGPS™ internal database. The input parameter allows

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selection of the data to be cleared.

Synopsis:

$PSTMSTAGPSINVALIDATE,<param>*<checksum><cr><lf>

Arguments:

Table 100. $PSTMSTAGPSINVALIDATE field description

Parameter	Format	Description
param	Decimal, 1 digits	Selects which database should be erased: 1: Clear the real ephemeris database (only autonomous). 2: Clear the satellite seeds database (autonomous and server based) 4: Clear the satellite polys database (autonomous and server based) 7: Clear all databases

Results:

According to the command parameter, the internal STAGPS™ databases will be erased.

The input parameter should be considered as a mask where the first three bits select the database to be cleared (e.g. using 3 as input parameter the real ephemeris and seed databases will be cleared).

When operation is complete, STAGPS subsystem sends a message:

$PSTMSTAGPSINVALIDATEOK in case of success

$PSTMSTAGPSINVALIDATEERROR in case of errors

2.7.3 $PSTMGETAGPSSTATUS

The command returns the status of the STAGPS™ internal processing.

Synopsis:

$PSTMGETAGPSSTATUS*<checksum><cr><lf>

Arguments:

None

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Results:

The system sends back the STAGPS™ status in the $PSTMAGPSSTATUS message.

2.7.4 $PSTMSTAGPSSETCONSTMASK

The command sets the ST-AGNSS constellation mask. It allows switching the ST-AGNSS constellation at run-time. All previous ST-AGNSS data will be erased

Synopsis:

$PSTMSTAGPSSETCONSTMASK,<constellation_mask>*<checksum><cr><lf>

Arguments:

Table 101. $PSTMSTAGPSSETCONSTMASK field description

Parameter	Format	Description
Constellation _mask	Decimal, 1 digits	It is a bit mask where each bit enables/disables a specific constellation independently of the others: bit 0: GPS constellation enabling/disabling bit 1: GLONASS constellation enabling/disabling bit 3: GALILEO constellation enabling/disabling bit 7: BEIDOU constellation enabling/disabling

Results:

According to the command parameter. one of the following messages is sent:

$PSTMSTAGPSSETCONSTMASKOK in case of success

$PSTMSTAGPSSETCONSTMASKERROR in case of error

Note: *GALILEO and BEIDOU support is still experimental and should not be used in production environment.*

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2.8 Predictive AGNSS NMEA commands

2.8.1 $PSTMSTAGPSSEEDBEGIN

The PGPS seed first block is sent via NMEA, for each constellation. After the command has been issued for a constellation, all the packets for that constellation must be sent. The command must be re-issued before transferring the seed first block and packets for a different constellation.

The seed first block is made up of the first 171 bits of the seed string for each constellation, padded with five 0 bits at the end to reach the length of 176 bits (i.e. 22 bytes). They are the first 171 bits of the binary seed for each constellation.

Synopsis:

$PSTMSTAGPSSEEDBEGIN,<Constellation>,<Leap seconds>,<Next Leap Time>,<Next Leap>,<Ref Time>,<T0>,<T1>,<T2>,<GNSS to ID>,<Week Number>,<Delta T>,<Seed 1st block String>*<checksum><cr><lf>

Arguments:

Table 102. $PSTMSTAGPSSEEDBEGIN field description

Parameter	Description
<Constellation>	1 = GPS 2 = GLONASS 3 = GALILEO 4 = BEIDOU
<Leap seconds>	Current number of leap seconds
<Next Leap Time>	Next GPS time for leap seconds change
<Next Leap>	Next number of leap seconds
<Ref Time>	sGANSS Time Model Reference Time
<T0>	sTA0
<T1>	sTA1
<T2>	sTA2
<GNSS to ID>	GNSS to ID
<Week Number>	Week number

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<DeltaT>	Delta T (BEIDOU only)
<Seed 1st block string>	22 Byte seed first block string (each byte is coded on 2 ASCII chars so this field will be 44 ASCII chars)

Results:

In case of no errors the message

$PSTMSTAGPSSEEDBEGINOK is returned

In case of error the device returns the error message

$PSTMSTAGPSSEEDBEGINERROR

2.8.2 $PSTMSTAGPSBLKTYPE

Send the list of all block types (in satellite number order) for the current constellation. If a particular satellite is missing, then “0” should be sent as block number for that satellite.

Synopsis:

$PSTMSTAGPSBLKTYPE,<Block Type #1>,...,<Block Type #n>*<checksum><cr><lf>

Arguments:

Table 103. $PSTMSTAGPSBLKTYPE field description

Parameter	Description
<Block Type #1>	Satellite block type for satellite #1, otherwise 0
…	
<Block Type #i>	Satellite block type for satellite #i, otherwise 0
…	
<Block Type #n>	Satellite block type for satellite #n, otherwise 0

Results:

If the block types list has been correctly received then the device returns the message

$PSTMSTAGPSBLKTYPEOK

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In case of error the device returns the error message

$PSTMSTAGPSBLKTYPEERROR

2.8.3 $PSTMSTAGPSSLOTFRQ

Send the list of all slot frequency channels (in satellite slot number order) for the GLONASS constellation. If a particular satellite is missing, then “-128” should be sent as slot frequency for that satellite. This command should be issued for the GLONASS constellation only.

Synopsis:

$PSTMSTAGPSSLOTFRQ,<Slot freq #1>,...,<Slot freq #24>*<checksum><cr><lf>

Arguments:

Table 104. $PSTMSTAGPSSLOTFRQ field description

Parameter	**Description**
<Slot freq. #1>	GLONASS frequency slot for satellite #1, otherwise 0
<Slot freq. #i>	GLONASS frequency slot for satellite #i, otherwise 0
<Slot freq. #24>	GLONASS frequency slot for satellite #24, otherwise 0

Results:

If the slot frequencies list has been correctly received then the device returns the message $PSTMSTAGPSSLOTFRQOK

In case of error the device returns the error message

$PSTMSTAGPSSLOTFRQERROR

2.8.4 $PSTMSTAGPSSEEDPKT

Send the PGPS seed via NMEA divided in separate packets. The packets can be obtained by dropping the first 171 bits of the binary seed and then dividing the remaining part into 155 byte blocks. The command should be issued for each block.

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Synopsis:

$PSTMSTAGPSSEEDPKT,<Seed Packet String>*<checksum><cr><lf>

Arguments:

Table 105. $PSTMSTAGPSSEEDPKT field description

Parameter	Description
<Seed Packet String>	155 Byte seed string (each byte is coded on 2 ASCII chars so this field will be 310 ASCII chars)

Results:

If the seed packet has been correctly received then the device returns the message

$PSTMSTAGPSSEEDPKTOK

In case of error the device returns the error message

$PSTMSTAGPSSLOTFRQERROR

2.8.5 $PSTMSTAGPSSEEDPROP

After all first blocks and packets for all available constellations have been sent, this command must be issued to start propagation of the seed.

Synopsis:

$PSTMSTAGPSSEEDPROP*<checksum><cr><lf>

Arguments:

None.

Results:

After the command the device returns the message

$PSTMSTAGPSSEEDPROPOK

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2.9 Real Time AGNSS NMEA commands

2.9.1 $PSTMSTAGPS8PASSGEN

Request the generation of a password to access the Real-Time AGPS server to the device.

Synopsis:

$PSTMSTAGPS8PASSGEN,<time>,<Ven ID>*<checksum><cr><lf>

Arguments:

Table 106. $PSTMSTAGPS8PASSGEN field description

Parameter	Description
<time>	GPS time in seconds.
<Vendor ID>	Unique Vendor ID

Results:

ST GNSS Teseo III returns the password in the message $PSTMSTAGPS8PASSRTN.

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3. Messages

This section contains both the standard NMEA messages and the proprietary messages delivered from any ST-GPS system. Additionally, it contains messages which result from a specific command input.

3.1 Standard NMEA messages list

Table 107. Standard NMEA messages list

Syntax	Default	Description
$--GNS	ON	NMEA: Global Position System Fix Data
$GPGGA	ON	NMEA: Global Position System Fix Data
$GPGLL	OFF	NMEA: Geographic Position Latitude/Longitude
$--GSA	ON	NMEA: GPS DOP and Active Satellites. "GP", "GL" and "GN" talker ID are supported according to the software configuration.
$--GSV	ON	NMEA: GPS Satellites in View. "GP", "GL" and "GN" talker ID are supported according to the software configuration.
$GPRMC	ON	NMEA: Recommended Minimum Specific GNSS Data
$GPVTG	OFF	NMEA: Track made good and ground speed
$GPZDA	OFF	NMEA: Time and Date
$GPGST	ON	NMEA: GNSS Pseudorange Noise Statistics
$--DTM	OFF	NMEA: Local datum offsets from reference

3.2 ST NMEA messages list

Table 108. ST NMEA messages list

Syntax	Default	Description
$PSTMDIFF	OFF	ST: Differential Correction Data
$PSTMPRES	OFF	ST: Position Residuals
$PSTMVRES	OFF	ST: Velocity Residuals

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$PSTMPA	OFF	ST: Position Algorithm
$PSTMRF	OFF	ST: Radio Frequency
$PSTMSAT	OFF	ST: Satellite Information
$PSTMSBAS	ON	ST: Augmentation System
PSTMSBASM	OFF	ST; Augmentation System Message
$PSTMTIM	OFF	ST: System Time
$PSTMTG	OFF	ST: Time and Number of used Satellites
$PSTMTS	OFF	ST: Tracked Satellite Data
$PSTMKFCOV	OFF	ST: Standard Deviation and Covariance
$PSTMAGPS(1)	OFF	ST: STAGPS predicted ephemeris information
$PSTMNOTCHSTATUS	OFF	ST: Reports the Notch filter status.
$PSTMCPU	ON	ST: Reports the CPU usage and CPU speed setting.
$PSTMPOSNHOLD	OFF	ST: Reports the status and position of Position Hold.
$PSTMPPSDATA	OFF	ST: Reports the Pulse Per Second data.
$PSTMTRAIMSTATUS	OFF	ST: Reports the TRAIM status data.
$PSTMTRAIMUSED	OFF	ST: Reports the satellites used for timing correction.
$PSTMTRAIMRES	OFF	ST: Reports the residuals for used satellites.
$PSTMTRAIMREMOVED	OFF	ST: Reports the satellites removed by timing correction algorithm.
$PSTMLOWPOWERDATA	OFF	ST: Reports the status of low power algorithm
$PSTMGALILEOGGTO	OFF	ST: Reports the Galileo broadcast GGTO

This message is available only if the STAGPS is supported.

3.3 Changing standard NMEA messages format

By default, Standard NMEA Messages are compliant with the “NMEA 0183” Standard Rev.

3.1 dated January 2002. To change format to Rev. 4.10, issued from the “National Marine Electronics Association” in the August 2012 some system configuration commands should be issued.

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It is required to change the value of Configuration Data Block 122 from the default value to “4”.

$PSTMSETPAR,1122,4

$PSTMSAVEPAR

$PSTMSRR

It is possible to go back to default configuration restoring parameters or setting CDB 122 as 0xC

$PSTMSETPAR,1122,C

$PSTMSAVEPAR

$PSTMSRR

3.4 Preliminary notes about satellites’ PRN ranges

The satellite PRN is an ID used to identify satellites. In NMEA 0183 Rev 3.1, PRN was not described for new constellation. Starting from Rev 4.10 more constraint about this info have been added. Thus, PRN ranges depend on NMEA revision in use.

Table 109. Satellite PRNs for each NMEA version

	GPS	SBAS	GLONASS	BAIDEU	QZSS	GALILEO
NMEA 3.10	from 1 to 32	from 33 to 51	from 65 to 92	from 141 to 172	from 183 to 197	from 301 to 330
NMEA 4.10	from 1 to 32	from 33 to 64	from 65 to 99	from 1 to 32	from 1 to 32	from 1 to 36

3.5 Standard NMEA messages specification

These messages are defined within the “NMEA 0183” Specification.

3.5.1 $--GGA

Global Positioning System Fixed data

NMEA message list bitmask (64 bits): 0000 0000 0000 0002

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPGGA,<Timestamp>,<Lat>,<N/S>,<Long>,<E/W>,<GPSQual>,<Sats>,<HDOP>,

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<Alt>,<AltVal>,<GeoSep>,<GeoVal>,<DGPSAge>,<DGPSRef>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>GGA,<Timestamp>,<Lat>,<N/S>,<Long>,<E/W>,<GPSQual>,<Sats>,<HDOP>,<Alt>,<AltVal>,<GeoSep>,<GeoVal>,<DGPSAge>,<DGPSRef>*<checksum><cr><lf>

Arguments:

Table 110. $--GGA message field description

Parameter	**Format**	**Description**
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Timestamp	hhmmss.sss	UTC Time of GPS Sample: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .sss: decimal fraction of seconds (Variable length) Note that decimal fraction assumes non zero values when the fix rate is bigger than 1Hz. Note that for Rev 4.10 this field is empty in case of invalid value
Lat	DDMM.MMMMM	Latitude as degrees: DD: Degree (Fixed two digits) MM: Minutes (Fixed two digits) .MMMMM: Decimal fraction of minutes (Variable) Note that for Rev 4.10 this field is empty in case of invalid value
N/S	"N" or "S"	Latitude direction: North or South Note that for Rev 4.10 this field is empty in case of invalid value
Long	DDMM.MMMMM	Longitude as degrees: DD: Degree (Fixed two digits) MM: Minutes (Fixed two digits) .MMMMM: Decimal fraction of minutes (Variable)

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		Note that for Rev 4.10 this field is empty in case of invalid value
E/W	"E" or "W"	Longitude direction: East or West Note that for Rev 4.10 this field is empty in case of invalid value
GPSQual	Decimal, 1digit	0 = Fix not available or invalid 1 = GPS, SPS Mode, fix valid 2 = Differential GPS, SPS Mode, fix valid 6 = Estimated (dead reckoning) mode
Sats	Decimal, 2 digits	Satellites in use: example: 8
HDOP	Decimal, 3 digits	Horizontal Dilution of Precision, max: 99.0
Alt	Decimal, 6 digits	Height above mean sea level, max: 100000m
AltVal	"M"	Reference Unit for Altitude ("M" = meters)
GeoSep	Decimal, 4 digits	Geoidal Separation measure in "M" = meters
GeoVal	"M"	Reference Unit for GeoSep ("M" = meters)
DGPSAge	Empty	Not supported
DGPSRef	Empty	Not supported
Checksum	:adecimal, 2 digits	Checksum of the message bytes without *<checksum><cr><lf> characters.

Example:

$GPGGA,183417.000,04814.03970,N,01128.52205,E,0,00,99.0,495.53,M,47.6,M*53

3.5.2 $--GLL

Geographic Positioning Latitude / Longitude

NMEA message list bitmask (64 bits): 0000 0000 0010 0000

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPGLL,<Lat>,<N/S>,<Long>,<E/W>,<Timestamp>,<Status>,<modeindicator>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>GLL,<Lat>,<N/S>,<Long>,<E/W>,<Timestamp>,<Status>,<modeindicator>*
<checksum><cr><lf>

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Arguments:

Table 111. $--GLL message field description

Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
N/S	“N” or “S”	Latitude direction: North or South Note that for Rev 4.10 this field is empty in case of invalid value
Long	DDMM.MMMMM	Longitude as degrees: DD: Degree (Fixed two digits) MM: Minutes (Fixed two digits) .MMMMM: Decimal fraction of minutes (Variable) Note that for Rev 4.10 this field is empty in case of invalid value
E/W	“E” or “W”	Longitude direction: East or West Note that for Rev 4.10 this field is empty in case of invalid value
Timestamp	hhmmss.sss	UTC Time of GGL Sample, example: 160836 “.sss” is the fraction of seconds; it assumes non zero values when the fix rate is bigger than 1Hz.
Status	“A” or “V”	Validity of Data “A” = valid, “V” = invalid
Mode indicator	“D”, “A”, “N” or “E”	Positioning system Mode Indicator: “D” = Differential mode “A” = Autonomous mode “N” = data not valid “E” = Estimated (dead reckoning) mode
checksum	xadecimal,2 digits	Checksum of the message bytes without* <checksum><cr><lf> characters.

Example:

$GPGLL,4055.04673,N,01416.54941,E,110505.000,A,A*54

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3.5.3 $--GSA

GNSS DOP and Active Satellites. Satellites from different constellations are sent on separate messages.

In case of multi-constellation mode, the talker ID is always GN. If NMEA is set as Rev 3.1, it is possible to force the talker ID as GN also acting on CDB-ID 200. (See STA8089-90 Firmware Configuration document).

When NMEA is set as Rev 4.10 (See chapter 6.4 in this document) the talker ID could not be forced and is managed internally to be compliant with the standard. See parameter table for info about Talker ID available values.

NMEA message list bitmask (64 bits): 0000 0000 0000 0004

Synopsis for NMEA 0183 Rev 3.1 (Default):

$--GSA,<Mode>,<CurrentMode>,<SatPRN1>,...,<SatPRNN>,<PDOP>,<HDOP>,<VDOP>*
<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$--GSA,<Mode>,<CurrentMode>,<SatPRN1>,...,<SatPRNN>,<PDOP>,<HDOP>,<VDOP>,
<SystemID>*<checksum><cr><lf>

Arguments:

Table 112. $--GSA message field description

Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
CurrentMode	Decimal, 1 digit	Current Mode: 1 = Fix not available or invalid 2 = GPS, SPS Mode, fix valid 3 = Differential GPS, SPS Mode, fix valid

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SatPRN(1 to 12)	:imal, 2 or 3 digits	Satellites list used for positioning. See Chapter 6.5 for more info about available values.
PDOP	Decimal, 3 digits	Position Dilution of Precision, max: 99.0
HDOP	Decimal, 3 digits	Horizontal Dilution of Precision, max: 99.0
VDOP	Decimal, 3 digits	Vertical Dilution of Precision, max: 99.0
SystemID	Hexadecimal, 1 digit	The system ID of this message: 1 = GPS 2 = GLONASS 3 = GALILEO 4 = BEIDOU 5 = QZSS
checksum	:adecimal, 2 digits	Checksum of the message bytes without*<checksum><cr><lf> characters.

Example for NMEA 0183 Rev 3.1 (Default):

$GPGSA,A,3,05,21,07,24,30,16,12,,,,,,2.4,1.9,1.5*38

Example for NMEA 0183 Rev 4.10:

$GNGSA,A,3,23,03,22,09,01,19,17,06,31,11,,,1.1,0.6,0.9,1*3E

$GNGSA,A,3,67,66,81,65,88,75,82,74,,,,, 1.1,0.6,0.9,2*3D

$GNGSA,A,3,03,05,22,08,30,16,12,,,,,, 1.1,0.6,0.9,3*32

3.5.4 $--GSV

GNSS Satellites in View.

Usually GSV messages are organized per constellation and each message carries information about up to 4 satellites in view. Thus, in certain cases, to describe all the satellites in view from a constellation more than a message is needed. This set of message is printed once per each constellation with talker ID related to described constellation.

Prior to NMEA Revision 3.1 it is possible to force the “GN” talker ID acting on CDB-ID 200 Bit 19. In such case a single set of messages is sent.

With NMEA Rev 4.10 the “GN” talker ID is forbidden in order to be compliant with the standard. Thus the module will print a set of messages for each constellation.

NMEA message list bitmask (64 bits): 0000 0000 0008 0000

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Synopsis for NMEA 0183 Rev 3.1 (Default):

$--GSV,<GSVAmount>,<GSVNumber>,<TotSats>,<Sat1PRN>,<Sat1Elev>,<Sat1Azim>,

<Sat1CN0>,…,<Sat4PRN>,<Sat4Elev>,<Sat4Azim>,<Sat4CN0>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$--GSV,<GSVAmount>,<GSVNumber>,<TotSats>,<Sat1PRN>,<Sat1Elev>,<Sat1Azim>,
<Sat1CN0>,…,<Sat4PRN>,<Sat4Elev>,<Sat4Azim>,<Sat4CN0>,<SignalID>*<checksum><cr><lf>

Arguments:

Table 113. $--GSV message field description

Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
GSVAmount	Decimal, 1 digit	Total amount of GSV messages
GSVNumber	Decimal, 1 digit	Continued GSV number of this message
TotSats	Decimal, 2 digits	Total Number of Satellites in view, max. 32
SatxPRN	Decimal, 2 digits	Satellites list used for positioning. See Section 11.4 for more info about available values.
SatxElev	Decimal, 2 digits	Elevation of satellite x in Degree, 0 … 90
SatxAzim	Decimal, 3 digits	Azimuth of satellite x in degree, ref. “North”, 000 … 359
SatxCN0	Decimal, 2 digits	Carrier to Noise Ratio for satellite x in dB, 00 … 99
SignalID	Decimal, 1 digits	An identifier to indicate the signal in use. Currently it is 1 for GPS, GLONASS, 2 for BEIDOU and QZSS 6 for GALILEO
checksum	xadecimal, 2 digits	Checksum of the message bytes without* <checksum><cr><lf> characters.

Example for NMEA 0183 Rev 3.1 (Default):

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$GPGSV,3,1,12,02,04,037,,05,27,125,44,06,78,051,23,07,83,021,30*7C

$GPGSV,3,2,12,10,16,067,30,12,11,119,36,16,24,301,41,21,44,175,50*73

$GPGSV,3,3,12,23,06,326,28,24,61,118,40,30,45,122,43,31,52,253,37*7C

Example for NMEA 0183 Rev 4.10:

$GPGSV,3,1,09,30,68,039,49,05,61,266,50,28,52,137,47,07,38,052,48,01*5C

$GPGSV,3,2,09,13,37,301,45,09,17,105,43,15,07,297,40,08,06,056,41,01*56

$GPGSV,3,3,09,20,,,41,,,,,,,,,,,,01*5A

$GLGSV,2,1,06,68,86,031,43,78,78,013,46,79,51,226,43,69,33,325,38,01*43

$GLGSV,2,2,06,67,33,139,41,77,26,035,36,,,,,,,,01*46

$GAGSV,2,1,05,08,76,129,44,02,65,057,46,30,56,205,45,07,48,311,44,06*4F

$GAGSV,2,2,05,03,22,129,40,,,,,,,,,,,,06*7D

3.5.5 $--RMC

Recommended Minimum Specific GPS/Transit data. Time, date, position and speed data provided by the GNSS Teseo. This sentence is transmitted at intervals not exceeding 2 seconds and is always accompanied by RMB when destination way point is active.

NMEA message list bitmask (64 bits): 0000 0000 0000 0040

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPRMC,<Timestamp>,<Status>,<Lat>,<N/S>,<Long>,<E/W>,<Speed>,

<Trackgood>,<Date>,<MagVar>,<MagVarDir>,<mode>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>RMC,<Timestamp>,<Status>,<Lat>,<N/S>,<Long>,<E/W>,<Speed>,<Trackgood>, <Date>,<MagVar>,<MagVarDir>,<mode>,<Nav_status>*<checksum><cr><lf>

Arguments:

Table 114. $--RMC message field description

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Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Timestamp	hhmmss.sss	UTC Time of GPS Sample: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .sss: decimal fraction of seconds (Variable length) Note that decimal fraction assumes non zero values when the fix rate is bigger than 1Hz. Note that for Rev 4.10 this field is empty in case of invalid value
Status	"A" or "V"	Teseo warning: "A" = valid, "V" = Warning ***Note:*** *"V" is reported in NO FIX conditions and "A" is reported in 2D and 3D fix conditions.*
Lat	DDMM.MMMMM	Latitude as degrees: DD: Degree (Fixed two digits) MM: Minutes (Fixed two digits) .MMMMM: Decimal fraction of minutes (Variable) Note that for Rev 4.10 this field is empty in case of invalid value
N/S	"N" or "S"	Latitude direction: North or South Note that for Rev 4.10 this field is empty in case of invalid value
Long	DDMM.MMMMM	Longitude as degrees: DD: Degree (Fixed two digits) MM: Minutes (Fixed two digits) .MMMMM: Decimal fraction of minutes (Variable) Note that for Rev 4.10 this field is empty in case of invalid value
E/W	"E" or "W"	Longitude direction: East or West Note that for Rev 4.10 this field is empty in case of invalid value
Speed	ddd.d	Speed over ground in knots

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Trackgood	Decimal, 4 digits	Course made good, max. 999.9
Date	Decimal, 6 digits	Date of Fix: ddmmyyyy
MagVar	Decimal, 4 digits	Magnetic Variation, max.: 090.0
MagVarDir	"E" or "W"	Magnetic Variation Direction
Mode	"D", "A", "N" or "E"	Positioning system Mode Indicator: "D" = Differential mode "A" = Autonomous mode "N" = data not valid "E" = Estimated (dead reckoning) mode
Nav_status	"S", "C", "U" or "V"	Navigational status indicator: "S" = Safe "C" = Caution "U" = Unsafe "V" = Not valid
checksum	Hexadecimal, 2 digits	Checksum of the message bytes without* <checksum><cr><lf> characters.

Example for NMEA 0183 Rev 3.1 (Default):

$GPRMC,183417.000,V,4814.040,N,01128.522,E,0.0,0.0,170907,0.0,W*6C

Example for NMEA 0183 Rev 4.10:

$GNRMC,,V,,,,,,,,,,N,V*37

or

$GNRMC,202340.000,A,4045.53297,N,01447.20361,E,0.2,0.0,291117,,,A,C*18

3.5.6 $--VTG

Course over ground and ground speed, this message provides the actual course and speed relative to ground.

NMEA message list bitmask (64 bits): 0000 0000 0000 0010

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPVTG,<TMGT>,T,<TMGM>,M,<SoGN>,N,<SoGK>,K,D*<checksum><cr><lf>

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Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>VTG,<TMGT>,T,<TMGM>,M,<SoGN>,N,<SoGK>,K,D*<checksum><cr><lf>

Arguments:

Table 115. $--VTG message field description

Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
TMGT	ddd.d in degrees	Track in reference to “true” earth poles
T		Indicates “terrestrial”
TMGM	ddd.d in degrees	Track in reference to “magnetic” earth poles
M		Indicates “magnetic”
SoGN	ddd.d in knots	Speed over Ground in knots
N		Indicates “knots”
SoGK	ddd.d in km/h	Speed over Ground in kilometers per hour
K		Indicates “kilometres”
D	char	Mode indicator: A = Autonomous mode D= Differential mode E= Estimated mode
checksum	Hexadecimal,2 digits	Checksum of the message bytes without* <checksum><cr><lf> characters

Example:

$GPVTG,73.2,T,,M,0.2,N,0.4,K,D*50

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3.5.7 $--ZDA

UTC, day, month and year.

NMEA message list bitmask (64 bits): 0000 0000 0100 0000

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPZDA,<Timestamp>,<Day>,<Month>,<Year>,00,00*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>ZDA,<Timestamp>,<Day>,<Month>,<Year>,,*<checksum><cr><lf>

Arguments:

Table 116. $--ZDA message field description

Parameter	**Format**	**Description**
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Timestamp	hhmmss.sss	UTC Time of GPS Sample: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .sss: decimal fraction of seconds (Variable length) Note that decimal fraction assumes non zero values when the fix rate is bigger than 1Hz. Note that for Rev 4.10 this field is empty in case of invalid value
Day	Decimal, 2 digits	Day of month (01 to 31)
Month	Decimal, 2 digits	Month (01 to 12)
Year	Decimal, 4 digits	Year (1994 - …)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes without *<checksum><cr><lf> characters.

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TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Timestamp	hhmmss.sss	UTC Time of GPS Sample: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .sss: decimal fraction of seconds (Variable length) Note that decimal fraction assumes non zero values when the fix rate is bigger than 1Hz. Note that for Rev 4.10 this field is empty in case of invalid value
Day	Decimal, 2 digits	Day of month (01 to 31)
Month	Decimal, 2 digits	Month (01 to 12)
Year	Decimal, 4 digits	Year (1994 - …)

Example for NMEA 0183 Rev 3.1 (Default):

$GPZDA,110505.00,25,01,2013,00,00*60

Example for NMEA 0183 Rev 4.10:

$GNZDA,204409.000,29,11,2017,,*4C

3.5.8 $--GST

Global Positioning System Pseudorange Noise Statistics.

NMEA message list bitmask (64 bits): 0000 0000 0000 0008

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPGST,<Timestamp>,<EHPE>,<Semi-major>,<Semi-minor>,<Angle>,<LatErr>,<LonErr>,

<Alt Err Dev>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

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$<TalkerID>GST,<Timestamp>,<EHPE>,<Semi-major>,<Semi-minor>,<Angle>,<LatErr>,
<LonErr>,<Alt Err Dev>*<checksum><cr><lf>

Arguments:

Table 117. $--GST message field description

Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Timestamp	hhmmss.sss	UTC Time of GPS Sample: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .sss: decimal fraction of seconds (Variable length) Note that decimal fraction assumes non zero values when the fix rate is bigger than 1Hz. Note that for Rev 4.10 this field is empty in case of invalid value
EHPE	dd.d in m	Equivalent Horizontal Position Error
Semi-major	dd.d in m	Standard deviation (meters) of semi-major axis of error ellipse
Semi-minor	dd.d in m	Standard deviation (meters) of semi-minor axis of error ellipse
Angle	dd.d in degree	Orientation of semi-major axis of error ellipse (true north degrees)
LatErr	dd.d in m	Standard deviation (meters) of latitude error
LonErr	dd.d in m	Standard deviation (meters) of longitude error
AltErr	dd.d in m	Standard deviation (meters) of altitude error
checksum	Hexadecimal,2 digits	Checksum of the message bytes without *<checksum><cr><lf> characters.

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Example for NMEA 0183 Rev 3.1 (Default):

$GPGST,101429.000,0.0,3.5,3.1,89.4,3.2,3.4,3.4*58

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Example for NMEA 0183 Rev 4.10:

$GNGST,205512.000,16.5,5.6,4.5,0.8,5.0,5.0,6.7*41

or

$GAGST,,,,,,,,*46

3.5.9 $--GBS

GNSS Satellite Fault Detection

NMEA message list bitmask (64 bits): 0000 2000 0000 0000

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPGBS,<Timestamp>,<LatErr>,<LonErr>,<AltErr>,<SatPRN>,<Prob>,

<Res>,<StdDev>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>GBS,<Timestamp>,<LatErr>,<LonErr>,<AltErr>,<SatPRN>,<Prob>,

<Res>,<StdDev>,<SystemID>,<SignalID>*<checksum><cr><lf>

Arguments:

Table 118. $--GBS message field description

Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Timestamp	hhmmss.sss	UTC Time of GPS Sample: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .sss: decimal fraction of seconds (Variable

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		length) Note that decimal fraction assumes non zero values when the fix rate is bigger than 1Hz. Note that for Rev 4.10 this field is empty in case of invalid value
LatErr	dd.d in m	Standard deviation (meters) of latitude error
LonErr	dd.d in m	Standard deviation (meters) of longitude error
AltErr	dd.d in m	Standard deviation (meters) of altitude error
SatPRN	Decimal, 2 digits	PRN Number of most likely failed satellite. This satellite is excluded by RAIM or FDE algorithm.
Prob	Empty	Probability of missed detection for most likely failed satellite Not supported
Res	dd.d in m	Range residual of most likely failed satellite
StdDev	Empty	Standard Deviation of bias estimate Not supported
SystemID	Hexadecimal, 1 digit	The system ID of this message: 1 = GPS 2 = GLONASS 3 = GALILEO 4 = BEIDOU 5 = QZSS
SignalID	Decimal, 1 digits	An identifier to indicate the signal in use. Currently it is 1 for GPS, GLONASS, 2 for BEIDOU and QZSS 6 for GALILEO
Checksum	Hexadecimal, 2 digits	Checksum of the message bytes without *<checksum><cr><lf> characters.

Example for NMEA 0183 Rev 3.1 (Default):

$GPGBS,033037.000,10.7,12.0,14.1,08,,-51.7,*7C

Example for NMEA 0183 Rev 4.10:

$GNGBS,211120.000,7.6,9.6,10.8,,,,,,*59

3.5.10 $--GNS

Fix data for single or combined satellite navigation system (GNSS). NMEA message list bitmask (64 bits): 0000 0000 0000 0001

Synopsis for NMEA 0183 Rev 3.1 (Default):

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$<TalkerID>GNS,<Timestamp>,<Lat>,<N/S>,<Long>,<E/W>,<Mode>,

<Sats>,<HDOP>,<AltVal>,<GEOVal>,<DGPSAge>,<DGPSRef>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>GNS,<Timestamp>,<Lat>,<N/S>,<Long>,<E/W>,<Mode>,<Sats>,<HDOP>,<AltVal>, <GEOVal>,<DGPSAge>,<DGPSRef>*<checksum><cr><lf>

Arguments:

Table 119. $--GNS message field description

Parameter	**Format**	**Description**
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Timestamp	hhmmss.sss	UTC Time of GPS Sample: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .sss: decimal fraction of seconds (Variable length) Note that decimal fraction assumes non zero values when the fix rate is bigger than 1Hz. Note that for Rev 4.10 this field is empty in case of invalid value
Lat	DDMM.MMMMM	Latitude as degrees: DD: Degree (Fixed two digits) MM: Minutes (Fixed two digits) .MMMMM: Decimal fraction of minutes (Variable) Note that for Rev 4.10 this field is empty in case of invalid value
N/S	"N" or "S"	Latitude direction: North or South Note that for Rev 4.10 this field is empty in case of invalid value
Long	DDMM.MMMMM	Longitude as degrees: DD: Degree (Fixed two digits)

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		MM: Minutes (Fixed two digits) .MMMMM: Decimal fraction of minutes (Variable) Note that for Rev 4.10 this field is empty in case of invalid value
E/W	“E” or “W”	Longitude direction: East or West Note that for Rev 4.10 this field is empty in case of invalid value
Mode Indicator	Char or String	In case of single constellation this is a character which can assume these values: N = NO Fix A = Autonomous D = Differential GPS E = Estimated (dead reckoning mode) In multi-constellation mode this is a 5 letter string where each letter is the mode indicator of each constellation in this order: GPS, GLONASS, GALILEO, BEIDOU, QZSS
Sats	Decimal, 2 digits	Satellites in use: example: 8
HDOP	Decimal, 3 digits	Horizontal Dilution of Precision, max: 99.0
Alt	Decimal, 6 digits	Height above WGS84 Elipsoid, max: 100000m
GEOSep	Decimal, 4 digits	Geoidal separation, meter
DGNSSAge	Empty field	Not supported
DGNSSRef	Empty field	Not supported
checksum	xadecimal,2 digits	Checksum of the message bytes without *<checksum><cr><lf> characters.

Note: *In case of single constellation setup the mode indicator consists in one character and the information about the constellation is given by talker id*

Example for NMEA 0183 Rev 3.1 (Default):

$GNGNS,091233.000,4055.04824,N,01416.55600,E,AAANN,19,0.7,0078.1,42.9,,*17

or

$GPGNS,083423.000,4055.04781,N,01416.55528,E,A,10,0.9,0092.0,42.9,,*06

Example for NMEA 0183 Rev 4.10:

$GPGNS,211803.000,4045.53340,N,01447.19988,E,A,04,2.2,0240.1,42.0,,*08

Or

$GAGNS,,,,,,N,00,99.0,0282.1,0.0,,*35

3.5.11 $--DTM

Local geodetic datum and datum offsets from a reference datum. This sentence is used to define the datum to which a position location, and geographic locations in subsequent sentences, is referenced. If enabled, this message is sent for every position fix as first NMEA message in the list.

NMEA message list bitmask (64 bits): 0000 0080 0000 0000

Synopsis for NMEA 0183 Rev 3.1 (Default):

$GPDTM,<Local_datum_code>,<local_datum_code_id>,<Lat_offset>,<N/S>,<Long_offest>,<E/W>,<Alt_offset>,<Reference_datum_code>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

$<TalkerID>DTM,<Local_datum_code>,<local_datum_code_id>,<Lat_offset>,<N/S>,<Long_offest>,<E/W>,<Alt_offset>,<Reference_datum_code>*<checksum><cr><lf>

Arguments:

Table 120. $--DTM message field description

Parameter	**Format**	**Description**
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in GALILEO only mode BD: If system works in BEIDOU only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
Local_datum _co de	ccc	Local datum code (three characters): W84 = WGS84 P90 = PZ90 999 = User Defined Datum IHO = Datum reported in the International Hydrographic Organization Publication S-60 Appendices B and C. ***Note:*** *all supported datum are listed in the Appendix A at the end of this document.*

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local_datum_cod e_id	ddd	In case the local datum code is W84 or 999 (User Defined) this field is left empty. In all other cases this field reports the local datum code ID (three numeric digits) as reported in Appendix A at the end of this document. The local datum code ID is the same number used to identify the datum code in the firmware configuration (CDB-ID)
Lat_offset	mmm.mmmmm	Latitude offset in minutes
N/S	"N" or "S"	Lat Direction: North or South
Long_offest	mmm.mmmmm	Longitude offset in minutes
E/W	"E" or "W"	Long Direction: East or West
Alt_offset	aaa.aaaaaa	Altitude offset in meters
Reference_datu m_code	ccc	Reference datum code (three characters): W84 = WGS84

Example for NMEA 0183 Rev 3.1 (Default):

$GPDTM,W84,,000.00000,N,000.00000,E,0.000000,W84*5F

$GPDTM,P90,253,000.00005,S,000.00266,E,0.000000,W84*73

$GPDTM,999,,000.18907,N,000.05146,W,0.000000,W84*2E

$GPDTM,IHO,037,000.11581,N,000.01822,W,0.000000,W84*69

Example for NMEA 0183 Rev 4.10:

$GNDTM,W84,,2445.54843,N,887.20838,E,0.000000,W84*7E

3.5.12 $--RLM

Return Link Message data.

NMEA message list bitmask (64 bits): 8000 0000 0000 0000.

Synopsis for NMEA 0183 Rev 3.1 (Default):

$<TalkerID>RLM,<BeaconID>,<TimeOfReception>,<MessageCode>,<MessageBody>*<checksum><cr><lf>

Synopsis for NMEA 0183 Rev 4.10:

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$<TalkerID>RLM,<BeaconID>,<TimeOfReception>,<MessageCode>,<MessageBody>*<checksum><cr><lf>

Arguments:

Table 121. $--RLM message field description

Parameter	Format	Description
TalkerID	String, 2 characters	The talker ID (Fixed two characters). GP: If the RLM has been received on a GPS satellite GL: If the RLM has been received on a GLO satellite GA: If the RLM has been received on a GAL satellite BD: If the RLM has been received on a BDS satellite QZ: If the RLM has been received on a QZS satellite ***Note:*** *Currently only GALILEO supports RLM*
BeaconID	Hexadecimal, 15 digits	Beacon intended to receive the message
TimeOfReception	hhmmss.ss	UTC Time of RLM (time of reception of the last 20 bit packet of the RLM: hh: hours (Fixed two digits) mm: minutes (Fixed two digits) ss: seconds (Fixed two digits) .ss: decimal fraction of seconds (Fixed two digits)
MessageCode	Hexadecimal, 1 digit	Type of RLM Message Service 0 = Reserved 1 = Acknowledgement Service RLM 2 = Command Service RLM 3 = Message Service RLM 4-E = Reserved F = Test Service RLM
MessageBody	Hexadecimal, up to 24 digits	Variable field length encapsulating the data parameters into hexadecimal format. GALILEO Short Message: 4 hexadecimal digits GALILEO Long Message: 24 hexadecimal digits

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Results:

None

Example:

GALILEO Short RLM

$GARLM,A5A5A123213C3C3,220151.00,1,CAFE*0E

GALILEO Long RLM

$GARLM,00CAFE11DECAF00,221909.00,1,1F0F1ABCDE2F0F2123453F0F*0C

3.6 ST NMEA messages specification

In order to provide further data and information from the ST GNSS receiver, which are not provided by the standard NMEA messages, STMicroelectronics provides “proprietary messages”. Any proprietary message on the NMEA port starts with “$PSTM…” where “STM” indicate that it is a ST proprietary message ($PSTMxxx…)

There are two sorts of “proprietary messages” within a ST-GNSS system. They are either sent repeatedly with a defined or definable reporting rate or they are sent only once as a reaction to a command.

3.6.1 $PSTMINITGPSOK

Message sent in response to command $PSTMINITGPS

Synopsis:

$PSTMINITGPSOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.6.2 $PSTMINITGPSERROR

Message sent in response to command $PSTMINITGPS

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Synopsis:

$PSTMINITGPSERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.6.3 $PSTMINITTIMEOK

Message sent in response to command $PSTMINITTIME

Synopsis:

$PSTMINITTIME OK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.6.4 $PSTMINITTIMEERROR

Message sent in response to command $PSTMINITTIME

Synopsis:

$PSTMINITTIMEERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

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3.6.5 $PSTMSETRANGEOK

Message sent in response to command $PSTMSETRANGE

Synopsis:

$PSTMSETRANGEOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.6.6 $PSTMSETRANGEERROR

Message sent in response to command $PSTMSETRANGE

Synopsis:

$PSTMSETRANGEERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.6.7 $PSTMSBASSERVICEOK

Message sent in response to command $PSTMSBASSERVICE

Synopsis:

$PSTMSBASSERVICEOK*<checksum><cr><lf>

Arguments:

None.

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Results:

Message sent in case of successful operation.

3.6.8 $PSTMSBASSERVICEERROR

Message sent in response to command $PSTMSBASSERVICE

Synopsis:

$PSTMSBASSERVICEERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.6.9 $PSTMSBASMOK

Message sent in response to command $PSTMSBASM

Synopsis:

$PSTMSBASMOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.6.10 $PSTMSBASMERROR

Message sent in response to command $PSTMSBASM

Synopsis:

$PSTMSBASMERROR*<checksum><cr><lf>

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Arguments:

None.

Results:

Message sent in case of error.

3.6.11 $PSTMGETALGOOK

Message sent in response to command $PSTMGETALGO

Synopsis:

$PSTMGETALGOOK,<algo_type>,<algo_status>*<checksum><cr><lf>

Arguments:

Table 122. $PSTMGETALGOOK field description

Parameter	Format	Description
algo_type	Decimal, 1 digit	1 = FDE algorithm on/off status is returned.
algo_status	Decimal, 1 digit	0 = the algorithm is disabled. 1 = the algorithm is enabled.

Results:

Message sent in case of successful operation.

3.6.12 $PSTMGETALGOERROR

Message sent in response to command $PSTMGETALGO

Synopsis:

$PSTMGETALGOERROR*<checksum><cr><lf>

Arguments:

None.

Results:

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Message sent in case of error.

3.6.13 $PSTMSETALGOOK

Message sent in response to command $PSTMGETALGO

Synopsis:

$PSTMSETALGOOK,<algo_type>,<algo_status>*<checksum><cr><lf>

Arguments:

Table 123. $PSTMSETALGOOK field description

Parameter	Format	Description
algo_type	Decimal, 1 digit	1 = FDE algorithm on/off status is returned.
algo_status	Decimal, 1 digit	0 = the algorithm is disabled. 1 = the algorithm is enabled.

Results:

Message sent in case of successful operation.

3.6.14 $PSTMSETALGOERROR

Message sent in response to command $PSTMSETALGO

Synopsis:

$PSTMGETALGOERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.6.15 $PSTMGETRTCTIME

Message sent in response to command $PSTMGETRTCTIME

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Synopsis:

$PSTMGETRTCTIME,<time>,<date>,<rtc_status>,<time_validity>*<checksum><cr>< lf>

Arguments:

Table 124. $PSTMGETRTCTIME message field description

Parameter	Format	Description
time	hhmmss.mms	Current time read on RTC.
date	ddmmyy	Current date read on RTC.
rtc_status	Decimal, 1 digit	Status: 0 - RTC_STATUS_INVALID 1 - RTC_STATUS_STORED 2 - RTC_STATUS_APPROXIMATE
time_validity	Decimal, 1 digit	Validity: 0 - NO_TIME 1 - FLASH_TIME 2 - USER_TIME 3 - USER_RTC_TIME 4 - RTC_TIME 5 - RTC_TIME_ACCURATE 6 - APPROX_TIME 7 - ACCURATE_TIME 8 - POSITION_TIME 9 - EPHEMERIS_TIME

Results:

None.

3.6.16 $PSTMDATUMSELECTOK

Message sent in response to command $PSTMDATUMSELECT

Synopsis:

$PSTMDATUMSELECTOK,<datum_type>*<checksum><cr><lf>

Arguments:

Table 125. $PSTMDATUMSELECTOK field description

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Parameter	Format	Description
datum_type	Integer	0: WGS84 1: TOKYO MEAN 2: OSGB

Results:

None

3.6.17 $PSTMDATUMSELECTERROR

Message sent in response to command $PSTMDATUMSELECT

Synopsis:

$PSTMSELECTDATUMERROR*<checksum><cr><lf>

Arguments:

None

Result:

None

3.6.18 $PSTMDATUMSETPARAMOK

Message sent in response to command $PSTMDATUMSETPARAM

Synopsis:

$PSTMDATUMSETPARAMOK*<checksum><cr><lf>

Arguments:

None

Result:

None

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3.6.19 $PSTMDATUMSETPARAMERROR

Message sent in response to command $PSTMDATUMSETPARAM

Synopsis:

$PSTMDATUMSETPARAMERROR*<checksum><cr><lf>

Arguments:

None

Result:

None

3.6.20 $PSTMPOSITIONHOLDENABLED

Message sent in response to command $PSTMENABLEPOSITIONHOLD

Synopsis:

$PSTMPOSITIONHOLDENABLED*<checksum><cr><lf>

Arguments:

None

Results:

None

3.6.21 $PSTMPOSITIONHOLDDISABLED

Message sent in response to command $PSTMENABLEPOSITIONHOLD.

Synopsis:

$PSTMPOSITIONHOLDDISABLED*<checksum><cr><lf>

Arguments:

None

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Results:

None

3.6.22 $PSTMENABLEPOSITIONHOLDERROR

Message sent in response to command $PSTMENABLEPOSITIONHOLD

Synopsis:

$PSTMENABLEPOSITIONHOLDERROR*<checksum><cr><lf>

Arguments:

None

Results:

None

3.6.23 $PSTMSETCONSTMASKOK

Message sent in response to command $PSTMSETCONSTMASK

Synopsis:

$PSTMSETCONSTMASKOK,<constellation_mask>*<checksum><cr><lf>

Arguments:

Table 126. $PSTMSETCONSTMASKOK message field description

Parameter	Format	Description
constellation_ mask	Decimal, 1 digit	It is a bit mask where each bit enables/disables a specific constellation independently of the others: bit 0: GPS constellation enabling/disabling bit 1: GLONASS constellation enabling/disabling bit 2: QZSS constellation enabling/disabling bit 3: GALILELO constellation enabling/disabling bit 7: BEIDOU constellation enabling/disabling

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Results:

Message sent in case of successful operation.

3.6.24 $PSTMSETCONSTMASKERROR

Message sent in response to command $PSTMSETCONSTMASK

Synopsis:

$PSTMSETCONSTMASKERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.6.25 $PSTMSQISETOK

Message sent in response to command $PSTMSQISET

Synopsis:

$PSTMSQISETOK,<dest_addr>*<checksum><cr><lf>

Arguments:

Table 127. $PSTMSQISETOK message field description

Parameter	Format	Description
dest_addr	HexDecimal, 4 digits	

Results:

Message is sent in case of no errors

3.6.26 $PSTMSQISETERROR

Message sent in response to command $PSTMSQISET

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Synopsis:

$PSTMSQISETERROR*<checksum><cr><lf>

Arguments:

No arguments

Results:

Message is sent in case of error

3.6.27 $PSTMSQIGETOK

Message sent in response to command $PSTMSQIGET

Synopsis:

$PSTMSQIGETOK,<dest_addr>,<word1>,...,<word8>*<checksum><cr><lf>

Arguments:

Table 128. $PSTMSQIGEOK message field description

Parameter	Format	Description
dest_addr	Hexadecimal, 4 digits	Offset from the base address of the chosen sector
Word-N	Hexadecimal, 4 digits	N-th word values read from SQI

Results:

Message is sent in case of no errors

3.6.28 $PSTMSQIGETERROR

Message sent in response to command $PSTMSQIGET

Synopsis:

$PSTMSQIGETERROR*<checksum><cr><lf>

Arguments:

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No arguments

Results:

Message sent in case of error

3.6.29 $PSTMSQIERASEOK

Message sent in response to command $PSTMSQIERASE

Synopsis:

$PSTMSQIERASEOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message is sent in case of no errors

3.6.30 $PSTMSQIERASEERROR

Message sent in response to command $PSTMSQIERASE

Synopsis:

$PSTMSQIERASEERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message is sent in case of errors

3.6.31 $PSTMPPS

Message sent in response to command $PSTMPPS

Synopsis:

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$PSTMPPS,1,<cmd_type>,<par_1>,…,<par_N>*<checksum><cr><lf>

Arguments:

Table 129. $PSTMPPS field description

Parameter	Format	Description
1	Decimal, 1 digit	1 = GET operation (to get data from PPS manager)
cmd_type	Decimal, 1 digit	1 = PPS_IF_ON_OFF_CMD 2 = PPS_IF_OUT_MODE_CMD 3 = PPS_IF_REFERENCE_CONSTELLATION_CMD 4 = PPS_IF_PULSE_DELAY_CMD 5 = PPS_IF_PULSE_DURATION_CMD 6 = PPS_IF_PULSE_POLARITY_CMD 7 = PPS_IF_PULSE_DATA_CMD 8 = PPS_IF_FIX_CONDITION_CMD 9 = PPS_IF_SAT_TRHESHOLD_CMD 10 = PPS_IF_ELEVATION_MASK_CMD 11 = PPS_IF_COSTELLATION_MASK_CMD 12 = PPS_IF_TIMING_DATA_CMD 13 = PPS_IF_POSITION_HOLD_DATA_CMD 14 = PPS_IF_AUTO_HOLD_SAMPLES_CMD 15 = PPS_IF_TRAIM_CMD 16 = PPS_IF_TRAIM_USED_CMD 17 = PPS_IF_TRAIM_RES_CMD 18 = PPS_IF_TRAIM_REMOVED_CMD 19 = PPS_IF_REFERENCE_TIME_CMD 20 = PPS_IF_CONSTELLATION_RF_DELAY_CMD
par_1 … par_N		Parameters list according to the command type specification (see below).

3.6.31.1 PPS Get PPS_IF_PULSE_DATA_CMD

Synopsis:

$PSTMPPS,1,7,<out_mode>,<reference_time>,<pulse_delay>,<pulse_duration>,<pulse_polarity>*<checksum><cr><lf>

Arguments:

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Table 130. $PSTMPPS field description on PPS_IF_PULSE_DATA_CMD

Parameter	Format	Description
out_mode	Decimal, 1 digit	0 = PPS always generated. 1 = PPS generated on even seconds. 2 = PPS generated on odd seconds.
reference_time	Decimal, 1 digit	0 = UTC 1 = GPS_UTC. 2 = GLONASS_UTC. 3 = UTC_SU 4 = GPS_UTC_FROM_GLONASS 5 =COMPASS_UTC 6 = UTC_NTSC 7 = GST 8 = UTC_GST 9 = GPS_FROM_GST ***Note:*** *UTC(SU) is the Soviet Union UTC, it is derived from GLONASS time applying the UTC delta time downloaded from GLONASS satellites.GPS_UTC_FROM_GLONASS is the GPS time derived from GLONASS time applying the GPS delta time downloaded from GLONASS satellites.If the software is configured to work in GLONASS only mode, UTC(SU) is identical to UTC and GPS_UTC_FROM_GLONASS is identical to GPS_UTC.*
pulse_delay	Decimal	Pulse delay [ns]
pulse_duration	Double	Pulse duration [s]
pulse_polarity	Decimal, 1 digit	0 = Not inverted. 1 = Inverted.

3.6.31.2 PPS Get PPS_IF_TIMING_DATA_CMD

Synopsis:

$PSTMPPS,1,12,<fix_condition>,<sat_th>,<elevation_mask>,<constellation_mask>,<gps_rf_delay>,<glonass_rf_delay>*<checksum><cr><lf>

Arguments:

Table 131. $PSTMPPS field description on PPS_IF_TIMING_DATA_CMD

Parameter	Format	Description

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fix_condition	Decimal, 1 digit	1 = NOFIX. 2 = 2DFIX. 3 = 3DFIX.
sat_th	Decimal	Minimum number of satellites for the PPS generation.
elevation_mask	Decimal	Minimum satellite elevation for satellite usage in timing filtering.
constellation_mask	Decimal (bit mask)	Satellite constellation selection for usage in timing filtering. bit0 = GPS bit1 = GLONASS bit3 = COMPASS bit7 = Galileo
gps_rf_delay	Decimal	GPS path RF delay [ns]
glonass_rf_delay	Decimal	GLONASS path RF delay [ns]

3.6.31.3 PPS Get PPS_IF_POSITION_HOLD_DATA_CMD

Synopsis:

$PSTMPPS,1,13,<on_off>,<lat>,<lat_dir>,<lon>,<lon_dir>,<h_msl>*<checksum>< cr><lf>

Arguments:

Table 132. $PSTMPPS field description on PPS_IF_POSITION_HOLD_DATA_CMD

Parameter	Format	Description
on_off	Decimal, 1 digit	0 = Position Hold disabled. 1 = Position Hold enabled.
lat	DDmm.mmmmm	Position Hold position latitude.
lat_dir	“N” or “S”	North or South direction.
lon	DDDmm.mmmmm	Position Hold position longitude.
lon_dir	“E” or “W”	East or West direction.
h_msl	Double	Position Hold mean see level altitude.

3.6.31.4 PPS Get PPS_IF_TRAIM_CMD

Synopsis:

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$PSTMPPS,1,15,<traim_enabled>,<traim_solution>,<ave_error>,<used_sats>,<removed_sats>*<checksum><cr><lf>

Arguments:

Table 133. $PSTMPPS field description on PPS_IF_TRAIM_CMD

Parameter	Format	Description
traim_enabled	Decimal, 1 digit	TRAIM ON/OFF status 0 = OFF 1 = ON
traim_solution	Decimal, 1 digit	TRAIM Algorithm status: 0 = UNDER Alarm 1 = OVER Alarm 2 = UNKNOWN
ave_error	Decimal	Average time error [ns]
used_sats	Decimal	Number of satellite used for timing correction.
removed_sats	Decimal	Number of satellites removed by the timing correction.

3.6.31.5 PPS Get PPS_IF_TRAIM_USED_CMD

Synopsis:

$PSTMPPS,1,16,<traim_enabled>,<used_sats>,<sat1>,..,<satN>*<checksum><cr>< lf>

Arguments:

Table 134. $PSTMPPS field description on PPS_IF_TRAIM_USED_CMD

Parameter	Format	Description
traim_enabled	Decimal, 1 digit	TRAIM ON/OFF status 0 = OFF 1 = ON
used_sats	Decimal	Number of satellite used for timing correction.
sat1...satN	Decimal	List of satellites IDs

3.6.31.6 PPS Get PPS_IF_TRAIM_RES_CMD

Synopsis:

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$PSTMPPS,1,17,<traim_enabled>,<used_sats>,<res1>,..,<resN>*<checksum><cr>< lf>

Arguments:

Table 135. $PSTMPPS field description on PPS_IF_TRAIM_RES_CMD

Parameter	Format	Description
traim_enabled	Decimal, 1 digit	TRAIM ON/OFF status 0 = OFF 1 = ON
used_sats	Decimal	Number of satellite used for timing correction.
res1...resN	Decimal	List of satellites residuals [ns]. Each residual corresponds to the satellite in the used sat list at the same message position.

3.6.31.7 PPS Get PPS_IF_TRAIM_REMOVED_CMD

Synopsis:

$PSTMPPS,1,18,<traim_enabled>,<rem_sats>,<sat1>,..,<satN>*<checksum><cr><l f>

Arguments:

Table 136. $PSTMPPS field description on PPS_IF_TRAIM_REMOVED_CMD

Parameter	Format	Description
traim_enzabled	Decimal, 1 digit	TRAIM ON/OFF status 0 = OFF 1 = ON
rem_sats	Decimal	Number of satellite removed by timing correction.
sat1...satN	Decimal	List of satellites IDs

3.6.32 $PSTMADCSTARTOK

Message sent in response to command $PSTMADCSTART

Synopsis:

$PSTMADCSTARTOK*<checksum><cr><lf>

Arguments:

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No arguments

Results:

Message is sent in case of no errors

3.6.33 $PSTMADCSTARTERROR

Message sent in response to command $PSTMADCSTART

Synopsis:

$PSTMADCSTARTERROR*<checksum><cr><lf>

Arguments:

No arguments

Results:

Message is sent in case of errors

3.6.34 $PSTMADCREADOK

Message sent in response to command $PSTMADCREAD

Synopsis:

$PSTMADCREADOK,<ain>,<data_read>*<checksum><cr><lf>

Arguments:

Table 137. $PSTMADCREADOK message field description

Parameter	Format	Description
ain	Decimal, 1 digit	Channel to be read
Data_read	Decimal, 1 digit	Data read from the buffer

Results:

Message is sent in case of no error

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3.6.35 $PSTMADCREADERROR

Message sent in response to command $PSTMADCREAD

Synopsis:

$PSTMADCREADERROR*<checksum><cr><lf>

Arguments:

No Arguments

Results:

Message will be sent in case of error

3.6.36 $PSTMCRCCHECK

Message sent in response to command $PSTMCRCCHECK

Synopsis:

$PSTMCRCCHECK,<result>,<code_add>,<code_len>,<code_eval_crc>,<code_stored_crc>,
<boot_add>,<boot_len>,<boot_eval_crc>,<boot_stored_crc>*<checksum><cr><lf>

Arguments:

Table 138. $PSTMCRCCHECK message field description

Parameter	Format	Description
result	Decimal, 1 Digit	CRC compare result: 0 = FAILED 1 = PASSED
code_add	Hexadecimal, 1 Digit	GNSS firmware base address
code_len	Hexadecimal, 1 Digit	GNSS firmware size
code_eval_crc	Hexadecimal, 1 Digit	GNSS firmware evaluated CRC
code_stored_crc	Hexadecimal, 1 Digit	GNSS firmware stored CRC
boot_add	Hexadecimal, 1 Digit	BOOT code base address
boot_len	Hexadecimal, 1 Digit	BOOT code size

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boot_eval_crc	Hexadecimal, 1 Digit	BOOT code evaluated CRC
boot_stored_crc	Hexadecimal, 1 Digit	BOOT code stored CRC

Results:

None

3.6.37 $PSTMFORCESTANDBYOK

Message sent in response to command $PSTMFORCESTANDBY

Note: *This command is not implemented in 3.7.x version of the software.*

Synopsis:

$PSTMFORCESTANDBYOK*<checksum><cr><lf>

Arguments:

No arguments

Results:

Message is sent in case of no error

3.6.38 $PSTMFORCESTANDBYERROR

Message sent in response to command $PSTMFORCESTANDBY

Note: *This command is not implemented in 3.7.x version of the software.*

Synopsis:

$PSTMFORCESTANDBYERROR*<checksum><cr><lf>

Arguments:

No arguments

Results:

Message is sent in case of error

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3.6.39 $PSTMGALILEODUMPGGTO

Message sent in response to command $PSTMGALILEODUMPGGTO

Synopsis:

$PSTMGALILEOGGTO,<brd>,<WN0G>,<t0G>,<A0G>,<A1G>,<validity>*<checksum><cr><lf>

Arguments:

Table 139. $PSTMGALILEODUMPGGTO message field description

Parameter	Format	Description
brd	Decimal, 1 digits	1=broadcast GGTO
WN0G	Decimal, 3 digits	Value for WN0G
t0G	Decimal, 5 digits	Value for t0G
A0G	Decimal, 5 digits	Value for A0G
A1G	Decimal, 5 digits	Value for A1G
validity	binary	0=not valid, 1=valid

Results:

No result

3.6.40 $PSTMSETTHTRKOK

Message sent in response to command $PSTMSETTHTRK

Synopsis:

$PSTMSETTHTRKOK*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error

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3.6.41 $PSTMSETTHTRKERROR

Message sent in response to command $PSTMSETTHTRK

Synopsis:

$PSTMSETTHTRKERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error

3.6.42 $PSTMSETTHPOSOK

Message sent in response to command $PSTMSETTHPOS

Synopsis:

$PSTMSETTHPOSOK*<checksum><cr><lf>

Arguments:

No arguments

Results:

Message sent in case no error

3.6.43 $PSTMSETTHPOSERROR

Message sent in response to command $PSTMSETTHPOS

Synopsis:

$PSTMSETTHPOSERROR*<checksum><cr><lf>

Arguments:

No arguments

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Results:

Message sent in case of errors

3.6.44 $PSTMIMUSELFTESTCMDOK

Message sent in response to command $PSTMIMUSELFTESTCMD

Synopsis:

$PSTMIMUSELFTESTCMDOK*<checksum><cr><lf>

Arguments:

No arguments

Results:

Message sent in case of no error

3.6.45 $PSTMIMUSELFTESTCMDERROR

Message sent in response to command $PSTMIMUSELFTESTCMD

Synopsis:

$PSTMIMUSELFTESTCMDERROR*<checksum><cr><lf>

Arguments:

No arguments

Results:

Message sent if self-test command is not supported by the mounted IMU or is not supported by the FW (sensor layer not present in FW).

3.6.46 $PSTMGETFLASHTYPE

Message sent in response to command $PSTMGETFLASHTYPE

Synopsis:

$PSTMGETFLASHTYPE,<idx>*<checksum><cr><lf>

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Arguments:

Table 140. $PSTMGETFLASHTYPE message field description

Parameter	Format	Description
idx	Decimal,2 digit	Memory type index: 0: Macronix U type 1: Winbond W25QxxxFV/DW/DV/BV Where xxx<256 2: Micron 3: - 4: Spansion 5: MACRONIX R type 6: ISSI LQ type 7: MACRONIX L type 8: MACRONIX V type 9: ISSI LP type

Results:

None.

3.6.47 $PSTMGETFLASHTYPEERROR

Message sent in response to command $PSTMGETFLASHTYPE

Synopsis:

$PSTMGETFLASHTYPEERROR*<checksum><cr><lf>

Arguments:

No arguments

Results:

None.

3.6.48 $PSTMFWUPGRADEOK

Message sent in response to command $PSTMFMWUPGRADE

Synopsis:

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$PSTMFWUPGRADEOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of no error

3.6.49 $PSTMFWUPGRADEERROR

Message sent in response to command $PSTMFMWUPGRADE

Synopsis:

$PSTMFWUPGRADEERROR*<checksum><cr><lf>

Arguments:

None

Results:

Message sent in case of error

3.6.50 $PSTMVER

Message sent in response to command $PSTMGETSWVER

Synopsis:

$PSTMVER,<Lib>_<Ver>_<Type>*<checksum><cr><lf>

Arguments:

Table 141. $PSTMVER field specification

Parameter	Format	Description
Lib	Text, fixed	Text String identifying the Library that the command is requiring the version: GNSSLIB if type = 0 OS20LIB if type = 1 GPSAPP

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		if type = 2 BINIMG if type = 6 SWCFG if type = 11 PID if type = 12
Ver	x.x.x.x	GNSS Library Version: example 7.1.1.15
Type	ARM, GNU	Compiler Type: ARM or GNU

Example:

$PSTMGETSWVER,0*<checksum><cr><lf>

Note: *If any id is passed as parameter to the command, its output acts as in the id = 0 case*

When id is 255 consecutive messages are sent reporting the library version string on each line following the above message syntax.

When id is 254 the entire configuration block is printed on several lines using the following syntax:

$PSTMSWCONFIG,<config_source>,<msg_n>,<msg_tot><data>*<checksum><cr><lf>

Arguments:

Table 142. $PSTMSWCONFIG field specification

Parameter	Format	Description
config_source	Decimal, 1 digit	Configuration block data source: 1 = Current Configuration (RAM) 2 = Default Configuration (ROM) 3 = Saved Configuration (FLASH)
msg_n	Decimal, 1 digit	Current message number
msg_tot	Decimal, 1 digit	Total number of messages
data	String	64 Bytes per line printing each byte in HEX format.

Note: *The HW version has the following syntax:*

$PSTMVER,STA80XX_<HW_SIGNATURE_STRING>*<checksum><cr><lf>

Table 143. HW_SIGNATURE_STRING description

HW_SIGNATURE_STRING	STA8088 HW

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0x2229D041	BB Mask
0x3229D041	BC Mask
HW_SIGNATURE_STRING	**STA8089 and STA8090 HW**
0x122BC043	AA Mask
0x222BC043	AB Mask
0x322BC043	BA Mask
0x422BC043	BB Mask
0x522BC043	BC Mask
0x622BC043	BD Mask

3.6.51 $PSTMRF

Provides “satellite signal data” for each tracked satellite. Single message contains the relevant fields for max 3 satellites. For all satellites the message is repeated with the data of the other satellites.

Synopsis:

$PSTMRF,<MessgAmount>,<MessgIndex>,<used_sats>,
[<Sat1ID>,<Sat1PhN>,<Sat1Freq>,<Sat1CN0>], [<Sat2ID>,<Sat2PhN>,<Sat2Freq>,<Sat2CN0>],
[<Sat3ID>,<Sat3PhN>,<Sat3Freq>,<Sat3CN0>],*<checksum><cr><lf>

Arguments:

Table 144. $PSTMRF message field description

Parameter	**Format**	**Description**
MessgAmount	Decimal, 1 digit	Number of consecutive $PSTMRF messages
MessgIndex	Decimal, 1 digit	Current number in the sequence of messages
used_sats	Decimal, 2 digits	Number of satellites used in the fix
SatxID	Decimal, 2 digits	Satellite x Number (PRN)
SatxPhN	Decimal, 5 digits	Satellite x Phase Noise
SatxFreq	Decimal, 6 digits	Satellite x Frequency

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SatxCN0	Decimal, 2 digits	Satellite x Carrier to Noise Ratio (in dB)

Results:

None

3.6.52 $PSTMTESTRF

Specific message containing information on just one satellite for RF testing purposes.

Synopsis:

$PSTMTESTRF,<Sat-ID>,<Sat-Freq>,<Sat-PhN><Sat-CN0>*<checksum><cr><lf>

Arguments:

Table 145. $PSTMTESTRF message field description

Parameter	Format	Description
Sat-ID	Decimal, 2 digits	Satellite Number (PRN)
Sat-Freq	Decimal, 5 digits	Satellite Frequency
Sat-PhN	Decimal, 5 digits	Satellite Phase Noise
Sat-CN0	Decimal, 2 digits	Satellite Carrier to Noise Ratio (in dB)

Results:

None

3.6.53 $PSTMTG

Time and Satellites Information

Synopsis:

$PSTMTG,<Week>,<TOW>,<TotSat>,<CPUTime><Timevalid><NCO><kf_config_status>
<constellation_mask><time_best_sat_type><time_master_sat_type><time_aux_sat_type>
<time_master_week_n><time_master_tow><time_master_validity><time_aux_week_n>
<time_aux_tow><time_aux_validity>*

Arguments:

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Table 146. $PSTMTG message field description

Parameter	Format	Description
Week	Decimal, 4 digits	Week Number
TOW	Decimal, 10 digits	Time of Week
Tot-Sat	Decimal, 2 digits	Total Number of satellites used for fix
CPU-Time	Decimal, 10 digits	CPU Time
Timevalid	Decimal, 2 digits	0 = no time 1 = time read from flash 2 = time set by user 3 = time set user RTC 4 = RTC time 5 = RTC time, accurate 6 = time approximate 7 = “not used” 8 = time accurate 9 = position time 10 = Ephemeris time
NCO	Decimal, 9 digits	NCO value
kf_config_status	Hexadecimal, 2 digits	Kalman Filter Configuration For each bit: – 0 means feature disabled – 1 means feature enabled
constellation_mask	Decimal, 3 digits max	It is a bit mask where each bit enables/disables a specific constellation independently of the others: bit 0: GPS constellation enabling/disabling bit 1: GLONASS constellation enabling/disabling bit 2: QZSS constellation enabling/disabling bit 3: GALILELO constellation enabling/disabling bit 7: BAIDEU constellation enabling/disabling
time_best_sat_type	Decimal	Selected best time satellite type
time_master_sat_type	Decimal	Master time satellite type
time_aux_sat_type	Decimal	Auxiliary time satellite type
time_master_week_n	Decimal	Master time week number

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time_master_tow	Floating	Master time TOW
time_master_validity	Decimal	Master week number time validity
time_aux_wek_n	Decimal	Auxiliary time
time_aux_tow	Floating	Auxiliary time TOW
time_aux_validity	Decimal	Auxiliary time validity

Table 147. $PSTMTG Kalman Filter Configuration

Bit	**Configuration**
0	Walking mode ON
1	Stop Detection ON
2	Frequency Ramp On (only Xtal mode)
3	Velocity estimator model: – 1 means MULTIPLE MODEL – 0 means SINGLE MODEL
4	Velocity estimator filter: – 1 means SLOW – 0 means FAST
5	FDE Status ON

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Results:

None

3.6.54 $PSTMTS

This message is repeated for each satellite tracked and used for the calculation of a fix

Synopsis:

$PSTMTS,<dsp-dat>,<SatID>,<PsR>,<Freq>,<plf>,<CN0>,<ttim>,<Satdat>,<Satx>,<Saty>,<Satz>,<Velx>,<Vely>,<Velz>,<src>,<ac>,<difdat>,<drc>,<drrc><predavl>,<predage>,<predeph>,<predtd>*<checksum><cr><lf>

Arguments:

Table 148. $PSTMTS message field description

Parameter	Format	Description
dsp-dat	Decimal, 1 digit	DSP data available: 0 = satellite not tracked 1 = satellite tracked
Sat-ID	Decimal, 2 digits	Satellite Number (PRN)
PsR	Decimal, 10 digits	Pseudo range
Freq	Decimal, 8 digits	Satellite tracking frequency offset
Plf	Decimal, 1 digit	Preamble Lock Flag 0 = Navigation data stream preamble not locked 1 = Navigation data stream preamble locked
CN0	Decimal, 3 digits	Satellite Carrier to Noise Ratio (in dB)
Ttim	Decimal, 6 digits	Track Time of Satellite (in seconds)
Satdat	Decimal, 1 digit	Satellite Data available Flag 0 = Sat. Ephemeris not available or unhealthy Sat. 1 = Sat. Ephemeris available and healthy Satellite
Satx	Decimal, 10 digits	Satellite Position, X-Coordinate
Saty	Decimal, 10 digits	Satellite Position, Y-Coordinate
Satz	Decimal, 10 digits	Satellite Position, Z-Coordinate
Velx	Decimal, 8 digits	Satellite Velocity, X-Coordinate
Vely	Decimal, 8 digits	Satellite Velocity, Y-Coordinate
Velz	Decimal, 8 digits	Satellite Velocity, Z-Coordinate
Src	Decimal, 6 Digits	Satellite Range Correction
Ac	Decimal, 3 Digits	Atmospheric Correction
Difdat	Decimal, 1 digit	Differential Data available Flag 0 = Differential Corrections not available 1 = Differential Corrections available
Drc	Decimal, 3 digits	Differential Range Correction (from DGPS Station)
Drrc	Decimal, 3 digits	Differential Range Rate Correction (from DGPS Stat.)

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predavl	Decimal, 1 digit	Prediction available Flag 0 = Predicted Ephemeris not available 1 = Predicted Ephemeris available
predage	Decimal, 1 digit	Age of predicted Ephemeris (in hours)
predeph	Decimal, 1 digit	Number of satellites used for prediction (1 or 2)
predtd	Decimal, 1 digit	Time distance of Ephemeris calculated from 2 Sats. Only valid if <pred-eph> = 2

Note: *<pred-xxx> fields are only included within the message if the AGPS software module has been included.*

Results:

None

Example:

$PSTMTS,1,05,15748178.41,30992.22,1,44,306150,1,16278399.26,20504574.30,46

53136.69,38.03,703.04,-3046.01,141169.29,11.45,1,-12.75,0.00,

$PSTMTS,1,31,14242886.83,-28462.15,1,37,304775,1,20641723.13,

-8713847.54,14517949.66,1788.86,311.39,-2382.23,1804.01,7.09,1,

-5.74,0.00,

$PSTMTS,1,21,14885540.17,-25018.74,1,50,301653,1,25482227.75, 6629457.30,5528104.33,-699.61,220.74,2983.68,23248.85,8.12,1,-2.84,0.00,

$PSTMTS,1,07,13337296.04,-27966.11,1,31,296621,1,15777659.46, 4155044.35,21301094.71,-1287.52,2301.27,509.20,-15394.31,5.65,1,-3.83,0.00,

$PSTMTS,1,06,1216319.39,-28367.75,0,23,40492,1,14595868.85, 6511991.60,21397698.91,-1394.03,2294.91,251.81,70766.81,5.72,1,-3.28,0.00,

$PSTMTS,1,24,13629659.89,-27176.62,1,40,298187,1,17698708.17, 12886703.95,15024752.78,-1901.12,-1.00,2298.33,11530.25,6.39,1,-9.27,0.00,

$PSTMTS,1,30,14421546.48,-30401.97,1,44,298264,1,17539544.73, 16864817.03,10440026.12,394.97,1346.12,-2741.16,14708.79,7.87,1,-9.96,0.00,

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$PSTMTS,1,16,16177492.44,-24593.30,1,40,298572,1,6202032.13,

-17659074.51,18852818.90,1139.40,2098.88,1613.11,35896.88,12.03,1,-4.54,0.00,

$PSTMTS,1,10,16728325.63,-26663.46,1,30,124750,1,-2057875.88, 21248945.17,15476302.66,-1018.51,-1731.48,2256.47,-32564.02,15.33,1,-12.86,0.00,

$PSTMTS,1,12,17539958.05,-31018.23,1,35,10528,1,11788804.59, 23841922.01,245355.77,-236.27,137.48,-3173.58,-103404.01,20.66,1,-19.21,0.00,

$PSTMTS,1,23,17770191.78,-27801.14,1,28,196026,1,-6131001.55,

-15740405.01,20363733.86,1549.10,-2097.11,-1173.09,89981.45,

27.98,0,0.00,0.00,

3.6.55 $PSTMPA

Position Algorithm

Synopsis:

$PSTMPA,<PosA>,<Dur>*<checksum><cr><lf>

Arguments:

Table 149. $PSTMPA message field description

Parameter	Format	Description
PosA	Char, 2	Position Algorithm Indicator Empty = none LS = LMS KF = Kalman Filter
Dur	Decimal, 3 digits	Time period in which the position has been stationary (count in seconds)

Results:

None

Example:

$PSTMPA,KF,433*<checksum><cr><lf>

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$PSTMPA, ,00*<checksum><cr><lf>

3.6.56 $PSTMSAT

This message is repeated for each satellite tracked and used for the calculation of a fix. The information contained in this message is a subset of the $PSTMTS message.

Synopsis:

$PSTMSAT,<SatID>,<PsR>,<Freq>,<Satx>,<Saty>,<Satz>*<checksum><cr><lf>

Arguments:

Table 150. $PSTMSAT message field description

Parameter	Format	Description
SatID	Decimal, 2 digits	Satellite Number (PRN)
PsR	Decimal, 10 digits	Pseudo Range
Freq	Decimal, 8 digits	Tracking Frequency of Satellite
Satx	Decimal, 10 digits	Satellite Position, X-Coordinate
Saty	Decimal, 10 digits	Satellite Position, Y-Coordinate
Satz	Decimal, 10 digits	Satellite Position, Z-Coordinate

Results:

None

3.6.57 $PSTMPRES

Position Residual

Note: *$PSTMPRES and $PSTMVRES are always enabled together.*

Synopsis:

$PSTMPRES,<RMSpos>,<res1>,...,<resN>*<checksum><cr><lf>

N = number of tracked satellites

Arguments:

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Table 151. $PSTMPRES message field description

Parameter	Format	Description
RMSpos	dd.d	position “rms” residual for the fix
resx	dd.d	Residual of tracked satellite x(Corresponds to x satellite in $GPGSA Message)

Results:

None

Example:

$PSTMPRES,8.1,-0.2,-0.2,-0.1,-0.3,-0.3,-0.4,,,,,,,*2D

$PSTMPRES,0.0,,,,,,,,,,,,,*20

3.6.58 $PSTMVRES

Velocity Residual

Note: *$PSTMPRES and $PSTMVRES are always enabled together.*

Synopsis:

$PSTMPRES,<RMSvel>,<vres1>,...,<vresN>*<checksum><cr><lf>

N = number of tracked satellites

Arguments:

Table 152. $PSTMVRES message field description

Parameter	Format	Description
RMSvel	dd.d	velocity “rms” residual for the fix
vresx	dd.d	Residual of tracked satellite x (Corresponds to x satellite in $GPGSA Message)

Results:

None

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Example:

$PSTMVRES,0.0,0.0,0.0,0.0,0.0,,,,,,,,,,*26

3.6.59 $PSTMNOISE

This message contains the raw noise floor estimation for GPS and GLONASS

Synopsis:

$PSTMNOISE,<GPS_raw_NF>,<GLONASS_raw_NF>*<checksum><cr><lf>

Arguments:

Table 153. $PSTMNOISE message field description

Parameter	Format	Description
GPS_raw_NF	integer	Noise floor raw estimation for GPS.
GLONASS_raw_NF	integer	Noise floor raw estimation for GLONASS.

Results:

None

3.6.60 $PSTMCPU

This message contains the real time CPU usage and the CPU speed setting.

Synopsis:

$PSTMCPU,<CPU_Usage>,<PLL_ON_OFF>,<CPU_Speed>*<checksum><cr><lf>

Arguments:

Table 154. $PSTMCPU message field description

Parameter	Format	Description
CPU_Usage	ddd.dd	CPU usage %
PLL_ON_OFF	Decimal, 1 digit	PLL enabling/disabling status: 0: PLL disabled 1: PLL enabled

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CPU_Speed	Decimal, 1 digit	CPU clock frequency: 52, 104, 156, 208 MHz.

Results:

None

3.6.61 $PSTMPPSDATA

Reports the Pulse Per Second data

Synopsis:

$PSTMPPSDATA,<on_off>,<pps_valid>,<synch_valid>,<out_mode>,<ref_time>,<ref_constellation>,
<pulse_duration>,<pulse_delay>,<gps_delay>,<glo_delay>,<bei_delay>,<gal_delay>,
<inverted_polarity>,<fix_cond>,<sat_th>,<elev_mask>,<const_mask>,<ref_sec>,<fix_status>,
<used_sats>,<gps_utc_delta_s>,<gps_utc_delta_ns>,<glonass_utc_delta_ns>,
<galileo_utc_delta_ns>,<quantization_error>,<pps_clock_freq>,<tcxo_clock_freq>*<checksum>
<cr><lf>

Arguments:

Table 155. $PSTMPPSDATA message field description

Parameter	Format	Description
on_off	Decimal, 1 digit	PPS signal ON/OFF status 0: OFF 1: ON
pps_valid	Decimal, 1 digit	Global PPS validity flag 0: PPS not valid 1: PPS valid
synch_valid	Decimal, 1 digit	PPS synchronization validity 0: Not Valid 1: Valid
out_mode	Decimal, 1 digit	0 = PPS_OUT_MODE_ALWAYS 1 = PPS_OUT_MODE_ON_EVEN_SECONDS 2 = PPS_OUT_MODE_ON_ODD_SECONDS
ref_time	Decimal, 1 digit	0 = UTC 1 = GPS_UTC (GPS Time) 2 = GLONASS_UTC (GLONASS Time) 3 = UTC_SU 4 = GPS_UTC_FROM_GLONASS

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		Note: *UTC(SU) is the Soviet Union UTC, it is derived from GLONASS time applying the UTC delta time downloaded from GLONASS satellites.* *GPS_UTC_FROM_GLONASS is the GPS time derived from GLONASS time applying the GPS delta time downloaded from GLONASS satellites.* *If the software is configured to work in GLONASS only mode, UTC(SU) is identical to UTC and GPS_UTC_FROM_GLONASS is identical to GPS_UTC.*
ref_constellation	Decimal, 1 digit	0 = GPS 1 = GLONASS ***Note:*** *The reference constellation reports which reference time has been used for the PPS generation.*
pulse_duration	Double	Pulse duration [s]
pulse_delay	Decimal	Pulse delay [ns]
gps_delay	Decimal	GPS path RF delay [ns]
glo_delay	Decimal	GLONASS path RF delay [ns]
bei_delay	Decimal	BEIDOU path RF delay [ns] ***Note:*** *This parameter is always zero if Beidou constellation is not supported by the hardware platform.*
gal_delay	Decimal	GALILEO path RF delay [ns]
inverted_polarity	Decimal, 1 digit	Pulse polarity inversion: 0 = not inverted 1 = inverted
fix_cond	Decimal, 1 digit	Selected GNSS fix condition for PPS signal generation: 1 = NO_FIX 2 = 2D_FIX 3 = 3D_FIX
sat_th	Decimal	Selected minimum number of satellites for PPS signal generation.
elev_mask	Decimal	Selected minimum satellite elevation for time correction.
const_mask	Decimal	Selected constellations for time correction.
ref_sec	Decimal, 2 digits	Second at which the reported PPS data is applied. According to the reference time configuration it could be a UTC or a GPS or a GLONASS time second.
fix_status	Decimal, 1 digit	GNSS position fix status when the time has been corrected.

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used_sats	Decimal	Used satellites for time correction.
gps_utc_delta_s	Decimal	UTC leap seconds [s]
gps_utc_delta_ns	Decimal	UTC – GPS delta time [ns]
glonass_utc_delta_ns	Decimal	UTC – GLONASS delta time [ns]
galileo_utc_delat_ns	Decimal	UTC – GALILEO delta time [ns]
quantization_error	Double (scientific notation format)	Quantization error [s].
pps_clock_freq	Double, 2 fractional digits	PPS clock frequency [Hz]
tcxo_clock_freq	Double, 2 fractional digits	TCXO clock frequency [Hz]

Results:

None

3.6.62 $PSTMPOSHOLD

Reports the Position Hold status and position.

Synopsis:

$PSTMPOSHOLD,<on_off>,<Lat>,<N/S>,<Long>,<E/W>,<Alt>*<checksum><cr><lf>

Arguments:

Table 156. $PSTMPOSHOLD message field description

Parameter	Format	Description
On_off	Decimal, 1 digit	Position Hold enabling/disabling status 0: disabled 1: enabled
Lat	DDMM.MMMMM	Lat in degree: DD: Degree MM: Minutes .MMMMM: partsMinutes
N/S	“N” or “S”	Lat Direction: North or South

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Long	DDMM.MMMMM	Long in degree: DD: Degree MM: Minutes .MMMMM: partsMinutes
E/W	"E" or "W"	Long Direction: East or West
Alt	Decimal, 8 digits	Height above WGS84 Elipsoid, max: 100000

Results:

None

3.6.63 $PSTMTRAIMSTATUS

Reports the TRAIM algorithm status.

Note: *All TRAIM related messages are enabled/disabled altogether by the same mask.*

Synopsis:

$PSTMTRAIMSTATUS,<on_off>,<traim_solution>,<alarm>,<ave_error>,<used_sats>,
<removed_sats>,<ref_second>*<checksum><cr><lf>

Arguments:

Table 157. $PSTMTRAIMSTATUS message field description

Parameter	Format	Description
on_off	Decimal, 1 digit	TRAIM ON/OFF status 0: OFF 1: ON
traim_solution	Decimal, 1 digit	TRAIM algorithm status: 0 = UNDER Alarm 1 = OVER Alarm 2 = UNKNOWN
alarm	Decimal	Time error threshold [ns]
ave_error	Decimal	Average time error [ns]
used_sats	Decimal	Number of used satellites.
removed_sats	Decimal	Number of removed satellites.

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ref_second	Decimal	Second at which the PPS signal is generated based on reported TRAIM status.

Results:

None

3.6.64 $PSTMTRAIMUSED

Reports the satellite used for timing correction.

Note: *All TRAIM related messages are enabled/disabled altogether by the same mask.*

Synopsis:

$PSTMTRAIMUSED,<on_off>,<used_sats>,<sat1>,...,<satN>*<checksum><cr><lf>

Arguments:

Table 158. $PSTMTRAIMUSED message field description

Parameter	**Format**	**Description**
on_off	Decimal, 1 digit	TRAIM ON/OFF status 0: OFF 1: ON
used_sats	Decimal	Number of used satellites.
Sat1..satN	Decimal	Used satellites list.

3.6.65 $PSTMTRAIMRES

Reports the time error residuals for satellites used for timing correction.

Note: *All TRAIM related messages are enabled/disabled altogether by the same mask.*

Synopsis:

$PSTMTRAIMRES,<on_off>,<used_sats>,<res1>,...,<resN>*<checksum><cr><lf>

Arguments:

Table 159. $PSTMTRAIMRES message field description

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Parameter	Format	Description
on_off	Decimal, 1 digit	TRAIM ON/OFF status 0: OFF 1: ON
used_sats	Decimal	Number of used satellites.
res1..resN	Decimal	Time error residuals for satellites reported in the TRAIMUSED message. Each residual refers to the satellite in the same message position.

3.6.66 $PSTMTRAIMREMOVED

Reports the satellite removed by the timing correction algorithm.

Note: *All TRAIM related messages are enabled/disabled altogether by the same mask.*

Synopsis:

$PSTMTRAIMUSED,<on_off>,<removed_sats>,<sat1>,...,<satN>*<checksum><cr><lf>

Arguments:

Table 160. $PSTMTRAIMREMOVED message field description

Parameter	Format	Description
on_off	Decimal, 1 digit	TRAIM ON/OFF status 0: OFF 1: ON
removed_sats	Decimal	Number of removed satellites.
Sat1..satN	Decimal	Removed satellites list.

3.6.67 $PSTMKFCOV

This message contains the Standard Deviations for position and velocity and their split into north, east and vertical components.

Synopsis:

$PSTMKFCOV,<PosStd>,<PosNcov>,<PosEcov>,<PosVcov>,<VelStd>,<VelNcov><VelEcov>,
<VelVcov>*<checksum><cr><lf>

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Arguments:

Table 161. $PSTMKFCOV message field description

Parameter	Format	Description
PosStd	ddd.d	Standard Deviation of Position in meters
PosNcov	ddd.d	Covariance (North/South) in m ^{2}(from Kalman Filter)
PosEcov	ddd.d	Covariance (East/West) in m ^{2}(from Kalman Filter)
PosVcov	ddd.d	Covariance (Vertical) in m ^{2}(from Kalman Filter)
VelStd	ddd.d	Standard Deviation of Velocity in meter/second
VelNcov	ddd.d	Covariance (North/South) in m ^{2}/s (from Kalman Filter)
VelEcov	ddd.d	Covariance (East/West) in m ^{2}/s (from Kalman Filter)
VelVcov	ddd.d	Covariance (Vertical) in m ^{2}/s (from Kalman Filter)

Example:

$PSTMKFCOV,8.7,50.9,25.4,150.7,0.4,0.1,0.0,0.2*49

3.6.68 $PSTMTIM

Time Validity.

Synopsis:

$PSTMTIM,<Tvalid>,<curr-CPU-Time>*<checksum><cr><lf>

Arguments:

Table 162. $PSTMTIM message field description

Parameter	Format	Description
Tvalid	ASCII	“RTC” = time read from RTC “VALID” = time downloaded from satellite or corrected using position “INVALID” = time is not valid
curr-CPU-Time	Decimal	Current CPU Time, i.e. the number of ticks since the system started to run

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3.6.69 $PSTMDIFF

Time Validity.

Synopsis:

$PSTMDIFF,<ListSize>,<NCS>,[<Sat1ID>,<Corr1Avl>,]...[<SatNID>,<CorrNAvl>,]*<checksum><cr><lf>

N = number of tracked satellites

Arguments:

Table 163. $PSTMDIFF message field description

Parameter	Format	Description
ListSize	Decimal, 2 digits	Amount of visible satellites in this message (n)
NCS	Decimal, 2 digits	Number of corrected satellites
SatxID	Decimal, 2 digits	Satellite x ID (PRN)
CorrxAvl	Decimal	Correction available for Satellite x

3.6.70 $PSTMSBAS

SBAS Satellite Data.

Synopsis:

$PSTMSBAS,<Status>,<SatTrk>,<SatID>,<Elev>,<Azim>,<Sig>*<checksum><cr><lf>

N = number of tracked satellites

Arguments:

Table 164. $PSTMSBAS message field description

Parameter	Format	Description
Status	Decimal, 1 digit	SBAS Status 0 = no SBAS used 1 = SBAS used
SatTrk	Decimal, 1 digit	SBAS Satellite tracked 0 = SBAS Satellite not tracked

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		1 = SBAS Satellite tracked, decoding is ongoing 2 = SBAS Satellite tracked and decoded. Differential Mode ON
SatID	Decimal, 3 digits	SBAS Satellite ID
Elev	Decimal, 2 digits	SBAS Satellite Elevation (in degrees)
Azim	Decimal, 3 digits	SBAS Satellite Azimuth (in degrees)
Sig	Decimal, 2 digits	SBAS Satellite Signal Strength CN0 (in dB)

Example:

$PSTMSBAS,1,0,124,65,090,00*09

3.6.71 $PSTMSBASM

SBAS Frame.

Synopsis:

$PSTMSBASM,<prn><sbas_frame>*<checksum><cr><lf>

Arguments:

Table 165. $PSTMSBASM message field description

Parameter	Format	Description
prn	Decimal, 3 digits	Satellite PRN (Range: from 120 to 140)
sbas_frame	adecimal, 64 digits	SBAS frame (250 bits + 6 padding)

Example:

$PSTMSBASM,123,536A481B40D8063829C12E08704B82DFFDFFEFFF7FFBFFDFFEF06E8037EFB440*6D

3.6.72 $PSTMNOTCHSTATUS

This message provides information on the Adaptive Notch Filter (ANF) status.

Synopsis:

$PSTMNOTCHSTATUS,<kfreq_now_Hz_gps>,<lock_en_gps>,<pwr_gps>,<ovfs_gps>,

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<mode_gps>,<kfreq_now_Hz_gln>,<lock_en_gln>,<pwr_gln>,<ovfs_gln>,<mode_gln>*<checksum><cr><lf>

Arguments:

Table 166. $PSTMNOTCHSTATUS message field description

Parameter	Format	Description
kfreq_now_Hz_gps	Decimal, 7 digits	Notch frequency estimation actual value [Hz] (GPS path)
lock_en_gps	Decimal, 1 digits	Frequency lock flag (GPS path)
pwr_gps	Decimal, 5 digits	Band Pass Filter internal power estimation (GPS path) [dimensionless quantity]
ovfs_gps	Decimal, 4 digits	Internal mask output as: 1000 * Notch_Removing_jammer (1/0,TRUE/FALSE) + overflow flags status (3 digits). E.g: “1000” means Block enabled, with no internal overflows detected
mode_gps	Decimal, 1 digits	ANF mode operation (GPS path) [0 → ANF disabled; 1 → Always ON(Internal Use only); 2 → Auto insertion mode (suggested);]
kfreq_now_Hz_gln	Decimal, 7 digits	Notch frequency estimation actual value [Hz] (GLONASS path)
lock_en_gln	Decimal, 1 digits	Frequency lock flag (GLONASS path)
pwr_gln	Decimal, 24 digits	Band Pass Filter internal power estimation (GLONASS path) [dimensionless quantity]
ovfs_gln	Decimal, 4 digits	Internal mask output as: 1000 * Notch_Removing_jammer (1/0,TRUE/FALSE) + overflow flags status (3 digits). E.g: “1000” means Block enabled, with no internal overflows detected
mode_gln	Decimal, 1 digits	ANF mode operation (GLONASS path) [0 → ANF disabled; 1 → Always ON (Internal Use only); 2 → Auto insertion mode(suggested);]

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Results:

This message provides the ANF status

When ANF is disabled all parameters are set to zero

Frequency /Power values are meaningful only when Notch is locked

3.6.73 $PSTMLOWPOWERDATA

Reports the status of adaptive low power algorithm.

Synopsis:

$PSTMLOWPOWERDATA,<low power state>,<steady state>,<RESERVED>,<RESERVED>,<ehpe>,<RESERVED>,<ehpe_average>,<RESERVED>, <RESERVED>,<eph const mask>, <switch constellation>,<duty cycle enable>,<duty cycle ms off>,<duty cycle state>*<checksum><cr><lf>

Arguments:

Table 167. $PSTMLOWPOWERDATA message field description

Parameter	Format	Description
low power state	Decimal, 1 digits	Low power state indicator: [0 → FULL CONST; 1 → LOW POWER STATE; 2 → EPH REFRESH]
steady state	Decimal, 1 digits	Steady state reached indicator
RESERVED		
RESERVED		
ehpe	dd.d [m]	Estimated Horizontal Position Error [m]
RESERVED		
ehpe_average	dd.d [m]	Estimated Horizontal Position Error Average [m]
RESERVED		
RESERVED		
eph const mask	Decimal, 2 digits	Bitfield of completed ephemeris download
switch constellation	Decimal, 1 digits	Switch constellation features indicator
duty cycle enable	Decimal, 1 digits	Duty cycle enable indicator
duty cycle ms	Decimal, 3 digits	Duty cycle ms signal off

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off		
duty cycle state	Decimal, 1 digits	Duty cycle state indicator

Results:

This message provides the adaptive low power status. In the case of dynamic low power disabled, all parameters are set to zero.

3.6.74 $PSTMADCDATA

Reports the ADC channels data read.

Synopsis:

$PSTMADCDATA,<ADC1>,<ADC2>,<ADC3>,<ADC4>,<ADC5>,<ADC6>,<ADC7>,<ADC8>*
<checksum><cr><lf>

Arguments:

Table 168. $PSTMADCDATA message field description

Parameter	Format	Description
ADCi	Decimal	ADC data read for the channel i Values between 0 and 1023

Results:

If this message is enabled it provides the ADC channels values read.

Example:

$PSTMADCDATA,754,862,0,754,13,754,754,81*4B

$PSTMADCDATA,793,,,,0,,,59*4D

Note: *This message is not supported in the standard NMEA message list. It is automatically enabled when the antenna sensing feature is enabled (see firmware configuration for details on how to enable/disable the feature).*

3.6.75 $PSTMANTENNASTATUS

This message reports the status of the antenna (working normally, open or short).

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Synopsis:

$PSTMANTENNASTATUS,<status>*<checksum><cr><lf>

Arguments:

Table 169. $PSTMANTENNASTATUS message field description

Parameter	Format	Description
status	Decimal	Antenna Status 0 = Antenna NORMAL 1 = Antenna OPEN 2 = Antenna SHORT

Results:

If this message is enabled it provides the antenna status.

Note: *This message is not supported in the standard NMEA message list. It is automatically enabled when the antenna sensing feature is enabled (see firmware configuration for details on how to enable/disable the feature).*

3.6.76 $PSTMPV

Provides position (Latitude, Longitude, Height), velocity (North, East, Vertical) and root square of covariance matrix values for position and velocity.

Synopsis:

$PSTMPV,<Timestamp>,<Lat>,<N/S>,<Long>,<E/W>,<Alt>,<AltVal>,<Vel_N>,<Vel_E>,<Vel_V>,
<P_cov_N>,<P_cov_NE>,<P_cov_NV>,<P_cov_E>,<P_cov_EV>,<P_cov_V>,<V_cov_N>,
<V_cov_NE>,<V_cov_NV>,<V_cov_E>,<V_cov_EV>,<V_cov_V>*<checksum><c r><lf>

Arguments:

Table 170. $PSTMPV message field description

Parameter	Format	Description
Timestamp	hhmmss.sss	UTC Time of GPS Sample, example: 160836.000 ".sss" is the fraction of seconds; it assumes non zero values when the fix rate is bigger than 1Hz.

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Lat	DDMM.MMMMM	Lat in degree: DD: Degree MM: Minutes .MMMMM: partsMinutes
N/S	“N” or “S”	Lat Direction: North or South
Long	DDMM.MMMMM	Long in degree: DD: Degree MM: Minutes .MMMMM: partsMinutes
E/W	“E” or “W”	Long Direction: East or West
Alt	Decimal, 6 digits	Height above mean sea level, max: 100000m
Alt-Val	“M”	Height measure in “M” = meters
Vel_N	ddd.d	Velocity North component [m/s]
Vel_E	ddd.d	Velocity East component [m/s]
Vel_V	ddd.d	Velocity Vertical component [m/s]
P_cov_N	ddd.d	Position North covariance [m]
P_cov_NE	ddd.d	Position North-East covariance [m]
P_cov_NV	ddd.d	Position North-Vertical covariance [m]
P_cov_E	ddd.d	Position East covariance [m]
P_cov_EV	ddd.d	Position East-Vertical covariance [m]
P_cov_V	ddd.d	Position Vertical covariance [m]
V_cov_N	ddd.d	Velocity North covariance [m/s]
V_cov_NE	ddd.d	Velocity North-East covariance [m/s]
V_cov_NV	ddd.d	Velocity North-Vertical covariance [m/s]
V_cov_E	ddd.d	Velocity East covariance [m/s]
V_cov_EV	ddd.d	Velocity East-Vertical covariance [m/s]
V_cov_V	ddd.d	Velocity Vertical covariance [m/s]

Example:

$PSTMPV,160635.000,4055.10928,N,01416.56027,E,026.96,M,0.2,0.0,0.1,22.6,12

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.8,5.8,17.2,10.9,18.8,5.5,4.1,1.7,4.6,0.0,2.7*70

3.6.77 $PSTMPVRAW

Provides not filtered position (Latitude, Longitude, Height), not filtered velocity (North, East, Vertical) and LMS fix related info

Synopsis:

$PSTMPVRAW,<Timestamp>,<Lat>,<N/S>,<Long>,<E/W>,<GPSQual>,<Sats>,<HDOP>,<Alt>,<AltVal>,<GeoSep>,<GeoVal>,<Vel_N>,<Vel_E>,<Vel_V>*<checksum><cr><lf>

Arguments:

Table 171. $PSTMPVRAW message field description

Parameter	Format	Description
Timestamp	hhmmss.sss	UTC Time of GPS Sample, example: 160836.000 ".sss" is the fraction of seconds; it assumes non zero values when the fix rate is bigger than 1Hz.
Lat	DDMM.MMMMM	Lat in degree: DD: Degree MM: Minutes .MMMMM: partsMinutes
N/S	"N" or "S"	Lat Direction: North or South
Long	DDMM.MMMMM	Long in degree: DD: Degree MM: Minutes .MMMMM: partsMinutes
E/W	"E" or "W"	Long Direction: East or West
GPSQual	Decimal, 1digit	0 = invalid 1 = GPS 2 = DGPS
Sats	Decimal, 2 digits	Satellites in use: example: 8
HDOP	Decimal, 3 digits	Horizontal Dilution of Precision, max: 99.0
Alt	Decimal, 6 digits	Height above mean sea level, max: 100000m
AltVal	"M"	Reference Unit for Altitude ("M" = meters)

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GeoSep	Decimal, 4 digits	Geoidal Separation measure in “M” = meters
GeoVal	“M”	Reference Unit for GeoSep (“M” = meters)
Vel_N	ddd.d	Velocity North component [m/s]
Vel_E	ddd.d	Velocity East component [m/s]
Vel_V	ddd.d	Velocity Vertical component [m/s]

Example:

$PSTMPVRAW,144056.000,5131.12414,N,00005.31484,W,2,09,1.2,043.31,M,47.0,M,

-0.6,0.1,0.6*58

3.6.78 $PSTMPVQ

Provides position and velocity processing noise matrix values.

Synopsis:

$PSTMPVQ,<P_Q_N>,<P_Q_E>,<P_Q_V>,<Q_CLKO>,<Q_GLPD>,<V_Q_N>,<V_Q_E>,
<V_Q_V>,<Q_CLKD>,<RESERVED>*<checksum><cr><lf>

Arguments:

Table 172. $PSTMPVQ message field description

Parameter	Format	Description
P_Q_N	ddd.d	Position North processing noise [m]
P_Q_E	ddd.d	Position East processing noise [m]
P_Q_V	ddd.d	Position Vertical processing noise [m]
Q_CLKO	ddd.d	Clock offset processing noise [m]
Q_GLPD	ddd.d	Glonass path delay [m]
V_Q_N	ddd.d	Velocity North processing noise [m/s]
V_Q_E	ddd.d	Velocity East processing noise [m/s]
V_Q_V	ddd.d	Velocity Vertical processing noise [m/s]

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Q_CLKD	ddd.d	Clock drift processing noise [m/s]
RESERVED	-	RESERVED for future use

Example:

$PSTMPVQ,0.0,0.0,0.0,0.0,4.0,3.0,3.0,0.0,3.0,0.0*4A

3.6.79 $PSTMUTC

This message reports the UTC time, date and time offset parameters.

Synopsis:

$PSTMUTC,<utc_time>,<utc_date>,<utc_timestamp>,<utc_offset>,<utc_offset_validity>*<checksum><cr><lf>

Arguments:

Table 173. $PSTMUTC message field description

Parameter	Format	Description
utc_time	hhmmss.sss	UTC Time of Fix, example: 160836.000 ".sss" is the fraction of seconds; it assumes non zero values when the fix rate is bigger than 1Hz.
utc_date	ddmmyyyy	Date of Fix : ddmmyyyy
utc_timestamp	Decimal	UTC time expressed as number of seconds since January 6th 1980
utc_offset	Decimal, 2 digits	UTC to GPS time offset [s]
utc_offset_validity	Decimal, 1 digit	UTC to GPS time offset validity 0 = NOT Valid 1 = Read From NVM 2 = Valid (downloaded from sky)

Example:

$PSTMUTC,161344.000,19062012,1024157624,15,2*52

3.6.80 $PSTMFEDATA

This message reports the current values of all RF front-end registers.

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Synopsis:

$PSTMFEDATA,<R0>,<R1>,<R2>,...,<R22>,<R23>,<R24>*<checksum><cr><lf>

Arguments:

Table 174. $PSTMFEDATA message field description

Parameter	Format	Description
From R0 up to R22	Hexadecimal, 2 digits	RESERVED
R23	Hexadecimal, 2 digits	Automatic gain control register for GPS+GALILEO RF path
R24	Hexadecimal, 2 digits	Automatic gain control register for GLONASS or BEIDOU RF path

Example:

$PSTMFEDATA,ff,ff,3c,6f,9d,78,b7,90,00,00,00,9a,28,f0,3f,30,e0,1a,28,e0,7f,30,40,3a,3a*75

3.6.81 $PSTMERRORMSG

This message reports an error, its location as well as additional (and optional) parameters helpful to understand the error cause.

Synopsis:

$PSTMERRORMSG,<error_code>,<param1>,...,<param6>*<checksum><cr><lf>

Arguments:

Table 175. $PSTMERRORMSG message field description

Parameter	Format	Description
error_code	adecimal, 8 digits	Indicates where the error comes from.
Param1 up to param6	adecimal, 8 digits	Optional parameters used to understand the error. There can be 0 additional parameter.

Example:

$PSTMERRORMSG,01900001,11111111,11111111,cccccccc,0000dddd,eeeeeeee*26

$PSTMERRORMSG,01920003*2E

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3.6.82 $PSTMGNSSINTEGRITY

This message is sent from GNSS Teseo to the host periodically it is enabled in the message list.

This message is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMGNSSINTEGRITY,<type>,<pos_const_mask>,<pos_err_AtoB>,<pos_err_AtoC>,<pos_err_BtoC>,<time_const_mask>,<time_err_AtoB>,<time_err_AtoC>,<time_err_BtoC>*<checksum><cr><lf>

Arguments:

Table 176. $PSTMGNSSINTEGRITY message field description

Parameter	Format	Description
type	Decimal	Integrity message type (currently always 0)
pos_const_mask	Decimal	Position related constellation mask
pos_err_AtoB	Double	Position error of second active constellation in comparison to the first one as meters
pos_err_AtoC	Double	Position error of third active constellation in comparison to the first one as meters
pos_err_BtoC	Double	Position error of third active constellation in comparison to the second one as meters
time_const_mask	Decimal	Time related constellation mask
time_err_AtoB	Double	Time error of second active constellation in comparison to the first one as nanoseconds
time_err_AtoC	Double	Time error of third active constellation in comparison to the first one as nanoseconds
time_err_BtoC	Double	Time error of third active constellation in comparison to the second one as nanoseconds

3.6.83 $PSTMNAVM

Navigation Data Frame.

Synopsis:

$PSTMNAVM,<msg_id>,<prn>,<nav_frame>*<checksum><cr><lf>

Arguments:

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Table 177. $PSTMNAVM message field description

Parameter	Format	Description
msg_id	Decimal, 1 digits	Message ID (GPS = 0, GLONASS = 1, GALILEO = 3, BEIDOU = 7)
prn	Decimal, 3 digits	Satellite PRN (Range: depending on the constellation)
nav_frame	Hexadecimal, up to 80 digits	Navigation data frame (length: depending on the constellation)

Details:

The navigation frame parameter depends on the constellation. The following table describes its meaning (see each constellation ICD document for details):

Table 178. Navigation frame data types

Constellation	Type	Length (bits)	Length (bytes)	Note
GPS	Sub-frame	300	40 (10 words)	For each 32 bit word 30 bits are used (the 2 msb are ignored)
GLONASS	1 or 2 strings	85 or 170 (85+85)	11 or 22 (11+11 bytes)	One string for each message for strings from 1 to 5. Two strings for each message for strings from 6 to 15. For the first byte of each string the 3 msb are ignored and the 4th is always zero. The payload is 84 bits long
GALILEO	payload	128	16 (4 words)	Each message contains the payload from I/NAV message (see Note for details)
BEIDOU	Sub-frame	300	40 (10 words)	For each 32 bit word 30 bits are used (the 2 msb are ignored)

Note: *In the above table, “word” means a 32-bit little endian encoded word, while “msb” means most significant bit(s).*

It means that, in a little endian architecture system, the navigation frame (converted to binary format) can be directly copied into a C 32 bit unsigned integer words array. In other words:

For GPS, the navigation frame can be copied into a C language variable defined according to the following type definition:

typedef tU32gps_subframe_t [10];

For GLONASS, the navigation frame can be copied into a C language variable defined *according to the following type definition:*

typedef tU08glo_subframe_t[22];

Note: *For strings for #1 to #5 just the first 11 bytes will be used, while for strings from #6 to #15 all 22 bytes will be used by storing two consecutive strings (e.g. strings #7 and #6). In this latter case the first sting (e.g. string #n) will be stored in the second part of the array (i.e. from byte #12 to #22), and the second string (e.g. string #n+1) will be stored in the first part of the array (i.e. from byte #1 to #11).*

For GALILEO, the navigation frame can be copied in a C language variable defined according to the following type definition:

typedef tU32gal_subframe_t[4];

Note: *The GALILEO navigation frame contains the message payload, encoded according to the following table.*

Table 179. Galileo payload, 128[bit], 32-bit packing

<table>
<tr><th></th><th>31</th><th>30</th><th>29</th><th>28</th><th>27</th><th>26</th><th>25</th><th>24</th><th>23</th><th>22</th><th>21</th><th>20</th><th>19</th><th>18</th><th>17</th><th>16</th><th>15</th><th>14</th><th>13</th><th>12</th><th>11</th><th>10</th><th>9</th><th>8</th><th>7</th><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>0</th></tr>
<tr><td>0</td><td colspan="32">Data k 0-31 (112 bit)</td></tr>
<tr><td>1</td><td colspan="32">Data k 32-63 (112 bit)</td></tr>
<tr><td>2</td><td colspan="32">Data k 64-95 (112 bit)</td></tr>
<tr><td>3</td><td colspan="16">Data k 96-111 (112 bit)</td><td colspan="16">Data j (16 bit)</td></tr>
</table>

For BEIDOU, the navigation frame can be copied in a C language variable defined according to the following type definition:

typedef tU32 bds_subframe_t [10];

where tU32 is a 32 bit unsigned integer type and tU08 is a 8 bit unsigned integer type.

Example:

$PSTMNAVM,0,4,00AFC32268A9BD26337FF43AC40B60D1B8B80018C8EE0B0330BDA238AF71 1D185E1000C088790781*23

3.6.84 $PSTMEPHEM

Ephemeris Data Dump.

This message is sent as a reply to a $PSTMDUMPEPHEMS command.

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Synopsis:

$PSTMEPHEM,<sat_id>,<N>,<byte1>,...,<byteN>*<checksum><cr><lf>

Arguments:

Table 180. $PSTMEPHEM message field description

Parameter	Format	Description
sat_id	Decimal, 2 digits	Satellite number
N	Decimal, 1 Digit	Number of the ephemeris data bytes
byte1	Hexadecimal, 2 digits	First byte of the ephemeris data
byteN	Hexadecimal, 2 digits	Last byte of the ephemeris data

The N Bytes that are in the message are the dump of a structure that contains all the information of the ephemeris.

Data formats are constellation dependant.

Table 181. $PSTMEPHEM message field description for GPS constellation

Bits	Structure Member	Description
16	week	Week number of the Issue of Data
16	toe	Time of week for ephemeris epoch
16	toc	Time of week for clock epoch
8	iode1	Issue of data 1
8	iode2	Issue of data 2
10	iodc	Issue of data clock
14	i_dot	Rate of inclination angle.
8	RESERVED	
24	omega_dot	Rate of right ascension.
8	RESERVED	Must be 0.

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16	crs	Amplitude of the sine harmonic correction to the orbit radius.
16	crc	Amplitude of the cosine harmonic correction to the orbit radius.
16	cus	Amplitude of the sine harmonic correction to the argument of latitude.
16	cuc	Amplitude of the cosine harmonic correction to the argument of latitude.
16	cis	Amplitude of the sine harmonic correction to the angle of inclination.
16	cic	Amplitude of the cosine harmonic correction to the angle of inclination.
16	motion_difference	Mean motion difference from computed value
16	RESERVED	Must be 0.
32	inclination	Inclination angle at reference time
32	e	Eccentricity.
32	root_A	Square root of major axis.
32	mean_anomaly	Mean anomaly at reference time.
32	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
32	perigee	Argument of perigee.
8	time_group_delay	Estimated group delay differential.
8	af2	Second order clock correction.
16	af1	First order clock correction.
22	af0	Constant clock correction.
1	RESERVED	RESERVED for use by GNSS library – must be 1
1	RESERVED	RESERVED for use by GNSS library – must be 1
1	RESERVED	RESERVED for use by GNSS library – must be 1
1	available	Contains 1 if ephemeris is available, 0 if not
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy
1	RESERVED	Must be 0.
4	accuracy	Accuracy

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Table 182. $PSTMEPHEM message field description for GLONASS constellation

Bits	Structure Member	Description
16	week	Week number of the Issue of Data.
16	toe	Time of week for ephemeris epoch.
4	toe_lsb	Time of week for ephemeris epoch (LBS).
11	NA	Calendar day number within the four-year period since the beginning of last leap year (almanac).
7	tb	Time of ephemeris index.
2	M	Type of satellite 00=GLONASS 01=GLONASS-M .
2	P1	Time interval between two adjacent tb parameters.
1	P3	Number of satellites for which almanac is transmitted within this frame 0=4 1=5.
1	P2	Flag of oddness ("1") or evenness ("0") of the value of tb
1	P4	Flag to show that ephemeris parameters are present.
2	KP	Notification on forthcoming leap second correction of UTC
1	RESERVED	
27	xn	Satellite PZ-90 x coordinate at epoch tb.
5	xn_dot_dot	Satellite PZ-90 x velocity at epoch tb.
24	xn_dot	Satellite PZ-90 x acceleration component at epoch tb.
5	n	Slot number (1…24).
3	Bn	Healthy flags.
27	yn	Satellite PZ-90 y coordinate at epoch tb.
5	yn_dot_dot	Satellite PZ-90 y acceleration component at epoch tb.
24	yn_dot	Satellite PZ-90 y velocity at epoch tb.
8	age_h	Age of predicted ephemeris (hours)
27	zn	Satellite PZ-90 z coordinate at epoch tb.
5	zn_dot_dot	Satellite PZ-90 z acceleration component at

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		epoch tb.
24	zn_dot	Satellite PZ-90 z velocity at epoch tb.
8	RESERVED	Must be 0.
11	gamma_n	Satellite clock frequency drift at epoch tb.
5	E_n	Age of the ephemeris information.
4	freq_id	Frequency ID
12	RESERVED	
22	tau_n	Satellite clock correction at epoch tb.
10	RESERVED	Must be 0.
32	tau_c	GLONASS to UTC(SU) time correction.
22	tau_GPS	GLONASS to GPS system time correction.
10	RESERVED	
11	NT	Calendar day number of ephemeris within the four-year period since the beginning of last leap year.
5	N4	Four-year interval number starting from 1996.
12	tk	Satellite time referenced to the beginning of the frame.
4	FT	Predicted satellite user range accuracy at time tb
32	RESERVED	
5	m_available	Must be 0x1F
1	nvm_reliable	Must be 1.
26	spare	
25	RESERVED	
1	available	Contains 1 if ephemeris is available, 0 if not.
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy.
1	RESERVED	Must be 0.
4	RESERVED	

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Table 183. $PSTMEPHEM message field description for Galileo constellation

Bits	Structure Member	Description
16	week	Week number of the Issue of Data
14	toe	Time of week for ephemeris epoch
2	RESERVED	
16	toc	Time of week for clock epoch
10	iod_nav	Issue of data
8	SISA	Signal In Space Accuracy
10	RESERVED	Must be 0.
10	BGD_E1_E5a	E1-E5a Broadcast Group Delay
10	BGD_E1_E5b	E1-E5b Broadcast Group Delay
2	E1BHS	E1-B Signal Health Status
32	inclination	Inclination angle at reference time
32	eccentricity	Eccentricity.
32	root_a	Square root of major axis.
32	mean_anomaly	Mean anomaly at reference time.
32	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
32	perigee	Argument of perigee.
14	i_dot	Rate of inclination angle.
1	available	Contains 1 if ephemeris is available, 0 if not
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy
16	motion_difference	Mean motion difference from computed value
16	crs	Amplitude of the sine harmonic correction to the orbit radius.
16	crc	Amplitude of the cosine harmonic correction to the orbit radius.
16	cus	Amplitude of the sine harmonic correction to the argument of latitude.

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16	cuc	Amplitude of the cosine harmonic correction to the argument of latitude.
16	cis	Amplitude of the sine harmonic correction to the angle of inclination.
16	cic	Amplitude of the cosine harmonic correction to the angle of inclination.
24	omega_dot	Rate of right ascension.
6	SVID	Satellite Identification.
1	E1BDVS	E1-B Data Validity Status
1	RESERVED	Must be 0.
8	RESERVED	Must be 0.
16	RESERVED	Must be 0.
6	af2	Second order clock correction.
21	af1	First order clock correction.
5	word_available	Must be 0x1F.
31	af0	Constant clock correction.
1	RESERVED	
6	RESERVED	Must be 0
26	RESERVED	RESERVED for use by GNSS library – must be 1
1	RESERVED	Must be 0.

Table 184. $PSTMEPHEM message field description for BEIDOU constellation

Bits	**Structure Member**	**Description**
32	inclination	Inclination angle at reference time
32	eccentricity	Eccentricity.
32	root_a	Square root of major axis.
32	mean_anomaly	Mean anomaly at reference time.
32	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
32	perigee	Argument of perigee.

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17	toe	Time of week for ephemeris epoch
10	time_group_delay	Estimated group delay differential.
5	aode	Issue of data, ephemeris
24	omega_dot	Rate of right ascension.
8	A0	Ionospheric Delay Model Parameter α0
24	af0	Constant clock correction.
8	A1	Ionospheric Delay Model Parameter α1
20	sow	Seconds of week
11	af2	Second order clock correction.
1	is_geo	1 for Geostationary satellites, otherwise 0
22	af1	First order clock correction.
10	subframe_avail	Must be 0x3FF.
16	motion_difference	Mean motion difference from computed value
8	A2	Ionospheric Delay Model Parameter α2
8	A3	Ionospheric Delay Model Parameter α3
18	crs	Amplitude of the sine harmonic correction to the orbit radius.
8	B2	Ionospheric Delay Model Parameter β2
4	urai	User range accuracy index
2	RESERVED	Must be 0.
18	crc	Amplitude of the cosine harmonic correction to the orbit radius.
8	B3	Ionospheric Delay Model Parameter β3
5	aodc	Issue of data, clock
1	spare	
18	cus	Amplitude of the sine harmonic correction to the argument of latitude.
14	i_dot	Rate of inclination angle.
18	cuc	Amplitude of the cosine harmonic correction to the argument of latitude.

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8	B0	Ionospheric Delay Model Parameter β0
6	spare	
18	cis	Amplitude of the sine harmonic correction to the angle of inclination.
8	B1	Ionospheric Delay Model Parameter β1
6	RESERVED	Must be 0.
18	cic	Amplitude of the cosine harmonic correction to the angle of inclination.
1	nvm_reliable	Must be 1.
11	RESERVED	Must be 0.
2	spare	
17	toc	Time of week for clock epoch
13	week	Week number of the Issue of Data
1	available	Contains 1 if ephemeris is available, 0 if not
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy

3.6.85 $PSTMALMANAC

Almanac Data Dump.

This message is sent as a reply to a $PSTMDUMPALMANAC command.

Synopsis:

$PSTMALMANAC,<sat_id>,<N>,<byte1>,...,<byteN>*<checksum><cr><lf>

Arguments:

Table 185. $PSTMALMANAC message field description

Parameter	Format	Description
sat_id	Decimal, 2 digits	Satellite number
N	Decimal, 1 digit	Number of the almanac data bytes
byte1	Hexadecimal, 2 digits	First byte of the almanac data

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byteN	Hexadecimal, 2 digits	Last byte of the almanac data

The N Bytes that are in the message are the dump of a structure that contains all the information of the almanac.

Data formats is constellation dependent

Table 186. $PSTMALMANAC message field description for GPS constellation

Bits	**Structure Member**	**Description**
8	satid	The satellite number
16	week	The week number for the epoch
8	toa	Reference time almanac.
16	e	Eccentricity.
16	delta_i	Rate of inclination angle.
16	omega_dot	Rate of right ascension.
24	root_A	Square root of semi-major axis.
24	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
24	perigee	Argument of perigee.
24	mean_anomaly	Mean anomaly at reference time.
11	af0	Constant clock correction.
11	af1	First order clock correction.
1	health	Contains 1 if the satellite is unhealthy 0 if healthy.
1	available	Contains 1 if almanac is available 0 if not.

Table 187. $PSTMALMANAC field description for GLONASS constellation

Bits	**Structure Member**	**Description**
8	satid	The satellite number.
16	week	The week number for the epoch.
8	toa	Reference time almanac.

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5	n_A	Slot number (1…24).
5	H_n_A	Carrier frequency channel number.
2	M_n_A	Type of satellite 00=GLONASS 01=GLONASS-M.
10	tau_n_A	Satellite clock correction.
15	epsilon_n_A	Eccentricity.
21	t_lambda_n_A	Time of the first ascending node passage.
21	lambda_n_A	Longitude of ascending node of orbit plane at almanac epoch.
18	delta_i_n_A	Inclination angle correction to nominal value.
7	delta_T_n_dot_A	Draconian period rate of change.
22	delta_T_n_A	Draconian period correction.
16	omega_n_A	Argument of perigee.
1	health	Contains 1 if the satellite is unhealthy 0 if healthy.
1	available	Contains 1 if almanac is available 0 if not.
32	Tau_c	
11	NA	
5	N4	
16	Spare	

Table 188. $PSTMALMANAC field description for Galileo constellation

Bits	**Structure Member**	**Description**
16	satid	The satellite number
6	svid	Space Vehicle Identificator
16	week	The week number for the epoch
20	toa	Reference time almanac.
13	delta_a	Delta of semi-major axis.

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11	e	Eccentricity.
16	perigee	Argument of perigee.
11	delta_i	Rate of inclination angle.
16	omega_zero	Longitude of ascending node of orbit plane at weekly epoch.
11	omega_dot	Rate of right ascension.
16	mean_anomaly	Mean anomaly at reference time.
16	af0	Constant clock correction.
13	af1	First order clock correction.
2	E5b_HS	E5 Signal Health Status
2	E1B_HS	E1-B Signal Health Status
4	ioda_1	Issue of data Almanac 1
4	ioda_2	Issue of data Almanac 2
1	health	Contains 1 if the satellite is unhealthy 0 if healthy.
2	RESERVED	RESERVED for use by GNSS library
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy
1	available	Contains 1 if almanac is available 0 if not.

3.6.86 $PSTMGPSSUSPENDED

Message sent in response to command $PSTMGPSSUSPEND

Synopsis:

$PSTMGPSSUSPENDED*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

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3.6.87 PSTMUSEDSATS

This message reports the number of used satellites for each constellation. NMEA message list bitmask (64 bits): 0000 0040 0000 0000

Synopsis:

$PSTMUSEDSATS,<GPS_n>,<GLONASS_n>,<GALILEO_n>,<BEIDOU_n>,<QZSS_n>*<checksum><cr><lf>

Arguments:

Table 189. $PSTMUSEDSATS message field description

Parameter	Format	Description
GPS_n	Decimal, 2 digits	Number of used satellites of the GPS constellation
GLONASS_n	Decimal, 2 digits	Number of used satellites of the GLONASS constellation
GALILEO_n	Decimal, 2 digits	Number of used satellites of the GALILEO constellation
BEIDOU_n	Decimal, 2 digits	Number of used satellites of the BEIDOU constellation
QZSS_n	Decimal, 2 digits	Number of used satellites of the QZSS constellation

Results:

None.

Example:

$PSTMUSEDSATS,08,07,00,00,00*2B

3.7 ST system configuration messages

3.7.1 $PSTMSETPAROK

Message sent in response to command $PSTMSETPAR

Synopsis:

$PSTMSETPAROK ,<ConfigBlock><ID>*<checksum><cr><lf>

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Arguments:

Table 190. $PSTMSETPAROK message field description

Parameter	Format	Description
ConfigBlock	Decima1,1 digit	Indicates one of the configuration blocks: 1=Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier (see Configuration Data Block as described in FW Configuration document)

Results:

Message sent in case of successful operation.

3.7.2 $PSTMSETPARERROR

Message sent in response to command $PSTMSETPAR

Synopsis:

$PSTMSETPARERROR*<checksum><cr><lf>

Argument:

No argument

Results:

Message sent in case of error.

3.7.3 $PSTMRESTOREPAROK

Message sent in response to command $PSTMRESTOREPAR

Synopsis:

$PSTMRESTOREPAROK*<checksum><cr><lf>

Arguments:

None.

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Results:

Message sent in case of successful operation.

3.7.4 $PSTMRESTOREPARERROR

Message sent in response to command $PSTMRESTOREPAR

Synopsis:

$PSTMRESTOREPARERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.5 $PSTMSAVEPAROK

Message sent in response to command $PSTMSAVEPAR

Synopsis:

$PSTMSAVEPAROK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.6 $PSTMSAVEPARERROR

Message sent in response to command $PSTMSAVEPAR

Synopsis:

$PSTMSAVEPARERROR*<checksum><cr><lf>

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Arguments:

None.

Results:

Message sent in case of error.

3.7.7 $PSTMSETPAR

Message sent in response to command $PSTMGETPAR

Synopsis:

$PSTMSETPAR,<ConfigBlock><ID>,<value>*<checksum><cr><lf>

Arguments:

Table 191. $PSTMSETPAR message field description

Parameter	Format	Description
ConfigBlock	Decima1, 1 digit	Indicates one of the configuration blocks: 1 = Current Configuration, 2 = Default Configuration, 3 = NVM Stored configuration.
ID	Decimal, 3 digits	ID - Identifier (see Configuration Data Block)
value	Hexadecimal or Decimal	The value of returned parameter. According to the parameter type it could be expressed in hexadecimal format (in case parameter is integer) or decimal format (in case the parameter is floating).

3.7.8 $PSTMGETPARERROR

Message sent in response to command $PSTMGETPAR.

Synopsis:

$PSTMGETPARERROR*<checksum><cr><lf>

Arguments:

No aruments

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Results:

In case of errors, the error message is returned

3.7.9 $PSTMCFGPORTOK

Message sent in response to command $PSTMCFGPORT

Synopsis:

$PSTMCFGPORTOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.10 $PSTMCFGPORTERROR

Message sent in response to command $PSTMCFGPORT

Synopsis:

$PSTMCFGPORTERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.11 $PSTMCFGANTSENSOK

Message sent in response to command $PSTMCFGANTSENS

Synopsis:

$PSTMCFGANTSENSOK*<checksum><cr><lf>

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Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.12 $PSTMCFGANTSENSERROR

Message sent in response to command $PSTMCFGANTSENS

Synopsis:

$PSTMCFGANTSENSERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.13 $PSTMCFGCLKSOK

Message sent in response to command $PSTMCFGCLKS

Synopsis:

$PSTMCFGCLKSOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

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3.7.14 $PSTMCFGCLKSERROR

Message sent in response to command $PSTMCFGCLKS

Synopsis:

$PSTMCFCLKSERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.15 $PSTMCFGMSGLOK

Message sent in response to command $PSTMCFGMSGL

Synopsis:

$PSTMCFGMSGLOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.16 $PSTMCFGMSGLERROR

Message sent in response to command $PSTMCFGMSGL

Synopsis:

$PSTMCFGMSGLERROR*<checksum><cr><lf>

Arguments:

None.

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Results:

Message sent in case of error.

3.7.17 $PSTMCFGGNSSOK

Message sent in response to command $PSTMCFGGNSS

Synopsis:

$PSTMCFGGNSSOKOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.18 $PSTMCFGGNSSERROR

Message sent in response to command $PSTMCFGGNSS

Synopsis:

$PSTMCFGGNSSERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.19 $PSTMCFGSBASOK

Message sent in response to command $PSTMCFGSBAS

Synopsis:

$PSTMCFGSBASOK*<checksum><cr><lf>

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Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.20 $PSTMCFGSBASERROR

Message sent in response to command $PSTMCFGSBAS

Synopsis:

$PSTMCFGSBASERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.21 $PSTMCFGPPSGENOK

Message sent in response to command $PSTMCFGPPSGEN

Synopsis:

$PSTMCFGPPSGENOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.22 $PSTMCFGPPSGENERROR

Message sent in response to command $PSTMCFGPPSGEN

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Synopsis:

$PSTMCFGPPSGENERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.23 $PSTMCFGPPSSATOK

Message sent in response to command $PSTMCFGPPSSAT

Synopsis:

$PSTMCFGPPSSATOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.24 $PSTMCFGPPSSATERROR

Message sent in response to command $PSTMCFGPPSSAT

Synopsis:

$PSTMCFGPPSSATERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

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3.7.25 $PSTMCFGPPSPULOK

Message sent in response to command $PSTMCFGPPSPUL

Synopsis:

$PSTMCFGPPSPULOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.26 $PSTMCFGPPSPULERROR

Message sent in response to command $PSTMCFGPPSPUL

Synopsis:

$PSTMCFGPPSPULERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.27 $PSTMCFGPOSHOLDOK

Message sent in response to command $PSTMCFGPOSHOLD

Synopsis:

$PSTMCFGPOSHOLDOK*<checksum><cr><lf>

Arguments:

None.

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Results:

Message sent in case of successful operation.

3.7.28 $PSTMCFGPOSHOLDERROR

Message sent in response to command $PSTMCFGPOSHOLD

Synopsis:

$PSTMCFGPOSHOLDERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.29 $PSTMCFGTRAIMOK

Message sent in response to command $PSTMCFGTRAIM

Synopsis:

$PSTMCFGTRAIMOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.30 $PSTMCFGTRAIMERROR

Message sent in response to command $PSTMCFGTRAIM

Synopsis:

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$PSTMCFGTRAIMERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.31 $PSTMCFGSATCOMPOK

Message sent in response to command $PSTMCFGSATCOMP

Synopsis:

$PSTMCFGSATCOMPOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.32 $PSTMCFGSATCOMERROR

Message sent in response to command $PSTMCFGSATCOMP

Synopsis:

$PSTMCFGSATCOMPERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

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3.7.33 $PSTMCFGLPAOK

Message sent in response to command $PSTMCFGLPA

Synopsis:

$PSTMCFGLPAOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.34 $PSTMCFGLPAERROR

Message sent in response to command $PSTMCFGLPA

Synopsis:

$PSTMCFGLPAERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.35 $PSTMCFGLPSOK

Message sent in response to command $PSTMCFGLPS

Synopsis:

$PSTMCFGLPSOK*<checksum><cr><lf>

Arguments:

None.

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Results:

Message sent in case of successful operation.

3.7.36 $PSTMCFGLPSERROR

Message sent in response to command $PSTMCFGLPS

Synopsis:

$PSTMCFGLPSERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.37 $PSTMCFGAGPSOK

Message sent in response to command $PSTMCFGAGPS

Synopsis:

$PSTMCFGAGPSOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.38 $PSTMCFGAGPSERROR

Message sent in response to command $PSTMCFGAGPS

Synopsis:

$PSTMCFGAGPSERROR*<checksum><cr><lf>

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Arguments:

None.

Results:

Message sent in case of error.

3.7.39 $PSTMCFGAJMOK

Message sent in response to command $PSTMCFGAJM

Synopsis:

$PSTMCFGAJMOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.40 $PSTMCFGAJMERROR

Message sent in response to command $PSTMCFGAJM

Synopsis:

$PSTMCFGAJMERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.41 $PSTMCFGODOOK

Message sent in response to command $PSTMCFGODO

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Synopsis:

$PSTMCFGODOOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.42 $PSTMCFGODOERROR

Message sent in response to command $PSTMCFGODO

Synopsis:

$PSTMCFGODOERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.43 $PSTMCFGLOGOK

Message sent in response to command $PSTMCFGLOG

Synopsis:

$PSTMCFGLOGOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

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3.7.44 $PSTMCFGLOGERROR

Message sent in response to command $PSTMCFGLOG

Synopsis:

$PSTMCFGLOGERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.45 $PSTMCFGGEOFENCEOK

Message sent in response to command $PSTMCFGGEOFENCE

Synopsis:

$PSTMCFGGEOFENCEOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.46 $PSTMCFGGEOFENCEERROR

Message sent in response to command $PSTMCFGGEOFENCE

Synopsis:

$PSTMCFGGEOFENCEERROR*<checksum><cr><lf>

Arguments:

None.

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Results:

Message sent in case of error.

3.7.47 $PSTMCFGGEOCIROK

Message sent in response to command $PSTMCFGGEOCIR

Synopsis:

$PSTMCFGGEOCIROK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.48 $PSTMCFGGEOCIRERROR

Message sent in response to command $PSTMCFGGEOCIR

Synopsis:

$PSTMCFGGEOCIRERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.49 $PSTMCFGGNSSOK

Message sent in response to command $PSTMCFGGNSS

Synopsis:

$PSTMCFGGNSSOKOK*<checksum><cr><lf>

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Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.50 $PSTMCFGGNSSERROR

Message sent in response to command $PSTMCFGGNSS

Synopsis:

$PSTMCFGGNSSERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.51 $PSTMCFGCONSTOK

Message sent in response to command $PSTMCFGCONST

Synopsis:

$PSTMCFGCONSTOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.52 $PSTMCFGCONSTERROR

Message sent in response to command $PSTMCFGCONST

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Synopsis:

$PSTMCFGCONSTERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.7.53 $PSTMCFGTHGNSSOK

Message sent in response to command $PSTMCFGTHGNSS

Synopsis:

$PSTMCFGTHGNSSOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.7.54 $PSTMCFGTHGNSSERROR

Message sent in response to command $PSTMCFGTHGNSS

Synopsis:

$PSTMCFGTDATAOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

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3.7.55 $PSTMCFGTDATAOK

Message sent in response to command $PSTMCFGTDATA

Synopsis:

$PSTMCFGTDATAOK*<checksum><cr><lf>

Arguments:

None.

Results:

"Message sent in case of successful operation.

3.7.56 $PSTMCFGTDATAERROR

Message sent in response to command $PSTMCFGTDATA

Synopsis:

$PSTMCFGTDATAERROR*<checksum><cr><lf>

Arguments:

None.

Results:

"Message sent in case of error.

3.8 Datalogging NMEA messages

3.8.1 $PSTMLOGCREATEOK

Message sent in response to command $PSTMLOGCREATE

Synopsis:

$PSTMLOGCREATEOK*<checksum><cr><lf>

Arguments:

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No argument

Results:

Message sent in case of successful operation.

3.8.2 $PSTMLOGCREATEERROR

Message sent in response to command $PSTMLOGCREATE

Synopsis:

$PSTMLOGCREATEERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

3.8.3 $PSTMLOGSTARTOK

Message sent in response to command $PSTMLOGSTART

Synopsis:

$PSTMLOGSTARTOK*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of successful operation.

3.8.4 $PSTMLOGSTARTERROR

Message sent in response to command $PSTMLOGSTART

Synopsis:

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$PSTMLOGSTARTERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

3.8.5 $PSTMLOGSTOPOK

Message sent in response to command $PSTMLOGSTOP

Synopsis:

$PSTMLOGSTOPOK*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of successful operation.

3.8.6 $PSTMLOGSTOPERROR

Message sent in response to command $PSTMLOGSTOP

Synopsis:

$PSTMLOGSTOPERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

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3.8.7 $PSTMLOGERASEOK

Message sent in response to command $PSTMLOGERASE

Synopsis:

$PSTMLOGERASEPOK*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of successful operation.

3.8.8 $PSTMLOGERASEERROR

Message sent in response to command $PSTMLOGERASE

Synopsis:

$PSTMLOGERASEERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

3.8.9 $PSTMLOGSTATUS

Message sent by the GNSS Teseo III in response to $PSTMLOGREQSTATUS the internal data log subsystem state.

This message is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMLOGSTATUS,<time-first-entry>,<data-first-entry>,<time-last-entry>,<data-last-entry>,
<latitude>,<used>,<bufer-status>,<free- entries>,<longitude>*<checksum><cr><lf>

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Arguments:

Table 192. $PSTMLOGSTATUS message field description

Parameter	Format	Description
time-first-entry	Decimal, 6 Digits	The first entry timestamp as hhmmss
data-first-entry	Decimal, 8 Digits	The first entry date stamp as yyyyMMdd
time-last-entry	Decimal, 6 Digits	The last entry timestamp as hhmmss
data-last-entry	Decimal, 8 Digits	The last entry date stamp as yyyyMMdd
used	Unsigned	Used entries
buffer-status	Decimal, 1 Digit	Status of data buffer: 0 = non full 1 = full
free-entries	Unsigned	Remaing free entries

3.8.10 $PSTMLOGSTATUSERROR

Message sent in response to command $PSTMLOGREQSTATUS

Synopsis:

$PSTMLOGREQSTATUSERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

3.8.11 $PSTMLOGQUERY

This messages is sent by the ST GNSS Teseo III in response to a query command

$PSTMLOGREQQUERY.

GNSS Teseo sends a message for each entry in the log compliant to the query raised by the host.

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This message is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMLOGQUERY,<status-bitmap>,<log-mask>,<timestamp>,<date-stamp>,<altitude>, <odometer>, <geo>,<quality>,<qual- idx>,<fix>,<speed>*<checksum><cr><lf>

Arguments:

Table 193. $PSTMLOGQUERY message field description

Parameter	Format	Description
status-bitmap	Decimal	[1]: DataValid (DV) [0]: EndOfData (EOD)
log-mask	Decimal, 1 digit	Which dataset is logged
timestamp	Decimal, 6 digits	Hour (2 digit) Minute (2 digit) Seconds (2 digit)
date-stamp	Decimal, 8 digits	Year (4 digit); Month (2 digit); Day (2 digit)
fix	Decimal, 1 digit	Fix status where: 1 = NO_FIX, 2 = FIX_2D, 3 = FIX 3D.
quality	Unsigned	Estimation of accuracy (ehpe) expressed in meters. Note that in case of log-mask type = 1 this quality is expressed as IDx where 0 = (quality > 50), 1 = (quality > 40), 2 = (quality > 30), 3 = (quality > 20), 4 = (quality > 15), 5 = (quality > 10), 6 = (quality > 5), 7 = (quality > 2).
geo	Decimal, 1 digit	Geo fencing status where: 0 = Status unknown 1 = Current position is outside the circle 2 = Current position on circle boundary 3 = Current position is inside the circle

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lat	Double	Current latitude.
lon	Double	Current longitude.
alt	Double	Current altitude. It depends on log-mask. If disabled this value will be always zero. See **Table 95: Data-log types description** for more details.
speed	Double	Current speed. It depends on log-mask. If disabled this value will be always zero. See **Table 95: Data-log types description** for more details.
odo	Double	Current odometer data. It depends on log-mask. If disabled this value will be always zero. See **Table 95: Data-log types description**for more details.

In the $PSTMLOGREQQUERY the bit-fields:

Status-bitmap.EndOfData (EOD) notifies no more data have to be sent by the GNSS Teseo;

Status-bitmap.DataValid (DV) notifies the data in the message is valid or not;

Using the EOD and the DV bit-fields the GNSS Teseo III can notify all the possible cases:[DV=0, EOD=0]: Out-Of-Spec GNSS Teseo cannot send message with this configuration;

[DV=0, EOD=1]: GNSS Teseo have no more data to send; this message can be:

the last one in a valid sequence of data-log;

the first one if the host raised a not valid request (ie.start_index out of the log range);

No data in the log;

[DV=1, EOD=0]: the message contains a valid data and the GNSS has to send other datas;

[DV=1, EOD=1]: the message contains a valid data and the GNSS has no more data to send;

If the message $PSTMLOGREQQUERY has the Status-bitmap.DV=0 the remaining fields could not be sent at all by the GNSS Teseo.

If the Host raises one of the commands, $PSTMLOGCREATE, $PSTMLOGERASE,

$PSTMLOGREQQUERY, while the GNSS Teseo has pending $PSTMLOGQUERY messages to be sent (in response to a previous $PSTMLOGQUERY), in this case the GNSS Teseo discards the pending $PSTMLOGQUERY messages.

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3.8.12 $PSTMLOGQUERYERROR

Message sent in response to command $PSTMLOGREQQUERY

Synopsis:

$PSTMLOGCREATEERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

3.9 Geofencing NMEA messages

3.9.1 $PSTMGEOFENCECFGOK

Message sent in response to command $PSTMGEOFENCECFG

Synopsis:

$PSTMGEOFENCECFGOK*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of successful operation.

3.9.2 $PSTMGEOFENCECFGERROR

Message sent in response to command $PSTMGEOFENCECFG

Synopsis:

$PSTMGEOFENCECFGERROR*<checksum><cr><lf>

Arguments:

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No argument

Results:

Message sent in case of error.

3.9.3 $PSTMGEOFENCESTATUS

This message is sent from GNSS Teseo to the host as response to $PSTMGEOFENCEREQ.

Geofence reports a bitmap against which circle is raising the alarm.

This message is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMGEOFENCESTATUS,<timestamp>,<datestamp>,<status_1>,<status_2>,…,<status_x>*<checksum><cr><lf>

Arguments:

Table 194. $PSTMGEOFENCESTATUS message field description

Parameter	Format	Description
timestamp	Decimal, 6 digits	Hour (2 digit) Minute (2 digit) Seconds (2 digit)
datestamp	Decimal, 8 digits	Year (4 digit); Month (2 digit); Day (2 digit)
status_x	Decimal, 1 digit	Geo fencing status for each circle where: 0 = Status unknown 1 = Current position is outside the circle 2 = Current position on circle boundary 3 = Current position is inside the circle

3.9.4 $PSTMGEOFENCEREQERROR

Message sent in response to command $PSTMGEOFENCEREQ

Synopsis:

$PSTMGEOFENCEREQERROR*<checksum><cr><lf>

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Arguments:

No argument

Results:

Message sent in case of error.

3.10 Odometer NMEA messages

3.10.1 $PSTMODOSTARTOK

Message sent in response to command $PSTMODOSTART

Synopsis:

$PSTMSTARTOK*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of successful operation.

3.10.2 $PSTMODOSTARTERROR

Message sent in response to command $PSTMODOSTART

Synopsis:

$PSTMSTARTERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

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3.10.3 $PSTMODOSTOPOK

Message sent in response to command $PSTMODOSTOP

Synopsis:

$PSTMSTOPOK*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of successful operation.

3.10.4 $PSTMODOSTOPERROR

Message sent in response to command $PSTMODOSTOP.

Synopsis:

$PSTMSTOPERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

3.10.5 $PSTMODORESETOK

Message sent in response to command $PSTMODORESET.

Synopsis:

$PSTMRESETOK*<checksum><cr><lf>

Arguments:

No argument

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Results:

Message sent in case of successful operation.

3.10.6 $PSTMODORESETERROR

Message sent in response to command $PSTMODORESET.

Synopsis:

$PSTMRESETERROR*<checksum><cr><lf>

Arguments:

No argument

Results:

Message sent in case of error.

3.10.7 $PSTMODO

This message is sent from GNSS Teseo III to the host periodically if Odometer subsystem is enabled and related messages are in the message list.

This message is implemented and supported only in Binary Image 4.5.8 and later.

Synopsis:

$PSTMODO,<timestamp>,<date-stamp>,<odo-A>,<odo-B>,<odo- pon>*<checksum><cr><lf>

Arguments:

Table 195. $PSTMODO message field description

Parameter	Format	Description
timestamp	Decimal, 6 digits	Hour (2 digit) Minute (2 digit) Seconds (2 digit)
date-stamp	Decimal, 8 digits	Year (4 digit); Month (2 digit); Day (2 digit)
odo-A	Unsigned	Odometer A value

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odo-B	Unsigned	Odometer B value
odo-pon	Unsigned	Odometer PON value

3.10.8 $PSTMODOREQERROR

Message sent in response to command $PSTMODOREQ.

Synopsis:

$PSTMODOREQERROR*<checksum><cr><lf>

Arguments:

None

Result:

Message sent in case of error.

3.11 Autonomous AGNSS NMEA messages

3.11.1 $PSTMPOLSTARTED

Message sent in response to command $PSTMSTAGPSONOFF.

Synopsis:

$PSTMPOLSTARTED*<checksum><cr><lf>

Arguments:

None

Results:

Message sent if the engine has been started

3.11.2 $PSTMPOLSUSPENDED

Message sent in response to command $PSTMSTAGPSONOFF.

Synopsis:

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$PSTMTPOLSUSPENDED*<checksum><cr><lf>

Arguments:

None

Results:

Message sent if the engine has been suspended

3.11.3 $PSTMPOLONOFFERROR

Message sent in response to command $PSTMSTAGPSONOFF.

Synopsis:

$PSTMTPOLONOFFERROR*<checksum><cr><lf>

Arguments:

None

Results:

Message sent in case of error

3.11.4 $PSTMSTAGPSINVALIDATEOK

Message sent in response to command $PSTMSTAGPSINVALIDATE.

Synopsis:

$PSTMSTAGPSINVALIDATEOK*<checksum><cr><lf>

Arguments:

None

Results:

Message sent in case of successful operation.

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3.11.5 $PSTMSTAGPSINVALIDATEERROR

Message sent in response to command $PSTMSTAGPSINVALIDATE.

Synopsis:

$PSTMSTAGPSINVALIDATEERROR*<checksum><cr><lf>

Arguments:

None

Results:

Message sent in case of error

3.11.6 $PSTMAGPSSTATUS

Message sent in response to command $PSTMGETAGPSSTATUS.

Synopsis:

$PSTMGETAGPSSTATUS,<status>*<checksum><cr><lf>

Arguments:

Table 196. $PSTMAGPSSSTATUS message field description

Parameter	Format	Description
status	Decimal, 1 digits	0 = the STAGPS™ processing is completed. Any number different from zero on means that the STAGPS™ processing is ongoing and so the ephemeris prediction data has not been completely generated.

Results:

Message returns the AGPS status.

3.11.7 $PSTMSTAGPSSETCONSTMASKOK

Message sent in response to command $PSTMSTAGPSSETCONSTMASK.

Synopsis:

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$PSTMSTAGPSSETCONSTMASKOK,<constellation_mask>*<checksum><cr><lf>

Arguments:

Table 197. $PSTMSTAGPSSETCONSTMASKOK message field description

Parameter	Format	Description
Constellation _mask	Decimal, 1 digits	It is a bit mask where each bit enables/disables a specific constellation independently of the others: bit 0: GPS constellation enabling/disabling bit 1: GLONASS constellation enabling/disabling bit 3: GALILEO constellation enabling/disabling bit 7: BEIDOU constellation enabling/disabling

Results:

Message sent in case of successful operation

3.11.8 $PSTMSTAGPSSETCONSTMASKERROR

Message sent in response to command $PSTMSTAGPSSETCONSTMASK

Synopsis:

$PSTMSTAGPSSETCONSTMASKERROR*<checksum><cr><lf>

Arguments:

None

Results:

Message sent in case of error.

3.11.9 $PSTMAGPS

This message has the same syntax as standard NMEA GSA message. Each parameter in the satellites PRN fields is an integer number that reports the satellite PRN and, in case a satellite is using a predicted ephemeris, it also reports the age of predicted ephemeris available for that satellite.

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They are generated using the formula: satID + 32 * STAGPS_AGE_DAYS where STAGPS_AGE_DAYS is the number of days from current time back to the most recent ephemeris used for STAGPS predictions. If a satellite has no predicted ephemeris (STAGPS_AGE_DAYS = 0) the satellite parameter, reported in the sentence, is exactly the satellite PRN.

Table 198. $PSTMAGPS ephemeris aging description

STAGPS_AGE_DAYS	Ephemeris aging description
1	Latest ephemeris has been downloaded from 0 up to 24 hours in the past
2	Latest ephemeris has been downloaded from 24 up to 48 hours in the past
3	Latest ephemeris has been downloaded from 48 up to 72 hours in the past
4	Latest ephemeris has been downloaded from 72 up to 96 hours in the past
5	Latest ephemeris has been downloaded from 96 up to 120 hours in the past

This message could be used to replace the standard GSA in all devices where STAGPS is enabled. If STAGPS is not enabled, it behaves in the same way as NMEA GSA message.

NMEA message list bitmask: 0x10000000 – This message is not enabled by default

Synopsis:

$PSTMAGPS,<Mode>,<CurrentMode>,[<SatPRN1>],...,[<SatPRNN>],<PDOP>,<HDOP>,<VDOP>*<checksum><cr><lf>

Arguments:

Table 199. $PSTMAGPS message field description

Parameter	Format	Description
Mode	“M” or “A”	Operating Mode: M = Manual, A = Auto (2D/3D)
CurrentMode	Decimal, 1 digit	Current Mode: 1 = no FIX available 2 = 2D FIX 3 = 3D FIX
SatPRN1...N	Decimal, 2 digits	Satellites list used in position FIX (max N 12)
PDOP	Decimal, 3 digits	Position Dilution of Precision, from 0.0 to 99.0

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HDOP	Decimal, 3 digits	Horizontal Dilution of Precision, from 0.0 to 99.0
VDOP	Decimal, 3 digits	Vertical Dilution of Precision, from 0.0 to 99.0

3.11.10 $PSTMAGLO

This message has the same syntax as standard NMEA GSA message. Each parameter in the satellites PRN fields is an integer number that reports the satellite PRN and, in case a satellite is using a predicted ephemeris, it also reports the age of predicted ephemeris available for that satellite. They are generated using the formula:

satID + 32 * STAGPS_AGE_DAYS

where STAGPS_AGE_DAYS is the number of days from current time back to the most recent ephemeris used for STAGPS predictions. If a satellite has no predicted ephemeris (STAGPS_AGE_DAYS = 0) the satellite parameter, reported in the sentence, is exactly the satellite PRN.

Table 200. $PSTMAGLO ephemeris aging description

STAGPS_AGE_DAYS	Ephemeris aging description
1	Latest ephemeris has been downloaded from 0 up to 24 hours in the past
2	Latest ephemeris has been downloaded from 24 up to 48 hours in the past
3	Latest ephemeris has been downloaded from 48 up to 72 hours in the past
4	Latest ephemeris has been downloaded from 72 up to 96 hours in the past
5	Latest ephemeris has been downloaded from 96 up to 120 hours in the past

This message could be used to replace the standard GSA in all devices where STAGPS is enabled. If STAGPS is not enabled, it behaves in the same way as NMEA GSA message.

NMEA message list bitmask: 0x10000000 – This message is not enabled by default

Synopsis:

$PSTMAGLO,<Mode>,<CurrentMode>,[<SatPRN1>],...,[<SatPRNN>],<PDOP>,<HDOP>,<VDOP>*<checksum><cr><lf>

Arguments:

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Table 201. $PSTMAGLO message field description

Parameter	Format	Description
Mode	“M” or “A”	Operating Mode: M = Manual, A = Auto (2D/3D)
CurrentMode	Decimal, 1 digit	Current Mode: 1 = no FIX available 2 = 2D FIX 3 = 3D FIX
SatPRN1...N	Decimal, 2 digits	Satellites list used in position FIX (max N 12)
PDOP	Decimal, 3 digits	Position Dilution of Precision, from 0.0 to 99.0
HDOP	Decimal, 3 digits	Horizontal Dilution of Precision, from 0.0 to 99.0
VDOP	Decimal, 3 digits	Vertical Dilution of Precision, from 0.0 to 99.0

3.12 Predictive AGNSS NMEA messages

3.12.1 $PSTMSTAGPSSEEDBEGINOK

Message sent in response to command $PSTMSTAGPSSEEDBEGIN

Synopsis:

$PSTMSTAGPSSEEDBEGINOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.12.2 $PSTMSTAGPSSEEDBEGINERROR

Message sent in response to command $PSTMSTAGPSSEEDBEGIN

Synopsis:

$PSTMSTAGPSSEEDBEGINERROR*<checksum><cr><lf>

Arguments:

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None.

Results:

Message sent in case of error.

3.12.3 $PSTMSTAGPSBLKTYPEOK

Message sent in response to command $PSTMSTAGPSBLKTYPE

Synopsis:

$PSTMSTAGPSBLKTYPEOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.12.4 $PSTMSTAGPSBLKTYPEERROR

Message sent in response to command $PSTMSTAGPSBLKTYPE

Synopsis:

$PSTMSTAGPSBLKTYPEERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error.

3.12.5 $PSTMSTAGPSSLOTFRQOK

Message sent in response to command $PSTMSTAGPSSLOTFRQ

Synopsis:

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$PSTMSTAGPSSLOTFRQOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.12.6 $PSTMSTAGPSSLOTFRQERROR

Message sent in response to command $PSTMSTAGPSSLOTFRQ

Synopsis:

$PSTMSTAGPSSLOTFRQERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error

$PSTMSTAGPSSEEDPKTOK

Message sent in response to command $PSTMSTAGPSSEEDPKT

Synopsis:

$PSTMSTAGPSSEEDPKTOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

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3.12.7 $PSTMSTAGPSSEEDPKTERROR

Message sent in response to command $PSTMSTAGPSSEEDPKT

Synopsis:

$PSTMSTAGPSSEEDPKTERROR*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of error

3.12.8 $PSTMSTAGPSSEEDPROPOK

Message sent in response to command $PSTMSTAGPSSEEDPROP

Synopsis:

$PSTMSTAGPSSEEDPROPOK*<checksum><cr><lf>

Arguments:

None.

Results:

Message sent in case of successful operation.

3.13 Real Time AGNSS NMEA messages

3.13.1 $PSTMSTAGPS8PASSRTN

Message sent in response to command $PSTMSTAGPS8PASSGEN.

Synopsis:

$PSTMSTAGPS8PASSRTN,<DevID>,<Password>*<checksum><cr><lf>

Arguments:

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Table 202. $PSTMSTAGPS8PASSRTN message field description

Parameter	Description
<DevID>	Unique Device ID
<Password>	41-character ASCII password.

Results:

None

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4. Firmware Configuration Data Block (CDB)

All configuration parameters are grouped in a data block. Each field is addressed by a unique ID. The IDs are made by three digits: the most significant one represents the parameter type and the others are used to identify different parameters of the same type.

The table below includes all parameters which can be changed to apply a different configuration to the firmware.

The IDs not reported in the table should be considered as RESERVED and must be left untouched to avoid unexpected system behaviors.

Table 203. Configuration data block list

ID	Parameter name	Size bytes	Allowed values	Default	Description
100	Debug Port Number	1	0...2	0	Set debug port number
101	NMEA Port Number	1	0...2	2	Set NMEA port number
102	NMEA Port Baudrate	1	0x0 = 300 baud 0x1 = 600 baud 0x2 = 1200 baud 0x3 = 2400 baud 0x4 = 4800 baud 0x5 = 9600 baud 0x6 = 14400 baud 0x7 = 19200 baud 0x8 = 38400 baud 0x9 = 57600 baud 0xA = 115200 baud 0xB = 230400 baud 0xC = 460800 baud 0xD = 921600 baud	0xA	Set NMEA Baudrate
103	GPS Debug Mode	1	0x00 = Debug Mode ON 0x01 = Debug Mode OFF 0x10 = Debug OUT ON + NMEA IN 0x11 = Debug OUT OFF + NMEA IN 0xA0 = Debug OUT ON + NMEA OUT 0xA1 = Debug OUT OFF + NMEA OUT 0xB0 = Debug OUT ON + NMEA IN/OUT 0xB1 = Debug OUT OFF + NMEA IN/OUT	0	Debug port IN/OUT configuration. Extended debug mode configuration allows having on the debug port the NMEA messages and/or the NMEA input commands. ***Note:*** *Bit7 and bit5 must be enabled to have the NMEA messages over debug port.*

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104	GNSS Mask Angle	1	0 …. 45	5	Set the GNSS Mask Angle for low Satellite Elevation
105	GNSS Tracking Threshold [dB]	1	9...40	10	Set the satellites tracking threshold
106	Debug Port Baudrate	1	0x0 = 300 baud 0x1 = 600 baud 0x2 = 1200 baud 0x3 = 2400 baud 0x4 = 4800 baud 0x5 = 9600 baud 0x6 = 14400 baud 0x7 = 19200 baud 0x8 = 38400 baud 0x9 = 57600 baud 0xA = 115200 baud 0xB = 230400 baud 0xC = 460800 baud 0xD = 921600 baud	0xA	Set Debug Baudrate
120	Cold Start Type	1	0xF = clear Almanach, Ephem, Time &Position 0xE = clear Ephemeris, Time, Position	0xE	Set the cold start type with selective data erase
121	NMEA Decimal Digits for Speed and Course values	1	First nibble: 0x1...0x8 Second nibble: 0x1...0x8	0x11	Allow setting the number of decimal digits for the speed and course data in the NMEA messages.
124	NMEA and Debug Output Redirection	1	0x11 = NMEA and Debug over UART 0x21 = NMEA over USB and Debug over UART 0x12 = NMEA over UART and Debug over USB 0x44 = NMEA and Debug over SD card 0x81 = NMEA over I2C and Debug over UART 0x18 = NMEA over UART and Debug over I2C	0x11	Configure the output method for NMEA and Debug messages (over UART, USB or SD card)
125	Notch Filter Setting	1	0x0...0xF	0x0	Enable or disable the Notch Filter usage
126	HW CONFIG	1	0...1	1	Select the HW configuration: 0: SOC 1: SAL
127	NMEA Decimal Digits	1	First nibble: 0x1...0x8 Second nibble: 0x1...0x8	0x55	Allow setting the number of decimal digits for the position data in the NMEA messages.
128	Differential Source Type	1	0...3	0x3	Allow selecting the differential mode source type.
129	GLONASS Satellite ID Type	1	0...1	0x1	Allow setting the GLONASS satellite ID type used in the GSV and GSA messages. 0x0 – the satellite ID is based on frequency 0x1 – the satellite ID is based on slot number.
130	CPU clock speed	1	0x00, 0x10, 0x20, 0x30, 0x02	0x30	Allow setting the CPU clock source and speed.

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131	NMEA Talker ID	1	‘P’, ‘L’, ‘N’	‘P’	Allow setting the second character of the NMEA talker ID.
132	GNSS positioning CN0 Threshold [dB]	1	9...40	15	Set the satellites CN0 threshold for the positioning stage
134	Configuration Version ID	1	0...255	0	Allow setting a version number for the specific configuration
135	SBAS Default Service	1	0...15	15	Set the SBAS default Service
138	RTCM Port Number	1	0...2	0	Set the serial port number for the RTCM input.
139	RTCM Port Baud rate	1	0x0 = 300 baud 0x1 = 600 baud 0x2 = 1200 baud 0x3 = 2400 baud 0x4 = 4800 baud 0x5 = 9600 baud 0x6 = 14400 baud 0x7 = 19200 baud 0x8 = 38400 baud 0x9 = 57600 baud 0xA = 115200 baud 0xB = 230400 baud 0xC = 460800 baud 0xD = 921600 baud	0xA	Set the baudrate for the RTCM input serial port.

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From 140 To 188 Even IDs	RF front-end address register and operation	1	b0...b5 = address (from 0 to 24) b6...b7= operation (00b or 01b or 10b)	0xFF = Don't Touch	Set the address and the operation to be performed on the corresponding RF front end register. The address is reported in the first 6 bits. The operation is reported in the last 2 bits. Any address from 0 to 24 is allowed. Supported operations are: b6...b7 = 00b: overwrite register with provided value b6...b7 = 01b: Perform OR operation between register and provided value b6...b7 = 11b: Perform AND operation between register and provided value. Provided value is the value reported in the next parameter (e.g. 140 reports the address and operation for the value reported on 141) ***Note:*** *Using 0xFF for this parameter means don't touch the front- end register. If the front-end registers configuration is not needed, all parameters from 140 to 188 (even IDs) should be set to 0xFF. This is the default value of standard ST image.*
From 141 To 189 Odd IDs	RF front-end data register value	1	Any RF front-end supported values (see front-end reference manual)	0xFF	The value to be applied to the front- end register pointed by the previous address and operation parameter (e.g. 141 reports the value to be applied to the address reported on 140)
190	NMEA Msg-List 0 output rate scaling factor.	1	1...255	1	Message list output rate scaling factor referred to the fix rate. Examples: 1 = message list is sent out at the selected fix-rate 2 = message list is sent out every 2 fixes N = message list is sent out every N fixes
191	NMEA Msg-List 1 output rate scaling factor.	1	1...255	1	Message list output rate scaling factor referred to the fix rate. Examples: 1 = message list is sent out at the selected fix-rate 2 = message list is sent out every 2 fixes N = message list is sent out every N fixes

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192	NMEA Msg-List 2 output rate scaling factor.	1	1...255	1	Message list output rate scaling factor referred to the fix rate. Examples: 1 = message list is sent out at the selected fix-rate 2 = message list is sent out every 2 fixes N = message list is sent out every N fixes
193	USB Detect feature	1	0...1	0	Enable or disable the USB detect feature
194	USB Detect GPIO pin configuration	1	GPIO pin number (from 0 to 63)	0	Configure GPIO pin used for USB detect feature
195	USB Data Terminal Equipment feature	1	0...1	1	Enable or disable the USB Data Terminal Equipment feature
197	PPS Clock	1	16,32,48,64	32	Allow setting the PPS clock. For accurate timing application, 64 is mandatory.
198	GNSS Mask Angle Positioning	1	0 …. 45	1	Set the GNSS Mask Angle for positioning algorithm. Satellites with elevation below the mask angle are not used in the position solution.
199	Local geodetic datum	1	0...215	255	Set the local geodetic datum to be used in position reporting over the NMEA messages. Not valid number (e.g. 255) means default datum which is WSG84.

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200	Application ON/OFF	4	0x2 = GPS_2D_FIX_ENABLE 0x4 = SBAS_ENABLE 0x8 = SBAS_SAT_ON_GSV_MSG_ENABLE 0x10 = STAGPS_ENABLE 0x20 = 2.5_PPM_TCXO_ENABLE 0x40 = NMEA_v301_ENABLE 0x80 = QZSS_DISTRIBUTED_ACQ_MODE_ENABLE 0x200 = CONFIG_TXT_HEADER_EN. 0x400 = ST_HEADERS_ENABLE 0x800 = RTCM_ENABLE 0x1000 = FDE_ENABLE 0x4000 = WALKING_MODE_ENABLE 0x8000 = STOP_DETECTION_ENABLE 0x10000 = GPS_ENABLE 0x20000 = GLONASS_ENABLE 0x40000 = QZSS_ENABLE 0x80000 = NMEA_GNGSV_ENABLE 0x100000 = NMEA_GNGSA_ENABLE 0x200000 = GLONASS_USE_ENABLE 0x400000 = GPS_USE_ENABLE 0x800000 = QZSS_USE_ENABLE 0x1000000 = PPS_ENABLE 0x2000000 = PPS_POLARITY_INVERSION 0x4000000 = POSITION_HOLD_ENABLE 0x8000000 = TIMING_TRAIM_ON_OFF 0x10000000 = RESERVED 0x20000000 = HIGH_DYNAMICS_ON_OFF 0x40000000 = NMEA_RAW_ON_OFF 0x80000000 = LOW_POWER_ON_OFF	0x09419644	Activates/Deactivates GNSS application features
201	NMEA Port Msg-List 0 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x288435F	Set NMEA Message List 0 (32 bits low)
202	NCO Range max.	4	-132000 to 132000	0x0	Set NCO range max. value in Hz
203	NCO Range min.	4	-132000 to 132000	0x0	Set NCO range min. value in Hz
204	NCO Center	4	-132000 to 132000	0x0	Set NCO center frequency Offset in Hz

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205	Position Data Time Delay [ms]	4	0..(fix rate time period)	80 ms	Set the time delay between the measurements (on UTC second) and the position data delivery. ***Note:*** To reduce the jittering of the NMEA message list 2 data delivery, the messages are sent over the uart port after a fixed delay from the measurement time. This delay can be configured to achieve the best jitter reduction at different CPU speed setting.
206	GPIO Port0 CFG0	4	0x0000.0000 to 0xFFFF.FFFF	0xFFFF FFFF	Config0 for GPIO Port0
207	GPIO Port0 CFG1	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	Config1 for GPIO Port0
208	GPIO Port1 CFG0	4	0x0000.0000 to 0xFFFF.FFFF	0xFFF FFFF	Config0 for GPIO Port1
209	GPIO Port1 CFG1	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	Config1 for GPIO Port1
210	NMEA Port Msg-List 1 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 1 (32 bits low)
211	NMEA Port Msg-List 2 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 2 (32 bits low)
213	PPS operating mode setting 1	4	-	0x0000000	Allow setting different operating modes for the PPS signal generation. (see details in the corresponding section)
214	PPS operating mode setting 2	4	-	0x0000000	Allow setting different operating modes for the PPS signal generation (see details in the corresponding section)
215	Position hold auto survey samples.	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Sets the number of position samples to be captured before entering in the position hold mode. If it is set to 0, the auto survey is disabled.
218	SBAS satellite parameters	4	-	0xFFFFFFF F	Allow setting parameters (PRN, longitude and service) for new SBAS satellites not supported by the was library. Not valid value (e.g. 0xFFFFFFFF) means not used.
219	SBAS satellite parameters	4	-	0xFFFFFFF F	Allow setting parameters (PRN, longitude and service) for new SBAS satellites not supported by the was library. Not valid value (e.g. 0xFFFFFFFF) means not used
220	Adaptive Low Power operating mode setting 1	4	-	15 m,10 s, 10s, 180s	Allow setting the operative mode for low power algorithm.

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221	Adaptive Low Power operating mode setting 2	4	-	4,60s,9,31min	Allow setting the operative mode for low power algorithm.
222	LMS operating mode setting 1	4	-	1,0,0,,50m, 50m,	Allow setting parameters for the LMS algorithm
223	LMS operating mode setting 2	4	-	5,3,-223m	Allow setting parameters for the LMS algorithm
224	Adaptive Low Power operating mode setting 3	4		1,1,740ms	Allow setting the operative mode for low power algorithm.
225	ADC channel read configuration parameters	4	-	0x3FE	Allow setting parameters for configuration of ADC channels reading
226	Antenna Sensing configuration parameters	4	-	0x7D096010	Allow setting parameters for configuration of Antenna Sensing feature
227	Application ON/OFF 2	4	0x1 = NMEA_COMMAND_ECO_ENABLE 0x2 = NMEA_TTFF_MESSAGE_ENABLE 0x4 = FEW_SATS_POS_ESTIMATION_ENABLE 0x8 = STBIN_IN_OUT_ENABLE 0x20 = NMEA_IN_OUT_INTERFACE_SELECT 0x40 = GALILEO_ENABLE 0x80 = GALILEO_USAGE_ENABLE 0x100 = COMPASS_ENABLE 0x200 = COMPASS_USAGE_ENABLE 0x800 = RTC_USAGE_DISABLING 0x1000 = FAST_SATELLITE_DROP_ENABLE 0x2000 = RESERVED 0x4000 = EXCLUDED_SATS_REPORTING_ENABLE	0x345	Activates/Deactivates GNSS application features
228	NMEA Port Msg-List 0 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x2000	Set NMEA Message List 0 (32 bits high)
229	NMEA Port Msg-List 1 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 1 (32 bits high)
230	NMEA Port Msg-List 2 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA Message List 2 (32 bits high)

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231	NMEA on Debug Port Msg-List 0 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 0 (32 bits low)
232	NMEA on Debug Port Msg-List 0 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 0 (32 bits high)
233	NMEA on Debug Port Msg-List 1 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 1 (32 bits low)
234	NMEA on Debug Port Msg-List 1 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 1 (32 bits high)
235	NMEA on Debug Port Msg-List 2 (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 2 (32 bits low)
236	NMEA on Debug Port Msg-List 2 (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set NMEA on Debug port Message List 2 (32 bits high)
237	Default GPS MIN-MAX week number	4	MIN: 0x0000 to 0xFFFF - MAX: 0x0000 to 0xFFFF	MIN = 1821 MAX =3300	Set default MIN-MAX range for GPS week number. ***Note:*** *Min week number is used for correct GPS week number decoding. Max week number is used for GPS week validity check.*
238	Default UTC delta time	4	0x0000.0000 to 0xFFFF.FFFF	16	Default value of GPS time to UTC delta time in seconds (leap second)
240	STBIN Msg-List (LOW)	4	0x0000.0000 to 0xFFFF.FFFF	0x1FF	Set STBIN Message List (32 bits low)
241	STBIN Msg-List (HIGH)	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Set STBIN Message List (32 bits high)
245	TCXO Frequency	4	0x0, 0xA, 0xB	0x0	Select the TCXO frequency among the supported ones. ***Note:*** *supported frequencies are 26MHz, 48MHz and 55MHz*
249	Flash Protection Setting 1	4	-	0x1	Flash Protection enabling/disabling
250	Flash Protection Setting 2	4	-	0x8000000	Flash sectors to be protected / auto- protection feature enabling/disabling
253	GPIO Port0 Mode AFSLA	4	0x0000.0000 to 0xFFFF.FFFF	0xFFF7C3F0	AFSLA register configuration for GPIO Port0
254	GPIO Port0 Mode AFSLB	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	AFSLB register configuration for GPIO Port0
255	GPIO Port1 Mode AFSLA	4	0x0000.0000 to 0xFFFF.FFFF	0xFFFFFFFF	AFSLA register configuration for GPIO Port1
256	GPIO Port1 Mode AFSLB	4	0x0000.0000 to 0xFFFF.FFFF	0x00000000	AFSLB register configuration for GPIO Port1

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257	Low Power Setting	4	0x0, 0x1	0x1	Allow configuration of low power functionalities
260	WLS configuration params	4	-	0x00190 A00	WLS algorithm configuration params
261	Dynamic modes configuration s	4	0,1,3	0	Allow setting the dynamic mode for the satellite tracking engine.
263	Nmea over serial configuration	4		0xE80	Allow configuring parameters for nmea over serial feature
264	Data logger Configuration 0	4	0x0000.0000 to 0xFFFF.FFFF	0x10180000	Data logger configuration field 0. Configures the memory base address for the data logger data structure
265	Data logger Configuration 1	4	0x0000.0000 to 0xFFFF.FFFF	0x80000	Data logger configuration field 1. Specify the maximum space available for data logger data structure
266	Data logger Configuration 2	4	0x0000.0000 to 0xFFFF.FFFF	0x80000	Data logger configuration field 2
267	Data logger Configuration 3	4	0x0000.0000 to 0xFFFF.FFFF	0x0000010 E	Data logger configuration field 3
268	Geofencing Configuration 0	4	0x0000.0000 to 0xFFFF.FFFF	0x0	Geofencing configuration field 0
270	Odometer Configuration	4	0x0000.0000 to 0xFFFF.FFFF	0x03E8000 0	Odometer configuration field
272	GNSS Integrity	4	0x0..0x3	0x0	Enabling/disabling position and time integrity feature
301	PPS Pulse Duration	8	<= 1.0 seconds	0.5	PPS pulse width. It is the time distance (in seconds) from PPS rising edge and next PPS falling edge.
302	PPS Delay Correction	8	< 1.0 seconds	0.0	PPS time delay correction n seconds. It allows to compensate any delay introduced on PPS signal by RF chain.
303	GNSS Fix Rate	8	> 0.1 seconds	1.0	Set the GNSS fix rate period in seconds. ***Note:*** high fix rates may require a different setting (e.g. 208MHz) of the CPU speed.
304	Position Hold Latitude [deg]	8	From -90.0 to 90.0	40.91747	Set the position hold latitude.
305	Position Hold Longitude [deg]	8	From -180.0 to 180.0	14.27586	Set the position hold longitude.
306	Position Hold Altitude [m]	8	From -1500 to 100000	88.43307	Set the position hold altitude.
307	GPS RF delay correction	8		718E-9	Time delay compensation for the GPS RF path.

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308	GLONASS RF delay correction	8		-420E-9	Time delay compensation for the GLONASS RF path.
309	TRAIM alarm threshold	8		15ns	Time error threshold for the satellites exclusion in the TRAIM algorithm.
310	COMPASS RF delay correction	8		100E-9	Time delay compensation for the COMPASS RF path.
311	GALILEO RF delay correction	8		718E-9	Time delay compensation for the GALILEO RF path.
314	Geofencing Circle 0 Latitude	8		41.11473	Allows to set up the geofencing circle number 0 by choosing its latitude as a double precision floating number
315	Geofencing Circle 0 Longitude	8		13.88093	Allows to set up the geofencing circle number 0 by choosing its longitude as a double precision floating number
316	Geofencing Circle 0 Radius	8		10.0	Allows to set up the geofencing circle number 0 by choosing its radius in meters as a double precision floating number
317	Geofencing Circle 1 Latitude	8		41.12148	Allows to set up the geofencing circle number 1 by choosing its latitude as a double precision floating number
318	Geofencing Circle 1 Longitude	8		13.87146	Allows to set up the geofencing circle number 1 by choosing its longitude as a double precision floating number
319	Geofencing Circle 1 Radius	8		10.0	Allows to set up the geofencing circle number 1 by choosing its radius in meters as a double precision floating number
320	Geofencing Circle 2 Latitude	8		41.24341	Allows to set up the geofencing circle number 2 by choosing its latitude as a double precision floating number
321	Geofencing Circle 2 Longitude	8		13.77443	Allows to set up the geofencing circle number 2 by choosing its longitude as a double precision floating number
322	Geofencing Circle 2 Radius	8		10.0	Allows to set up the geofencing circle number 2 by choosing its radius in meters as a double precision floating number

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323	Geofencing Circle 3 Latitude	8		41.24328	Allows to set up the geofencing circle number 3 by choosing its latitude as a double precision floating number
324	Geofencing Circle 3 Longitude	8		13.77424	Allows to set up the geofencing circle number 3 by choosing its longitude as a double precision floating number
325	Geofencing Circle 3 Radius	8		10.0	Allows to set up the geofencing circle number 3 by choosing its radius in meters as a double precision floating number

4.1 CDB-ID 100 – Debug port setting

Allow setting the debug port number.

System reboot needed to have new setting in use.

4.2 CDB-ID 101 – NMEA port setting

Allow setting the NMEA port number.

System reboot needed to have new setting in use.

4.3 CDB-ID 102 – NMEA port baudrate setting

Allow setting the baudrate for the NMEA port number. The translation table in **Table 204: CDB-ID 102 field description.**

Table 204. CDB-ID 102 field description

Parameter	**Description**
0x0	300 baud
0x1	600 baud
0x2	1200 baud
0x3	2400 baud
0x4	4800 baud
0x5	9600 baud

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0x 6	14400 baud
0x 7	19200 baud
0x 8	38400 baud
0x 9	57600 baud
0xA	115200 baud
0xB	230400 baud
0xC	460800 baud
0xD	921600 baud

System reboot needed to have new setting in use.

4.4 CDB-ID 103 – Debug mode setting

Allow setting the debug port operational modes.

Table 205. CDB-ID 103 field description

Bits	Bitmask	Description
0	0x1	Debug messages ON/OFF 0 = ON 1 = OFF
1	0x2	Not Used
2	0x4	Not Used
3	0x8	Not Used
4	0x10	NMEA Input on debug port enabling/disabling 0 = disabled 1 = enabled
5	0x20	NMEA Output on debug port enabling/disabling 0 = disabled 1 = enabled ***Note:*** *This bit is used only when bit7 is enabled.*
6	0x40	NMEA Output enabling/disabling 0 = disabled 1 = enabled ***Note:*** *This bit is used only when bit7 is enabled.*
7	0x80	Dual NMEA Output enabling/disabling 0 = disabled

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		1 = enabled ***Note :*** *This bit is used to enable/disable the dual NMEA port feature. It must be enabled to have NMEA messages over debug port.*

Any combination of bits in the bitmask is allowed. When debug is configured to be OFF and both NMEA IN and OUT are disabled, the debug port pins are in high impedance mode.

Example: setting 0x01 the debug port pins are in high impedance mode. System reboot needed to have new setting in use.

4.5 CDB-ID 104 – Mask angle setting

Allow setting the minimum elevation angle at which a satellite can be tracked. Satellite with elevation below the mask angle cannot be tracked.

System reboot needed to have new setting in use.

4.6 CDB-ID 105 – GNSS tracking threshold

Allow setting the minimum CN0 [dB] at which a satellite can be tracked. Satellite with CN0 below the configured threshold cannot be tracked.

A GNSS engine reset (suspend/restart) is needed to have this setting in place.

4.7 CDB-ID 106 – DEBUG port baudrate setting

Allow setting the baudrate for the DEBUG port number. The translation table in **Table 206: CDB-ID 106 field description.**

Table 206. CDB-ID 106 field description

Parameter Value	Baudrate
0x0	300 baud
0x1	600 baud
0x2	1200 baud
0x3	2400 baud
0x4	4800 baud
0x5	9600 baud

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0x 6	14400 baud
0x 7	19200 baud
0x 8	38400 baud
0x 9	57600 baud
0xA	115200 baud
0xB	230400 baud
0xC	460800 baud
0xD	921600 baud

System reboot needed to have new setting in use.

4.8 CDB-ID 120 – Cold start setting

Allow setting the data to be cleared during the COLD start command execution. This parameter is a bitmask where bit=1 indicates the data to be cleared.

Table 207. CDB-ID 120 field description

Bits	Bitmask	Description
0	0x1	Clear almanacs
1	0x2	Clear ephemeris
2	0x4	Clear position
3	0x8	Clear time

Any bitmask combination is allowed, the default one is 0xE.

This setting is in place as soon as the $PSTMSETPAR is performed.

4.9 CDB-ID 121 – Number of decimal digits for speed and course data in NMEA messages

Allow setting the number of decimal digits for the speed and course data in NMEA messages. It affects both RMC and VTG messages

It is possible to set a different number of decimal digits.

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Table 208. CDB-ID 121 field description

Bit	Values	Description
From B0 to B3	From 1 up to 5	Allow setting the number of decimal digits for speed value in RMC and VTG massages
From B4 to B7	From 1 up to 5	Allow setting the number of decimal digits for course value in RMC and VTG messages.

4.10 CDB-ID 122 – NMEA format configuration

Allow setting the change the format of NMEA. Note that this changing the default value of this parameter the Bit 6 of CDB-ID 200 – Application ON/OFF is bypassed.

The default value of this parameter is 0x0C.

In case of wrong configuration NMEA is configured as 3.01 like.

Table 209. CDB-ID 122 field description

Bit	Values	Description
From B0 to B3	Hexadecimal	Changes the NMEA format 0x01 = NMEA is 3.00 like 0x02 = NMEA is 3.01 like 0x04 = NMEA is 4.10 like 0x0C = Depends on Bit 6 of CDB-ID 200

4.11 CDB-ID 124 – NMEA and debug output redirection

Allow setting the output channel for NMEA and Debug messages. Supported channels are UART, USB and SD card. UART is the default channel. If the SD card is selected for NMEA and Debug output but the SD card is not present in the slot, the system switch automatically to the UART mode. NMEA and Debug output cannot be redirected to USB together.

This parameter is made by two bit masks (4 bits each one):

Table 210. CDB-ID 124 field description

Bits	Bitmask	Description
From B0 to B3	0x01=enable/disable UART output 0x02=enable/disable USB output 0x04=enable/disable SD output 0x08=enable/disable I2C output	Bit mask for Debug output configuration (only one bit can be enabled at the same time in the bitmask)

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From B4 to B7	0x10=enable/disable UART output 0x20=enable/disable USB output 0x40=enable/disable SD output 0x80=enable/disable I2C output	Bit mask for NMEA output configuration (only one bit can be enabled at the same time in the bitmask)

Note: *USB output works only with TCXO 48Mhz.*

Note: *ST provides a specific USB driver that can be found in the standard installation pack inside the folder \drivers\usb.*

4.12 CDB-ID 125 – Notch filter setting

Allow setting the Notch filter usage on GPS RF path, GLONASS RF path or both GPS and GLONASS RF paths. The notch filter can be enabled and inserted in the RF path (normal mode – see b0, b1 below) or the notch filter can be enabled but inserted only if locked on a jammer (auto-insertion mode – see b2, b3 below).

Table 211. CDB-ID 125 field description

Parameter Value	Baudrate
b0...b3 = 0x00	Notch Filter is disabled on both GPS and GLONASS paths
b0	Enable/disable notch filter on GPS path (normal mode).
b1	Enable/disable notch filter on GLONASS path (normal mode).
b2	Enable/disable notch filter on GPS path in auto-insertion mode.
b3	Enable/disable notch filter on GLONASS path in auto-insertion mode.

4.13 CDB-ID 126 – HW Config

Allow setting the HW configuration (SOC=0 or SAL=1). It is currently used for PPS signal configuration.

4.14 CDB-ID 127 – Number of decimal digits in NMEA position messages

Allow setting the number of decimal digits for the NMEA position messages.

It is possible to set a different number of decimal digits for GGA and for both RMC and GLL messages.

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Table 212. CDB-ID 127 field description

Bit	Values	Description
From B0 to B3	From 1 up to 5	Allow setting the number of decimal digits for the RMC and GLL massages
From B4 to B7	From 1 up to 5	Allow setting the number of decimal digits for the GGA massage.

4.15 CDB-ID 128 – Differential Source Type

Allow selecting the differential mode source type.

Table 213. CDB-ID 128 field description

Value	Description
0x0 - NONE	No differential source.
0x1 - SBAS	SBAS is the source for differential correction.
0x2 - RTCM	RTCM is the source for differential corrections.
0x3 - AUTO	RTCM (if available) or SBAS (if available) is the source for differential corrections.

4.16 CDB-ID 129 – GLONASS Satellite ID Type

Allow selecting between two different ways to report the GLONASS satellites ID in the GSV and GSA messages.

Table 214. CDB-ID 129 field description

Value	Description
0x0	GLONASS satellite ID based on the satellite frequency. If lowest frequency is marked with freq_ID = 1 and highest frequency is marked with freq_ID = 14, the satellite IDs are reported, starting from lowest frequency as 64+freq_ID. Satellites from 79 up to 92 are the antipodal of satellites from 65 up to 78 (they are received at the same frequency).
0x1	GLONASS satellite ID based on the satellite slot (reported in almanacs and ephemeris data). The satellite IDs are reported as 64+slot_number. The slot number is in the range from 1 up to 24.

4.17 CDB-ID 130 – CPU clock speed

Allow setting the CPU clock speed.

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Table 215. CDB-ID 130 field description

Bit	Values	Description
From B0 to B3	0 = 192f0 1 = TCXO 2 = RTC 3 = RING Oscillator	Allow setting the CPU clock source
From B4 to B6	0 = 1 1 = 2 3 = 4	Allow setting the CPU clock divisor factor
B7		RESERVED

Examples:

0x00 sets the CPU speed at 192f0 MHz

0x10 sets the CPU speed at 96f0 MHz

0x20 sets the CPU speed at 64f0 MHz

0x30 sets the CPU speed at 48f0 MHz

4.18 CDB-ID 131 – NMEA Talker ID

Allow setting the second character of the NMEA talker ID for the GGA, RMC, VTG, GLL NMEA sentences. The talked ID for GSV and GSA is managed in a different way (see CDB- ID 200, bits 19 and 20).

4.19 CDB-ID 132 – GNSS Positioning CN0 threshold

Allow setting the minimum CN0 [dB] at which a satellite can be used in the position solution. Satellites with CN0 below the configured threshold are not used in the position evaluation.

A GNSS engine reset (suspend/restart) is needed to have this setting in place.

4.20 CDB-ID 134 – Configuration version ID

Allow setting a version identification number for the configuration data block. This parameter has two main purposes:

Mark a specific configuration data block with a unique identifier which is readable at the application level using the command interface

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Replace any saved configuration data with the default setting configuration if the version number of the default setting is different from the version number of the saved data block. Example: the GNSS module is flashed with a firmware which has an embedded default setting marked as version 1. The user changes some parameter and saves the new configuration. The module is then updated with a firmware which has the configuration version marked as version 2. At the first startup the saved configuration (version 1) is automatically cleared and the version 2 configuration is applied to the GNSS software.

4.21 CDB-ID 135 – SBAS default service

Allow setting the default service for the SBAS library. System reboot needed to have new setting in use.

Note: *For compatibility, a default SBAS PRN can also be set. In that case the SBAS AUTO service will be used.*

4.22 CDB-ID 138 – RTCM port setting

Allow setting the RTCM port number.

Note: *The RTCM feature is supported on all serial ports. It can be configured also to work on the same serial port already used for NMEA or Debug messages.*

System reboot needed to have new setting in use.

4.23 CDB-ID 139 – RTCM port baudrate setting

Allow setting the baudrate for the RTCM port number. The translation table in **Table 216: CDB-ID 139 field description.**

Table 216. CDB-ID 139 field description

Parameter Value	Baudrate
0x0	300 baud
0x1	600 baud
0x2	1200 baud
0x3	2400 baud
0x4	4800 baud
0x5	9600 baud

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0x 6	14400 baud
0x 7	19200 baud
0x 8	38400 baud
0x 9	57600 baud
0xA	115200 baud
0xB	230400 baud
0xC	460800 baud
0xD	921600 baud

System reboot needed to have new setting in use.

4.24 CDB-ID From 140 to 189 – GNSS RF front-end configuration

Allow setting the GNSS RF front-end register. By default the front-end registers don't need to be configured. If a specific configuration is required (see RF front-end reference manual for details about registers) it can be achieved by setting in the proper way the configuration parameters in the range from 140 to 189.

Even IDs (e.g. 140, 142, …, 188) are used to set the address at which the value (reported in the next odd ID parameter) is applied. Together with the address (first 6 bits of parameter) there is the operation to perform (last 2 bits).

Allowed addresses are from 0 to 24 (see front-end specs).

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Supported operations are:

00b: overwrite the register with provided value.

01b: execute “OR” operation between register content and provided value.

10b: execute “AND” operation between register content and provided value.

Odd IDs (e.g. 141, 143, …, 189) are the values to be applied (according to the operation) to the address reported on the previous even ID. For example the value in the parameter ID 141 is applied to the address in the parameter 140 etc.

Examples:

Param 140=0x81 and Param 141=0x55: the front-end register at 0x1 address is updated with the result of bit-to-bit AND operation between the register content and 0x55 value.

Param 140=0x44 and Param 141=0x55: the front-end register at 0x4 address is updated with the result of bit-to-bit OR operation between the register content and 0x55 value.

Param 140=0x08 and Param 141=0x55: the front-end register at 0x8 address is overwritten with 0x55 value.

Note: *0xFF value in the address IDs is used to skip the parameter without applying any configuration to the front-end registers. The default setting in the ST binary image is all addresses parameters set to 0xFF.*

4.25 CDB-ID 190 - CDB-ID 201 - CDB-ID 228 - NMEA message list 0 parameters

CDB-ID 201 and CDB-ID 228 allow enabling/disabling each NMEA message in the message list 0. CDB-ID 201 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 228 for second 32 bits (high bits) of 64 bits message list.

CDB-ID 190 allows setting the message list output rate for the message list 0. It is a scaling factor referred to the selected fix rate. The default value is 1 and this means that the messages are sent out on every fix. Setting the scaling factor to “N” means that the corresponding message list is sent out every “N” fixes.

Note: *The message list 0 is the standard message list. Only the message list 0 should be used if the NMEA multiple rate feature is not required.*

For each bit:

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0 means feature disabled

1 means feature enabled

Table 217. CDB-ID 201 - CDB-ID 228 fields description

	Bit	Values	Description
Low 32bits	0	0x1	$GPGNS Message
	1	0x2	$GPGGA Message
	2	0x4	$GPGSA Message
	3	0x8	$GPGST Message
	4	0x10	$GPVTG Message
	5	0x20	$PSTMNOISE Message
	6	0x40	$GPRMC Message
	7	0x80	$PSTMRF Message
	8	0x100	$PSTMTG Message
	9	0x200	$PSTMTS Message
	10	0x400	$PSTMPA Message
	11	0x800	$PSTMSAT Message
	12	0x1000	$PSTMRES Message
	13	0x2000	$PSTMTIM Message
	14	0x4000	$PSTMWAAS Message
	15	0x8000	$PSTMDIFF Message
	16	0x10000	$PSTMCORR Message
	17	0x20000	$PSTMSBAS Message
	18	0x40000	$PSTMTESTRF Message
	19	0x80000	$GPGSV Message
	20	0x100000	$GPGLL Message
	21	0x200000	$PSTMPPSDATA Message

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	22	0x400000	RESERVED
	23	0x800000	$PSTMCPU Message
	24	0x1000000	$GPZDA Message
	25	0x2000000	$PSTMTRAIMSTATUS Message
	26	0x4000000	$PSTMPOSHOLD Message
	27	0x8000000	$PSTMKFCOV Message
	28	0x10000000	$PSTMAGPS Message
	29	0x20000000	$PSTMLOWPOWERDATA Message
	30	0x40000000	$PSTMNOTCHSTATUS
	31	0x80000000	$PSTMTM Message
Hight 32bits	32	0x1	$PSTMPV Message
	33	0x2	$PSTMPVQ Message
	34	0x4	$PSTMUTC Message
	35	0x8	$PSTMADCDATA Message
	36	0x10	$PSTMANTENNASTATUS Message
	37	0x20	RESERVED
	38	0x40	$PSTMUSEDSATS
	39	0x80	$GPDTM Message
	40	0x100	$PSTMEPHEM Message
	41	0x200	$PSTMALMANAC Message
	42	0x400	$PSTMIONOPARAMS Message
	43	0x800	RESERVED
	44	0x1000	$PSTMBIASDATA Message
	45	0x2000	$GPGBS Message
	46	0x4000	$PSTMPVRAW Message
	47	0x8000	RESERVED

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	48	0x10000	$PSTMFEDATA Message
	49	0x20000	RESERVED
	50	0x40000	$PSTMODO Message
	51	0x80000	$PSTMGEOFENCESTATUS Message
	52	0x100000	$PSTMLOGSTATUS Message
	53	0x200000	$PSTMGNSSINTEGRITY Message
	54	0x400000	RESERVED for DRAW (see DRAW documentation)
	55	0x800000	RESERVED for DRAW (see DRAW documentation)
	56	0x1000000	RESERVED for DRAW (see DRAW documentation)
	57	0x2000000	RESERVED for DRAW (see DRAW documentation)
	58	0x4000000	RESERVED for DRAW (see DRAW documentation)
	59	0x8000000	RESERVED for DRAW (see DRAW documentation)
	60	0x10000000	RESERVED for DRAW (see DRAW documentation)
	61	0x20000000	RESERVED for DRAW (see DRAW documentation)
	62	0x40000000	RESERVED for DRAW (see DRAW documentation)
	63	0x80000000	$--RLM

The Bit-Value indicates the bit position, thus multiple choices are possible.

Note: *The message list 0 is the standard message list. Only the message list 0 should be used if the NMEA multiple rate feature is not required.*

4.26 CDB-ID 191 - CDB-ID 210 - CDB-ID 229 - NMEA message list 1 parameters

CDB-ID 210 and CDB 229 allow enabling/disabling each NMEA message in the message list 2. CDB-ID 210 represents first 32 bits (low bits) of extended 64 bits NMEA message list, CDB-ID 220 represents second 32 bits (high bits) of extended 64 bits NMEA message list.

CDB-ID 191 allows setting the message list 1 output rate. It is a scaling factor referred to the selected fix rate. The default value is 1 and it means that messages are sent out on every fix. Setting the scaling

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factor to “N” means that the corresponding message list is sent out every “N” fixes.

Table 218. NMEA message list 1 CDB-IDs

CDB-ID	Baudrate
191	Message list 1 - Output rate scaling factor
210	Message list 1 - Low bitmap mask
229	Message list 1 - High bitmap mask

4.27 CDB-ID 192 - CDB-ID 211 - CDB-ID 230 - NMEA message list 2 parameters

CDB-ID 211 and CDB 230 allow enabling/disabling each NMEA message in the message list 2. CDB-ID 211 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 230 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the message list 0.

If not used the message list must be set to “0”

CDB-ID 230 allows setting the message list output rate for the message list 2. It is a scaling factor referred to the selected fix rate. The default value is 1 and it means that messages are sent out on every fix. Setting the scaling factor to “N” means that the corresponding message list is sent out every “N” fixes.

Table 219. NMEA message list 2 CDB-IDs

CDB-ID	Baudrate
192	Message list 2 - Output rate scaling factor
211	Message list 2 - Low bitmap mask
230	Message list 2 - High bitmap mask

Note: *The message list 2 is RESERVED for those messages which need to be sent at high rate (e.g. 10 Hz) and/or require accurate message output timing (low jitter). If high rate messages or low jitter are not required, this message list should not be used.*

4.28 CDB-ID 193 - USB Detect feature

Enable or disable the USB detect feature. When enabled the USB VCOM is open only if detect pin is

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high. Look at the next CDB to see how to configure and detect the GPIO pin.

Note: *as soon as the USB is recognized the PLL is automatically enabled if not done before by configuration.*

4.29 CDB-ID 194 - USB detect GPIO pin configuration

Allow setting of USB detect GPIO pin.

Table 220. CDB-ID 194 field description

Bit	Values	Description
From B0 to B7	From 0 to 63	GPIO pin number
From B0 to B7	From 0 to 63	GPIO pin number
From B0 to B7	From 0 to 63	GPIO pin number

CDB-ID 195 - USB Data Terminal Equipment feature

Enable or disable the USB Data Terminal Equipment feature. When enabled, the data (NMEA or Debug depending on CDB-ID 124 configuration) are sent over USB VCOM only when DTE is present. This signal corresponds to RS-232 signal DTR. When this feature is enabled, the host must open the VCOM enabling DTR mode.

4.30 CDB-ID 197 – PPS clock

Allow setting the PPS clock frequency. For accurate timing application 64MHz is mandatory.

Table 221. CDB-ID 197 field description

Value	Description
16	Sets PPS clock to 16MHz
32	Sets PPS clock to 32MHz
64	Sets PPS clock to 64MHz

4.31 CDB-ID 198 – GNSS Mask angle positioning

Set the GNSS Mask Angle for positioning algorithm. Satellites with elevation below the mask angle are not used in the position solution.

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4.32 CDB-ID 199 – Local geodetic datum selection

Set the local geodetic datum to be used when position data is reported over the NMEA messages. See Appendix A for the list of all supported datum. In the last column of the tables, it is reported the number to be used for the CDB-ID configuration according to the selected datum.

4.33 CDB-ID 200 - CDB-ID 227 - Application ON/OFF

Allow enabling/disabling different features in the GNSS library.

All features are mapped in a 64-bit bitmap with one bit for each feature; CDB-ID 200 represents the first 32 bits (low 32 bits) and CDB-227 represents the second 32 bits (high 32 bits).

For each bit:

0 means feature disabled

1 means feature enabled

Table 222. CDB-ID 200 field description

Bit(1)	Bitmask	Function	Description
0	0x1	RESERVED	
1	0x2	RESERVED	
2	0x4	SBAS (WAAS / EGNOS) augmentation system	Enable/disable the SBAS engine. When enabled, the SBAS engine starts searching for SBAS satellites at system startup.
3	0x8	Enabling SBAS satellite reporting in the GSV messages	If enabled the SBAS satellite is reported in the GSV messages. The SBAS satellite ID, reported in the GSV messages, is in the range from 33 to 51 according to the NMEA specifications
4	0x10	STAGPS enable	Enable/disable the STAGPS functionality. During STAGPS processing a high CPU load is required, for best performances it is suggested to increase the CPU frequency when the STAGPS is enabled. The server based assisted GPS (PGPS) is included in the STAGPS software. It is

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			enabled/disabled if the STAGPS functionality is enabled/disabled.
5	0x20	2.5ppm TCXO support enable	Enable/disable support for TCXO with 2.5ppm accuracy
6	0x40	NMEA v301 support enable	Enable/disable the NMEA v3.01 support. To support the NMEA v3.01 standard some new values have been reported in the –RMC, --VTG and –GLL NMEA messages. This feature is enabled by default. To ensure full compatibility with the previous releases, the old NMEA format can be restored disabling this feature
7	0x80	QZSS distributed acquisition mode enable	Enable/disable the distributed acquisition operative mode for the QZSS constellation. When distributed acquisition mode for QZSS is enabled, the acquisition stage usage is widespread along the time in order to mitigate the current consumption spikes required by the acquisition engine.
9	0x200	Send “config text” in the “Header Message” at start up	Enable/disable sending the configured text on the NMEA port at startup.
10	0x400	Send standard ST NMEA Headers	Enable/disable sending the ST standard headers on the NMEA port at startup.
11	0x800	RTCM enable	Enable/disable the RTCM data processing.
12	0x1000	FDE Algorithm	Enable/disable the False Detection and Exclusion algorithm.
14	0x4000	Walking Mode Algorithm	Enable/disable the Walking Mode algorithm.
15	0x8000	Stop Detection Algorithm	Enable/disable the Stop Detection algorithm.
16	0x10000	GPS constellation enable(2)	Enable/disable the GPS constellation. When this bit is enabled GPS satellites are enabled to be tracked and used for positioning. This bit setting affect also the talker ID of GSV and GSA NMEA messages. If only the GPS constellation is enabled the NMEA talker ID for GSV and GSA is “GP”. If

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			GLONASS constellation is also enabled "GP" is used for GPS related GSV messages while "GN" is used for the GSA messages.
17	0x20000	GLONASS constellation enable(2)	Enable/disable the GLONASS constellation. When this bit is enabled GLONASS satellites are enabled to be tracked. To be used for positioning also the Bit 21 should be enabled. This bit setting affect also the talker ID of GSV and GSA NMEA messages. If only the GLONASS constellation is enabled the NMEA talker ID for GSV and GSA is "GL". If GPS constellation is also enabled "GL" is used for GLONASS related GSV messages while "GN" is used for the GSA messages
18	0x40000	QZSS constellation enable(2)	Enable/disable the QZSS constellation. When this bit is enabled QZSS satellites are enabled to be tracked and used for positioning
19	0x80000	NMEA GNGSV enable	Enable/disable the "GN" talker ID for GSV messages reporting satellite for all constellations. When this bit is enabled, only the talker ID "GN" is used for GSV messages.
20	0x100000	NMEA GNGSA enable	Enable/disable the "GN" talker ID for GSA messages reporting satellite for all constellations. When this bit is enabled, only the talker ID "GN" is used for GSA messages.
21	0x200000	GLONAS usage for positioning enable	Enable/disable the usage of GLONASS satellite for the GNSS position fix. If this bit is disabled and GLONASS constellation is enabled, the GLONASS satellites are only tracked.
22	0x400000	GPS usage for positioning enable	Enable/disable the usage of GPS satellite for the GNSS position fix. If this bit is disabled and GPS constellation is enabled, the GPS satellites

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			are only tracked
23	0x800000	QZSS usage for positioning enable	Enables/disables the usage of QZSS satellites for the GNSS position fix. If this bit is disabled and QZSS constellation is enabled, the QZSS satellites are only tracked.
24	0x1000000	PPS enabling	Enables/disables the PPS generation on the PPS pin.
25	0x2000000	PPS polarity inversion	Enables/disables the PPS signal polarity inversion. If polarity inversion is disabled (Bit25 = 0) the PPS signal has the rising edge on the PPS event. If polarity inversion is enabled (Bit25 = 1) the PPS signal has a falling edge on the PPS event.
26	0x4000000	Position Hold enable	Enables/disables the Position Hold functionality (timing applications).
27	0x8000000	TRAIM algorithm enable	Enables/disables the TRAIM algorithm (timing applications).
28	0x10000000	RESERVED	
29	0x20000000	High dynamics enable.	Enables/disables the high dynamics functionality. This feature increases the sample rate of the DSP measurements. It is required when high fix rate (> 5Hz) is selected
30	0x40000000	ST NMEA DSP raw messages enable	Enables/disables the DSP raw messages over the NMEA port. They are proprietary messages which reports info from DSP stage.
31	0x80000000	Low power algorithm enable	Enables/disables the low power management features

The Bit-Value indicates the bit position (starting from 0 as the least significant bit), thus multiple choices are possible.

Multi-constellation firmware supports the following constellations: GPS, GALILEO, GLONASS, COMPASS and QZSS. All constellations cannot be enabled at the same time, allowed combinations to achieve maximum coverage, are: (GPS+GALILEO+QZSS+GLONASS), (GPS+GALILEO+QZSS+ COMPASS) and (GLONASS+COMPASS). Any constellation can be enabled as standalone satellite navigation system.

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Table 223. CDB-ID 227 field description

Bit(1)	Bitmask	Function	Description
1	0x1	NMEA commands eco enable	Enable/disable the command eco on the NMEA port
2	0x2	NMEA Time To First Fix enable	Enable/disable the Time To First Fix message on the NMEA port. If enabled, the TTFF message is sent only one time as soon as the GNSS position fix is achieved.
3	0x4	Few satellites position estimation enable	Enable/disable the position estimation algorithm when tracked satellites are less than 3.
4	0x8	STBIN in/out enable	Enable/disable the STBIN in/out communication protocol.
5	0x10	RESERVED	
6	0x20	NMEA in/out interface selection	Select the communication interface to be used over the NMEA port at startup: 0 = NMEA in/out interface 1 = STBIN in/out interface
7	0x40	Galileo constellation enable(2)	Enable/disable the Galileo constellation. When this bit is enabled Galileo satellites are enabled to be tracked and used for positioning
8	0x80	Galileo usage for positioning enable	Enable/disable the usage of Galileo satellite for the GNSS position fix. If this bit is disabled and Galileo constellation is enabled, the Galileo satellites are only tracked.
9	0x100	Compass constellation enable(2)	Enable/disable the Compass constellation. When this bit is enabled Compass satellites are enabled to be tracked and used for positioning.
10	0x200	Compass usage for positioning enable	Enable/disable the usage of Compass satellite for the GNSS position fix. If this bit is disabled and Compass constellation is enabled, the Compass satellites are only tracked.
11	0x400	RESERVED	

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12	0x800	RTC usage disabling	Enable/disable the usage of RTC from the GNSS engine. It is recommended to have RTC usage disabled (Bit12 set to 1) is the RTC crystal is not mounted.
13	0x1000	Fast Satellite Drop feature enable	Enable/disable the Fast Satellite Drop feature. When fast satellite drop is enabled, the GNSS software reports NO FIX status immediately after the tunnel entrance; the position update is no more propagated for some seconds inside the tunnel.
14	0x2000	RESERVED	
15	0x4000	Excluded satellites reporting enable	Enable/disable the excluded satellites reporting in the GGA, GSA, GNS and PSTMTG nmea messages. If this bit is enabled, satellites excluded by positioning stage due to RAIM or FDE algorithms, are included in the number of used satellites (present in the GGA, GNS and PSTMG messages) and their satellites IDs are included in the list of used satellite (present in the GSA message). This bit is disabled by default.
16	0x8000	RESERVED	
17	0x10000	RESERVED	
18	0x20000	RESERVED	
19	0x40000	RESERVED	
20	0x80000	RESERVED	
21	0x100000	RESERVED	
22	0x200000	External RTC oscillator enable	Enable/disable the usage on an external oscillator for the RTC peripheral. When enabled the internal oscillator is not used and the RTC clock must be fed from the xtal_in pin
23	0x400000	RESERVED	

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24	0x800000	RESERVED	
25	0x1000000	RESERVED	
26	0x2000000	RESERVED	
27	0x4000000	RTC calibration enable	Enable/disable the RTC calibration feature. When enabled the RTC counter is calibrated using the accurate GNSS internal time reference.

The Bit-Value indicates the bit position (starting from 0 as the least significant bit), thus multiple choices are possible.

Multi-constellation firmware supports the following constellations: GPS, GALILEO, GLONASS, COMPASS and QZSS. All constellations cannot be enabled at the same time, allowed combinations to achieve maximum coverage, are: (GPS+GALILEO+QZSS+GLONASS), (GPS+GALILEO+QZSS+COMPASS). Any constellation can be enabled as standalone satellite navigation system.

Note: *If the STAGPS feature is not required (bit 4) and it is disabled, it is strongly suggested to clear all the STAGPS data from the NVM memory. This can be done via NMEA sending the "$PSTMSTAGPSINVALIDATE,7" command. If the NVM was empty (e.g. the STAGPS has been never enabled or the NVM has been completely erased before) the invalidate command is not required.*

When GPS and GLONASS constellation are enabled, the GSV messages are sent in two separate sets: one with "GP" as talker ID and one with "GL".

Only "GN" is supported as talker ID for QZSS GSV and GSA messages.

In this case the GSV messages are sent in a single set reporting satellites for all enabled constellations.

4.34 CDB-ID 202 – NCO range max value

Allow setting the upper limit for the NCO search range. STA8090 supports different TCXO frequencies:

26 MHz

48 MHz

55 MHz

The NCO range and center frequency settings depend on the TCXO in use. There is the possibility to let the GNSS software to evaluate automatically the best range and center values for the selected TCXO. In such case all NCO configuration parameters (CDB-ID 202, 203 and 204) must be set to 0.

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System reboot needed to have new setting in use.

Note: *Configured value is used only if the NCO value is not yet stored in the GNSS backup memory.*

4.35 CDB-ID 203 – NCO range min value

Allow setting the lower limit for the NCO search range. STA8090 supports different TCXO frequencies:

26 MHz

48 MHz

55 MHz

The NCO range and center frequency settings depend on the TCXO in use. There is the possibility to let the GNSS software to evaluate automatically the best range and center values for the selected TCXO. In such case all NCO configuration parameters (CDB-ID 202, 203 and 204) must be set to 0.

System reboot needed to have new setting in use.

Note: *Configured value is used only if the NCO value is not yet stored in the GNSS backup memory.*

4.36 CDB-ID 204 – NCO centre value

Allow setting the NCO centre frequency. STA8090 supports different TCXO frequencies:

26 MHz

48 MHz

55 MHz

The NCO range and center frequency settings depend on the TCXO in use. There is the possibility to let the GNSS software to evaluate automatically the best range and center values for the selected TCXO. In such case all NCO configuration parameters (CDB-ID 202, 203 and 204) must be set to 0.

System reboot needed to have new setting in use.

Note: *Configured value is used only if the NCO value is not yet stored in the GNSS backup memory.*

4.37 CDB-ID 205 – Position data time delay

Allow setting the time delay [ms] between the measurements (on the UTC second) and the GNSS position data delivery. This parameter should never be bigger than the time period of the configured fix rate.

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If “0” is used, the time delay is set in accordance with the CPU speed:

50 ms if CPU is running @ 208 MHz

500 ms if CPU is running @ 52 MHz

System reboot needed to have new setting in use.

4.38 CDB-ID From 206 to 209 – GPIO High/Low Status Setting

Allow setting the High/Low status for each GPIO.

Parameters 206 and 207 refer to the GPIO port 0; parameters 208 and 209 refer to GPIO port 1. Each parameter is a 32-bit mask representing the 32 pins of the GPIO port (bit 0 corresponds to PIN0 and bit31 corresponds to PIN31).

For each pin three configurations are possible: DO_NOT_TOUCH, SET_HIGH and SET_LOW. Each configuration is achieved setting in the proper way the bits corresponding to the same pin in the two configurations bit mask of the same port.

Table 224. CDB-ID 206-209 field description

Port CFG0 Bit	Port CFG1 Bit	Description
0	0	SET_LOW: GPIO pin is configured as output and set to LOW state.
1	1	SET_HIGH: GPIO pin is configured as output and set to HIGH state.
0	1	DO_NOT_TOUCH: the pin is left unchanged
1	0	DO_NOT_TOUCH: the pin is left unchanged

Examples:

Param 206=0xFFFFFFFE and Param 207=0x08000000 GPIO Port0 pin 0 is set to LOW and GPIO Port0 pin 27 is set to HIGH. All other GPIO Port0 pins are left unchanged.

Param 208=0x7FFFFFFF and Param 209=0x00000004 GPIO Port1 pin 2 is set to HIGH and GPIO Port1 pin 31 is set to LOW. All other GPIO Port1 pins are left unchanged.

4.39 CDB-ID 213 – PPS operating mode setting 1

Allow setting different operating modes for the PPS signal generation. Full operating mode setting is achieved using both 213 and 214 parameters. This parameter includes different fields as reported in

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the following table.

Table 225. CDB-ID 213 field description

Bits	Values	Description
From B0 to B3	0 = on every second 1 = on even seconds 2 = on odd seconds	PPS generation mode
From B4 to B7	0 = UTC 1 = GPS_UTC (GPS Time) 2 = GLONASS_UTC (GLONASS Time) 3 = UTC_SU 4 = GPS_UTC_FROM_GLONASS	Reference time on which the PPS signal is synchronized. ***Note:*** *-UTC(SU) is the Soviet Union UTC, it is derived from GLONASS time applying the UTC delta time downloaded from GLONASS satellites.* *-GPS_UTC_FROM_GLONASS is the GPS time derived from GLONASS time applying the GPS delta time downloaded from GLONASS satellites.* *-If the software is configured to work in GLONASS only mode, UTC(SU) is identical to UTC and GPS_UTC_FROM_GLONASS is identical to GPS_UTC.*
From B8 to B11	1 = NO FIX 2 = 2D FIX 3 = 3D FIX	GNSS fix condition for PPS signal generation. NO FIX: PPS signal is present even in GNSS NO fix conditions. 2D FIX: the PPS is present if the GNSS is at least in 2D fix condition. 3D FIX: the PPS is present only if the GNSS is in 3D fix conditions.
From B16 to B23	0...24	Minimum number of satellites used for timing correction. PPS signal is generated if the number of satellites used for time correction is bigger the minimum number. This parameter should be set to 0 is the threshold is not used.
From B24 to B31	0...90	Satellite elevation mask for time correction. It is the minimum satellite elevation angle to use the satellite for time correction. If this parameter is set to 0 there is no satellites filtering based on the elevation.

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4.40 CDB-ID 214 – PPS operating mode setting 2

Allow setting different operating modes for the PPS signal generation. Full operating mode setting is achieved using both 213 and 214 parameters. This parameter includes different fields as reported in the following table:

Table 226. CDB-ID 214 field description

Bits	Values	Description
From B0 to B7	0 = mixing constellation disabled 1 = GPS sats are enabled for	Enable/disable mixing constellations for time correction.

	GLONASS time correction. 2 = GLONASS sats are enabled for GPS time correction. B7 = BEIDOU constellation	

Mixing constellations for time correction means that satellites from one constellation are used to correct the reference time for other constellations.

For example if GPS time is selected for PPS signal generation and B1 (or B7) is enabled, also Glonass satellites (or Beidou satellites) are used to correct the GPS reference time. If Glonass time is selected for PPS signal generation and B0 is enabled, also GPS satellites are used to correct the Glonass reference time.

4.41 CDB-ID 215 – Position hold auto survey samples

Sets the number of position samples to be captured before entering in the position hold mode. The auto survey procedure is disabled if the number of samples is set to 0.

4.42 CDB-ID 218 – SBAS satellite parameter

Allow to add or modify a SBAS satellite parameter into a default list.

Table 227. CDB-ID 218 field description

Bits	Values	Description
From B0 to B7	From 120 to 138	SBAS PRN
From B8 to B15	From 0 to 180	Satellite longitude in degree
B16	0: EAST 1: WEST	Longitude sense
From B17:B18	0: WAAS 1: EGNOS 2: MSAS 3:GAGAN	The SBAS service

4.43 CDB-ID 219 – SBAS satellite parameter

Allow to add or modify a SBAS satellite parameter into a default list.

Table 228. CDB-ID 219 field description

Bits	Values	Description

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From B0 to B7	From 120 to 138	SBAS PRN
From B8 to B15	From 0 to 180	Satellite longitude in degree
B16	0: EAST 1: WEST	Longitude sense
From B17:B18	0: WAAS 1: EGNOS 2: MSAS 3:GAGAN	The SBAS service

4.44 CDB-ID 220 – Adaptive and Cyclic operating mode setting 1

Configure the cyclic low power mode. This parameter includes different fields as reported in **Table 237: CDB-ID 220 field description**.

Table 229. CDB-ID 220 field description

Bits	Values	Description
B0	0	Reserved - must be 0
B1	0/1	Duty cycle enable/disable
From B2 to B3	0	Reserved
From B4 to B11	0	Reserved - must be 0
From B12 to B19	32	Reserved - must be 32
From B20 to B31	1, 3, 5	Duty cycle fix period [s]

4.45 CDB-ID 221 – Low Power operating mode setting

Low Power management:

Table 230. CDB-ID 221 field description

Bits	Values	Description
From B0 to B31		RESERVED

4.46 CDB-ID 222 – LMS operating mode setting 1

Table 231. CDB-ID 222 field description

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Bits	Values	Description
B0	0/1	2D Fix enable/disable
B1	0/1	HDOP product in range error metric enable/disable

Table 232. CDB-ID 222 field description

Bits	Values	Description
B2	0/1	GLONASS path delay lock enable/disable
From B8 to B15	0...255	Position residual threshold [m]
From B16 to B23	0...255	Position residual threshold after RAIM [m]

4.47 CDB-ID 223 – LMS operating mode setting 2

Table 233. CDB-ID 223 field description

Bits	Values	Description
From B0 to B7	0...255	Minimum number of satellites in GNSS mode
From B8 to B15	0...255	Minimum number of satellites in single constellation mode
From B16 to B31	-32768...32767	Initial GLONASS path delay [dm]. (It is expressed in 2-complements on 16 bits)

4.48 CDB-ID 224 – Low power operating mode setting

Low Power management

Table 234. CDB-ID 224 field description

Bits	Values	Description
From B0 to B31		RESERVED

4.49 CDB-ID 225 – ADC channels read parameters

This parameter allows configuring different parameters for the ADC channels reading. This parameter includes different fields as reported in the following table where the description of the ADC channel reading configuration parameters is reported:

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Table 235. CDB-ID 225 field description

Bits	Values	Description
B0	0 = OFF 1 = ON	ADC channels data reading OFF (default mode)/ON
From B1 to B8	1...255	Channel Mask
From B9 to B16	0...255	Clk divisor factor to configure ADC sampling rate

4.50 CDB-ID 226 – Antenna Sensing parameters

This parameter allows configuring different parameters for the Antenna Sensing feature. This parameter includes different fields as reported in the following table where the description of the Antenna Sensing configuration parameters is reported:

Table 236. CDB-ID 226 field description

Bits	Values	Description
From B0 to B1	0...1	0 = Antenna Sensing OFF (default value) 1 = Antenna Sensing RF mode ON 2 = Antenna Sensing ADC mode ON 3 = Antenna Sensing GPIO mode ON
Bit2	0...1	Periodic antenna status NMEA message reporting (if disabled the antenna status is reported on status change event) 0 = disabled 1 = enabled
Bit3	0...1	Antenna switching capability: 0 = disabled 1 = enabled
From B4 to B11	0...255	Clk divisor factor to configure ADC sampling rate
From B12 to B21	< 63	Minimum Threshold value (mV).
From B22 to B31	> 210	Maximum Threshold value (mV)

The thresholds values have to be tuned according to the specific Antenna Sensing application implementation. The default values reported in the table above are dimensioned assuming an antenna powered with 3.3 V and with a partitioned maximum input voltage to ADC of 1.4 V.

4.51 CDB-ID 231 – CDB-ID 232 - NMEA on Debug Port Message List 0

Allow enabling/disabling each NMEA message in the message list 0 used for sending messages over the debug port. CDB-ID 231 represents first 32 bits (low bits) of extended 64 bits NMEA message list.

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See CDB-ID 232 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 231 and CDB-ID 232 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

4.52 CDB-ID 233 – CDB-ID 234 - NMEA on Debug Port Message List 1

Allow enabling/disabling each NMEA message in the message list 1 used for sending messages over the debug port. CDB-ID 233 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 234 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 233 and CDB-ID 234 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

4.53 CDB-ID 235 – CDB-ID 236 - NMEA on Debug Port Message List 2

Allow enabling/disabling each NMEA message in the message list 2 used for sending messages over the debug port. CDB-ID 235 represents first 32 bits (low bits) of extended 64 bits NMEA message list. See CDB-ID 236 for second 32 bits (high bits) of 64 bits message list. The message list configuration is done in the same way as for the NMEA message list 0 (see CDB-ID 201 and CDB-ID 228 for details). See CDB-ID 201 also for supported message list table.

If not used the message list must be set to “0” (both CDB-ID 235 and CDB-ID 236 must be set to 0). It must be set to “0” also when the dual NMEA port feature is disabled (see CDB-ID 103 for details on enabling/disabling dual NMEA port).

Note: *The message list 2 is RESERVED for those messages which need to be sent at high rate (e.g. 10Hz) and/or require accurate message output timing (low jitter). If high rate messages or low jitter are not required, this message list should not be used.*

4.54 CDB-ID 237 – Default GPS MIN-MAX week number

Allow setting of minimum and maximum GPS week number.

Minimum week number is used for correct GPS week decoding. The GNSS software is able to decode

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correctly the GPS week number for a number of 1024 weeks (about 20 years) starting from minimum week number.

Note: *The minimum week number should be moved ahead along years to guarantee at least 20 years of correct week decoding in the future.*

Maximum week number is used for GPS week validity check. It must be set at least 1024 weeks ahead to the minimum week number.

Note: *As soon as the max week number is reached, the GNSS software is no more able to validate the time and so it is no more able to achieve the GNSS position fix.*

Table 237. CDB-ID 237 field description

Bits	Values	Description
From B0 to B15	0...65535	GPS minimum week number
From B16 to B31	0...65535	GPS maximum week number

4.55 CDB-ID 238 – Default UTC delta time

Allow setting the default value for the GPS time to UTC delta time seconds (leap seconds). This parameter is used by the GNSS software only is the UTC backup data is not available in the backup memory (e.g. first startup after production or in case of backup memory content lost occurrence).

4.56 CDB-ID 240 – CDB-ID 241 – STBIN Msg-List

Allow enabling/disabling each STBIN message in the binary protocol message list. CDB-ID 240 represents first 32 bits (low bits) of extended 64 bits STBIN message list. See CDB-ID 241 for second 32 bits (high bits) of 64 bits message list.

For each bit:

0 means feature disabled

1 means feature enabled

Table 238. CDB-ID 240 field description

	Bit(1)	Bitmask (32 bits)	Function
Low 32 bi	0	0x1	ECEF Position Information

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	1	0x2	LLH Position Information
	2	0x4	Fix Status Information
	3	0x8	DOP Information
	4	0x10	ECEF Velocity Information
	5	0x20	NEU Velocity Information
	6	0x40	GNSS Time Information
	7	0x80	UTC Time Information
	8	0x100	SV Information
	9	0x200	DGPS Information
	10	0x400	DGPS Information Per Satellite
	11	0x800	Position Residuals
	12	0x1000	Velocity Residuals
	13	0x2000	Satellite Fix Information
	14	0x4000	Fix Information
	15	0x8000	Positioning Algorithm Information
	16	0x10000	Satellites RF Data
	17	0x20000	Position and Velocity Covariance
	18	0x40000	Position Accuracy Data
	19	0x80000	PPS Data
	20	0x100000	Position Hold Data
	21	0x200000	TRAIM Data
	22	0x400000	Low Power Management Information
	23	0x800000	CPU Information
	24	0x1000000	Notch Filter Status Data
	25	0x2000000	Not Used
	26	0x4000000	Not Used

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	27	0x8000000	Not Used
	28	0x10000000	Not Used
	29	0x20000000	Not Used
	30	0x40000000	Not Used
	31	0x80000000	Not Used
Hight 32bits	32	0x1	Not Used
	33	0x2	Not Used
	34	0x4	Not Used
	35	0x8	Not Used
	36	0x10	Not Used
	37	0x20	Not Used
	38	0x40	Not Used
	39	0x80	Not Used
	40	0x100	STAGPS GPS Prediction Information
	41	0x200	STAGPS LONASS Prediction Information
	42	0x400	Not Used
	43	0x800	Not Used
	44	0x1000	Not Used
	45	0x2000	Not Used
	46	0x4000	Not Used
	47	0x8000	Not Used
	48	0x10000	SBAS Satellite Data
	49	0x20000	SBAS Corrections Data
	50	0x40000	Not Used
	51	0x80000	Not Used
	52	0x100000	Not Used

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	53	0x200000	Not Used
	54	0x400000	Not Used
	55	0x800000	RF Test Data
	56	0x1000000	Not Used
	57	0x2000000	Not Used
	58	0x4000000	Not Used
	59	0x8000000	Not Used
	60	0x10000000	Not Used
	61	0x20000000	Not Used
	62	0x40000000	Not Used
	63	0x80000000	Not Used

The Bit-Value indicates the bit position, thus multiple choices are possible.

The Bit-Value indicates the bit position, thus multiple choices are possible.

4.57 CDB-ID 242 – Antenna Sensing via GPIO setting 1

Allow GPIO pin configuration for the antenna detection and control signals.

Table 239. CDB-ID 242 field description

Bits	Values	Description
From B0 to B7	0...63	GPIO pin number for antenna diagnostic enable signal (output)
From B8 to B15	0...63	GPIO pin number for antenna switch control signal (output)
From B16 to B23	0...63	GPIO pin number for antenna SHORT detection signal (input)
From B24 to B31	0...63	GPIO pin number for antenna OPEN detection signal (input)

4.58 CDB-ID 243 – Antenna Sensing via GPIO setting 2

Allow GPIO mode configuration for the antenna detection and control signals.

Table 240. CDB-ID 243 field description

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Bits	Values	Description
From B0 to B7	0...3	GPIO mode for antenna diagnostic enable signal (output) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C
From B8 to B15	0...3	GPIO mode for antenna switch control signal (output) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C
From B16 to B23	0...3	GPIO mode for antenna SHORT detection signal (input) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C
From B24 to B31	0...3	GPIO mode for antenna OPEN detection signal (input) 0 = Alternate NONE 1 = Alternate MODE_A 2 = Alternate MODE_B 3 = Alternate MODE_C

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4.59 CDB-ID 244 – Antenna Sensing via GPIO setting 3

Allow setting the active levels for the antenna detection and control signals.

Table 241. CDB-ID 244 field description

Bits	Values	Description
From B0 to B7	0..1	Active level for antenna diagnostic enable signal (output)
From B8 to B15	0..1	Active level for antenna switch control signal (output)
From B16 to B23	0..1	Active level for antenna SHORT detection signal (input)
From B24 to B31	0..1	Active level for antenna OPEN detection signal (input)

4.60 CDB-ID 245 – TCXO frequency

Allow selecting the TCXO frequency in the set of supported frequencies.

Table 242. CDB-ID 245 field description

Value	TCXO Frequency
0x00	26 MHz
0x0A	48 MHz
0x0B	55 MHz

Note: *This parameter allows setting the TCXO frequency only for the GNSS firmware. It doesn't configure the BOOT firmware which is present at the beginning of flash memory and which is used to perform the firmware upgrade procedure. The proper BOOT code must be flashed into the device to ensure the firmware upgrade functionality with the TCXO frequency in use.*

Note: *55 MHz TCXO is supported to avoid RF interferer injection from GNSS subsystem into FW radio frequency band. This configuration should be used when an RF coupling is possible between GNSS and Radio. To guarantee no interferer injected into the radio subsystem, also the CPU speed (see parameter CDB-ID 130) must be set to 55 MHz.*

4.61 CDB-ID 249 – Flash Protection Setting 1

Allow enabling/disabling the flash write protection feature.

Note: *This parameter can only be changed in the factory setting (e.g. changing firmware configuration before flashing with fwconfig.exe tool). The parameter setting by commands is no more supported. If the command interface is used to change the value of this parameter, the new configuration doesn't take effect even after the system reboot.*

Table 243. CDB-ID 249 field description

Bits	Values	Description
B0	0...1	0: Flash protection feature disabled 1: Flash protection feature enabled

4.62 CDB-ID 250 – Flash Protection Setting 2

Allow setting the flash sectors to be write protected.

Note: *This parameter can only be changed in the factory setting (e.g. changing firmware configuration before flashing with fwconfig.exe tool). The parameter setting by commands is no more supported. If the command interface is used to change the value of this parameter, the new configuration doesn't take effect even after the system reboot.*

Table 244. CDB-ID 250 field description

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Bits	**Values**	**Description**
B0..B30	0x0...0x7FFFFFFF	The word programmed inside the flash memory control registers to select the set of sectors to be protected. It could be different for different memory vendors (see the application note for details). The memory area which is protected by the flash protection feature is the code area. Sectors used by NVM must not be protected. Default setting is 0x0 because the auto-configuration mode is enabled.
B31	0,1	Flash memory auto-protection feature enabling/disabling 0 = disabled 1 = enabled ***Note:*** *when enabled the value configured in B0..B30 is not used.* *B31 is set to 1 by default.*

In case of Teseo III, part number with embedded SQI follow the **Table 245: CDB-ID 250 configuration in case of embedded SQI.**

Table 245. CDB-ID 250 configuration in case of embedded SQI

Embedded SQI	**CDB-ID 250 SPM_CONFIGURATION**
STA8089Fxx	0x0A
STA8090Fxx	0x0A
STA8090F4xx	0x15

While in case of external SQI flash follow Table 246: Embedded SQI flash memory supported on Teseo III.

Table 246. Embedded SQI flash memory supported on Teseo III

External SQI		**CDB-ID 250 SPM_CONFIGURATION**
Vendor	**p/n**	
Macronix	MX25U1635E MX25U1635F	0x0A
Winbond	W25QxxFV/DW/DV Where xx<64	0x0D
Winbond	W25QxxJV Where xx<64	0x0D

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Winbond	W25Q64FV	0x0C
Winbond	W25Q64JV	0x0C
Winbond	W25Q128FV	0x0B
Winbond	W25Q128JV	0x0B
Winbond	W25Q256FV/JV	0x15
Micron	N25Q032A N25Q064A	0x0D
Spansion	S25FL116K S25FL132K	0x0D
Spansion	S25FL164K	0x0C
Macronix	MX25R1635F MX25R3235F	0x15
Macronix	MX25V1635F	0x15
Macronix	MX25L3233F	0x15
ISSI	IS25LQ0xxB	0x0A
ISSI	IS25LP016D IS25WP016D	0x0A

4.63 CDB-ID 252 – Antenna sensing ADC inputs configuration

Allow setting the ADC inputs for the antenna sensing feature.

Table 247. CDB-ID 252 field description

Bits	**Values**	**Description**
B0...B7	Any combination with two bits high	ADC channel input mask. The bit position represents the ADC channel. The selected channel must have the corresponding bit enabled in the mask. Any combination of couples of channels is allowed only for STA8090EXG. For all other packages default value must be used: 0x3.

The configurability of ADC input is allowed only for STA8090EXG. For other packages the default ADC input configuration must be used. Default ADC input values are: AIN0 and AIN1.

4.64 CDB-ID From 253 to 256 – GPIO Pin Mode Setting

Allow setting the pin mode required by the GPIO function. These settings are used together with parameters from CDB-ID 206 to 209. The default values should be OK and don't require to be changed

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when parameters from 206 to 209 are configured. Anyway this type of configuration has been added to give flexibility in case a different silicon cut reports a different pin mode setting for the GPIO functionality.

Parameters 253 and 254 refer to the GPIO port 0; parameters 255 and 256 refer to GPIO port 1. Each parameter is a 32-bit mask representing the 32 pins of the GPIO port (bit 0 corresponds to PIN0 and bit31 corresponds to PIN31).

These parameters have the same meaning of the AFSLA and AFSLB registers, described in the STA8090 datasheet, they allow setting the alternate functions (NONE, A, B and C) for each pin.

4.65 CDB-ID 257 – Periodic operating mode setting 1

Configure the periodic low power mode. This CBD has to be combined with CBD-258.This parameter includes different fields as reported in the following table:

Table 248. CDB-ID 257 field description

Bits	Values	Description
From B0 to B7	0/1 for each feature	Periodic feature set Enable/Disable: B0-B1: 00: Periodic mode OFF 01: Active Periodic mode 11: Standby Periodic mode B2: Ephemeris refresh required B3: RTC calibration required B4: FixOnDemand by WakeUp pin enable - must have B0-B1=11. B5 to B7 are reserved for further usage.
From B8 to B24	0...86400	FixPeriod [s]. 0 means no periodic fix is required.
From B25 to B31	1...127	FixOnTime - Number of fix to report every fix wakeup – used for FixOnDemand and Periodic mode.

4.66 CDB-ID 258 – periodic operating mode setting 2

Configure the periodic low power mode. This CBD has to be combined with CBD-257.This parameter includes different fields as reported in the following table:

Table 249. CDB-ID 258 field description

Bits	Values	Description
From B0 to B7	0...255	NoFixCnt [s] - Time to declare fix loss in HOT conditions.

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From B8 to B19	0...4095.	NoFixOff [s] - Off duration time after a fix loss event. 0 means the counter is not active. The fix retry will be based on FixPeriod.
From B20 to B28	0...300	NoFixCnt2 [s] – Time to declare fix loss in non-HOT conditions – startup case, obsolete ephemeris.

4.67 CDB-ID 259 – Low Power Mode HW Setting

Describe the state of each power supplies in the TESEO. The TESEO has a Backup LDO, LDO1, LDO2 and SMPS. Two different states are possible, the High and the Low frequency states, basically related to the TCXO ON or OFF state. The value 0 means OFF, any other values represent a voltage (1.0V 1.1V or 1.2V) or an ON state. The different frequency states are obtained by configuring the periodic mode. High frequency is used when the GNSS Library is active, the low frequency is used when the GNSS Library is inactive.

During standby state, only the backup LDO is ON.

Be careful, the voltage source of LDO1 is common to SMPS. If both are ON with a given voltage, the SMPS one will be applied.

Table 250. CDB-ID 259 field description

Bits	**Values**	**Description**
B0-B1	0,1	Enable/disable the stop mode functionality of the backup LDO during High frequency periods. If stop mode functionality is enabled, the power consumption in standby mode is reduced. 0 = stop mode disabled 1= stop mode enabled
B2-B3	0,1	Enable/disable the stop mode functionality of the backup LDO during Low frequency periods. If stop mode functionality is enabled, the power consumption in standby mode is reduced. 0 = stop mode disabled 1= stop mode enabled
B4-B5	0,1,2,3	LDO1 status during High frequency mode 0 = OFF, 1 = 1.0 V, 2 = 1.1 V, 3 = 1.2 V. If the LDO1 is configured in 1.8 V, any value different from 0 means ON.
B6-B7	0,1,2,3	LDO1 status during Low frequency mode 0 = OFF, 1 = 1.0 V, 2 = 1.1 V, 3 = 1.2 V. If the LDO1 is configured in 1.8 V, any value different from 0 means ON.
B8-B9	0,1,2,3	LDO2 status during High frequency mode 0 = OFF, 1 = 1.0 V, 2 = 1.1 V, 3 = 1.2 V.
B10-B11	0,1,2,3	LDO2 status during Low frequency mode 0 = OFF, 1 = 1.0 V, 2 = 1.1 V, 3 = 1.2 V.

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B12-B13	0,1,2,3	SMPS status during High frequency mode 0 = OFF, 1 = 1.0 V, 2 = 1.1 V, 3 = 1.2 V.
B14-B15	0,1,2,3	SMPS status during Low frequency mode 0 = OFF, 1 = 1.0 V, 2 = 1.1 V, 3 = 1.2 V.

4.68 CDB-ID 260 – WLS algorithm configuration

Allow to configure the WLS algorithm implemented in the positioning stage.

Table 251. CDB-ID 260 field description

Bits	Values	Description
B0	0...1	Enable/Disable the WLS algorithm usage in the positioning stage. 0 = disabled 1= enabled
B1...B7	xxx	Not used
B8...B15	1...100	Parameter1 multiplied by 10. Parameter1 is a coefficient to change the measurements weighting in the position filter. Allowed values are from 0.1 to 10.0 (suggested value is 1.0) means high acceptance of satellites measurements in the position filter. 10.0 means low acceptance of satellites measurements in the position filter.
B16...B23	10...100	Parameter2 multiplied by 10. Parameter2 is a coefficient to change the measurements acceptance threshold. Allowed values are from 1.0 to 10.0 (suggested value is 2.5) means strong satellite exclusions by FDE (high false alarm rate). 10.0 means relaxed satellites exclusions by FDE.

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4.69 CDB-ID 261 – Dynamic modes configuration

Allow to configure the supported dynamic modes for the satellites tracking engine. This configuration replaces the old high/low dynamic setting in the CDB-ID 200 bit mask 0x20000000.

Note: *The old High/Low setting is still operative for backward compatibility reasons. To use CDB- ID 261 the CDB-ID 200 bit mask 0x20000000 must be set to 0.*

Table 252. CDB-ID 261 field description

Bits	Values	Description
B0..B3	0,1,3	Dynamic mode selection.

		0 = Low Dynamic 1= High Dynamic 2= RESERVED 3 = Auto Dynamic

4.70 CDB-ID 262 – HW Shutdown GPIO configuration

This parameter allows to select and configure the GPIO to be used for the HW shutdown feature.

Table 253. CDB-ID 262 field description

Bits	Values	Description
B0	0 = OFF 1 = ON	HW shutdown feature enabling/disabling
From B1 to B2	0,1,2	Edge configuration: 0= rising edge 1=falling edge 2=rising and falling edges
From B3 to B7	-	RESERVED
From B8 to B13	0...63	GPIO ID
From B8 to B13	0,1,2,3	Pin alternate function configuration: 0=None 1=Alternate A 2=Alternate B 3=Alternate C
From B14 to B31	-	RESERVED

4.71 CDB-ID 263 – NMEA over Serial Configuration

Allow configuring the Nmea over serial feature. This Configuration ID allows switching on the feature and configuring the serial peripheral. Only Nmea over I2C is available: it is possible to configure the slave address, different baud rates and I2C pins different from default ones.

Table 254. CDB-ID 263 field description

Bits	Values	Description	Default
Bit 0-1	0..3	0 = NMEA over I2C OFF 1 = NMEA over I2C ON	0
Bit 2-5	-	RESERVED	0
Bit 6-15	0...0x3F	Slave address	0x3A
Bit 16-23	0...2	0 = Speed mode STANDARD 1 = Speed mode FAST	0

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		2 = Speed mode HS	
Bit 24-27	0...4	0 = I2C_SD as P0.9 default pin 1 = I2C_SD as P0.20 2 = I2C_SD as P0.28 3 = I2C_SD as USP_DM 4 = I2C_SD as P0.6	0
Bit 28-31	0...3	0 = I2C_CLK as P0.8 default pin 1 = I2C_CLK as P0.7 2 = I2C_CLK as P0.29 3 = I2C_SD as USP_DP	0

4.72 CDB-ID 264 – Data logger Configuration 0

Data logger configuration field 0. Configures the memory base address for the data logger data structure. This configuration is supported only in Binary Image 4.5.8 and later.

Table 255. CDB-ID 264 field description

Bits	Values	Description	Default
Bit 0-31	-	Specify the base address where the log is created	0x10180000

4.73 CDB-ID 265 – Data logger Configuration 1

Data logger configuration field 1. Specify the maximum space available for data logger data structure. This configuration is supported only in Binary Image 4.5.8 and later.

Table 256. CDB-ID 265 field description

Bits	Values	Description	Default
Bit 0-31	0...3	Specify the maximum space available for the log	0x80000

4.74 CDB-ID 266 – Data logger Configuration 2

Data logger configuration field 2. This configuration is supported only in Binary Image 4.5.8 and later.

Table 257. CDB-ID 266 field description

Bits	Values	Description	Default
Bit 0	0...1	0 = Data logger disabled on boot 1 = Data logger enabled on boot	0

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Bit 1	0...1	0 = Circular buffer disabled 1 = Circular buffer enabled	0x1
Bit 2-4	0..3	0 = RESERVED 1 = Log type 1 2 = Log type 2 3 = Log type 3	0x11
Bit 5	0...	0 = One shot mode disabled 1 = One shot mode enabled	0
Bit 6	0...1	0 = Auto start mode disabled 1 = Auto start mode enabled	0
Bit 7-15	1...255	RESERVED	0
Bit 16-23	0...255	0	0
Bit 24-31	-	RESERVED	0

4.75 CDB-ID 267 – Data logger Configuration 3

Data logger configuration field 3. This configuration is supported only in Binary Image 4.5.8 and later.

Table 258. CDB-ID 267 field description

Bits	**Values**	**Description**	**Default**
Bit 24-31	-	RESERVED	0
Bit 0-23	0..65535	Minimal distance between to logs expressed in meters	0

4.76 CDB-ID 268 – Geofencing Configuration 0

Geofencing configuration field 0. This configuration is supported only in Binary Image 4.5.8 and later.

Table 259. CDB-ID 268 field description

Bits	**Values**	**Description**	**Default**
Bit 0	0...1	0 = Geofencing disabled on boot 1 = Geofencing enabled on boot	0
Bit 1-2	0...3	Geofencing tolerance: 0 = No tolerance 1 = Geofencing status probability is 68% 2 = Geofencing status probability is 95% 3 = Geofencing status probability is 99%	0x1
Bit 3	0...1	0 = Autostart disabled 1 = Autostart enabled	0
Bit 4-7	-	RESERVED	0x1

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Bit 8	0...1	0 = Circle 0 disabled 1 = Circle 0 enabled	0x1
Bit 9	0...1	0 = Circle 1 disabled 1 = Circle 1 enabled	0x1
Bit 10	0...1	0 = Circle 2 disabled 1 = Circle 2 enabled	0x1
Bit 11	0...1	0 = Circle 3 disabled 1 = Circle 3 enabled	0x1
Bit 12-31	-	RESERVED	0

4.77 CDB-ID 270 – Odometer Configuration

Odometer configuration field. This configuration is supported only in Binary Image 4.5.8 and later.

Table 260. CDB-ID 270 field description

Bits	**Values**	**Description**	**Default**
Bit 0	0...1	0 = Odometer disabled on boot 1 = Odometer enabled on boot	0
Bit 1	0...1	0 = Odometer related NMEA messages disabled 1 = Odometer related NMEA messages enabled	0
Bit 2	0...1	0 = Odometer does not starts to record on boot 1 = Odometer automatically starts to record on boot	0
Bit 3-15	-	RESERVED	0
Bit 16-31	0...1	Distance in meter to trigger the alarm	0x03E8

4.78 CDB-ID 272 – GNSS integrity check configuration

Position and time integrity check enabling/disabling.

Table 261. CDB-ID 271 field description

Bits	**Values**	**Description**	**Default**
Bit 0	0...1	0 = Position integrity check disabled 1 = Position integrity check enabled	0
Bit 1	0...1	0 = Time integrity check disabled 1 = Time integrity check enabled	0

4.79 CDB-ID 301 – PPS Pulse Duration

Allow setting the pulse duration of the PPS signal. The pulse duration is intended to be the time distance between the PPS rising edge and the next falling edge if polarity inversion is disabled or the

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time distance between falling and rising edge if polarity inversion is enabled.

4.80 CDB-ID 302 – PPS Delay Correction

Allow setting a time correction to compensate any delay introduced on the Pulse per Second (PPS) signal by cables and/or RF chain.

4.81 CDB-ID 303 – GNSS fix rate

Allow setting the GNSS library fix rate. It is the time period between two consecutive position fix evaluations.

System reboot needed to have new setting in use.

4.82 CDB-ID 304 – Position Hold Latitude

Allow setting the latitude [degrees] for the position hold mode

Note: *To be used the position hold functionality must be enabled, see CDB-ID 200 for details.*

System reboot needed to have new setting in use.

4.83 CDB-ID 305 – Position Hold Longitude

Allow setting the longitude [degrees] for the position hold mode

Note: *To be used the position hold functionality must be enabled, see CDB-ID 200 for details).*

System reboot needed to have new setting in use.

4.84 CDB-ID 306 – Position Hold Altitude

Allow setting the altitude [m] for the position hold mode (NOTE: to be used the position hold functionality must be enabled, see CDB-ID 200 for details).

Note: *The altitude to be configured in this parameter mustn't be compensated with the geoid correction. If the altitude value is retrieved by the $GPGGA NMEA message, it must be added to the geoid correction (reported in the same $GPGGA message) before setting it in the CDB-ID 306 parameter.*

System reboot needed to have new setting in use.

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4.85 CDB-ID 307 – GPS RF delay correction

Allow setting the RF time delay for the GPS signal path. The RF compensation for GPS is independent of the PPS clock setting. The value calibrated for the ST reference design is 713E-9 s.

4.86 CDB-ID 308 – GLONASS RF delay correction

Allow setting the RF time delay for the GLONAS signal path. The RF compensation for GLONASS depends on the PPS clock setting (see CDB-ID). Here are the values calibrated for the ST reference design.

Table 262. CDB-ID 308 field description

PPS Clock Setting	GLONASS RF Correction
32 MHz	-
64 MHz	-

Note: *If the PPS clock setting is changed in the configuration block, also the GLONASS RF delay correction must be changed accordingly. For accurate timing applications it is strongly recommended to set PPS clock to 64 MHz.*

4.87 CDB-ID 309 – TRAIM alarm threshold

Allow setting the time error threshold for satellites removal in the TRAIM algorithm. Satellites which have a time error bigger than the TRAIM threshold are not used for time correction. The TRAIM threshold is also used to rise the TRAIM alarm if the time correction error is bigger than it.

4.88 CDB-ID 310 – COMPASS RF delay correction

Allow setting the RF time delay for COMPASS signal path.

4.89 CDB-ID 311 – GALILEO RF delay correction

Allow setting the RF time delay for GALILEO signal path.

4.90 CDB-ID 314 – CDB-ID 315 – CDB-ID 316 – Geofencing Circle 0

Allows to set up the geofencing circle number 0 parameters.

Table 263. Geofencing circle 0 field description

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CDB-ID	Type value	Description
314	double precision floating number	Circle latitude
315	double precision floating number	Circle longitude
316	double precision floating number	Circle radius in meters

This configuration is supported only in Binary Image 4.5.8 and later.

4.91 CDB-ID 317 – CDB-ID 318 - CDB-ID 319 - Geofencing Circle 1

Allows to set up the geofencing circle number 1 parameters.

Table 264. Geofencing circle 1 field description

CDB-ID	Type value	Description
317	Double precision floating number	Circle latitude
318	Double precision floating number	Circle longitude
319	Double precision floating number	Circle radius in meters

This configuration is supported only in Binary Image 4.5.8 and later.

4.92 CDB-ID 320 – CDB-ID 321 – CDB-ID 322 – Geofencing Circle 2

Allows to set up the geofencing circle number 2 parameters

Table 265. Geofencing circle 2 field description

CDB-ID	Type value	Description
320	Double precision floating number	Circle latitude
321	Double precision floating number	Circle longitude
322	Double precision floating number	Circle radius in meters

This configuration is supported only in Binary Image 4.5.8 and later. CDB-ID 323 – CDB-ID 324 – CDB-ID 325 – Geofencing Circle 3

Allows to set up the geofencing circle number 3 parameters

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Table 266. Geofencing circle 3 field description

CDB-ID	Type value	Description
323	double precision floating number	Circle latitude
324	double precision floating number	Circle longitude
325	double precision floating number	Circle radius in meters

This configuration is supported only in Binary Image 4.5.8 and later.

4.93 CDB-ID 400 – Default 2D DOP

Allow setting the default value for the 2D DOP. This value is used at run-time, after the GNSS startup phase, as a threshold for the 2D fix validation. DOP below this threshold will be considered valid for position fixing.

System reboot needed to have new setting in use.

4.94 CDB-ID 401 – Default 3D DOP

Allow setting the default value for the 3D DOP. This value is used at run-time, after the GNSS startup phase, as a threshold for the 3D fix validation. DOP below this threshold will be considered valid for position fixing.

System reboot needed to have new setting in use.

4.95 CDB-ID 402 – Startup 2D DOP

Allow setting the startup value for the 2D DOP. This value is used during the GNSS startup phase as a threshold for the 2D fix validation. DOP below this threshold will be considered valid for position fixing.

System reboot needed to have new setting in use.

4.96 CDB-ID 403 – Startup 3D DOP

Allow setting the startup value for the 3D DOP. This value is used during the GNSS startup phase as a threshold for the 3D fix validation. DOP below this threshold will be considered valid for position fixing.

System reboot needed to have new setting in use.

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4.97 CDB-ID 500 – Text message

Allow setting a text message which is sent (if enabled – see bit9 of CDB-ID 200 parameter) at startup over the NMEA port. The user is free to use this text as product name or as specific configuration marker.

System reboot needed to have new setting in us

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