L26-T&L26-P GNSS Protocol Specification

GNSS Module Series

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About the Document

Revision History

Version	Date	Author	Description
1.0	2020-02-13	Berton PENG	Initial
1.1	2020-03-17	Berton PENG	1. Updated the default constellation combination of L26-P module to GPS + BeiDou in Chapter 4. 2. Updated the default baud rate of L26-P module from 115200 bps to 460800 bps in Chapter 4. 3. Updated the default NMEA output messages in Chapter 3.1.1, Chapter 3.2.1 and Chapter 4. 4. Added the message $PSTMCPU in Chapter 3.2.2.11.

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1 Introduction

L26-T and L26-P GNSS modules both support GPS, GLONASS, BeiDou, Galileo and QZSS constellations and feature accurate acquisition. All of the supported constellations cannot be enabled at the same time, the allowed combinations to achieve maximum coverage are: GPS + Galileo + QZSS + GLONASS or GPS + Galileo + QZSS + BeiDou. Any constellation can be enabled as standalone satellite navigation system. The two modules also support autonomous GNSS C/A and SBAS functions. Thus, they are suitable for applications such as position fixing and navigation.

L26-T can be used for standalone positioning and high-accuracy time service applications based on variant firmware. This module provides an accurate time reference even with only one visible satellite.

L26-P features high precision. This module has integrated a 6-axis sensor, and supports to output raw data of GNSS and the sensor. Combined with RTK and DR (dead reckoning) algorithms, this module is one of the best choices for applications requiring high-precision positioning. L26-P is dedicated for Chinese market only.

This document describes the software aspects of L26-T and L26-P. Both of them support NMEA 0183 messages. Also, it supports to control and configure the modules through ST proprietary commands (PSTM commands).

NOTE

Please use the commands listed in this document only. Quectel assumes no responsibility for other commands that are not listed in this document.

2 Commands

2.1. List of NMEA Proprietary Commands

The table below summarizes all the commands supported by the proprietary NMEA layer.

Table 1: Proprietary NMEA Commands List

Syntax	Description
$PSTMINITGPS	Initialize position and GPS time using UTC format
$PSTMINITTIME	Initialize GPS time using UTC format
$PSTMCLREPHS	Clear all ephemeris
$PSTMDUMPEPHEMS	Dump ephemeris data
$PSTMCLRALMS	Clear all almanacs
$PSTMDUMPALMANAC	Dump almanacs data
$PSTMCOLD	Perform cold start
$PSTMWARM	Perform warm start
$PSTMHOT	Perform hot start
$PSTMSRR	Reset system
$PSTMSBASONOFF	Enable/disable SBAS activity
$PSTMSBASSERVICE	Set SBAS service
$PSTMGETRTCTIME	Get current RTC time
$PSTMSETCONSTMASK	Set GNSS constellation mask
$PSTMPPS	Manage command interface for pulse per second
$PSTMFORCESTANDBY	Force the module to enter into standby mode

$PSTMGEOFENCEREQ	Request internal geo-fence subsystem status
$PSTMODOSTART	Enable and reset odometer subsystem
$PSTMODOSTOP	Stop odometer subsystem
$PSTMODOREQ	Request odometer subsystem status
$PSTMCFGCONST	Configure constellation
$PSTMODORESET	Reset odometer subsystem
$PSTMCFGPORT	Configure char port
$PSTMCFGTDATA	Configure date and time related parameters
$PSTMCFGMSGL	Configure message list
$PSTMCFGAGPS	Configure assisted GNSS
$ PSTMCFGAJM	Configure anti-jamming
$PSTMCFGODO	Configure odometer
$PSTMCFGGEOFENCE	Configure geo-fencing
$PSTMCFGGEOCIR	Configure geo-fencing circle
$PSTMIMUSELFTESTCMD	Execute IMU self-test
$PSTMSETTHTRK	Set track threshold
$PSTMSETTHPOS	Set position threshold

2.2. Structure of NMEA Proprietary Commands

Table 2: Structure of NMEA Proprietary Commands

Field		Length (Bytes)	Description
$		1	Each NMEA message starts with “$”
Talker ID		1	“P” for proprietary message
NMEA	Data type	3	“STM” to indicate ST proprietary command

Data Field	Packet type	Valid characters	Packet type
	Packet data	Variable, depend on the packet type	Data fields, delimited by comma “,”
*		1	End character of data field
Checksum		2	A hexadecimal number of all characters between “$” and “*”, which is calculated by exclusive OR
<CR><LF>		2	Each NMEA message ends with <CR><LF>

NOTE

The string ***<checksum>** is optional when users input commands.

2.3. GNSS Commands

2.3.1. $PSTMINITGPS

This command initializes the position and GPS time of GNSS receiver by UTC format. It must be issued after a cold reset or the command will fail. The date issued with parameters Day, Month and Year must be after January 2018.

Synopsis:

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

Arguments:

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: E = East W = 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 (2018 to…)
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)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the position and time will be initialized successfully and the returned message will be:

```
$PSTMINITGPSOK*<checksum><CR><LF>
```

- If there is any error, the returned message will be:

```
$PSTMINITGPSERROR*<checksum><CR><LF>
```

Example:

```
$PSTMINITGPS,4811.365,N,01164.123,E,0530,23,02,2018,09,44,12
```

NOTES

1. The error between input time and real time should be less than 3 seconds.
   GPS time = UTC time + Leap second. In 2019, Leap second = 18s.
2. The error between input position and real position should be less than 30 kilometers.

2.3.2. $PSTMINITTIME

This command initializes the GPS time of GNSS receiver by UTC format. The date issued with parameters Day, Month and Year must be after January 2018.

Synopsis:

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

Arguments:

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 (2018 to …)
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)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the time will be initialized successfully and the returned message will be:

```
$PSTMINITTIMEOK*<checksum><CR><LF>
```

- If there is any error, the returned message will be:

```
$PSTMINITTIMEERROR*<checksum><CR><LF>
```

Example:

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

NOTE

The error between inputted GPS time and real GPS time should be less than 3 seconds.
GPS time = UTC time + Leap second. In 2019, Leap second = 18s.

2.3.3. $PSTMCLREPHS

This command clears the ephemeris which is stored in the backup section of NVM.

Synopsis:

```
$PSTMCLREPHS*<checksum><CR><LF>
```

Arguments:

None.

Results

- All ephemerides that are stored in the backup section of NVM, will be deleted.
- No message will be sent as reply.

Example:

```
$PSTMCLREPHS
```

2.3.4. $PSTMDUMPEPHEMS

This command dumps the ephemeris stored in the backup section of NVM .

Synopsis:

```
$PSTMDUMPEPHEMS*<checksum><CR><LF>
```

Arguments:

None.

Result

```
$PSTMEPHEM,<sat_id>,<N>,<byte1>…<byteN>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

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
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

The data from byte1 to byteN (byte1 and byteN included) are the dump of structure that contains all the information of the ephemeris. The format of ephemeris data varies among different constellations, please

refer to the following tables for details.

Table 3: Ephemeris Data Format for GPS

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
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

Table 4: Ephemeris Data Format for GLONASS

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 (LSB)
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 satellites 1 = 5 satellites

1	P2	Flag of oddness (“1”) or evenness (“0”) of the value of tb
1	P4	Flag to show that ephemeris parameters are present
1	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 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	reversed	-
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	-

Table 5: Ephemeris Data Format for Galileo

Bits	Structure Member	Description
16	week	Week number of the issue of data
16	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
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 6: Ephemeris Data Format for BeiDou

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
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

Example:

```
$PSTMDUMPEPHEMS
$PSTMEPHEM,1,64,0f06bc34bc345f5f5f84f400dea4ff00f9f63c239f0a35f81400fbff33420000ee632f276
98ef001afa50da16cfcfa22e0b65a3e7a3cee27d700f7ffc616fe03*57
$PSTMEPHEM,2,64,0f06bc34bc344f4f4f78110019a5ff00b004fa1d1e0e3f04c8ffcaff1937000033515726
556ba9048eae0da1b6c346bd8f985c93ade10c76db001d00f8c7c503*58
$PSTMEPHEM,4,64,0f06bb34bb344b4b4b98050038a4ff000005351e110eea041b00b8ffd037000020b8
4e26b5138b0425580ca16b211030e68b1a949cac9615f30066ffea92f603*06
$PSTMEPHEM,9,64,0f06bc34bc341818189c0a0069aaff005f06eb249a09ca0477ff6c00f72e00005131d
827592b950a91010da1c7af88538e7ca1122fb9be3df4001300c4a0c203*52
```

2.3.5. $PSTMCLRALMS

This command erases the Almanac file stored in the backup section of NVM .

Synopsis:

```
$PSTMCLRALMS*<checksum><CR><LF>
```

Arguments:

None.

Results

- The Almanac files stored in the backup section of NVM will be deleted.
- No message will be sent as reply.

Example:

```
$PSTMCLRALMS
```

2.3.6. $PSTMDUMPALMANAC

This command dumps Almanac data that is stored in the backup section of NVM.

Synopsis:

```
$PSTMDUMPALMANAC*<checksum><CR><LF>
```

Arguments:

None.

Results

```
$PSTMDUMPALMANAC,<sat_id>,<N>,<byte1>…<byteN>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

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 between but not including the “$” and “*” characters

The data from byte1 to byteN (byte1 and byteN included) are the dump of structure that contains all the information of the Almanac. Almanac data format varies according to different constellations. For more details, please check the tables below.

Table 7: Almanac Data Format for GPS

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 8: Almanac Data Format for GLONASS

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
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 9: Almanac Data Format for Galileo

Bits	Structure Member	Description
16	satid	The satellite number
6	svid	Space vehicle identification
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
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

Table 10: Almanac Data Format for BeiDou

Bits	Structure Member	Description
8	prn	PRN number of the corresponding almanac data
16	week	Almanac reference week number
8	toa	Almanac reference time
17	eccentricity	Eccentricity
11	af0	Satellite clock time bias correction coefficient
1	is_geo	Satellite orbit type
1	WNa_valid	-
2	spare0	-
17	omega_dot	Rate of right ascension
11	af1	Satellite clock time drift correction coefficient
4	spare1	-
24	root_a	Square root of semi-major axis
8	spare2	-
24	omega_zero	Longitude of ascending node of orbital plane at weekly epoch
8	spare3	-
24	perigee	Argument of perigee
8	spare4	-
24	mean_anomaly	Mean anomaly at reference time
8	spare5	-
16	delta_i	Correction of inclination angle at reference time
1	health	Satellite health information

1	available	Contains 1 if almanac is available 0 if not.
8	last_received_toa	-
6	spare6	-

Example:

```
$PSTMDUMPALMANAC
$PSTMALMANAC,1,32,011a06903f1f9f0d58fd0800d90ca1418713060099ee260034024200b4ffff00*1a
$PSTMALMANAC,2,32,021a0690944b78fe37fd0800770da141ef0c5b0060487700989bd800d8088000*1a
$PSTMALMANAC,3,32,031a06904f68a2f540fd0800f60ca141922a2c003cae27009496cf00020a8000*15
$PSTMALMANAC,4,32,041a0690a94aeffd36fd0800390ca141afc95b00de7a1700dfc74e004ddebf00*13
$PSTMALMANAC,5,32,051a0690940eee0b5efd0800900ca141582b8600d3000b0060641200e40f8000*14
```

2.3.7. $PSTMCOLD

This command performs a cold start.

Synopsis:

```
$PSTMCOLD*<checksum><CR><LF>
```

Arguments:

None.

Results

Cold start initialization and system restart [1)].

Example:

```
$PSTMCOLD
```

NOTE

[1)] The GNSS engine will be reset. It is not a system reboot.

2.3.8. $PSTMWARM

This command performs a warm start.

Synopsis:

```
$PSTMWARM*<checksum><CR><LF>
```

Arguments:

None.

Results

Warm start initialization and system restart [1].

Example:

```
$PSTMWARM
```

NOTE

[1] The GNSS engine will be reset. It is not a system reboot.

2.3.9. $PSTMHOT

This command performs a hot start.

Synopsis:

```
$PSTMHOT*<checksum><CR><LF>
```

Arguments:

None.

Results

The system restarts [1]

Example:

```
$PSTMHOT
```

NOTE

[1] The GNSS engine will be reset. It is not a system reboot.

2.3.10. $PSTMSRR

This command executes a system reset. The GNSS firmware is rebooted.

Synopsis:

```
$PSTMSRR*<checksum><CR><LF>
```

Arguments:

None.

Results

- The GNSS firmware reboots.
- No message will be sent as reply.

Example:

```
$PSTMSRR
```

2.3.11. $PSTMSBASONOFF

This command suspends/resumes the SBAS software execution. The SBAS is active by default. If SBAS has been suspended, it will not be reported in the GSV sentences even when it is in view.

Synopsis:

```
$PSTMSBASONOFF*<checksum><CR><LF>
```

Arguments:

None.

Results

If SBAS is active, it will be suspended; if SBAS has been suspended, it will return to active.

Example:

```
$PSTMSBASONOFF
```

2.3.12. $PSTMSBASSERVICE

This command changes the SBAS service.

Synopsis:

```
$PSTMSBASSERVICE,<service>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
service	Integer	SBAS service: 0 = WAAS 1 = EGNOS 2 = MSAS 3 = GAGAN 4 = SDCM 7 = Off 15 = Auto (default)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- If no error occurs, the returned message will be:

```
$PSTMSBASSERVICEOK*<checksum><CR><LF>
```

  If service is 0, 1, 2, 3 or 4, the SBAS engine will track all the SBAS satellites which correspond to the specified service.

  If service is 7, no SBAS satellites will be tracked.

  If service is 15, the SBAS engine will automatically select an appropriate SBAS service based on the computed user location.

- If there is any error, the following message will be returned:

```
$PSTMSBASSERVICEERROR*<checksum><CR><LF
```

Example:

```
$PSTMSBASSERVICE,15
```

2.3.13. $PSTMGETRTCTIME

This command is used to get the current RTC time.

Synopsis:

```
$PSTMGETRTCTIME*<checksum><CR><LF>
```

Arguments:

None.

Results

The system will provide RTC data and status:

```
$PSTMGETRTCTIME,<time>,<date>,<rtc_status>,<time_validity>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

Parameter	Format	Description
time	hhmmss.sss	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 = TOW_TIME 3 = USER_TIME 4 = USER_RTC_TIME 5 = RTC_TIME 6 = RTC_TIME_ACCURATE 7 = APPROX_TIME 8 = ACCURATE_TIME 9 = POSITION_TIME 10 = EPHEMERIS_TIME
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Example:

```
$PSTMGETRTCTIME
```

2.3.14. $PSTMSETCONSTMASK

This command sets the GNSS constellation mask. It allows GNSS constellation to switch during running time. The configuration will not be saved after reset.

Synopsis:

```
$PSTMSETCONSTMASK,<constellation_mask>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
constellation_mask	1-9999	It is a bit mask. Each bit enables/disables a specific constellation independently by the others: bit 0: Enabling/disabling GPS constellation bit 1: Enabling/disabling GLONASS constellation bit 2: Enabling/disabling QZSS constellation bit 3: Enabling/disabling Galileo constellation bit 7: Enabling/disabling BeiDou constellation
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- If no error occurs, the returned message will be:

```
$PSTMSETCONSTMASKOK,<constellation_mask>*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMSETCONSTMASKERROR*<checksum><CR><LF>
```

Example:

- Enabling GPS only:

```
$PSTMSETCONSTMASK,1
```

- Enabling GLONASS only:

```
$PSTMSETCONSTMASK,2
```

- Enabling GPS and GLONASS:

```
$PSTMSETCONSTMASK,3
```

2.3.15. $PSTMPPS

This command modifies various parameters related to the 1PPS feature. The configuration will not be saved after reset.

Synopsis:

```
$PSTMPPS,<cmd_mode>,<cmd_type>,<par_1>,…,<par_N>*<checksum><CR><LF>
```

Arguments:

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	Command type. 1 = PPS_IF_ON_OFF_CMD 2 =PPS_IF_OUT_MODE_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 in accordance with the command type specification.
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

According to the operation mode, data is retrieved from or set into the PPS manager. Please refer to ***Chapter 2.3.15.1*** to ***Chapter 2.3.15.23***.

Example:

Set L26-T to auto position hold mode:

```
$PSTMPPS,2,10,10        //Satellites with elevation angle below 10° are not involved in 1PPS timing
$PSTMPPS,2,11,1         //Set GPS satellite to participate in 1PPS timing
$PSTMPPS,2,19,1         //Set the GPS satellite UTC time as the 1PPS timing reference time
$PSTMPPS,2,14,3600      //Set the L26-T to automatically calculate the position hold reference
                          parameter after 3600 times positioning. L26-T will set the position hold
                          reference position by itself after sending the command an hour later (3600s).
$PSTMPPS,2,8,1          //Set L26-T to continuously output 1PPS when location lose lock.
//Wait for 1 hour.
$PSTMPPS,2,4,-10        //Execute this command to calibrate the 1PPS time error by comparing with
                          the reference 1PPS output when L26-T 1PPS delays 10ns compared to the
                          reference time. Because the loss of RF link is exist objectively.
```

2.3.15.1. Getting PPS Data: PPS_IF_PULSE_DATA_CMD

This command is used to get the pulse information from PPS manager.

Synopsis:

```
$PSTMPPS,1,7*<checksum><CR><LF>
```

Result:

```
$PSTMPPS,1,7,<out_mode>,<reference_time>,<pulse_delay>,<pulse_duration>,<pulse_polarity>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

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 NOTES: 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 will be identical to UTC and GPS_UTC_FROM_GLONASS will be identical to GPS_UTC.
pulse_delay	Decimal	Pulse delay Unit: ns
pulse_duration	Double	Pulse duration Unit: s
pulse_polarity	Decimal, 1 digit	0 = Not inverted 1 = Inverted
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.2. Getting PPS Data: PPS_IF_TIMING_DATA_CMD

This command is used to get the time information from PPS manager.

Synopsis:

```
$PSTMPPS,1,12*<checksum><CR><LF>
```

Result:

```
$PSTMPPS,1,12,<fix_condition>,<sat_th>,<elevation_mask>,<constellation_mask>,<gps_rf_delay>,<glonass_rf_delay>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

Parameter	Format	Description
fix_condition	Decimal, 1 digit	0/1 = No fix 2 = 2D fix 3 = 3D fix
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
gps_rf_delay	Decimal	GPS path RF delay Unit: ns
glonass_rf_delay	Decimal	GLONASS path RF delay Unit: ns
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.3. Getting PPS Data: PPS_IF_POSITION_HOLD_DATA_CMD

This command is used to get the position hold information from PPS manager. In position hold state, the timing service is still available when there is only one visible satellite.

Synopsis:

```
$PSTMPPS,1,13*<checksum><CR><LF>
```

Result:

```
$PSTMPPS,1,13,<on_off>,<lat>,<lat_dir>,<lon>,<lon_dir>,<h_msl>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

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	Direction: E = East W = West
h_msl	Double	Position hold mean see level altitude
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.4. Getting PPS Data: PPS_IF_TRAIM_CMD

This command is used to get the TRAIM related information from PPS manager. TRAIM is a timing calibration algorithm.

Synopsis:

```
$PSTMPPS,1,15*<checksum><CR><LF>
```

Result:

```
$PSTMPPS,1,15,<traim_enabled>,<traim_solution>,<ave_error>,<used_sats>,<removed_sats>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

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 Unit: ns
used_sats	Decimal	Number of satellites used for timing correction
removed_sats	Decimal	Number of satellites removed by the timing correction
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.5. Getting PPS Data: PPS_IF_TRAIM_USED_CMD

This command is used to get satellites used in the TRAIM algorithm from PPS manager.

Synopsis:

```
$PSTMPPS,1,16*<checksum><CR><LF>
```

Result:

```
$PSTMPPS,1,16,<traim_enabled>,<used_sats>,<sat1>,…,<satN>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

Parameter	Format	Description
traim_enabled	Decimal, 1 digit	TRAIM on/off status: 0 = Off 1 = On
used_sats	Decimal	Number of satellites used for timing correction
sat1...satN	Decimal	List of satellites IDs
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.6. Getting PPS Data: PPS_IF_TRAIM_RES_CMD

This command is used to get satellites residuals in the TRAIM algorithm from PPS manager. Each residual is corresponding to the satellite in the list of used satellite at the same message position.

Synopsis:

```
$PSTMPPS,1,17*<checksum><CR><LF>
```

Result:

```
$PSTMPPS,1,17,<traim_enabled>,<used_sats>,<res1>,...,<resN>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

Parameter	Format	Description
traim_enabled	Decimal, 1 digit	TRAIM on/off status: 0 = Off 1 = On
used_sats	Decimal	Number of satellites used for timing correction
res1,...,resN	Decimal	List of satellites residuals. Unit: ns. Each residual corresponds to the satellite in the list of used satellite at the same message position
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.7. Getting PPS Data: PPS_IF_TRAIM_REMOVED_CMD

This command is used to get removed satellites in the TRAIM algorithm from PPS manager.

Synopsis:

```
$PSTMPPS,1,18*<checksum><CR><LF>
```

Result:

```
$PSTMPPS,1,18,<traim_enabled>,<rem_sats>,<sat1>,…,<satN>*<checksum><CR><LF>
```

The parameters included in the result above are listed below:

Parameter	Format	Description
traim_enabled	Decimal, 1 digit	TRAIM on/off status: 0 = Off 1 = On
rem_sats	Decimal	Number of satellites removed by timing correction
sat1,...,satN	Decimal	List of satellites IDs
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.8. Setting PPS Data: PPS_IF_ON_OFF_CMD

This command is used to set PPS on/off feature.

Synopsis:

```
$PSTMPPS,2,1,<on_off>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
on_off	Decimal, 1 digit	0 = PPS disabled 1 = PPS enabled (default)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.9. Setting PPS Data: PPS_IF_OUT_MODE_CMD

This command sets PPS output mode.

Synopsis:

```
$PSTMPPS,2,2,<out_mode>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
out_mode	Decimal, 1 digit	0 = PPS always generated (default) 1 = PPS generated on even seconds 2 = PPS generated on odd seconds
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.10. Setting PPS Data: PPS_IF_REFERENCE_TIME_CMD

This command sets PPS reference time.

Synopsis:

```
$PSTMPPS,2,19,<reference_time>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
reference_time	Decimal, 1 digit	0 = UTC (default) 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 NOTES: 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.
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.11. Setting PPS Data: PPS_IF_PULSE_DELAY_CMD

This command sets the pulse delay time caused by cable transmission.

Synopsis:

```
$PSTMPPS,2,4,<pulse_delay>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
pulse_delay	Decimal	Pulse delay Unit: ns (default value: 0)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.12. Setting PPS Data: PPS_IF_CONSTELLATION_RF_DELAY_CMD

This command sets the pulse delay time caused by satellite RF signal transmission.

Synopsis:

```
$PSTMPPS,2,20,<sat_type><time_delay>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
sat_type	Decimal	Satellite constellation type: 0 = GPS 1 = GLONASS 3 = Galileo 7 = COMPASS
time_delay	Decimal	Time delay Unit: ns
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.13. Setting PPS Data: PPS_IF_PULSE_DURATION_CMD

This command sets pulse duration.

Synopsis:

```
$PSTMPPS,2,5,<pulse_duration>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
pulse_duration	Double	Pulse duration Unit: s (default value: 0.500000)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.14. Setting PPS Data: PPS_IF_PULSE_POLARITY_CMD

This command sets pulse polarity.

Synopsis:

```
$PSTMPPS,2,6,<pulse_polarity>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
pulse_polarity	Decimal, 1 digit	0 = Not inverted (default) 1 = Inverted
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.15. Setting PPS Data: PPS_IF_PULSE_DATA_CMD

This command sets pulse data into PPS manager.

Synopsis:

```
$PSTMPPS,2,7,<out_mode>,<reference_time>,<pulse_delay>,<pulse_duration>,<pulse_polarity>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
out_mode	Decimal, 1 digit	0 = PPS always generated (default) 1 = PPS generated on even seconds 2 = PPS generated on odd seconds
reference_time	Decimal, 1 digit	0 = UTC (default) 1 = GPS_UTC 2 = GLONASS_UTC 3 = UTC_SU 4 = GPS_UTC_FROM_GLONASS
pulse_delay	Decimal	Pulse delay Unit: ns (default value: 0)
pulse_duration	Double	Pulse duration Unit: ns (default value: 0.500000)
pulse_polarity	Decimal, 1 digit	0 = Not inverted (default) 1 = Inverted

checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.16. Setting PPS Data: PPS_IF_FIX_CONDITION_CMD

This command sets PPS fix condition.

Synopsis:

```
$PSTMPPS,2,8,<fix_condition>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
fix_condition	Decimal, 1 digit	0/1 = No fix (default value: 0) 2 = 2D fix 3 = 3D fix
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.17. Setting PPS Data: PPS_IF_SAT_TRHESHOLD_CMD

This command sets minimum number of satellites for the PPS generation.

Synopsis:

```
$PSTMPPS,2,9,<sat_th>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
sat_th	Decimal	Minimum number of satellites for the PPS generation (default value: 0)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.18. Setting PPS Data: PPS_IF_ELEVATION_MASK_CMD

This command sets the minimum satellite elevation for satellite used in timing filtering.

Synopsis:

```
$PSTMPPS,2,10,<elevation_mask>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
elevation_mask	Decimal	Minimum satellite elevation for satellite usage in timing filtering (default value: 0)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.19. Setting PPS Data: PPS_IF_CONSTELLATION_MASK_CMD

This command is used to select the satellite constellation to be used in timing filtering.

Synopsis:

```
$PSTMPPS,2,11,<constellation_mask>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
constellation_mask	Decimal (bit mask)	Selection of satellite constellation to be used in timing filtering. bit0: GPS bit1: GLONASS bit3: Galileo bit7: BeiDou (default value: 0) NOTES: 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, GLONASS satellites are used to correct the GPS reference time together with the GPS satellites. When constellation mask is

		zero (default), only GPS satellites are used to correct the GPS reference time and only GLONASS satellites are used to correct the GLONASS reference time. Same description is also valid for GPS and BeiDou constellations enabling/disabling bit0 and bit7.
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Example:

Enable GPS only (bit0):

```
$PSTMPPS,2,11,1
```

2.3.15.20. Setting PPS Data: PPS_IF_TIMING_DATA_CMD

This command sets timing data into PPS manager.

Synopsis:

```
$PSTMPPS,2,12,<fix_condition>,<sat_th>,<elevation_mask>,<constellation_mask>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
fix_condition	Decimal, 1 digit	0/1 = No fix (default value: 0) 2 = 2D fix 3 = 3D fix
sat_th	Decimal	Minimum number of satellites for the PPS generation (default value: 0)
elevation_mask	Decimal	Minimum satellite elevation for satellite usage in timing filtering (default value: 0)
constellation_mask	Decimal (bit mask)	Satellite constellation selection for usage in timing filtering (default value: 0). bit0: GPS bit1: GLONASS
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.21. Setting PPS Data: PPS_IF_POSITION_HOLD_DATA_CMD

This command sets the position hold in PPS feature.

Synopsis:

```
$PSTMPPS,2,13,<on_off>,<lat>,<lat_dir>,<lon>,<lon_dir>,<h_msl>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
on_off	Decimal, 1 digit	0 = Position hold disabled (default) 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	Direction: E = East W = West
h_msl	Double	Position hold mean sea level altitude
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.22. Setting PPS Data: PPS_IF_AUTO_HOLD_SAMPLES_CMD

This command sets the number of position samples for the auto position algorithm.

Synopsis:

```
$PSTMPPS,2,14,<auto_ph_samples>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
auto_ph_samples	Decimal	Number of position samples for the auto position algorithm. If the number of samples is set to “0”, the auto position hold feature will be disabled. The position average evaluation is restarted every time the command is executed. (default value: 0)

checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.15.23. Setting PPS Data: PPS_IF_TRAIM_CMD

This command enables/disables TRAIM algorithm.

Synopsis:

```
$PSTMPPS,2,15,<on_off>,<alarm>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
on_off	Decimal, 1 digit	0 = TRAIM disabled 1 = TRAIM enabled (default)
alarm	Double	TRAIM alarm – scientific notation is allowed Unit: s
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

2.3.16. $PSTMFORCESTANDBY

This command forces the module into standby mode.

Synopsis:

```
$PSTMFORCESTANDBY,<duration>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
duration	Decimal, 5 digits	Duration of the standby time in seconds. Range: 0-99999. When set to 0, the module remains in standby mode until it is awakened by driving WAKE_UP pin to high voltage level.
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the returned message will be:

```
$PSTMFORCESTANDBYOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMFORCESTANDBYERROR*<checksum><CR><LF>
```

2.3.17. $PSTMGEOFENCEREQ

This command forces the GNSS receiver to send a **$PSTMGEOFENCESTATUS** message to query internal geo-fence subsystem status.

The geo-fence must be enabled, which can be set through the command **$PSTMCFGGEOFENCE**. Otherwise, the request will be rejected with error.

Synopsis:

```
$PSTMGEOFENCEREQ*<checksum>*<CR><LF>
```

Arguments:

None.

Results:

- If no error occurs, the following message will be returned. Please refer to ***Chapter 3.2.2.3*** for details.

```
$PSTMGEOFENCESTATUS,<timestamp>,<datestamp>,<status_1>,<status_2>,…,<status_x>*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMGEOFENCEREQERROR*<checksum><CR><LF>
```

2.3.18. $PSTMODOSTART

This command enables and resets the odometer subsystem, which calculates the ground distance from the current resolved position.

The odometer must be enabled, which can be set through the command **$PSTMCFGODO**. Otherwise, the request will be rejected with error.

Synopsis:

```
$PSTMODOSTART*<checksum><CR><LF>
```

Arguments:

None.

Results

- If no error occurs, the following message will be returned:

```
$PSTMODOSTARTOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMODOSTARTERROR*<checksum><CR><LF>
```

2.3.19. $PSTMODOSTOP

This command stops the odometer subsystem.

The odometer must be enabled, which can be set through the command **$PSTMCFGODO**. Otherwise, the request will be rejected with error.

Synopsis:

```
$PSTMODOSTOP*<checksum><CR><LF>
```

Arguments:

None.

Results

- If no error occurs, the following message will be returned:

```
$PSTMODOSTOPOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMODOSTOPERROR*<checksum><CR><LF>
```

2.3.20. $PSTMODOREQ

This command requests the odometer status.

The odometer must be enabled, which can be set through the command **$PSTMCFGODO**. Otherwise, the request will be rejected with error.

Synopsis:

```
$PSTMODOREQ*<checksum><CR><LF>
```

Arguments:

None.

Results

- If no error occurs, the following message will be returned. Please refer to ***Chapter 3.2.2.5*** for details.

```
$PSTMODO,<timestamp>,<date-stamp>,<odo-A>,<odo-B>,<odo-pon>*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMODOREQERROR*<checksum><CR><LF>
```

2.3.21. $PSTMCFGCONST

This command configures satellite constellation. The command will take effect during running time. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGCONST,<GPS>,<GLONASS>,<Galileo>,<QZSS>,<BeiDou>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
GPS	Unsigned	GPS constellation status: 0 = Constellation off 1 = Constellation being tracked 2 = Constellation being tracked and used in positioning
GLONASS	Unsigned	GLONASS constellation status: 0 = Constellation off 1 = Constellation being tracked 2 = Constellation being tracked and used in positioning
Galileo	Unsigned	Galileo constellation status: 0 = Constellation off 1 = Constellation being tracked 2 = Constellation being tracked and used in positioning
QZSS	Unsigned	QZSS constellation status: 0 = Constellation off 1 = Constellation being tracked 2 = Constellation being tracked and used in positioning
BeiDou	Unsigned	BeiDou constellation status: 0 = Constellation off

		1 = Constellation being tracked 2 = Constellation being tracked and used in positioning
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the following message will be returned:

```
$PSTMCFGCONFOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGCONFERROR*<checksum><CR><LF>
```

NOTES

1. L26-T and L26-P GNSS modules both support GPS, GLONASS, BeiDou, Galileo and QZSS constellations. All of the supported constellations cannot be enabled at the same time, the allowed combinations to achieve maximum coverage are: GPS + Galileo + QZSS + GLONASS or GPS + Galileo + QZSS + BeiDou. Any constellation can be enabled as standalone satellite navigation system.
2. The default constellation combination of L26-T is GPS + GLONASS + Galileo and that of L26-P is GPS + BeiDou.

2.3.22. $PSTMODORESET

This command resets the odometer subsystem.

The odometer must be enabled, which can be set through the command **$PSTMCFGODO**. Otherwise, the request will be rejected with error.

Synopsis:

```
$PSTMODORESET,<odo_mask>*<checksum><CR><LF>
```

Arguments:

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
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- If no error occurs, the following message will be returned:

```
$PSTMODORESETOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMODORESETERROR*<checksum><CR><LF>
```

2.3.23. $PSTMCFGPORT

This command configures a general-purpose port for NMEA, STBIN, DEBUG or RTCM purpose. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGPORT,<port_type>,<protocol_type>,<portnumb>,<baudrate>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
port_type	Decimal, 1 digit	Select the port type: 0 = UART
protocol_type	Decimal, 1 digit	Select the protocol type: 0 = NMEA
portnumb	From 0 to 255	UART GPIO ID (Linearly addressed) NOTE: No NMEA sentence will be output if configuration of this parameter is incorrect. Only by re-flashing firmware can this issue be resolved. An example of obtaining current NMEA port number is as follows: Command: **$PSTMGETPAR,1101<CR><LF>** Response: **$PSTMSETPAR,1101,0x01*53<CR><LF>** According to the response, the current NMEA port number is 1.

		Set the baud rate of NMEA port 1 to 115200 bps: **$PSTMCFGPORT,0,0,1,115200<CR><LF>** **$PSTMSAVEPAR<CR><LF>** **$PSTMSRR<CR><LF>**
baudrate	Integer	Baud rate of the port. Allowed values are: 9600 14400 19200 38400 57600 115200 230400 460800 921600
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the following message will be returned:

```
$PSTMCFGPORTOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGPORTERROR*<checksum><CR><LF>
```

2.3.24. $PSTMCFGTDATA

This command configures date and time related parameters. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGTDATA,<gps_min_week>,<gps_max_week>,<fix_rate>,<utcdelta>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
gps_min_week	Unsigned	Minimum GPS week number (default value: 1964)
gps_max_week	Unsigned	Maximum GPS week number (default value: 3443)
fix_rate	Double	Fix rate

		Unit: s (default value: 1.0)
utcdelta	Unsigned	UTC delta time
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the following message will be returned:

```
$PSTMCFGTDATAOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGTDATAERROR*<checksum><CR><LF>
```

Example:

```
$PSTMCFGTDATA,1964,3443,1,00000012
```

2.3.25. $PSTMCFGMSGL

This command configures the message list. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGMSGL,<listid>,<rate>,<listlow>,<listhigh>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
listid	Decimal, 1 digit	List selector: 0 = NMEA list 0
rate	From 0 to 255	Message list rate scaler
listlow	Hexadecimal, 8 digits	Low 32 bits. NOTE: CDB-ID 201 represents this low 32 bits of extended 64 bits NMEA message list. The command to get current configuration is as follows: **$PSTMGETPAR,1201<CR><LF>** Response:

		$PSTMSETPAR,1201,0x00180056*5B<CR><LF>
listhigh	Hexadecimal, 8 digits	High 32 bits. NOTE: CDB-ID 228 represents this high 32 bits of extended 64 bits NMEA message list. The command to get configuration value is as follows: **$PSTMGETPAR,1228<CR><LF>** Response: **$PSTMSETPAR,1228,0x7ec22000*5B<CR><LF>**
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

NOTE

For each bit, 0 indicates that the feature is disabled, while 1 indicates that the feature is enabled.

Low 32 Bits		
Bit	**Bitmask (32 bits)**	**Function**
0	0x1	$--GNS message
1	0x2	$--GGA message
2	0x4	$--GSA message
3	0x8	$--GST message
4	0x10	$--VTG message
5	0x20	Reserved
6	0x40	$--RMC message
7	0x80	Reserved
8	0x100	$PSTMTG Message
9	0x200	$PSTMTS Message
10	0x400	Reserved
11	0x800	Reserved
12	0x1000	Reserved
13	0x2000	Reserved

14	0x4000	Reserved
15	0x8000	Reserved
16	0x10000	Reserved
17	0x20000	$PSTMSBAS Message
18	0x40000	Reserved
19	0x80000	$--GSV message
20	0x100000	$--GLL message
21	0x200000	$PSTMPPSDATA Message
22	0x400000	Reserved
23	0x800000	$PSTMCPU Message
24	0x1000000	$--ZDA message
25	0x2000000	Reserved
26	0x4000000	Reserved
27	0x8000000	Reserved
28	0x10000000	Reserved
29	0x20000000	Reserved
30	0x40000000	$PSTMNOTCHSTATUS Message
31	0x80000000	Reserved
High 32 Bits		
Bit	**Bitmask (32 Bits)**	**Function**
32	0x1	Reserved
33	0x2	Reserved
34	0x4	$PSTMUTC Message
35	0x8	Reserved
36	0x10	$PSTMANTENNASTATUS message
37	0x20	Reserved

38	0x40	Reserved
39	0x80	Reserved
40	0x100	Reserved
41	0x200	Reserved
42	0x400	Reserved
43	0x800	Reserved
44	0x1000	Reserved
45	0x2000	$--GBS message
46	0x4000	Reserved
47	0x8000	Reserved
48	0x10000	Reserved
49	0x20000	Reserved
50	0x40000	$PSTMODO message
51	0x80000	$PSTMGEOFENCESTATUS message
52	0x100000	Reserved
53	0x200000	Reserved
54	0x400000	Reserved
55	0x800000	Reserved
56	0x1000000	Reserved
57	0x2000000	Reserved
58	0x4000000	Reserved
59	0x8000000	Reserved
60	0x10000000	Reserved
61	0x20000000	Reserved
62	0x40000000	Reserved
63	0x80000000	Reserved

Results:

- If no error occurs, the following message will be returned:

```
$PSTMCFGMSGLOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGMSGLERROR*<checksum><CR><LF>
```

Example:

```
//Disable the output of RMC sentence.
$PSTMGETPAR,1201<CR><LF>                    //input
$PSTMSETPAR,1201,0x00180056*5B<CR><LF>      //response:
$PSTMGETPAR,1228<CR><LF>                    //input
$PSTMSETPAR,1228,0x7ec22000*5B<CR><LF>      //response
//The bitmask of $GPRMC message is 0x40, low 32 bits. Then, 0x00180056 – 0x40 = 0x00180016.
$PSTMCFGMSGL,0,1,00180016,7ec22000<CR><LF>
$PSTMSAVEPAR<CR><LF>
$PSTMSRR<CR><LF>
```

2.3.26. $PSTMCFGAGPS

This command configures the Assisted GPS. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGAGPS,<en_agps>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
en_agps	Decimal	Enable/disable AGPS engine 0 = AGPS disabled (default) 1 = AGPS enabled
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the following message will be returned:

```
$PSTMCFGAGPSOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGAGPSERROR*<checksum><CR><LF>
```

2.3.27. $PSTMCFGAJM*

This command configures the anti-jamming algorithm. The anti-jamming algorithm protects receivers from interference and intentional jamming. If anti-jamming algorithm is disabled, the module will lose fix quickly when facing narrowband interference. After enabled, when the module encounters narrowband interference, only the C/No slightly reduces and the module can maintain positioning status. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGAJM,<gpsmode>,<glonassmode>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
gpsmode	Decimal, 1 digit	Notch filter on GPS path: 0 = Disable 1 = Normal mode 2 = Auto mode (default)
glonassmode	Decimal, 1 digit	Notch filter on GLONASS path: 0 = Disable 1 = Normal mode 2 = Auto mode (default)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results:

- If no error occurs, the following message will be returned:

```
$PSTMCFGAJMOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGAJMERROR*<checksum><CR><LF>
```

NOTE

* means under development.

2.3.28. $PSTMCFGODO

This command configures the odometer. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGODO,<en>,<auto>,<enmsg>,<alarm>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
en	Decimal, 1 digit	Enable/disable the odometer: 0 = Odometer disabled (default) 1 = Odometer enabled
auto	Decimal, 1 digit	Enable/disable the auto-start (i.e. odometer is automatically started on start-up and no **$PSTMODOSTART** command is required): 0 = Auto-start disabled (default) 1 = Auto-start enabled
enmsg	Decimal, 1 digit	Enable/disable odometer related periodic messages: 0 = Periodic message disabled (default) 1 = Periodic message enabled
alarm	Decimal, 0-65535	Distance travelled between two NMEA messages. Unit: m (default value: 1000)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- If no error occurs, the following message will be returned:

```
$PSTMCFGODOOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGODOERROR*<checksum><CR><LF>
```

Example:

```
$PSTMCFGODO,1,0,0,0      //Enable odometer feature
$PSTMSAVEPAR             //Save
$PSTMSRR                 //Restart
$PSTMODOSTART            //Start odometer
$PSTMODOSTOP             //Stop odometer
```

```
$PSTMODOREQ          //Inquiry odometer
$PSTMODORESET        //Reset odometer
```

2.3.29. $PSTMCFGGEOFENCE

This command configures the geo-fencing feature. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGGEOFENCE,<en>,<tol>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
en	Decimal, 1 digit	Enable/disable geo-fencing: 0 = Geo-fencing disabled (default) 1 = Geo-fencing enabled
tol	Decimal, 1 digit	Tolerance: 0 = No tolerance 1 = Geofencing status probability is 68% (default) 2 = Geofencing status probability is 95% 3 = Geofencing status probability is 99%
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- If no error occurs, the following message will be returned:

```
$PSTMCFGGEOFENCEOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGGEOFENCEERROR*<checksum><CR><LF>
```

Example:

```
$PSTMCFGGEOFENCE,1,1          //Enable the geo-fencing feature
$PSTMCFGGEOCIR,1,1,31.839225,117.21645277777777,200
                              //Set the circle geo-fencing
$PSTMSAVEPAR                  //Save
$PSTMSRR                      //Restart
$PSTMGEOFENCEREQ              //Inquiry the status
```

```
$PSTMGEOFENCESTATUS,022026,20190402,1,1,1,1,0,0,0,0*00
                                    //Response: current position is outside of the circle.
```

2.3.30. $PSTMCFGGEOCIR

This command configures the circle parameter of geo-fencing. The setting can only take effect by issuing the saving command (i.e. **$PSTMSAVEPAR**) and, then, resetting the system (through **$PSTMSRR**). Once saved, the configurations will persist even after a power cycling.

Synopsis:

```
$PSTMCFGGEOCIR,<circleid>,<en>,<lat>,<lon>,<rad>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
circleid	Decimal, 1 digit	Geo-fencing circle ID From 0 to 4
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
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- If no error occurs, the following message will be returned:

```
$PSTMCFGGEOCIROK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMCFGGEOCIRERROR*<checksum><CR><LF>
```

2.3.31. $PSTMIMUSELFTESTCMD

This command executes the self-test procedure in IMU. Only L26-P module supports this command.

Synopsis:

```
$PSTMIMUSELFTESTCMD,<IMU Cat>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
IMU Cat	Decimal, 1 digit	Indicates one of IMU types: 0 = Accelerometer 1 = Gyroscope
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- In the case of a successful execution of this command, the following message will be returned:

```
$PSTMIMUSELFTESTCMDOK*<checksum><CR><LF>
```

- In the case of a failure of this command, the following message will be returned:

```
$PSTMIMUSELFTESTCMDKO*<checksum><CR><LF>
```

- In the case that this command is not supported by the mounted IMU or the firmware, or the sensor layer is not present in FW, the following message will be returned:

```
$PSTMIMUSELFTESTCMDERROR*<checksum><CR><LF>
```

Example:

```
$PSTMIMUSELFTESTCMD,0    //Accelerometer self-test
$PSTMIMUSELFTESTCMD,1    //Gyroscope self-test
```

2.3.32. $PSTMSETTHTRK

This command configures the C/No and elevation mask angle thresholds for tracking. It changes these parameters at run-time and no reset is required. The configuration will not be saved after reset.

Synopsis:

```
$PSTMSETTHTRK,<C/No>,<el>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
C/No	Decimal	Tracking C/No threshold Unit: dB (default value: 7)
el	Double	Tracking elevation mask angle Unit: degree (default value: 5)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Results

- If no error occurs, the following message will be returned:

```
$PSTMSETTHTRKOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMSETTHTRKERROR*<checksum><CR><LF>
```

2.3.33. $PSTMSETTHPOS

This command configures the C/No and elevation mask angle thresholds for positioning. It changes these parameters at run-time and no reset is required. The configuration will not be saved after reset.

Synopsis:

```
$PSTMSETTHPOS,<C/No>,<el>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
C/No	Decimal	Positioning C/No threshold Unit: dB (default value: 15)
el	Double	Positioning elevation mask angle Unit: degree (default value: 5)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters.

Results

- If no error occurs, the following message will be returned:

```
$PSTMSETTHTRKOK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMSETTHTRKERROR*<checksum><CR><LF>
```

2.4. System Commands

The GNSS software utilizes a “Configuration Data Block” in which parameters used for receiver configuration are grouped.

2.4.1. $PSTMGETPAR

This command gets the software version information.

Synopsis:

```
$PSTMGETPAR,1500*<checksum><CR><LF>
```

Arguments:

None.

Results:

- If there are no error, the version information is returned:

```
$PSTMSETPAR,1500,<version info>*<checksum><CR><LF>
```

- In case of errors, the error message is returned:

```
$PSTMGETPARERROR*<checksum><CR><LF>
```

Example:

```
$PSTMGETPAR,1500                    //input
$PSTMSETPAR,1500,L26TNR01A03V03*09  //response
```

2.4.2. $PSTMSAVEPAR

This command saves current configuration data block into the backup section of NVM.

Synopsis:

```
$PSTMSAVEPAR*<checksum><CR><LF>
```

Arguments:

None.

Results:

- If no error occurs, the current configuration data block, including changed parameters, will be stored into the backup section of NVM, and the returned message will be:

```
$PSTMSAVEPAROK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMSAVEPARERROR*<checksum><CR><LF>
```

Example:

```
$PSTMSAVEPAR
```

2.4.3. $PSTMRESTOREPAR

This command is used to reset to factory settings. The configuration data block stored in NVM, if present, will be invalidated. Any changed parameter will be lost. A system rebooting (e.g. $PSTMSRR) is needed to complete the factory setting restoring and to get system working with default configurations.

Synopsis:

```
$PSTMRESTOREPAR*<checksum><CR><LF>
```

Arguments:

None.

Results:

- If no error occurs, the factory settings will be restored and the configuration block in the backup section of NVM will be lost. System reboot is needed to complete the restoring to get the system work with factory default settings. In this case, the returned message will be:

```
$PSTMRESTOREPAROK*<checksum><CR><LF>
```

- If there is any error, the following message will be returned:

```
$PSTMRESTOREPARERROR*<checksum><CR><LF>
```

Example:

```
$PSTMRESTOREPAR
```

3 Messages

3.1. Standard NMEA Messages

This chapter introduces the standard NMEA messages supported by L26-T and L26-P modules.

3.1.1. List of Standard NMEA Messages

L26-T and L26-P modules supports output of the following NMEA messages ($--GBS is only supported by L26-P).

Table 11: List of Standard NMEA Messages

Syntax	Default	Description
$--RMC	ON	NMEA: Recommended minimum specific GNSS data
$--VTG	L26-T: ON L26-P: OFF	NMEA: Course over ground and ground speed
$--GGA	ON	NMEA: Global positioning system fix data
$--GSA	L26-T: ON L26-P: OFF	NMEA: GPS DOP and active satellites.
$--GSV	L26-T: ON L26-P: OFF	NMEA: GPS satellites in view.
$--GLL	L26-T: ON L26-P: OFF	NMEA: Geographic position - latitude/longitude
$--GBS	OFF	NMEA: GNSS satellite fault detection (only supported by L26-P)
$--GNS	OFF	NMEA: GNSS fix data
$--GST	OFF	NMEA: GNSS pseudo range error statistics
$--ZDA	OFF	NMEA: Time & Date

3.1.2. Specification of Standard NMEA Messages

These messages are defined within the “NMEA 0183” specification. The structure of NMEA message is shown as below:

Table 12: Structure of Standard NMEA Messages

Field	Length (Bytes)	Description
$	1	Each NMEA message starts with “$”
Talker ID	1~2	GP: If system works in GPS only mode GL: If system works in GLONASS only mode GA: If system works in Galileo only mode BD: If system works in BeiDou only mode QZ: If system works in QZSS only mode GN: If system works in multi-constellation mode.
NMEA Message ID	3	NMEA message ID
Data Field	Variable, depend on the NMEA message type	Data fields, delimited by comma “,”
*	1	End character of data field
Checksum	2	A hexadecimal number of all characters between “$” and “*”, which is calculated by exclusive OR
<CR><LF>	2	Each NMEA message ends with <CR><LF>

3.1.2.1. $--RMC

RMC, Recommended Minimum Specific GNSS Data. Time, date, position, course and speed data provided by a GNSS navigation receiver. All data fields must be provided, null fields used only when data is temporarily unavailable.

Format for NMEA 0183 Rev 3.01 (Default):
$GPRMC,<Timestamp>,<Status>,<Lat>,<N/S>,<Long>,<E/W>,<Speed>,<Trackgood>,<Date>,<MagVar>,<MagVarDir>,<mode>*<checksum><CR><LF>
Format 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>
Example for NMEA 0183 Rev 3.01 (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,202340.000,A,4045.53297,N,01447.20361,E,0.2,0.0,291117,,,A,C*18

Field	Format	Description
$	Char	Each NMEA message starts with “$”
TalkerID	String, 2 characters	For NMEA 4.10: 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 1: decimal fraction assumes non-zero values when the fix rate is bigger than 1 Hz. NOTE 2: for Rev 4.10, this field is empty in the case of invalid value.
Status	A or V	V = Invalid A = Valid
Lat	DDMM.MMMMM	Latitude as degrees: DD: Degree (fixed two digits) MM: Minutes (fixed two digits) .MMMMM: Decimal fraction of minutes (variable) NOTE: for Rev 4.10, this field is empty in the case of invalid value.
N/S	N or S	Latitude direction: N = North S = South NOTE: for Rev 4.10, this field is empty in the case of invalid value.
Long	DDDMM.MMMMM	Longitude as degrees: DDD: Degree (fixed three digits) MM: Minutes (fixed two digits) .MMMMM: Decimal fraction of minutes (variable) NOTE: for Rev 4.10, this field is empty in the case of invalid value.
E/W	E or W	Longitude direction: E = East W = West NOTE: for Rev 4.10, this field is empty in the case of invalid

		value.
Speed	x.x,	Speed over ground in knots (variable length)
Trackgood	x.x,	Course made good, max. 999.9 (variable length)
Date	Decimal, 6 digits	Date in format “ddmmyy”
MagVar	Decimal, 4 digits	Magnetic variation in degree, not being output
MagVarDir	E or W	Magnetic variation E or W indicator, not being output
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
*	1 byte	End character of data field
Checksum	2 bytes	A hexadecimal number of all characters between “$” and “*”, which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.2. $--VTG

VTG, Course Over Ground and Ground Speed. The actual course and ground speed.

Format for NMEA 0183 Rev 3.01 (Default):
$GPVTG,<TMGT>,T,<TMGM>,M,<SoGN>,N,<SoGK>,K,D*<checksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>VTG,<TMGT>,T,<TMGM>,M,<SoGN>,N,<SoGK>,K,D*<checksum><CR><LF>
Example:
$GPVTG,73.2,T,,M,0.2,N,0.4,K,D*50

Field	Format	Description
$	Char	Each NMEA message starts with “$”
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 “kilometers”
D	Char	Mode indicator: A = Autonomous mode D = Differential mode E = Estimated mode
*	1 byte	End character of data field
Checksum	2 bytes	A hexadecimal number of all characters between “$” and “*”, which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.3. $--GGA

GGA, Global Positioning System Fix Data. Time, position and fix related data for a GPS receiver.

Format for NMEA 0183 Rev 3.01 (Default):
$--GGA,<Timestamp>,<Lat>,<N/S>,<Long>,<E/W>,<GPSQual>,<Sats>,<HDOP>,<Alt>,<AltVal>,<GeoSep>,<GeoVal>,<DGPSAge>,<DGPSRef>*<checksum><CR><LF>
Format 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>
Example:
$GPGGA,183417.000,04814.03970,N,01128.52205,E,0,00,99.0,495.53,M,47.6,M,,*53

Field	Format	Description
$	Char	Each NMEA message starts with “$”

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 1: decimal fraction assumes non-zero values when the fix rate is bigger than 1 Hz. NOTE 2: 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: for Rev 4.10, this field is empty in the case of invalid value.
N/S	N or S	Latitude direction: North or South NOTE: for Rev 4.10, this field is empty in the case of invalid value.
Long	DDDMM.MMMMM	Longitude as degrees: DDD: Degree (fixed three digits) MM: Minutes (fixed two digits) .MMMMM: Decimal fraction of minutes (variable) NOTE: for Rev 4.10, this field is empty in the case of invalid value.
E/W	E or W	Longitude direction: E = East W = West NOTE: for Rev 4.10, this field is empty in the 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, for example, 08
HDOP	x.x	Horizontal dilution of precision, maximum value is 99.0 (variable length)

Alt	x.x	Height above mean sea level, maximum value is 100000.0m (variable length)
AltVal	M	Reference unit for altitude M = meter
GeoSep	x.x	Geoidal separation measure in meters (variable length)
DGPSAge	Empty	Not supported
DGPSRef	Empty	Not supported
*	1 byte	End character of data field
Checksum	2 bytes	A hexadecimal number of all characters between "$" and "*", which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.4. $--GSA

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

In multi-constellation mode, the talker ID is always GN. If NMEA is set as Rev 3.01, it is possible to force the talker ID as GN.

When NMEA is set as Rev 4.10, the talker ID could not be forced and is managed internally to be compliant with the standard. For information about available values of Talker ID, please check the following parameter table.

Format for NMEA 0183 Rev 3.01 (Default):
$--GSA,<Mode>,<CurrentMode>,<SatPRN1>,...,<SatPRNN>,<PDOP>,<HDOP>,<VDOP>*<checksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>GSA,<Mode>,<CurrentMode>,<SatPRN1>,...,<SatPRNN>,<PDOP>,<HDOP>,<VDOP>,<SystemID>*<checksum><CR><LF>
Example for NMEA 0183 Rev 3.01 (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

Field	Format	Description
$	Char	Each NMEA message starts with "$"

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.
Mode	1 character	M = Manual, forced to operate in 2D or 3D mode A = Automatic, allowed to automatically switch 2D/3D
CurrentMode	Decimal, 1 digit	1 = Fix not available 2 = 2D 3 = 3D
SatPRN (1 to 12)	Decimal, 2 or 3 digits	Satellites list used for positioning
PDOP	x.x	Position dilution of precision, maximum value is 99.0 (variable length)
HDOP	x.x	Horizontal dilution of precision, maximum value is 99.0 (variable length)
VDOP	x.x	Vertical dilution of precision, maximum value is 99.0 (variable length)
SystemID	Hexadecimal, 1 digit	The system ID of this message: 1 = GPS 2 = GLONASS 3 = Galileo 4 = BeiDou 5 = QZSS
*	1 byte	End character of data field
Checksum	2 bytes	Hexadecimal checksum
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.5. $--GSV

GSV, GNSS Satellites in View. The GSV sentence provides the number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value. The GSV sentence contains four satellites maximum per transmission. The total number of sentences being transmitted and the sentence number being transmitted are indicated in the first two fields.

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.

Format for NMEA 0183 Rev 3.01 (Default):
$--GSV,<GSVAmount>,<GSVNumber>,<TotSats>,<Sat1PRN>,<Sat1Elev>,<Sat1Azim>,<Sat1C/No>,…,<Sat4PRN>,<Sat4Elev>,<Sat4Azim>,<Sat4C/No>*<checksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>GSV,<GSVAmount>,<GSVNumber>,<TotSats>,<Sat1PRN>,<Sat1Elev>,<Sat1Azim>,<Sat1C/No>,…,<Sat4PRN>,<Sat4Elev>,<Sat4Azim>,<Sat4C/No>,<SignalID>*<checksum><CR><LF>
Example for NMEA 0183 Rev 3.01 (Default):
$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

Field	Format	Description
$	Char	Each NMEA message starts with “$”
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
GSVAmount	Decimal, 1 digit	Total amount of GSV messages, maximum value is 8
GSVNumber	Decimal, 1 digit	Continued GSV number of this message
TotSats	Decimal, 2 digits	Total number of satellites in view, maximum value is 32
SatxPRN	Decimal, 2 digits	Satellites list used for positioning.
SatxElev	Decimal, 2 digits	Elevation of satellite x in degree (00-90)
SatxAzim	Decimal, 3 digits	Azimuth of satellite x in degree, ref. “North”, (000-359)
SatxC/No	Decimal, 2 digits	Carrier to noise ratio for satellite x in dB, (00-99)
SignalID	Decimal, 1 digit	An identifier to indicate the signal in use. Currently it is 1 for GPS, GLONASS, 2 for BeiDou and QZSS, 6 for Galileo
*	1 byte	End character of data field

Checksum	2 bytes	A hexadecimal number of all characters between “$” and “*”, which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.6. $--GLL

GLL, Geographic Position – Latitude/Longitude. Latitude and Longitude of vessel position, time of position fix and status.

Format for NMEA 0183 Rev 3.01 (Default):
$GPGLL,<Lat>,<N/S>,<Long>,<E/W>,<Timestamp>,<Status>,<Mode indicator>*<checksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>GLL,<Lat>,<N/S>,<Long>,<E/W>,<Timestamp>,<Status>,<Mode indicator>*<checksum><CR><LF>
Example:
$GPGLL,4055.04673,N,01416.54941,E,110505.000,A,A*54

Field	Format	Description
$	Char	Each NMEA message starts with “$”
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.
Lat	DDMM.MMMMM	Latitude as degrees: DD: Degree (fixed two digits) MM: Minutes (fixed two digits) .MMMMM: Decimal fraction of minutes (variable) NOTE: for Rev 4.10, this field is empty in the case of invalid value.
N / S	N or S	Latitude direction: N = North S = South NOTE: for Rev 4.10, this field is empty in the case of invalid value.
Long	DDDMM.MMMMM	Longitude as degrees: DDD: Degree (fixed three digits) MM: Minutes (fixed two digits) .MMMMM: Decimal fraction of minutes (variable)

		NOTE: for Rev 4.10, this field is empty in the case of invalid value.
E / W	E or W	Longitude direction: E = East W = West NOTE: for Rev 4.10, this field is empty in the case of invalid value.
Timestamp	hhmmss.sss	UTC time of GGL sample ".sss" is the fraction of seconds; it assumes non-zero values when the fix rate is bigger than 1 Hz.
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
*	1 byte	End character of data field
Checksum	2 bytes	A hexadecimal number of all characters between "$" and "*", which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.7. $--GBS

GBS, GNSS Satellite Fault Detection.

Format for NMEA 0183 Rev 3.01 (Default):
$GPGBS,<Timestamp>,<LatErr>,<LonErr>,<AltErr>,<SatPRN>,<Prob>,<Res>,<StdDev>*<checksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>GBS,<Timestamp>,<LatErr>,<LonErr>,<AltErr>,<SatPRN>,<Prob>,<Res>,<StdDev>,<SystemID>,<SignalID>*<checksum><CR><LF>
Example for NMEA 0183 Rev 3.01 (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

Field	Format	Description
$	Char	Each NMEA message starts with "$"
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 1: decimal fraction assumes non zero values when the fix rate is bigger than 1 Hz. NOTE 2: for Rev 4.10 this field is empty in the case of invalid value.
LatErr	dd.d	Standard deviation of latitude error Unit: m
LonErr	dd.d	Standard deviation of longitude error Unit: m
AltErr	dd.d	Standard deviation of altitude error Unit: m
SatPRN	Decimal, 2 digits	PRN Number of most likely failed satellite. This satellite is excluded by RAIM algorithm.
Prob	Empty	Probability of missed detection for most likely failed satellite. Not supported.
Res	dd.d	Range residual of most likely failed satellite Unit: m
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 6 = IRNSS
SignalID	Decimal, 1 digit	An identifier to indicate the signal in use. Currently it is 1 for GPS, GLONASS, 2 for BeiDou and QZSS, 6 for Galileo, IRNSS is 7.
*	1 byte	End character of data field
Checksum	2 bytes	A hexadecimal number of all characters between “$”

		and “*”, which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.8. $--GNS

GNS, Fix data for single or combined satellite navigation systems (GNSS). This sentence provides fix data for GPS, GLONASS, possible future satellite systems, and systems combining these. This sentence could be used with the talker ID of GP for GPS, GL for GLONASS, GA for Galileo, BD for Beidou, GN for GNSS combined systems, as well as future identifiers. Some fields may be null fields for certain applications.

Format for NMEA 0183 Rev 3.01 (Default):
$<TalkerID>GNS,<UTC>,<Latitude>,<N/S>,<Longitude>,<E/W>,<Mode indicator>,<number of SU>,<HDOP>,<Antenna altitude>,<Geoidal separation>,<Age of differential data>,<Differential reference station ID>*<checksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>GNS,<UTC>,<Latitude>,<N/S>,<Longitude>,<E/W>,<Mode indicator>,<number of SU>,<HDOP>,<Antenna altitude>,<Geoidal separation>,<Age of differential data>,<Differential reference station ID>*<checksum><CR><LF>
Example for NMEA 0183 Rev 3.01 (Default):
$GNGNS,014253.000,3150.78452,N,11711.91865,E,AANNN,11,0.7,0085.6,0.0,,*24

Field	Format	Description
$	Char	Each NMEA message starts with “$”
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.
UTC	hhmmss.sss	UTC of position
Latitude	DDMM.MMMMM	Latitude as degrees: DD: Degree (fixed two digits) MM: Minutes (fixed two digits) .MMMMM: Decimal fraction of minutes (variable)
N / S	N or S	Latitude direction: N = North S = South
Longitude	DDDMM.MMMMM	Longitude as degrees: DDD: Degree (fixed three digits)

		MM: Minutes (fixed two digits) .MMMMM: Decimal fraction of minutes (variable)
E / W	E or W	Longitude direction: E = East W = West
Mode indicator	CCCCC	A variable length valid character field type. The order of characters in the Mode Indicator is: GPS, GLONASS, Galileo, Beidou and QZSS. The characters shall take one of the following values: A = Autonomous. Satellite system used in non-differential mode in position fix. D = Differential. Satellite system used in differential mode in position fix. Corrections from ground stations or Satellite Based Augmentation System (SBAS). N = No fix. Satellite system not used in position fix, or fix not valid. The Mode Indicator shall not be a null field.
number of SU	decimal	Total number of satellites in use, 00-99
HDOP	x.x	Horizontal dilution of precision, maximum value is 99.0 (variable length)
Antenna altitude	x.x	Antenna altitude, meters, re: mean-sea-level (geoid) (variable length)
Geoidal separation	x.x	Geoidal separation measured in meters (variable length)
Age of differential data	Empty	Not supported
Differential reference station ID	Empty	Not supported
*	1 byte	End character of data field
Checksum	2 bytes	A hexadecimal number of all characters between “$” and “*”, which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.9. $--GST

GST, GNSS Pseudorange Error Statistics.

Format for NMEA 0183 Rev 3.01 (Default):
$GPGST,<Timestamp>,<EHPE>,<Semi-major>,<Semi-minor>,<Angle>,<LatErr>,<LonErr>,<AltErr>*<c

hecksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>GST,<Timestamp>,<EHPE>,<Semi-major>,<Semi-minor>,<Angle>,<LatErr>, <LonErr>,<AltErr>*<checksum><CR><LF>
Example for NMEA 0183 Rev 3.01 (Default):
$GPGST,101429.000,0.0,3.5,3.1,89.4,3.2,3.4,3.4*58
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

Field	Format	Description
$	Char	Each NMEA message starts with “$”
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 1 Hz. Note that for Rev 4.10 this field is empty in case of invalid value.
EHPE	dd.d	Equivalent Horizontal Position Error Unit: m
Semi-major	dd.d	Standard deviation of semi-major axis of error ellipse Unit: m
Semi-minor	dd.d	Standard deviation of semi-minor axis of error ellipse Unit: m
Angle	dd.d	Orientation of semi-major axis of error ellipse (true North degrees)
LatErr	dd.d	Standard deviation of latitude error Unit: m
LonErr	dd.d	Standard deviation of longitude error Unit: m
AltErr	dd.d	Standard deviation of altitude error Unit: m

*	1 byte	End character of data field.
Checksum	2 bytes	A hexadecimal number of all characters between “$” and “*”, which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.1.2.10. $--ZDA

ZDA, UTC, day, month and year.

Format for NMEA 0183 Rev 3.01 (Default):
$GPZDA,<Timestamp>,<Day>,<Month>,<Year>,00,00*<checksum><CR><LF>
Format for NMEA 0183 Rev 4.10:
$<TalkerID>ZDA,<Timestamp>,<Day>,<Month>,<Year>,,*<checksum><CR><LF>
Example for NMEA 0183 Rev 3.01 (Default):
$GPZDA,110505.00,25,01,2013,00,00*60
Example for NMEA 0183 Rev 4.10:
$GNZDA,204409.000,29,11,2017,,*4C

Field	Format	Description
$	Char	Each NMEA message starts with “$”
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 1 Hz. 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 - …)

*	1 byte	End character of data field
Checksum	2 bytes	A hexadecimal number of all characters between "$" and "*", which is calculated by exclusive OR
<CR><LF>	2 bytes	Each NMEA message ends with <CR><LF>

3.2. Proprietary NMEA Messages

This chapter introduces the proprietary NMEA messages supported by L26-T and L26-P modules.

3.2.1. List of Proprietary NMEA Messages

Table 13: List of Proprietary NMEA Messages

Syntax	Default	Description
$PSTMANTENNASTATUS	ON	Report the status of the antenna (only supported by L26-T)
$ PSTMDRSENMSG	ON	Sensor raw data: report the sensor values (only supported by L26-P)
$PSTMGEOFENCESTATUS	OFF	Report the status of the geo-fence
$PSTMNOTCHSTATUS	OFF	Report the notch filter status
$PSTMODO	OFF	Report the values of the odometer
$PSTMTG	L26-T: OFF L26-P: ON	GNSS raw data: Time and number of used satellites
$PSTMTS	L26-T: OFF L26-P: ON	GNSS raw data: Tracked satellite data
$PSTMPPSDATA	L26-T: OFF L26-P: ON	Report the pulse per second data
$PSTMUTC	OFF	Report the UTC time, date and time offset parameters (only supported by L26-T)
$PSTMSBAS	OFF	Report SBAS satellite data
$PSTMCPU	ON	Report the real time CPU usage and speed setting (only supported by L26-P)

3.2.2. Specification of Proprietary NMEA Messages

3.2.2.1. $PSTMANTENNASTATUS

This message reports the status of the antenna (normal, open or short-circuited). It also reports information about the operating mode of antenna detection and the antenna (external or internal antenna) being used. Only L26-T supports this message.

Synopsis:

```
$PSTMANTENNASTATUS,<ant_status>,<op_mode>,<rf_path>,<pwr_switch>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
ant_status	Decimal, 1 digit	Antenna status: 0 = Normal 1 = Open 2 = Short-circuited
op_mode	Decimal, 1 digit	Operating mode 0 = Auto - the antenna is managed automatically by the software logic 1 = Manual - the antenna ON-OFF or RF switching is controlled by commands
rf_path	Decimal, 1 digit	Current RF path: 0 = External antenna 1 = Internal antenna
pwr_switch	Decimal, 1 digit	Current antenna power status: 0 = Antenna power is on 1 = Antenna power is off
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

3.2.2.2. $PSTMDRSENMSG

This message reports sensor message data, which is specific to the message ID for each sensor configuration. Only L26-P supports this message.

Synopsis: for Message ID=1

```
$PSTMDRSENMSG,1,<cpu timestamp>,<odometer>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
cpu timestamp	Decimal, 10 digits	Microseconds
odometer	Decimal, 5 digits	Unsigned odometer count
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Synopsis: for Message ID=2

```
$PSTMDRSENMSG,2,<cpu timestamp>,<reverse>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
cpu timestamp	Decimal, 10 digits	Microseconds
reverse	Enum	0 = Forward 1 = Reverse
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Synopsis: for Message ID=3

```
$PSTMDRSENMSG,3,<cpu timestamp>,<odometer>,<reverse>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
cpu timestamp	Decimal, 10 digits	Microseconds
odometer	Decimal, 5 digits	Unsigned odometer count
reverse	Enum	0 = Forward 1 = Reverse
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Synopsis: for Message ID=14

```
$PSTMDRSENMSG,14,<cpu timestamp>,<vehicle speed>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
cpu timestamp	Decimal, 10 digits	Microseconds
vehicle speed	Decimal, 5 digits	1 kph resolution
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Synopsis: for Message ID=24

$PSTMDRSENMSG,24,<cpu timestamp>,<temperature>,<validity>*<checksum><CR><LF>

Arguments:

Parameter	Format	Description
cpu timestamp	Decimal, 10 digits	Microseconds
temperature	Decimal	Gyro sensor temperature
validity	Boolean	0 = Temperature is not valid 1 = Temperature is valid
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Synopsis: for Message ID=30

$PSTMDRSENMSG,30,<cpu timestamp>,<raw_x>,<raw_y>,<raw_z>*<checksum><CR><LF>

Arguments:

Parameter	Format	Description
cpu timestamp	Decimal, 10 digits	Microseconds
raw_x	Decimal, 5 digits	Raw signed 16-bit X-axis acceleration
raw_y	Decimal, 5 digits	Raw signed 16-bit Y-axis acceleration
raw_z	Decimal, 5 digits	Raw signed 16-bit Z-axis acceleration
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Synopsis: for Message ID=31

```
$PSTMDRSENMSG,31,<cpu timestamp>,<raw_x>,<raw_y>,<raw_z> *<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
cpu timestamp	Decimal, 10 digits	Microseconds
raw_x	Decimal, 5 digits	Raw signed 16-bit X-axis angular rate
raw_y	Decimal, 5 digits	Raw signed 16-bit Y-axis angular rate
raw_z	Decimal, 5 digits	Raw signed 16-bit Z-axis angular rate
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Result:

This message provides sensor data at the typical sampling rate of 15 Hz.

3.2.2.3. $PSTMGEOFENCESTATUS

This message is sent from GNSS receiver to the host as response to **$PSTMGEOFENCEREQ**. Geo-fencing reports a bitmap against which circle is raising the alarm.

Synopsis:

```
$PSTMGEOFENCESTATUS,<timestamp>,<datestamp>,<status_1>,<status_2>,…,<status_x>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
timestamp	Decimal, 6 digits	Hour (2 digits) Minute (2 digits) Seconds (2 digits)
datestamp	Decimal, 8 digits	Year (4 digits) Month (2 digits) Day (2 digits)
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
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

3.2.2.4. $PSTMNOTCHSTATUS

This message provides information on the Adaptive Notch Filter (ANF) status. When ANF is disabled, all parameters will be set to zero. Frequency/Power values are meaningful only when Notch is locked.

Synopsis:

```
$PSTMNOTCHSTATUS,<kfreq_now_Hz_gps>,<lock_en_gps>,<pwr_gps>,<ovfs_gps>,<mode_gps>,<kfreq_now_Hz_gln>,<lock_en_gln>,<pwr_gln>,<ovfs_gln>,<mode_gln>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
kfreq_now_Hz_gps	Decimal, 7 digits	Actual value of notch frequency estimation (GPS path). Unit: Hz
lock_en_gps	Decimal, 1 digit	Frequency lock flag (GPS path)
pwr_gps	Decimal, 5 digits	Internal power estimation of band pass filter (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 digit	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	Actual value of Notch frequency estimation (GLONASS path) Unit: Hz
lock_en_gln	Decimal, 1 digit	Frequency lock flag (GLONASS path)
pwr_gln	Decimal, 24 digits	Internal power estimation of band pass filter (GLONASS/BeiDou 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 digit	ANF mode operation (GLONASS path) [0 = ANF disabled; 1 = Always on (internal use only); 2 = Auto insertion mode (suggested);]
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

3.2.2.5. $PSTMODO

This message is sent from GNSS receiver to the host periodically if odometer subsystem is enabled and related messages are in the message list.

Synopsis:

```
$PSTMODO,<timestamp>,<date-stamp>,<odo-A>,<odo-B>,<odo-pon>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
timestamp	Decimal, 6 digits	Hour (2 digits) Minute (2 digits) Seconds (2 digits)
date-stamp	Decimal, 8 digits	Year (4 digits) Month (2 digits) Day (2 digits)
odo-A	Unsigned	Odometer A value
odo-B	Unsigned	Odometer B value
odo-pon	Unsigned	Odometer PON value
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

3.2.2.6. $PSTMTG

This message includes time and satellite information of GNSS raw data.

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>*<checksum><CR><LF>

Arguments:

Parameter	Format	Description
Week	Decimal, 4 digits	Week number
TOW	Decimal, 10 digits	Time of week
TotSat	Decimal, 2 digits	Total number of satellites used for fix
CPUTime	Decimal, 10 digits	CPU time
Timevalid	Decimal, 2 digits	0 = NO_TIME 1 = FLASH_TIME 2 = TOW_TIME 3 = USER_TIME 4 = USER_RTC_TIME 5 = RTC_TIME 6 = RTC_TIME_ACCURATE 7 = APPROX_TIME 8 = ACCURATE_TIME 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 Bit 0: walking mode ON Bit 1: stop detection ON Bit 2: frequency ramp on (only Xtal mode) Bit 3: Velocity estimator model: 1 means MULTIPLE MODEL 0 means SINGLE MODEL Bit 4: velocity estimator filter:

		1 means SLOW 0 means FAST Bit 5: FDE status ON
constellation_mask	Decimal, 4 digits max	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: Galileo constellation enabling/disabling bit 7: BeiDou constellation enabling/disabling bit 10: IRNSS 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
time_master_tow	Floating	master time TOW
time_master_validity	Decimal	master week number time validity
time_aux_week_n	Decimal	auxiliary time
time_aux_tow	Floating	auxiliary time TOW
time_aux_validity	Decimal	auxiliary time validity
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Example:

```
$PSTMTG,2077,305269.99942163,6,80629533,9,-46783.4687,902a,172824.512674,173188.703,80630122,80630124,129,0,0,7,2077,305269.999422,9,2077,305255.999421,7*5C
```

3.2.2.7. $PSTMTS

This message, one of GNSS raw data messages, is repeated for each satellite tracked and used for the calculation of a fix.

Synopsis:

```
$PSTMTS,<dsp-dat>,<SatID>,<PsR>,<Freq>,<plf>,<C/No>,<ttim>,<Satdat>,<Satx>,<Saty>,<Satz>,<Velx>,<Vely>,<Velz>,<src>,<ac>,<difdat>,<drc>,<drrc>,<predavl>,<predage>,<predeph>,<predtd>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
dsp-dat	Decimal, 1 digit	DSP data available: 0 = Satellite not tracked 1 = Satellite tracked
SatID	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
C/No	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 station)
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 satellites. Only valid if predeph is 2
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

NOTE

The fields with the prefix “pre” are only included within the message when the module features AGPS.

Example:

```
$PSTMTS,9,31,27191687.188,-47783.31,-112052111.594,83,43,70089,1,-15949190.28,9220862.31,19278766.31,-2295.81,-824.37,-1458.89,56.09,10.00,0,-5868881.295,-0.574,0,0.00,0.00,82,624,6,0*14
$PSTMTS,9,26,26076888.812,-47111.38,-106193797.500,83,45,68793,1,-6896673.34,19338521.28,16725965.12,-797.03,-1995.33,1995.73,21908.08,8.56,2,-5868881.241,-0.188,0,0.00,0.00,-135,670,7,0*2B
$PSTMTS,9,29,29170198.125,-48495.34,-122449250.855,83,40,69283,1,-17785024.34,-1867321.59,19615071.81,1831.05,-1690.23,1494.41,17253.18,16.50,-3,-5868881.352,-0.984,0,0.00,0.00,77,662,7,0*16
$PSTMTS,9,164,31455006.188,48356.22,133233642.289,83,38,54255,1,-23514955.72,-3673439.81,14593322.12,-1307.96,-1039.22,-2367.64,-263184.42,11.55,0,-5868881.377,0.957,0,0.00,0.00,-23,1008,8,0*2E
$PSTMTS,9,165,28267805.188,46893.12,116637070.141,83,46,67506,1,-10473734.34,12339379.47,22735594.84,-2170.89,-1427.47,-223.81,-119095.67,4.62,-3,-5868881.258,0.113,0,0.00,0.00,69,625,11,0*3E
$PSTMTS,9,174,29814901.500,45135.53,124693214.855,83,41,52020,1,-25868140.91,7182316.47,7584998.72,720.36,-497.19,2928.01,-58275.11,6.92,-8,-5868881.115,-0.898,0,0.00,0.00,-78,747,7,0*00
```

3.2.2.8. $PSTMPPSDATA

This message is used to report the PPS (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><compass_utc_delta_time>*<checksum><CR><LF>
```

Arguments:

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 NOTES: 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/BeiDou NOTE: the reference constellation reports which reference time has been used for the PPS generation.
pulse_duration	Double	Pulse duration Unit: s
pulse_delay	Decimal	Pulse delay Unit: ns
gps_delay	Decimal	GPS path RF delay Unit: ns
glo_delay	Decimal	GLONASS path RF delay Unit: ns

bei_delay	Decimal	BeiDou path RF delay Unit: ns NOTE: this parameter is always zero if Beidou constellation is not supported by the hardware platform.
gal_delay	Decimal	Galileo path RF delay Unit: 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 or a BeiDou time second.
fix_status	Decimal, 1 digit	GNSS position fix status when the time has been corrected.
used_sats	Decimal	Used satellites for time correction.
gps_utc_delta_s	Decimal	UTC leap seconds Unit: s
gps_utc_delta_ns	Decimal	UTC – GPS delta time Unit: ns
glonass_utc_delta_ns	Decimal	UTC – GLONASS delta time Unit: ns
galileo_utc_delat_ns	Decimal	UTC – Galileo delta time Unit: ns
quantization_error	Double (scientific notation format)	Quantization error Unit: s
pps_clock_freq	Double, 2 fractional digits	PPS clock frequency Unit: Hz
tcxo_clock_freq	Double, 2 fractional digits	TCXO clock frequency Unit: Hz
compass_utc_delta_time	Decimal	UTC-COMPASS delta time

		Unit: ns
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters.

3.2.2.9. $PSTMUTC

This message reports the UTC time, date and time offset parameters. NMEA $PSTMUTC message is not supported for Galileo constellation. Only supported by L26-T.

Synopsis:

```
$PSTMUTC,<utc_time>,<utc_date>,<utc_timestamp>,<gps_utc_leap>,<gps_utc_validity>,<glonass_utc_leap>,<glonass_utc_validity>,<beidou_utc_leap>,<beidou_utc_validity>*<checksum><CR><LF>
```

Arguments:

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 1 Hz.
utc_date	ddmmyyyy	Date of fix
utc_timestamp	Decimal	UTC time expressed as number of seconds since January 6th 1980
gps_utc_leap	Decimal, 2 digits	UTC to GPS time offset Unit: s
gps_utc_validity	Decimal, 1 digit	UTC to GPS time offset validity 0 = Invalid 1 = Read from NVM 2 = Valid (downloaded from sky)
glonass_utc_leap	Decimal, 2 digits	UTC to GLONASS time offset (always 0) Unit: s
glonass_utc_validity	Decimal, 1 digit	UTC to GLONASS time offset validity 0 = Invalid 1 = Read from NVM 2 = Valid (downloaded from sky)
beidou_utc_leap	Decimal, 2 digits	UTC to BeiDou time offset Unit: s
beidou_utc_validity	Decimal, 1 digit	UTC to BeiDou time offset validity 0 = Invalid 1 = Read from NVM 2 = Valid (downloaded from sky)

checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters.

Example:

```
$PSTMUTC,012358.000,02122015,1133054638,16,2,00,2,02,2*58
```

3.2.2.10. $PSTMSBAS

This message reports SBAS satellite data.

Synopsis:

```
$PSTMSBAS,<Status>,<SatTrk>,<SatID>,<Elev>,<Azim>,<Sig>*<checksum><CR><LF>
```

Arguments:

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 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 C/No (in dB)
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the “$” and “*” characters

Example:

```
$PSTMSBAS,1,1,129,45,141,20*14
$PSTMSBAS,1,1,137,42,135,23*1C
```

3.2.2.11. $PSTMCPU

This message reports the real time CPU usage and the CPU speed setting. Only L26-P supports this message.

Synopsis:

```
$PSTMCPU,<CPU_Usage>,<PLL_ON_OFF>,<CPU_Speed>*<checksum><CR><LF>
```

Arguments:

Parameter	Format	Description
CPU_Usage	ddd.dd	CPU usage in percent (%)
PLL_ON_OFF	Decimal, 1 digit	PLL enabling/disabling status: 0 = PLL disabled 1 = PLL enabled -1 = Not supported
CPU_Speed	Decimal	CPU clock frequency: 49, 98, 196 MHz
checksum	Hexadecimal, 2 digits	Checksum of the message bytes between but not including the "$" and "*" characters

Example:

```
$PSTMCPU,29.51,-1,196*73
```

4 Default Configurations

Table 14: Default Configurations

Item	Default
NMEA port baud rate	**L26-T:** 9600 bps **L26-P:** 460800 bps
Datum	WGS84
Update rate	**L26-T:** NMEA data: 1 Hz **L26-P:** NMEA data: 1 Hz GNSS raw data: 1 Hz Sensor raw data: 50 Hz
DGPS mode	On
NMEA output messages	**L26-T:** RMC, VTG, GGA, GSA, GSV, GLL and PSTMANTENNASTATUS **L26-P:** RMC, GGA, PSTMCPU, PSTMPPSDATA, PSTMTG, PSTMTS and PSTMDRSENMSG
GNSS configuration	**L26-T:** GPS + GLONASS + Galileo **L26-P:** GPS + BeiDou

5 Appendix A References

Table 15: Related Documents

SN	Document Name	Remark
[1]	Quectel_L26-T&L26-P_Hardware_Design	Hardware design of L26-T and L26-P modules
[2]	Quectel_L26-T&L26-P_Reference_Design	Reference design L26-T and L26-P modules

Table 16: Terms and Abbreviations

Abbreviation	Description
CR	Carriage Return
DGPS	Differential Global Positioning System
GBS	GNSS Satellite Fault Detection
GGA	NMEA: Global Positioning System Fix Data
GLL	NMEA: Geographic Position – Latitude/Longitude
GLONASS	Global Navigation Satellite System (The Russian GNSS)
GNS	GNSS Fix Data
GNSS	Global Navigation Satellite System
GPS	Global Navigation Satellite System
GSA	NMEA: GPS DOP and Active Satellites
GST	GNSS Pseudorange Error Statistics
GSV	NMEA: GPS Satellites in View
HDOP	Horizontal Dilution of Precision
LF	Line Feed

NMEA	National Marine Electronics Association
PDOP	Position Dilution of Precision
PPS	Pulse Per Second
RAIM	Receiver Autonomous Integrity Monitoring
RMC	NMEA: Recommended Minimum Specific GNSS Data
RTK	Real Time Kinematic
SBAS	Satellite-Based Augmentation System
TRAIM	Timing Receiver Autonomous Integrity Monitoring
UTC	Universal Time Coordinated
VDOP	Vertical Dilution of Precision
VTG	NMEA: Course Over Ground and Ground Speed
WGS84	World Geodetic System 1984
ZDA	Time & Date