L26-DR&L26-P&L26-T&LC98S Series
GNSS Protocol Specification

GNSS Module Series

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About the Document

Document Information	
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Revision History

Version	Date	Description
1.0	2020-02-13	Initial
1.1	2020-03-17	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.
1.2	2022-10-20	1. Incorporated the information of L26-DR series and LC98S into this document. 2. Added RLM sentence formatter (*Chapter 2.2.10*). 3. Added the following proprietary NMEA messages: ● PSTMSETPAR,1122 (*Chapter 2.3.25*); ● PSTMGETPAR,1122 (*Chapter 2.3.26*); ● PSTMPOSHOLD (*Chapter 2.3.44*); ● PSTMTRAIMSTATUS (*Chapter 2.3.45*); ● PSTMTRAIMUSED (*Chapter 2.3.46*); ● PSTMTRAIMRES (*Chapter 2.3.47*); ● PSTMTRAIMREMOVED (*Chapter 2.3.48*). 4. Updated PSTMDRSENMSG (*Chapter 2.3.33*).

Version	Date	Description
		5. Added table of GNSS Numbering (*Table 16*).
1.3	2023-09-12	1. Incorporated the information of L26-DR (AA), L26-T (B) and L26-T (D) into this document. 2. Added the following proprietary NMEA messages: ● PSTMSBASSERVICE (*Chapter 2.3.11*); ● PSTMSETPAR,1300 (*Chapter 2.3.27*); ● PSTMNOTCH (*Chapter 2.3.31*); ● PSTMNOTCHSTATUS (*Chapter 2.3.32*); ● PSTMPRES (*Chapter 2.3.40*); ● PSTMVRES (*Chapter 2.3.41*); ● PSTMPV (*Chapter 2.3.42*); ● PSTMNAVM (*Chapter 2.3.43*). 3. Added a note about GSV when the LC98S module is configured with NMEA V3.01 protocol (*Chapter 2.2.4*). 4. Added a note about configuring RLM message output (*Chapter 2.2.10*). 5. Added a note about the module response if it enters the Standby mode immediately after receiving $PSTMFORCESTANDBY (*Chapter 2.3.16*). 6. Added a note about baud rates supported on L26-DR series module (*Chapter 2.3.17*). 7. Updated the description of <ListID> field (*Chapter 2.3.19*). 8. Added 0x02 supported by <NMEA_Format> on L26-DR (ADRC) (*Chapters 2.3.25* and *2.3.26*). 9. Added information that the LC98S module does not support $PSTMANTENNASTATUS and instructions on how to enable the message output on L26-P (*Chapter 2.3.30*). 10. Added a note about configuring $PSTMSBAS message output for the LC98S module (*Chapter 2.3.38*).
1.4	2024-08-22	1. Added the $PSTMCFGAJM message (*Chapter 2.3.31*). 2. Deleted the following messages (*Chapter 2*): ● $PSTMSETCONSTMASK; ● $PSTMNOTCH. 3. Updated the description of <NavStatus> in RMC and GNS messages (*Chapters 2.2.1* and *2.2.3*). 4. Updated the range of <Year> in $PSTMINITGPS and $PSTMINITTIME messages and added the corresponding note (*Chapters 2.3.1* and *2.3.2*). 5. Updated the description of <FixRate> and added a note on <GPS_Min_Week> and <GPS_Max_Week> in the $PSTMCFGTDATA message (*Chapter 2.3.18*). 6. Updated the description of <Rate>, <ListLow>, and <ListHigh> in the $PSTMCFGMSGL message, added the description of using $PSTMCFGMSGL message in the example, and added a note indicating the modules supporting <Rate> (*Chapter 2.3.19*).

Version	Date	Description
		7. Added the description of using the $PSTMSETPAR,1300 command in the example and added a note on configuring multi-Hz output of PVT solution related messages for L26-DR (ADR) (*Chapter 2.3.27*).
1.5	2025-02-14	1. Added a note for setting PPS generation mode (*Chapter 2.3.15.9*). 2. Added PSTMSETPAR,1285,1 and PSTMSETPAR,1667,0x200000 messages (*Chapters 2.3.49* and *2.3.50*). 3. Added PQTMLS message (*Chapter 2.4*).

Contents

Table Index

1 Introduction

Quectel L26-DR series, L26-P, L26-T series and LC98S GNSS modules support GPS, GLONASS, Galileo, BDS and QZSS constellations. Tracking of GPS L1 C/A, GLONASS L1, Galileo E1, BDS B1 and QZSS L1 C/A frequency bands provides fast and accurate acquisition and makes these modules ideal positioning, navigation or timing solutions for various vertical markets.

This document describes the software commands that are needed to control and modify the module configuration. The software commands are NMEA proprietary commands defined by the chipset supplier (PSTM commands). To report GNSS information, these modules support outputting messages in NMEA 0183 standard protocol format.

The L26-DR series, L26-P, L26-T series and LC98S modules support the following protocols:

Table 1: Supported Protocol

Protocol	Type
NMEA 0183 V3.01/V4.10	Output, ASCII, standard
	Input/output, ASCII, proprietary

This document is applicable to the following Quectel GNSS modules:

Table 2: Applicable Modules

Module Series	Module
L26-DR Series	L26-DR (AA)
	L26-DR (ADR)
	L26-DR (ADRC)
	L26-DR (UDR)
L26-P	L26-P
L26-T Series	L26-T

Module Series	Module
	L26-T (B)
	L26-T (D)
LC98S	LC98S

NOTE

1. It is impossible to enable all supported constellations at the same time. Allowed combinations to achieve maximum coverage are:
   - GPS + GLONASS + Galileo + QZSS and
   - GPS + Galileo + BDS + QZSS.

   Any of the aforementioned constellations can be enabled as a standalone satellite navigation system.
2. Quectel assumes no responsibility if commands other than the ones listed herein are used.

2 NMEA Protocol

2.1. Structure of NMEA Protocol Messages

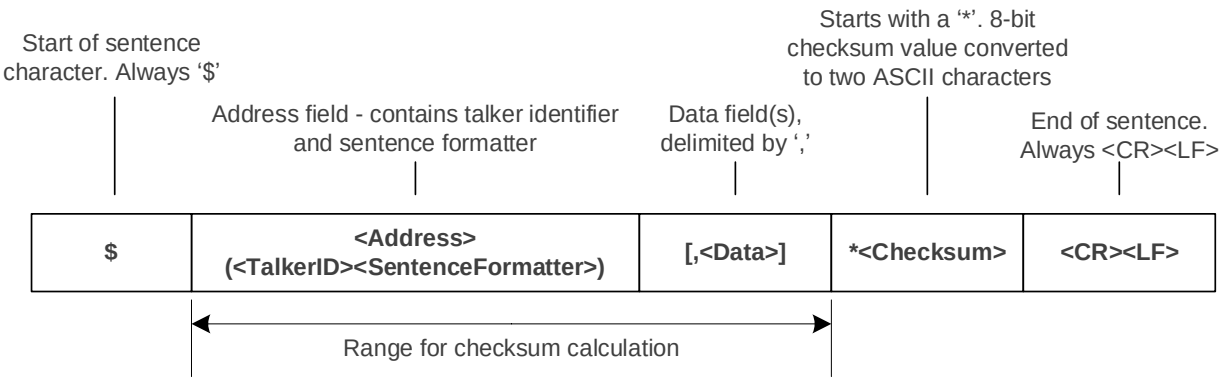

Figure 1: Structure of NMEA Protocol Messages

Table 3: Structure of NMEA Protocol Messages

Field	Description
$	Start of sentence (Hex 0x24).
<Address>	**In Standard Messages:** In standard messages, this field consists of a two-character talker identifier (Talker ID) and a three-character sentence formatter (SentenceFormatter). The talker identifier identifies the type of talker. For more information on the Talker ID, see *Table 4: NMEA Talker ID*. The sentence formatter identifies the data type and the string format of the successive fields. **In Proprietary Messages:** In proprietary messages, this field consists of the proprietary character **P** followed by a three-character Manufacturer's Mnemonic Code, used to identify the TALKER issuing a proprietary sentence, and any additional characters as required.

Field	Description
<Data>	Data fields, delimited by data field delimiter ‘,’. Variable length (depending on NMEA message type).
<Checksum>	Checksum field follows the checksum delimiter character ‘*’. Checksum is the 8-bit exclusive OR of all characters in the sentence, including ‘,’ the field delimiter, between but not including the ‘$’ and the ‘*’ delimiters.
<CR><LF>	End of sentence (Hex 0x0D 0x0A).

Table 4: NMEA Talker ID

GNSS Constellation Configuration	Talker ID (NMEA 0183 V3.01/V4.10)
GPS	GP
GLONASS	GL
Galileo	GA
BDS	BD
QZSS	QZ
Combination of Multiple Satellite Systems	GN

NMEA Checksum Sample Code:

```
// pData  is the data array of which the checksum needs to be calculated:

unsigned char Ql_Check_XOR(const unsigned char *pData, unsigned int Length)
{
    unsigned char result = 0;
    unsigned int i = 0;

    if((NULL == pData) || (Length < 1))
    {
        return 0;
    }
    for(i = 0; i < Length; i++)
    {
        result ^= *(pData + i);
    }
```

```
    return result;
}
```

2.2. Standard Messages

This chapter explains the standard NMEA 0183 V3.01 and V4.10 messages supported by the modules.

- L26-DR (AA, ADR, UDR), L26-P, and L26-T series modules are configured to NMEA 0183 V3.01 format by default.
- L26-DR (ADRC) and LC98S modules are configured to supporting NMEA 0183 V4.10 format by default.

2.2.1. RMC

Recommended Minimum Specific GNSS Data. Time, date, position, course, and speed data provided by a GNSS receiver.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$GPRMC,<UTC>,<Status>,<Lat>,<N/S>,<Lon>,<E/W>,<SOG>,<COG>,<Date>,<MagVar>,<MagVarDir>,<ModeInd>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>RMC,<UTC>,<Status>,<Lat>,<N/S>,<Lon>,<E/W>,<SOG>,<COG>,<Date>,<MagVar>,<MagVarDir>,<ModeInd>,<NavStatus>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GN	Talker identifier. See *Table 4: NMEA Talker ID*. Always “GP” in NMEA 0183 V3.01.
RMC	String	-	RMC	Recommended Minimum Specific GNSS Data.

Field	Format	Unit	Example	Description
<UTC>	hhmmss.sss	-	080215.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Status>	Character	-	A	Positioning system status. A = Data valid. V = Navigation receiver warning.
<Lat>	ddmm.mmmmm	-	3149.33195	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Lon>	dddmm.mmmmm	-	11706.94936	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<SOG>	Numeric	Knot	0.0	Speed over ground. Variable length. Note that this field is empty in case of an invalid value.
<COG>	Numeric	Degree	0.0	Course over ground. Variable length. Maximum value: 359.9.

Field	Format	Unit	Example	Description
				Note that this field is empty in case of an invalid value.
<Date>	ddmmyy	-	150222	Date. dd: Day of month mm: Month yy: Year Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<MagVar>	-	-	-	Magnetic variation. Not supported.
<MagVarDir>	-	-	-	Direction of magnetic variation. Not supported.
<ModeInd>	Character	-	A	Mode indicator. A = Autonomous mode. Satellite system used in non-differential mode in position fix. D = Differential mode. Satellite system used in differential mode in position fix. Corrections from ground stations or Satellite Based Augmentation System (SBAS). E = Estimated (dead reckoning) mode. N = No fix. Satellite system not used in position fix, or fix not valid.
<NavStatus>	Character	-	C	Navigational status (refers to positioning status only). C = Navigational status valid V = Navigational status invalid Note that this parameter is only available in messages in line with NMEA 0183 V4.10 and later versions.
<Checksum>	Hexadecimal	-	*15	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GPRMC,081027.000,A,3149.33388,N,11706.94688,E,0.0,0.0,140222,,,D*66
```

NMEA 0183 V4.10 example:

```
$GNRMC,080215.000,A,3149.33195,N,11706.94936,E,0.0,0.0,150222,,,A,C*15
```

2.2.2. GGA

Global Positioning System Fix Data. Time, position, and fix-related data for the GNSS receiver.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$GPGGA,<UTC>,<Lat>,<N/S>,<Lon>,<E/W>,<Quality>,<NumSatUsed>,<HDOP>,<Alt>,M,<Sep>,M,<DiffAge>,<DiffStation>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>GGA,<UTC>,<Lat>,<N/S>,<Lon>,<E/W>,<Quality>,<NumSatUsed>,<HDOP>,<Alt>,M,<Sep>,M,<DiffAge>,<DiffStation>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GN	Talker identifier. See *Table 4: NMEA Talker ID*. Always “GP” in NMEA 0183 V3.01.
GGA	String	-	GGA	Global Positioning System Fix Data.
<UTC>	hhmmss.sss	-	080247.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Lat>	ddmm.mmmmm	-	3149.33477	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.

Field	Format	Unit	Example	Description
<N/S>	Character	-	N	North-south direction. N = North S = South Note that in NMEA 0183 V4.10 messages, this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmm	-	11706.94845	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Quality>	Numeric	-	1	GPS quality indicator. 0 = Fix not available or invalid. 1 = GPS SPS Mode, fix valid. 2 = Differential GPS, SPS Mode, or Satellite Based Augmentation System (SBAS), fix valid. 6 = Estimated (dead reckoning) mode.
<NumSatUsed> [1)]	Numeric	-	17	Number of satellites in use.
<HDOP>	Numeric	-	0.8	Horizontal dilution of precision. Variable length. Maximum value: 99.0.
<Alt>	Numeric	Meter	048.21	Altitude above mean-sea-level (geoid). Variable length. Maximum value: 100000.0. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
M	Character	-	M	Unit of <Alt>. "M" = meter.
<Sep>	Numeric	Meter	-0.3	Geoid separation (the difference between the earth ellipsoid surface and the mean-sea-level (geoid)

Field	Format	Unit	Example	Description
				surface defined by the reference datum used in the position solution). Variable length. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
M	Character	-	M	Unit of <Sep>. "M" = meter.
<DiffAge>	-	-	-	Differential GPS data age. Not supported.
<DiffStation>	-	-	-	Differential reference station ID. Not supported.
<Checksum>	Hexadecimal	-	*6A	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GPGGA,082233.000,3149.33371,N,11706.94684,E,2,16,0.8,054.42,M,-0.3,M,,*7D
```

NMEA 0183 V4.10 example:

```
$GNGGA,080247.000,3149.33477,N,11706.94845,E,1,17,0.8,048.21,M,-0.3,M,,*6A
```

NOTE

1. The NMEA 0183 specification indicates that **GGA** messages are GPS specific. However, when the receiver is configured for multi-constellations, the content of a **GGA** message will be generated from the multi-constellation solution.
2. [1)] According to the NMEA 0183 specification, the number of satellites in use is between 00 and 12. However, in the multi-constellation solution, the number of satellites in use may exceed 12.

2.2.3. GNS

GNSS Fix Data. Fix data for single or combined satellite navigation systems (GNSS).

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$<TalkerID>GNS,<UTC>,<Lat>,<N/S>,<Lon>,<E/W>,<ModeInd>,<NumSatUsed>,<HDOP>,<Alt>,<Sep>
,<DiffAge>,<DiffStation>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>GNS,<UTC>,<Lat>,<N/S>,<Lon>,<E/W>,<ModeInd>,<NumSatUsed>,<HDOP>,<Alt>,<Sep>
,<DiffAge>,<DiffStation>,<NavStatus>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GN	Talker identifier. See *Table 4: NMEA Talker ID*.
GNS	String	-	GNS	GNSS Fix Data.
<UTC>	hhmmss.sss	-	090647.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Lat>	ddmm.mmmmm	-	3149.33069	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Lon>	dddmm.mmmmm	-	11706.94657	Longitude. ddd: Degrees (000–180)

Field	Format	Unit	Example	Description
				mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<ModeInd> 1)	Character	-	ADDNNN	Mode indicator. A = Autonomous mode. Satellite system used in non-differential mode in position fix. D = Differential mode. Satellite system used in differential mode in position fix. Corrections from ground stations or Satellite Based Augmentation System (SBAS). E = Estimated (dead reckoning) mode. N = No fix. Satellite system not used in position fix, or fix not valid.
<NumSatUsed>	Numeric	-	17	Total number of satellites in use. Range: 00–99.
<HDOP>	Numeric	-	0.7	Horizontal dilution of precision. Maximum value: 99.0.
<Alt>	Numeric	Meter	0055.7	Antenna altitude above the mean-sea-level (geoid). Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Sep>	Numeric	Meter	-0.3	Geoid separation (the difference between the earth ellipsoid surface and the mean-sea-level (geoid) surface defined by the reference datum used in the position solution). Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.

Field	Format	Unit	Example	Description
<DiffAge>	-	-	-	Differential GPS data age. Not supported.
<DiffStation>	-	-	-	Differential reference station ID. Not supported.
<NavStatus>	Character	-	C	Navigational status (refers to positioning status only). C = Navigational status valid V = Navigational status invalid Note that this parameter is only available in messages in line with NMEA 0183 V4.10 and later versions.
<Checksum>	Hexadecimal	-	*24	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GNGNS,082901.000,3149.32957,N,11706.95092,E,AAANNN,16,0.7,0051.4,-0.3,,*48
```

NMEA 0183 V4.10 example:

```
$GNGNS,090647.000,3149.33069,N,11706.94657,E,ADDNNN,17,0.7,0055.7,-0.3,,,C*24
```

NOTE

1) **<ModeInd>** is a variable length field. The first character indicates the use of GPS satellites; the second character indicates the use of GLONASS satellites; the third character indicates the use of Galileo satellites; the fourth character indicates the use of BDS satellites; the fifth character indicates the use of QZSS satellites; and the sixth character is fixed as N.

2.2.4. GSV

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

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$<TalkerID>GSV,<TotalNumSen>,<SenNum>,<TotalNumSat>{,<SatID>,<SatElev>,<SatAz>,<SatCN0>}*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>GSV,<TotalNumSen>,<SenNum>,<TotalNumSat>{,<SatID>,<SatElev>,<SatAz>,<SatCN0>},<SignalID>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GP	Talker identifier. See *Table 4: NMEA Talker ID*.
GSV	String	-	GSV	GNSS Satellites in View.
<TotalNumSen>	Numeric	-	3	Total number of sentences. Range: 1–8.
<SenNum>	Numeric	-	1	Sentence number. Range: 1–**<TotalNumSen>**.
<TotalNumSat>	Numeric	-	12	Total number of satellites in view. Maximum value: 32.
Start of repeat block. Repeat times: 1–4.				
<SatID>	Numeric	-	20	Satellite ID. See *Table 16: GNSS Satellites (NMEA) Numbering*.
<SatElev>	Numeric	Degree	66	Satellite elevation. Range: 00–90.
<SatAz>	Numeric	Degree	295	Satellite azimuth, with true north as the reference plane. Range: 000–359.
<SatCN0>	Numeric	dB-Hz	31	Satellite C/N_0. Range 00–99. Null when not tracking.
End of repeat block.				
<SignalID>	Numeric	-	1	GNSS signal ID. See *Table 16: GNSS Satellites (NMEA) Numbering*. Note that this parameter is only available in messages in line with NMEA 0183 V4.10 or later versions.

Field	Format	Unit	Example	Description
<Checksum>	Hexadecimal	-	*6E	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GPGSV,3,1,12,20,66,289,38,11,59,348,37,02,57,343,36,06,46,063,36*70
$GPGSV,3,2,12,05,40,250,38,19,37,142,28,12,29,256,34,09,23,049,29*77
$GPGSV,3,3,12,17,18,143,31,25,15,298,30,13,11,184,,50,51,161,31*78
$GLGSV,2,1,06,68,71,186,34,82,54,074,38,67,51,035,33,83,48,352,23*62
$GLGSV,2,2,06,69,19,203,20,81,16,115,,,,,,,,*6C
```

NMEA 0183 V4.10 example:

```
$GPGSV,3,1,12,20,66,295,31,11,59,354,31,02,59,346,35,06,45,066,34,1*6E
$GPGSV,3,2,12,05,41,253,34,19,35,143,31,12,28,253,28,09,22,047,26,1*66
$GPGSV,3,3,12,25,15,296,25,17,15,144,28,13,13,183,,50,51,161,26,1*6E
$GLGSV,2,1,06,68,74,187,34,82,54,079,35,83,50,355,25,67,48,034,34,1*7D
$GLGSV,2,2,06,69,22,204,22,81,14,117,,,,,,,,,1*7C
```

NOTE

1. **GN** cannot be used for **GSV** sentences. If satellites of multiple constellations are in view, **GSV** sentences are output with the corresponding talker ID for each constellation.
2. When the LC98S module is configured with the NMEA V3.01 protocol, **<TalkerID>** of the **GSV** sentence is always **GN**. If satellites of multiple constellations are in view, **<TotalNumSen>**, **<SenNum>**, **<TotalNumSat>** are collectively reported, with no individual count provided for each constellation.

2.2.5. 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.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$<TalkerID>GSA,<Mode>,<FixMode>{,<SatID>},<PDOP>,<HDOP>,<VDOP>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

$<TalkerID>GSA,<Mode>,<FixMode>{,<SatID>},<PDOP>,<HDOP>,<VDOP>,<SystemID>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GN	Talker identifier. See *Table 4: NMEA Talker ID*.
GSA	String	-	GSA	GNSS DOP and Active Satellites.
<Mode>	Character	-	A	Selection of 2D or 3D fix. M = Manual, forced to operate in 2D or 3D mode. A = Automatic, allowed to automatically switch to 2D or 3D mode.
<FixMode>	Numeric	-	3	Fix mode. 1 = Fix not available 2 = 2D 3 = 3D
Start of repeat block. Repeat times: 12.				
<SatID>	Numeric	-	08	ID numbers of satellites used in solution. See *Table 16: GNSS Satellites (NMEA) Numbering*. Note that this field is empty in case of invalid value.
End of repeat block.				
<PDOP>	Numeric	-	1.4	Position dilution of precision. Maximum value: 99.99.
<HDOP>	Numeric	-	0.8	Horizontal dilution of precision. Maximum value: 99.99.
<VDOP>	Numeric	-	1.1	Vertical dilution of precision. Maximum value: 99.99.
<SystemID>	Numeric	-	1	GNSS system ID. See *Table 16: GNSS Satellites (NMEA) Numbering*. Note that this parameter is only available in messages in line with NMEA 0183 V4.10 or higher versions.

Field	Format	Unit	Example	Description
<Checksum>	Hexadecimal	-	*37	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GNGSA,A,3,08,07,01,30,27,14,17,,,,,,1.1,0.7,0.9*29
```

NMEA 0183 V4.10 example:

```
$GNGSA,A,3,08,07,21,01,27,30,,,,,,,1.4,0.8,1.1,1*37
```

NOTE

If less than 12 satellites are used for navigation, the remaining **<SatID>** fields are left empty. If more than 12 satellites are used, only the IDs of the first 12 are output.

2.2.6. VTG

Course Over Ground & Ground Speed. The actual course and speed relative to the ground.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$GPVTG,<COGT>,T,<COGM>,M,<SOGN>,N,<SOGK>,K,<ModeInd>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>VTG,<COGT>,T,<COGM>,M,<SOGN>,N,<SOGK>,K,<ModeInd>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GN	Talker identifier. See *Table 4: NMEA Talker ID*. Always “GP” in NMEA 0183 V3.01.

Field	Format	Unit	Example	Description
VTG	String	-	VTG	Course Over Ground & Ground Speed.
<COGT>	Numeric	Degrees	110.3	Course over ground, in true north direction. Note that this field is empty in case of an invalid value.
T	Character	-	T	Fixed field: true.
<COGM>	Numeric	Degrees	-	Course over ground (magnetic). Not supported.
M	Character	-	M	Fixed field: magnetic.
<SOGN>	Numeric	Knots	0.4	Speed over ground in knots. Variable length. Note that this field is empty in case of invalid value.
N	Character	-	N	Fixed field: knot.
<SOGK>	Numeric	km/h	0.6	Speed over ground in kilometers per hour. Variable length. Note that this field is empty in case of invalid value.
K	Character	-	K	Fixed field: kilometers per hour.
<ModeInd>	Character	-	D	Mode indicator. A = Autonomous mode. Satellite system used in non-differential mode in position fix. D = Differential mode. Satellite system used in differential mode in position fix. Corrections from ground stations or Satellite Based Augmentation System (SBAS). E = Estimated (dead reckoning) mode. N = Data not valid.
<Checksum>	Hexadecimal	-	*17	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GPVTG,0.0,T,,M,0.1,N,0.2,K,A*0E
```

NMEA 0183 V4.10 example:

```
$GNVTG,110.3,T,,M,0.4,N,0.6,K,D*17
```

2.2.7. GLL

Geographic Position – Latitude/Longitude. Latitude and longitude of the GNSS receiver position, the time of position fix and status.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$GPGLL,<Lat>,<N/S>,<Lon>,<E/W>,<UTC>,<Status>,<ModeInd>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>GLL,<Lat>,<N/S>,<Lon>,<E/W>,<UTC>,<Status>,<ModeInd>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GP	Talker identifier. See *Table 4: NMEA Talker ID*. Always “GP” in NMEA 0183 V3.01.
GLL	String	-	GLL	Geographic Position – Latitude/Longitude.
<Lat>	ddmm.mmmmm	-	3149.33233	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Lon>	dddmm.mmmmm	-	11706.94768	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.

Field	Format	Unit	Example	Description
<E/W>	Character	-	E	East-west direction. E = East W = West Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<UTC>	hhmmss.sss	-	083358.000	Position UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Status>	Character	-	A	Positioning system status. A = Data valid. V = Data not valid.
<ModeInd>	Character	-	A	Mode indicator. A = Autonomous mode. Satellite system used in non-differential mode in position fix. D = Differential mode. Satellite system used in differential mode in position fix. Corrections from ground stations or Satellite Based Augmentation System (SBAS). E = Estimated (dead reckoning) mode. N = Data not valid.
<Checksum>	Hexadecimal	-	*54	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GPGLL,3149.33233,N,11706.94768,E,083358.000,A,A*54
```

NMEA 0183 V4.10 example:

```
$GNGLL,3149.33372,N,11706.94794,E,065910.000,A,A*43
```

2.2.8. ZDA

Time & Date. UTC, day, month and year.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$GPZDA,<UTC>,<Day>,<Month>,<Year>,00,00*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>ZDA,<UTC>,<Day>,<Month>,<Year>,,*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GN	Talker identifier. See *Table 4: NMEA Talker ID*. Always “GP” in NMEA 0183 V3.01.
ZDA	String	-	ZDA	Time & Date. UTC, day, month and year.
<UTC>	hhmmss.sss	-	080839.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Day>	Numeric	-	15	Day of month. Range: 01–31. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Month>	Numeric	-	02	Month. Range: 01–12. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Year>	Numeric	-	2022	Year. Minimum value: 1994. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Checksum>	Hexadecimal	-	*46	Checksum.

Field	Format	Unit	Example	Description
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GPZDA,084707.000,14,02,2022,00,00*5F
```

NMEA 0183 V4.10 example:

```
$GNZDA,080839.000,15,02,2022,,*46
```

2.2.9. GST

GNSS Pseudorange Error Statistics. This sentence supports Receiver Autonomous Integrity Monitoring (RAIM). Pseudorange measurement error statistics can be translated in the position domain in order to give statistical measures of the quality of the position solution.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$GPGST,<UTC>,<EHPE>,<SemiMajor>,<SemiMinor>,<Orient>,<LatErr>,<LonErr>,<AltErr>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>GST,<UTC>,<EHPE>,<SemiMajor>,<SemiMinor>,<Orient>,<LatErr>,<LonErr>,<AltErr>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 4: NMEA Talker ID*. Always “GP” in NMEA 0183 V3.01.
GST	String, 3 characters	-	GST	GNSS Pseudorange Error Statistics.
<UTC>	hhmmss.sss	-	081018.000	Position fix UTC. hh: Hours (00–23)

Field	Format	Unit	Example	Description
				mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<EHPE>	Numeric	Meter	29.5	Equivalent Horizontal Position Error. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<SemiMajor>	Numeric	Meter	6.7	Standard deviation of semi-major axis of error ellipse. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<SemiMinor>	Numeric	Meter	4.9	Standard deviation of semi-minor axis of error ellipse. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Orient>	Numeric	Degree	90.4	Orientation of semi-major axis of error ellipse (true north degrees). Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<LatErr>	Numeric	Meter	5.3	Standard deviation of latitude error. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<LonErr>	Numeric	Meter	6.4	Standard deviation of longitude error. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<AltErr>	Numeric	Meter	5.6	Standard deviation of altitude error. Note that in NMEA 0183 V4.10 messages, this field is empty in case of invalid value.
<Checksum>	Hexadecimal	-	*71	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GPGST,091702.000,17.5,5.7,4.8,90.7,5.1,5.3,5.2*6C
```

NMEA 0183 V4.10 example:

```
$GNGST,081018.000,29.5,6.7,4.9,90.4,5.3,6.4,5.6*71
```

2.2.10. RLM

Return link message. The receiver will detect the Galileo Search and Rescue (SAR) Return Link Message when the **RLM** function is enabled.

Type:

Output

Synopsis:

NMEA 0183 V3.01 format:

```
$<TalkerID>RLM,<BeaconID>,<UTC>,<MessageCode>,<MessageBody>*<Checksum><CR><LF>
```

NMEA 0183 V4.10 format:

```
$<TalkerID>RLM,<BeaconID>,<UTC>,<MessageCode>,<MessageBody>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String	-	GA	Talker identifier. See *Table 4: NMEA Talker ID*.
RLM	String		RLM	Return link message.
<BeaconID>	Hexadecimal	-	9A22BE29 630F010	Beacon of RLM. Beacon ID. 15 hex characters (60 bits).
< UTC >	hhmmss.ss	-	081213.00	RLM timestamp (i.e., time of reception of the last 20-bit packet of the RLM) in UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) ss: Decimal fraction of seconds
<MessageCode>	Hexadecimal	-	F	Type of **RLM** Message Service. 0 = Reserved

Field	Format	Unit	Example	Description
				1 = Acknowledgement Service RLM 2 = Command Service RLM 3 = Message Service RLM 4–E = Reserved F = Test Service RLM.
<MessageBody>	Hexadecimal	-	1F02	The data parameters provided by **RLS**. Short message contains 4 hex characters (16 bits) and long message contains 24 hex characters (96 bits).
<Checksum>	Hexadecimal		*77	Checksum.
<CR><LF>	Character		-	Carriage return and line feed.

NMEA 0183 V3.01 example:

```
$GARLM,9982BE29630F100,074813.00,F,1F02*05
```

NMEA 0183 V4.10 example:

```
$GARLM,9A22BE29630F010,081213.00,F,1F02*77
```

NOTE

1. Currently **RLM** is only supported by Galileo.
2. You must send **$PSTMCFGMSGL** and **$PSTMSETPAR,1227,10,1*01** commands to enable **RLM** message output. The settings take effect only after you send **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. The configurations are retained even after power cycling.

2.3. PSTM Messages

This chapter explains PSTM messages (proprietary NMEA messages defined by the chipset supplier) supported by L26-DR series, L26-P, L26-T series and LC98S modules.

2.3.1. PSTMINITGPS

Initializes the GPS position and time of GNSS receiver in UTC format. The command must be issued after a cold start or it will fail. The date issued with parameters **<Day>**, **<Month>** and **<Year>** must be within the validity period of the GPS week number.

Type:

Input

Synopsis:

```
$PSTMINITGPS,<Lat>,<N/S>,<Lon>,<E/W>,<Alt>,<Day>,<Month>,<Year>,<Hour>,<Minute>,<Second>
*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Lat>	ddmm.mmm	-	Latitude (i.e., Degree-Minutes. Minute decimals).
<N/S>	Character	-	North-south direction. N = North S = South
<Lon>	dddmm.mmm	-	Longitude (i.e., Degree-Minutes. Minute decimals).
<E/W>	Character	-	East-west direction. E = East W = West
<Alt>	Numeric	Meter	Altitude in meters. Range: 0–10000.
<Day>	dd	-	Day of month. Range: 01–31.
<Month>	mm	-	Month. Range: 01–12.
<Year>	yyyy	-	Year.
<Hour>	hh	-	Hours. Range: 00–23.
<Minute>	mm	-	Minutes. Range: 00–59.
<Second>	ss	-	Seconds. Range: 00–59.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
$PSTMINITGPS,3149.333,N,11706.947,E,0530,15,02,2022,01,31,30*56
```

```
$PSTMINITGPSOK*40
```

NOTE

1. The deviation of input time from current time should be less than 3 seconds.
   GPS time = UTC time + Leap second. For example, in 2019, Leap second = 18 s.
2. The deviation of input position from actual position should be less than 30 kilometers.
3. For the validity period of GPS week number of a specific firmare version, refer to the “Take Note of” in the corresponding Firmware Release Notes.

2.3.2. PSTMINITTIME

Initializes the GPS time of GNSS receiver in UTC format. The date issued with parameters **<Day>**, **<Month>** and **<Year>** must be within the validity period of the GPS week number.

Type:

Input

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<Day>	dd	-	Day of month. Range: 01–31.
<Month>	mm	-	Month. Range: 01–12.
<Year>	yyyy	-	Year.
<Hour>	hh	-	Hours. Range: 00–23.
<Minute>	mm	-	Minutes. Range: 00–59.
<Second>	ss	-	Seconds. Range: 00–59.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
$PSTMINITTIME,15,02,2022,01,37,30*17
$PSTMINITTIMEOK*11
```

NOTE

1. The error deviation of input GPS time from current GPS time should be less than 3 seconds. GPS time = UTC time + Leap second, e.g., in 2019, Leap second = 18 s.
2. For the validity period of GPS week number of a specific firmware version, refer to the “Take Note of” in the corresponding Firmware Release Notes.

2.3.3. PSTMCLREPHS

Clears all ephemeris data. It erases all the ephemeris data stored in the NVM backup memory.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- All ephemeris data stored in the NVM backup memory will be deleted.
- No message is sent as a reply.

Example:

```
$PSTMCLREPHS*49
```

2.3.4. PSTMDUMPEPHEMS

Sends all ephemeris data stored in the NVM backup memory.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

```
$PSTMEPHEM,<SatID>,<EphemerisDataBytes>{,<Byte>}*<Checksum><CR><LF>
```

Parameters in the result:

Field	Format	Unit	Description
<SatID>	Numeric	-	Satellite ID.
<EphemerisDataBytes>	Numeric	-	Number of the ephemeris data bytes.
Start of repeat block. Repeat **<EphemerisDataBytes>** times.			
<Byte>	Hexadecimal	-	The Nth byte of the ephemeris data.
End of repeat block.			

The data from byte 1 to byte N (byte 1 and byte N included) are the dump of structures that contain all ephemeris information. Ephemeris data format is constellation dependent. Refer to the tables below for details.

Table 5: 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.

Bits	Structure Member	Description
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 the computed value.
16	reserved	Must be 0.
32	inclination	Inclination angle at the reference time.
32	e	Eccentricity.
32	root_A	Square root of major axis.
32	mean_anomaly	Mean anomaly at the reference time.
32	omega_zero	Longitude of the ascending node of an 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 the ephemeris is available, 0 if not.

Bits	Structure Member	Description
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy.
1	reserved	Must be 0.
4	accuracy	Accuracy.

Table 6: 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 the 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.
2	KP	Notification on the 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 acceleration at epoch tb.
24	xn_dot	Satellite PZ-90 x velocity component at epoch tb.
5	n	Slot number (1–24).
3	Bn	Healthy flags.

Bits	Structure Member	Description
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	-

Bits	Structure Member	Description
25	reserved	-
1	available	Contains 1 if the 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 7: 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 the reference time.
32	eccentricity	Eccentricity.
32	root_a	Square root of the major axis.
32	mean_anomaly	Mean anomaly at the reference time.
32	omega_zero	Longitude of the ascending node of an orbit plane at weekly epoch.
32	perigee	Argument of perigee.
14	i_dot	Rate of inclination angle.

Bits	Structure Member	Description
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 the 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	Space vehicle 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 8: Ephemeris Data Format for BDS

Bits	Structure Member	Description
32	inclination	Inclination angle at the reference time.
32	eccentricity	Eccentricity.
32	root_a	Square root of the major axis.
32	mean_anomaly	Mean anomaly at the reference time.
32	omega_zero	Longitude of the ascending node of an 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 the 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.

Bits	Structure Member	Description
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 the ephemeris is available, 0 if not.
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy.

Example:

```
$PSTMDUMPEPHEMS*10
$PSTMEPHEM,3,64,9508f12bf12b0c0c0c60ee0063a7ff00bbeff8214a0cd1f11f00ecff0a2e00001930a027ec46fe012d7f0da18f02f723734557dc3a87fe26040069ff1102fc03*5E
$PSTMEPHEM,10,64,9508f22bf22b0f0f0ff8ee007ca6ff001df26423ed0abaf322000600a42e0000a65d9e27035dd70387780da1fdad330011313adc8eec94990500a4ffa07df503*32
```

$PSTMEPHEM,16,64,9508f12bf12b020202d0ec00b3aaff000affc61adc1176ff2b00a000102f0000d6948727d6848806becf0ca1b5ea81d138d400609eeedc1cea00d5ff309df003*6C
$PSTMEPHEM,22,64,9508f22bf22b232323cc13005aaeff000afe1c15e2162cfeb7ff6400292d0000dfe92e276e51990627440da195a78ba62bc1590addb1b3b3eb003200d000c703*38
$PSTMEPHEM,25,64,9508f22bf22b2a2a2a5ce700c0a6ff009afda01b6411a6fd3900aafff73300000c410427b1bc600570a70da1a957cc12086b1e5c2096fa270c002f00385cc903*3D
$PSTMEPHEM,26,64,9508f12bf12b16161690eb0095a4ff0037fdc41bbf0fc4fd2500230062380000cc153c26b7528503af940da1feae19f8634b345ab76c130f0f001c00a901c603*31

2.3.5. PSTMCLRALMS

Deletes all the almanacs stored in the NVM backup memory.

Type:

Command

Synopsis:

$PSTMCLRALMS*<Checksum><CR><LF>

Parameter:

None

Result:

- All almanacs stored in the NVM backup memory will be deleted.
- No message is sent as a reply.

Example:

$PSTMCLRALMS*54

2.3.6. PSTMDUMPALMANAC

Dumps almanac data, i.e., the command sends out all almanacs stored in the NVM backup memory.

Type:

Command

Synopsis:

$PSTMDUMPALMANAC*<Checksum><CR><LF>

Parameter:

None

Result:

```
$PSTMALMANAC,<SatID>,<AlmanacDataByte>{,<Byte>}*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<SatID>	Numeric	-	Satellite ID.
<AlmanacDataByte>	Numeric	-	Number of the almanac data bytes.
Start of repeat block. Repeat **<AlmanacDataByte>** times.			
<Byte>	Hexadecimal	-	The Nth byte of the almanac data.
End of repeat block.			

The data from byte 1 to byte N are the dump of structures that contain all almanac information. Almanac data format is constellation dependent. Refer to tables below for details.

Table 9: Almanac Data Format for GPS

Bits	Structure Member	Description
8	satid	Satellite ID.
16	week	Week number for the epoch.
8	toa	Almanac reference time.
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 orbital plane at weekly epoch.
24	perigee	Argument of perigee.
24	mean_anomaly	Mean anomaly at the reference time.

Bits	Structure Member	Description
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 the almanac is available, 0 if not.

Table 10: Almanac Data Format for GLONASS

Bits	Structure Member	Description
8	satid	Satellite ID.
16	week	Week number for the epoch.
8	toa	Reference time almanac.
5	n_A	Slot number. Range: 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 the ascending node of an orbital plane at almanac epoch.
18	delta_i_n_A	Inclination angle correction to the 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 the almanac is available, 0 if not.
32	Tau_c	-

Bits	Structure Member	Description
11	NA	-
5	N4	-
16	Spare	-

Table 11: Almanac Data Format for Galileo

Bits	Structure Member	Description
16	satid	Satellite ID.
6	svid	Space vehicle identification.
16	week	Week number for the epoch.
20	toa	Almanac reference time.
13	delta_a	Semi-major axis difference at reference time
11	e	Eccentricity.
16	perigee	Argument of perigee.
11	delta_i	Rate of inclination angle.
16	omega_zero	Longitude of ascending node of orbital plane at weekly epoch.
11	omega_dot	Rate of change of right ascension.
16	mean_anomaly	Satellite mean anomaly at reference time.
16	af0	Satellite clock correction bias “truncated”
13	af1	Satellite clock correction linear “truncated”
2	E5b_HS	Satellite E5b signal health status.
2	E1B_HS	Satellite E1-B/C signal health status.
4	ioda_1	Almanac issue of data 1.
4	ioda_2	Almanac issue of data 2.
2	word_available	-
1	health	Contains 1 if the satellite is unhealthy, 0 if healthy.

Bits	Structure Member	Description
1	available	Contains 1 if almanac is available, 0 if not.
3	spare6	-
32	spare7	-
32	spare8	-

Table 12: Almanac Data Format for BDS

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 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 computed according to reference time.
8	spare3	-
24	perigee	Argument of perigee.
8	spare4	-
24	mean_anomaly	Mean anomaly at reference time.

Bits	Structure Member	Description
8	spare5	-
16	delta_i	Correction of orbit reference inclination at reference time.
1	health	Satellite health information.
1	available	Contains 1 if the almanac is available, 0 if not.
8	last_received_toa	-
6	spare6	-

Example:

```
$PSTMDUMPALMANAC*5B
$PSTMALMANAC,1,40,0195084e495dd41c48fd0000f90ca1000e1ab200f1ea23007eff8f00c3e9bf0000
00000000000000*15
$PSTMALMANAC,2,40,0295084e56a9b90e41fd0000250da1007276ae008143c500bedd95005505800
00000000000000000*15
$PSTMALMANAC,3,40,0395084ee51f94133cfd00000a0da1003b4bdc00d9fa2600710561007edfbf000
000000000000000*1B
$PSTMALMANAC,4,40,0495084eec0d770c66fd0000e60ca100af560800e15483002489d8003a0f8000
0000000000000000*4C
$PSTMALMANAC,5,40,0595084e2230160b2ffd0000eb0ca1009ba5da0052132900c323fc00b5078000
0000000000000000*16
$PSTMALMANAC,6,40,0695084e19166d1c4bfd0000fc0ca100c5c3b100ce02d9003b4f9d00d5188000
0000000000000000*45
$PSTMALMANAC,15,40,0f95084e2e722af847fd00008a0da10099dc0100d2cd2b005ba5c300a90f800
00000000000000000*29
```

2.3.7. PSTMCOLD

Performs a cold start. The cold start restarts the GNSS engine without location information stored in the receiver, including time, position and ephemeris data.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

The GNSS engine will be restarted and no message will be sent as a reply.

Example:

```
$PSTMCOLD*1E
```

2.3.8. PSTMWARM

Performs a warm start. The warm start restarts the GNSS engine, and the modules retain valid position, time and almanac. However, the ephemeris becomes invalid, requiring the modules to download the ephemeris before achieving a fix.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

The GNSS engine will be restarted and no message will be sent as a reply.

Example:

```
$PSTMWARM*13
```

2.3.9. PSTMHOT

Performs a hot start. The hot start restarts the GNSS engine, and the modules retain valid position, time, ephemeris and almanac. As a result, the modules will achieve positioning in a shorter time.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

The GNSS engine will be restarted and no message will be sent as a reply.

Example:

```
$PSTMHOT*49
```

2.3.10. PSTMSRR

Executes a system reset. The GNSS software will be rebooted.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

The GNSS software will be rebooted and no message will be sent as a reply.

Example:

```
$PSTMSRR*49
```

2.3.11. PSTMSBASSERVICE

Switches between SBAS services or disables the SBAS service.

Type:

Command

Synopsis:

```
$PSTMSBASSERVICE,<Service>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Service>	Numeric	-	SBAS service. 0 = WAAS 1 = EGNOS 2 = MSAS 3 = GAGAN 7 = OFF 15 = AUTO

Result:

- If **<Service>** is set to 0, 1, 2 or 3, the SBAS engine will assign all satellites associated with the specified service to the tracker.
- If **<Service>** is set to 7 (OFF), no satellites will be assigned to the tracker.
- If **<Service>** is set to 15 (AUTO), the SBAS engine automatically selects the appropriate SBAS service based on the computed user position (latitude and longitude).
- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
$PSTMSBASSERVICE,15*6C
$PSTMSBASSERVICEOK*40
```

2.3.12. PSTMSBASONOFF

Suspends/resumes the SBAS software execution.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If SBAS is running, it will be suspended. If SBAS has been suspended, it will start running.
- No message is sent as a reply.

Example:

```
$PSTMSBASONOFF*57
```

2.3.13. PSTMGETRTCTIME

Gets the current RTC time and status.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- The module returns RTC time and status:

```
$PSTMRTCTIME,<Time>,<Date>,<RTC_Status>,<TimeValidity>*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<Time>	hhmmss.sss	-	Current time read on RTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds

Field	Format	Unit	Description
<Date>	ddmmyy	-	Current date read on RTC. dd: Day of month mm: Month yy: Year
<RTC_Status>	Numeric	-	RTC status. 0 = RTC status invalid 1 = RTC status stored 2 = RTC status approximate
<TimeValidity>	Numeric	-	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 = Approximate time 8 = Accurate time 9 = Position time 10 = Ephemeris time

Example:

```
$PSTMGETRTCTIME*1C
$PSTMRTCTIME,022234.670,150222,2,8*5C
```

2.3.14. PSTMCFGCONST

Configures satellite constellation. The settings can only take effect if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling.

Type:

Set

Synopsis:

```
$PSTMCFGCONST,<GPS>,<GLONASS>,<Galileo>,<QZSS>,<BDS>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	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
<BDS>	Unsigned	-	BDS constellation status. 0 = Constellation off 1 = Constellation being tracked 2 = Constellation being tracked and used in positioning

Result:

- If successful, the module returns:

```
$PSTMCFGCONSTOK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PSTMCFGCONSTERROR*<Checksum><CR><LF>
```

Example:

```
$PSTMCFGCONST,2,0,0,0,0*03
$PSTMCFGCONSTOK*19
```

NOTE

If the default value is not given for any parameter in a Set command, you can query it with the corresponding Get command if the default setting has not been changed. If the default setting had been changed with the Set command, contact Quectel Technical Support (support@quectel.com) for the default setting.

2.3.15. PSTMPPS

Sets/gets configurations related to the 1PPS feature. Configurations are not saved after a system reset, hardware reset, or power cycling.

Type:

Set/Get

Synopsis:

```
$PSTMPPS,<CmdMode>,<CmdType>,[<Par_1>,…,<Par_N>]*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<CmdMode>	Numeric	-	Command operation mode. 1 = GET operation (to get data from PPS management) 2 = SET operation (to set data for PPS management)
<CmdType>	Numeric	-	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 in accordance with the command types.

Result:

According to the operation mode, parameters for PPS management are retrieved or set. For details, refer to the commands listed in the following sub-chapters (i.e., *Chapter 2.3.15.1 Getting PPS Data: PPS_IF_PULSE_DATA_CMD* to *Chapter 2.3.15.23 Setting PPS Data: PPS_IF_TRAIM_CMD*).

- For SET operations, if successful, the module returns:

```
$PSTMPPSOK,2,<CmdType>*<Checksum><CR><LF>
```

- For both SET and GET operations, if failed, the module returns:

```
$PSTMPPSERROR*<Checksum><CR><LF>
```

2.3.15.1. Getting PPS Data: PPS_IF_PULSE_DATA_CMD

Gets the operating modes for PPS signal generation.

Type:

Get

Synopsis:

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

Result:

```
$PSTMPPS,1,7,<OutMode>,<ReferenceTime>,<PulseDelay>,<PulseDuration>,<PulsePolarity>*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<OutMode>	Numeric	-	PPS generation mode. 0 = PPS always generated 1 = PPS generated on even seconds 2 = PPS generated on odd seconds
<ReferenceTime>	Numeric	-	PPS reference time. 0 = UTC 1 = GPS time 2 = GLONASS time 3 = UTC (SU) 4 = GPS time from GLONASS 5 = BDS time 6 = UTC (NTSC)

Field	Format	Unit	Description
			7 = Galileo time 8 = UTC (GST) 9 = GPS time from Galileo
<PulseDelay>	Numeric	Nanosecond	Pulse delay.
<PulseDuration>	Numeric	Second	Pulse duration.
<PulsePolarity>	Numeric	-	Pulse polarity. 0 = Not inverted 1 = Inverted

Example:

```
$PSTMPPS,1,7*4F
$PSTMPPS,1,7,0,0,0,0.500000,0*78
```

NOTE

1. **UTC (SU)**, the Universal Time Coordinated of Russia, is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to UTC (SU) downloaded from GLONASS satellites.
2. **GPS time from GLONASS** is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to GPS time downloaded from GLONASS satellites.
3. If the software is configured to work in GLONASS-only mode, **UTC (SU)** is identical to **UTC** and **GPS time from GLONASS** is identical to **GPS time**.
4. **GPS time from Galileo** is calculated based on the Galileo time and the correction parameters of Galileo time relative to GPS time downloaded from Galileo satellites.

2.3.15.2. Getting PPS Data: PPS_IF_TIMING_DATA_CMD

Gets the PPS related parameter configuration from PPS management.

Type:

Get

Synopsis:

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

Result:

```
$PSTMPPS,1,12,<FixCondition>,<SatTh>,<ElevationMask>,<ConstellationMask>,<GPS_RF_Delay>,<GLONASS_RF_Delay>*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<FixCondition>	Numeric	-	GNSS fix condition for generating PPS signal. 0 or 1 = No fix 2 = 2D fix 3 = 3D fix
<SatTh>	Numeric	-	Minimum number of satellites required to participate in timing correction for generating PPS signal.
<ElevationMask>	Numeric	Degree	Minimum satellite elevation for satellite usage in timing correction.
<ConstellationMask>	Hexadecimal	-	Satellite constellation bitmask for timing correction. Bit 0 = GPS Bit 1 = GLONASS Bit 3 = Galileo Bit 7 = BDS
<GPS_RF_Delay>	Numeric	Nanosecond	GPS path RF delay.
<GLONASS_RF_Delay>	Numeric	Nanosecond	GLONASS path RF delay.

Example:

```
$PSTMPPS,1,12*7B
$PSTMPPS,1,12,0,0,10,0000000b,633,420*28
```

NOTE

1. **<ConstellationMask>** parameter enables the usage of mixed constellation satellites in the timing correction. Mixing constellations for time correction means that satellites from one constellation are used to correct the reference time for other constellations.
2. If GPS time is selected for PPS signal generation and bit 1 (or bit 7) is enabled, GLONASS satellites (or BDS satellites) are used to correct the GPS reference time. If GLONASS time is selected for PPS signal generation and bit 0 is enabled, GPS satellites are used to correct the GLONASS reference time.

2.3.15.3. Getting PPS Data: PPS_IF_POSITION_HOLD_DATA_CMD

Gets the information about Position Hold feature.

Type:

Get

Synopsis:

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

Result:

```
$PSTMPPS,1,13,<OnOff>,<Lat>,<N/S>,<Lon>,<E/W>,<H_Msl>*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<OnOff>	Numeric	-	Position Hold status. 0 = Disabled 1 = Enabled
<Lat>	ddmm.mmmmm	-	Latitude in degrees. dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes
<N/S>	Character	-	North-south direction. N = North S = South
<Lon>	dddmm.mmmmm	-	Longitude in degrees. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes
<E/W>	Character	-	East-west direction. E = East W = West
<H_Msl>	Numeric	m	Height above mean sea level. Range: -1500 to 100000.

Example:

```
$PSTMPPS,1,13*7A
$PSTMPPS,1,13,1,3149.29601,N,11706.91919,E,076.68*6A
```

2.3.15.4. Getting PPS Data: PPS_IF_TRAIM_CMD

Gets the TRAIM-related information. TRAIM is a timing calibration algorithm.

Type:

Get

Synopsis:

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

Result:

```
$PSTMPPS,1,15,<TraimEnabled>,<TraimSolution>,<AveError>,<UsedSats>,<RemovedSats>*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = Disabled 1 = Enabled
<TraimSolution>	Numeric	-	TRAIM algorithm status. 0 = Under alarm 1 = Over alarm 2 = Unknown
<AveError>	Numeric	Nanosecond	Average time error.
<UsedSats>	Numeric	-	Number of satellites used for timing correction.
<RemovedSats>	Numeric	-	Number of satellites removed by timing correction.

Example:

```
$PSTMPPS,1,15*7C
$PSTMPPS,1,15,1,0,14,5,1*50
```

2.3.15.5. Getting PPS Data: PPS_IF_TRAIM_USED_CMD

Gets satellites used in the TRAIM algorithm.

Type:

Get

Synopsis:

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

Result:

```
$PSTMPPS,1,16,<TraimEnabled>,<UsedSats>{,<SatID>}*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = Disabled 1 = Enabled
<UsedSats>	Numeric	-	Number of satellites used for timing correction.
Start of repeat block. Repeat **<UsedSats>** times.			
<SatID>	Numeric	-	Satellite ID.
End of repeat block.			

Example:

```
$PSTMPPS,1,16*7F
$PSTMPPS,1,16,1,4,26,31,16,4*4F
```

2.3.15.6. Getting PPS Data: PPS_IF_TRAIM_RES_CMD

Gets satellite residuals in the TRAIM algorithm.

Type:

Get

Synopsis:

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

Result:

```
$PSTMPPS,1,17,<TraimEnabled>,<UsedSats>{,<Resi>}*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = Disabled 1 = Enabled
<UsedSats>	Numeric	-	Number of satellites used for timing correction.
Start of repeat block. Repeat **<UsedSats>** times.			
<Resi>	Numeric	Nanosecond	Satellite residuals. Each residual corresponds to the satellite in the used satellite list in the same position.
End of repeat block.			

Example:

```
$PSTMPPS,1,17*7E
$PSTMPPS,1,17,1,5,9,-10,-3,1,2*5E
```

2.3.15.7. Getting PPS Data: PPS_IF_TRAIM_REMOVED_CMD

Gets the removed satellites in the TRAIM algorithm.

Type:

Get

Synopsis:

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

Result:

```
$PSTMPPS,1,18,<TraimEnabled>,<RemSats>{,<SatID>}*<Checksum><CR><LF>
```

Parameters included in the result:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = Disabled 1 = Enabled
<RemSats>	Numeric	-	Number of satellites removed by timing correction.

Start of repeat block. Repeat **<RemSats>** times.			
<SatID>	Numeric	-	Removed satellite ID.
End of repeat block.			

Example:

```
$PSTMPPS,1,18*71
$PSTMPPS,1,18,1,2,3,29*4A
```

2.3.15.8. Setting PPS Data: PPS_IF_ON_OFF_CMD

Sets the status of PPS feature.

Type:

Set

Synopsis:

```
$PSTMPPS,2,1,<OnOff>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<OnOff>	Numeric	-	PPS feature status. 0 = Off 1 = On

Example:

```
$PSTMPPS,2,1,1*57
$PSTMPPSOK,2,1*4E
```

2.3.15.9. Setting PPS Data: PPS_IF_OUT_MODE_CMD

Sets PPS generation mode.

Type:

Set

Synopsis:

```
$PSTMPPS,2,2,<OutMode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<OutMode>	Numeric	-	PPS generation mode. 0 = PPS always generated 1 = PPS generated on even seconds 2 = PPS generated on odd seconds

Example:

```
$PSTMPPS,2,2,0*55
$PSTMPPSOK,2,2*4D
```

NOTE

PPS generated on even/odd seconds cannot be used simultaneously with polarity inversion. For the use of polarity inversion, contact Quectel Technical Support.

2.3.15.10. Setting PPS Data: PPS_IF_REFERENCE_TIME_CMD

Sets reference time for PPS signal synchronization.

Type:

Set

Synopsis:

```
$PSTMPPS,2,19,<ReferenceTime>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<ReferenceTime>	Numeric	-	PPS reference time. 0 = UTC 1 = GPS time 2 = GLONASS time 3 = UTC (SU) 4 = GPS time from GLONASS 5 = BDS time

Field	Format	Unit	Description
			6 = UTC (NTSC) 7 = Galileo time 8 = UTC (GST) 9 = GPS time from Galileo

Example:

```
$PSTMPPS,2,19,1*6E
$PSTMPPSOK,2,19*77
```

NOTE

1. **UTC (SU)**, the Universal Time Coordinated of Russia, is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to UTC (SU) downloaded from GLONASS satellites.
2. **GPS time from GLONASS** is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to GPS time downloaded from GLONASS satellites.
3. If the software is configured to work in GLONASS-only mode, **UTC (SU)** is identical to **UTC** and **GPS time from GLONASS** is identical to **GPS time**.
4. **GPS time from Galileo** is calculated based on the Galileo time and the correction parameters of Galileo time relative to GPS time downloaded from Galileo satellites.

2.3.15.11. Setting PPS Data: PPS_IF_PULSE_DELAY_CMD

Sets PPS pulse delay.

Type:

Set

Synopsis:

```
$PSTMPPS,2,4,<PulseDelay>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PulseDelay>	Numeric	Nanosecond	Pulse delay. Range: 0 to 1 second.

Example:

```
$PSTMPPS,2,4,10*62
$PSTMPPSOK,2,4*4B
```

2.3.15.12. Setting PPS Data: PPS_IF_CONSTELLATION_RF_DELAY_CMD

Sets the RF time delay for the satellite signal path.

Type:

Set

Synopsis:

```
$PSTMPPS,2,20,<SatType><TimeDelay>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<SatType>	Numeric	-	Satellite constellation type. 0 = GPS 1 = GLONASS 3 = Galileo 7 = BDS
<TimeDelay>	Numeric	Nanosecond	Time delay.

Example:

```
$PSTMPPS,2,20,0,633*7F
$PSTMPPSOK,2,20*7D
```

2.3.15.13. Setting PPS Data: PPS_IF_PULSE_DURATION_CMD

Sets the pulse duration of the PPS signal.

Type:

Set

Synopsis:

```
$PSTMPPS,2,5,<PulseDuration>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PulseDuration>	Numeric	Second	Pulse duration. Range: 0–1.

Example:

```
$PSTMPPS,2,5,0.5*49
$PSTMPPSOK,2,5*4A
```

2.3.15.14. Setting PPS Data: PPS_IF_PULSE_POLARITY_CMD

Sets pulse polarity. The pulse duration is the time interval between the PPS rising edge and the next falling edge if polarity inversion is disabled or the time interval between falling and rising edge if polarity inversion is enabled.

Type:

Set

Synopsis:

```
$PSTMPPS,2,6,<PulsePolarity>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PulsePolarity>	Numeric	-	Pulse polarity. 0 = Not inverted 1 = Inverted

Example:

```
$PSTMPPS,2,6,0*51
$PSTMPPSOK,2,6*49
```

2.3.15.15. Setting PPS Data: PPS_IF_PULSE_DATA_CMD

Sets the operating modes for PPS signal generation.

Type:

Set

Synopsis:

$PSTMPPS,2,7,<OutMode>,<ReferenceTime>,<PulseDelay>,<PulseDuration>,<PulsePolarity>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<OutMode>	Numeric	-	PPS generation mode. 0 = PPS always generated 1 = PPS generated on even seconds 2 = PPS generated on odd seconds
<ReferenceTime>	Numeric	-	PPS reference time. 0 = UTC 1 = GPS time 2 = GLONASS time 3 = UTC (SU) 4 = GPS time from GLONASS 5 = BDS time 6 = UTC (NTSC) 7 = Galileo time 8 = UTC (GST) 9 = GPS time from Galileo
<PulseDelay>	Numeric	Nanosecond	Pulse delay. Range: 0–1 second.
<PulseDuration>	Numeric	Second	Pulse duration. Range: 0–1.
<PulsePolarity>	Numeric	-	Pulse polarity. 0 = Not inverted 1 = Inverted

Example:

```
$PSTMPPS,2,7,0,1,10,0.5,0*7B
$PSTMPPSOK,2,7*48
```

NOTE

1. **UTC (SU)**, the Universal Time Coordinated of Russia, is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to UTC (SU) downloaded from GLONASS satellites.
2. **GPS time from GLONASS** is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to GPS time downloaded from GLONASS satellites.
3. If the software is configured to work in GLONASS-only mode, **UTC (SU)** is identical to **UTC** and **GPS time from GLONASS** is identical to **GPS time**.

4. **GPS time from Galileo** is calculated based on the Galileo time and the correction parameters of Galileo time relative to GPS time downloaded from Galileo satellites.

2.3.15.16. Setting PPS Data: PPS_IF_FIX_CONDITION_CMD

Sets GNSS fix condition for generating PPS signal.

Type:

Set

Synopsis:

```
$PSTMPPS,2,8,<FixCondition>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<FixCondition>	Numeric	-	GNSS fix condition for generating PPS signal. 0 or 1 = No fix 2 = 2D fix 3 = 3D fix

Example:

```
$PSTMPPS,2,8,1*5E
$PSTMPPSOK,2,8*47
```

2.3.15.17. Setting PPS Data: PPS_IF_SAT_TRHESHOLD_CMD

Sets minimum number of satellites required to participate in timing correction for generating PPS signal.

Type:

Set

Synopsis:

```
$PSTMPPS,2,9,<SatTh>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<SatTh>	Numeric	-	Minimum number of satellites required to participate in timing correction for generating PPS signal. Range: 0–24.

Example:

```
$PSTMPPS,2,9,5*5B
$PSTMPPSOK,2,9*46
```

2.3.15.18. Setting PPS Data: PPS_IF_ELEVATION_MASK_CMD

Sets the minimum elevation of a satellite when it is used in timing correction.

Type:

Set

Synopsis:

```
$PSTMPPS,2,10,<ElevationMask>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<ElevationMask>	Numeric	Degree	Minimum satellite elevation for timing correction. Range: 0–90

Example:

```
$PSTMPPS,2,10,10*57
$PSTMPPSOK,2,10*7E
```

2.3.15.19. Setting PPS Data: PPS_IF_CONSTELLATION_MASK_CMD

Selects the satellite constellation for timing correction.

Type:

Set

Synopsis:

```
$PSTMPPS,2,11,<ConstellationMask>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<ConstellationMask>	Numeric	-	Satellite constellation bitmask for timing correction. Bit 0 = GPS Bit 1 = GLONASS Bit 3 = Galileo Bit 7 = BDS

Example:

```
$PSTMPPS,2,11,1*66
$PSTMPPSOK,2,11*7F
```

NOTE

1. **<ConstellationMask>** parameter enables the usage of mixed satellite constellations in the timing correction. Mixed constellations for time correction mean that satellites from one constellation are used for correcting the reference time for other constellations.
2. If GPS time is selected for PPS signal generation and bit 1 (or bit 7) is enabled, also GLONASS satellites (or BDS satellites) are used to correct the GPS reference time. If GLONASS time is selected for PPS signal generation and bit 0 is enabled, GPS satellites are used to correct the GLONASS reference time.

2.3.15.20. Setting PPS Data: PPS_IF_TIMING_DATA_CMD

Sets PPS related parameters for PPS management.

Type:

Set

Synopsis:

```
$PSTMPPS,2,12,<FixCondition>,<SatTh>,<ElevationMask>,<ConstellationMask>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<FixCondition>	Numeric	-	GNSS fix condition for PPS signal generation. 0 or 1 = No fix 2 = 2D fix 3 = 3D fix
<SatTh>	Numeric	-	Minimum number of satellites required to participate in timing correction for generating PPS signal. Range: 0–24.
<ElevationMask>	Numeric	Degree	Minimum satellite elevation for satellite usage in timing correction. Range: 0–90.
<ConstellationMask>	Numeric	-	Satellite constellation bitmask for timing correction. Bit 0 = GPS Bit 1 = GLONASS Bit 3 = Galileo Bit 7 = BDS

Example:

```
$PSTMPPS,2,12,0,0,10,11*79
$PSTMPPSOK,2,12*7C
```

2.3.15.21. Setting PPS Data: PPS_IF_POSITION_HOLD_DATA_CMD

Sets Position Hold feature.

Type:

Set

Synopsis:

```
$PSTMPPS,2,13,<OnOff>,<Lat>,<N/S>,<Lon>,<E/W>,<H_Msl>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<OnOff>	Numeric	-	Position Hold status. 0 = Disabled 1 = Enabled
<Lat>	ddmm.mmmmm	-	Latitude in degrees. dd: Degrees (00–90) mm: Minutes (00–59)

Field	Format	Unit	Description
			mmmmm: Decimal fraction of minutes
<N/S>	Character	-	North-south direction. N = North S = South
<Lon>	dddmm.mmmmm	-	Longitude in degrees. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes
<E/W>	Character	-	East-west direction. E = East W = West
<H_Msl>	Numeric	m	Height above mean sea level. Range: -1500 to 100000.

Example:

```
$PSTMPPS,2,13,1,3149.32536,N,11706.98049,E,136.42*6C
$PSTMPPSOK,2,13*7D
```

2.3.15.22. Setting PPS Data: PPS_IF_AUTO_HOLD_SAMPLES_CMD

Sets the number of position samples for the auto position algorithm.

Type:

Set

Synopsis:

```
$PSTMPPS,2,14,<Auto_PH_Samples>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Auto_PH_Samples>	Numeric	-	Number of position samples for the auto position algorithm. If the number of samples is set to “0”, the auto position hold feature is disabled. Position average evaluation is restarted every time the command is executed. Maximum value: 65535.

Example:

```
$PSTMPPS,2,14,3600*57
$PSTMPPSOK,2,14*7A
```

2.3.15.23. Setting PPS Data: PPS_IF_TRAIM_CMD

Sets the time error threshold for satellite removal in the TRAIM algorithm. Satellites which have a time error greater than the TRAIM threshold are not used for time correction. If the time correction error is greater that the TRAIM threshold, the TRAIM alarm will be raised.

Type:

Set

Synopsis:

```
$PSTMPPS,2,15,<TraimEnabled>,<Alarm>,<AdaptiveMode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	Enable or disable TRAIM. 0 = Disable 1 = Enable
<Alarm>	Numeric	Second	TRAIM alarm – scientific notation is allowed.
<AdaptiveMode>	Numeric	-	Enable or disable TRAIM adaptive mode. 0 = Disable 1 = Enable

Example:

```
$PSTMPPS,2,15,1,1.000000E-06,0*23
$PSTMPPSOK,2,15*7B
```

2.3.16. PSTMFORCESTANDBY

Forces the module to enter the Standby mode.

Type:

Command

Synopsis:

```
$PSTMFORCESTANDBY,<Duration>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Duration>	Numeric	Second	Standby time duration. Valid range: 0–65535. When set to *0*, the module stays in the Standby mode until it is awakened by hardware. For details, see *documents [1]*, *[2]* and *[3] hardware designs*.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
$PSTMFORCESTANDBY,5*09
$PSTMFORCESTANDBYOK*14
```

NOTE

If the module enters Standby mode immediately after receiving the **$PSTMFORCESTANDBY** command, **$PSTMFORCESTANDBYOK*14** will not be returned.

2.3.17. PSTMCFGPORT

Configures a general-purpose port for NMEA purpose. The settings can only be saved if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling.

Type:

Set

Synopsis:

```
$PSTMCFGPORT,<PortType>,<ProtocolType>,<PortNumb>,<Baudrate>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PortType>	Numeric	-	Port type. 0 = UART
<ProtocolType>	Numeric	-	Protocol type. 0 = NMEA
<PortNumb> 1)	Numeric	-	NMEA port number (linearly addressed). Range: 0–255.
<Baudrate>	Numeric	bps	Port baud rate. 9600 14400 19200 38400 57600 115200 230400 460800 921600

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
//Get the current NMEA port number:
$PSTMGETPAR,1101*22
//Response:
$PSTMSETPAR,1101,0x01*53
//According to the response, the current NMEA port number is 01. The commands for changing the baud rate to 230400 bps are as follows.
//Set a general-purpose port for NMEA:
$PSTMCFGPORT,0,0,1,230400*75
//Response:
$PSTMCFGPORTOK*45
//Save the configuration:
$PSTMSAVEPAR*58
//Response:
$PSTMSAVEPAROK*5C
```

```
//Reset the system:
$PSTMSRR*49
```

NOTE

1. [1)] No NMEA sentence will be output if the configuration of this parameter is incorrect. This issue can only be resolved by re-flashing firmware.
2. L26-DR series only supports the following baud rates: 115200, 230400, 460800, and 921600 bps.

2.3.18. PSTMCFGTDATA

Configures date and time-related parameters. The setting can only take effect if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling.

Type:

Set

Synopsis:

```
$PSTMCFGTDATA,<GPS_Min_Week>,<GPS_Max_Week>,<FixRate>,<UTC_Delta>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GPS_Min_Week>	Unsigned	-	Minimum GPS week number.
<GPS_Max_Week>	Unsigned	-	Maximum GPS week number.
<FixRate>	Double	-	Fix rate. This field is fixed at 1.0.
<UTC_Delta>	Unsigned	Second	UTC delta time.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
$PSTMCFGTDATA,1964,3443,1.0,10*38
$PSTMCFGTDATAOK*18
```

NOTE

The minimum and maximum GPS week numbers are related to the validity period of GPS week number. For the validity period of GPS week number of a specific firmware version, refer to the "Take Note of" in the corresponding Firmware Release Notes.

2.3.19. PSTMCFGMSGL

Configures the message list, which allows you to enable or disable message output. The setting can only take effect if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling.

Type:

Set

Synopsis:

```
$PSTMCFGMSGL,<ListID>,<Rate>,<ListLow>,<ListHigh>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<ListID>	Numeric	-	List selector. 0 = NMEA list 0 (for messages output at 1 Hz) 2 = NMEA list 2 (for messages output at multi-Hz) Note that an output message cannot be configured by both message lists simultaneously.
<Rate> 1)	Numeric	-	Rate scaler of a message list. Range: 1–255. Note that this is only used for NEMA list 0, for NMEA list 2 it is fixed at 1.
<ListLow>	Hexadecimal, 8 digits	-	Low 32 bits. For each bit, 0 means disabled while 1 means enabled. See *Table 13: NMEA Message List* for details.
<ListHigh>	Hexadecimal, 8 digits	-	High 32 bits. For each bit, 0 means disabled while 1 means enabled. See *Table 13: NMEA Message List* for details.

Table 13: NMEA Message List

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	**$PSTMPRES** message **$PSTMVRES** message
13	0x2000	Reserved
14	0x4000	**$PSTMSBAS** message
15	0x8000	Reserved
16	0x10000	Reserved
17	0x20000	Reserved
18	0x40000	Reserved
19	0x80000	**GSV** message
20	0x100000	**GLL** message
21	0x200000	**$PSTMPPSDATA** message
22	0x400000	Reserved

23	0x800000	**$PSTMCPU** message
24	0x1000000	**ZDA** message
25	0x2000000	**$PSTMTRAIMSTATUS** message **$PSTMTRAIMUSED** message **$PSTMTRAIMRES** message **$PSTMTRAIMREMOVED** message
26	0x4000000	**$PSTMPOSHOLD** message
27	0x8000000	Reserved
28	0x10000000	Reserved
29	0x20000000	Reserved
30	0x40000000	**$PSTMNOTCHSTATUS** message
31	0x80000000	Reserved
High 32 Bits		
Bit	**Bitmask (32 bits)**	**Function**
32	0x1	**$PSTMPV** message
33	0x2	Reserved
34	0x4	**$PSTMUTC** message
35	0x8	Reserved
36	0x10	**$PSTMANTENNASTATUS** message
37	0x20	**$PSTMNAVM** message
38	0x40	Reserved
39	0x80	Reserved
40	0x100	Reserved
41	0x200	Reserved
42	0x400	Reserved
43	0x800	Reserved
44	0x1000	Reserved
45	0x2000	Reserved

46	0x4000	Reserved
47	0x8000	Reserved
48	0x10000	Reserved
49	0x20000	Reserved
50	0x40000	Reserved
51	0x80000	Reserved
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	**$PSTMDRSENMSG** message
61	0x20000000	Reserved
62	0x40000000	Reserved
63	0x80000000	**RLM** message

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
//Disable the 1 Hz output of RMC message:
//First, get the values of <ListLow> and <ListHigh> of the current NMEA list 0 by issuing $PSTMGETPAR,1201*21 and $PSTMGETPAR,1228*2A. Then, adjust the values of <ListLow> and
```

<ListHigh> in the **$PSTMCFGMSGL** command by disabling the bits corresponding to the **RMC** message to avoid accidentally disabling other bits.
//Get low 32-bit NMEA message list 0:
$PSTMGETPAR,1201*21
//Response:
$PSTMSETPAR,1201,0x00180056*5B
//Get high 32-bit message list 0:
$PSTMGETPAR,1228*2A
//Response:
$PSTMSETPAR,1228,0x6ec20010*59
//The bitmask of **RMC** message is 0x40, low 32 bits. Then, 0x00180056 - 0x40 = 0x00180016.
//Set the message list 0:
$PSTMCFGMSGL,0,1,00180016,6ec20010*41
//Response:
$PSTMCFGMSGLOK*49
//Save the configuration:
$PSTMSAVEPAR*58
//Response:
$PSTMSAVEPAROK*5C
//Reset the system:
$PSTMSRR*49

NOTE

[1] The **<Rate>** parameter is only supported by L26-DR (AA, ADR), L26-P, L26-T, L26-T (D), and LC98S. For other modules, **<Rate>** is fixed at 1.

2.3.20. PSTMCFGAGPS

Enable or disable AGNSS. The setting can only take effect if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling.

Type:

Set

Synopsis:

$PSTMCFGAGPS,<EnAGPS>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<EnAGPS>	Numeric	-	Enable or disable AGNSS. 0 = Disable 1 = Enable

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
$PSTMCFGAGPS,1*40
$PSTMCFGAGPSOK*59
```

2.3.21. PSTMIMUSELFTESTCMD

Executes the self-test procedure in IMU. Only L26-DR (UDR, ADR, ADRC) and L26-P support this command.

Type:

Command

Synopsis:

```
$PSTMIMUSELFTESTCMD,<IMU_Cat>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<IMU_Cat>	Numeric	-	IMU type. 0 = Accelerometer 1 = Gyroscope

Result:

- In successful, the module returns:

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

- In failed, the module returns:

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

- If the self-test command is not supported by the mounted IMU or by the FW (sensor layer is not present in FW), the module returns:

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

Example:

```
//Executes accelerometer self-test:
$PSTMIMUSELFTESTCMD,0*17
$PSTMIMUSELFTESTCMDOK*0F
//Executes gyroscope self-test:
$PSTMIMUSELFTESTCMD,1*16
$PSTMIMUSELFTESTCMDOK*0F
```

2.3.22. PSTMSETTHTRK

Configures the C/N_0 and elevation mask angle thresholds for tracking. It takes effect immediately. The configuration will not be saved after a system reset, hardware reset, or power cycling.

Type:

Command

Synopsis:

```
$PSTMSETTHTRK,<C/N0>,<El>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<C/N_0>	Numeric	dB-Hz	Tracking C/N_0 threshold.
<El>	Numeric	Degree	Tracking elevation mask angle.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

Example:

```
$PSTMSETTHTRK,7,5*0B
$PSTMSETTHTRKOK*0D
```

2.3.23. PSTMSETTHPOS

Configures the C/N_0 and elevation mask angle thresholds for positioning. It takes effect immediately. The configuration will not be saved after a system reset, hardware reset, or power cycling.

Type:

Set

Synopsis:

```
$PSTMSETTHPOS,<C/N0>,<El>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<C/N_0>	Numeric	dB-Hz	Positioning C/N_0 threshold.
<El>	Numeric	Degree	Positioning elevation mask angle.

Result:

- If successful, the module returns:

```
$PSTMSETTHPOSOK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PSTMSETTHPOSERROR*<Checksum><CR><LF>
```

Example:

```
$PSTMSETTHPOS,15,5*39
$PSTMSETTHPOSOK*0C
```

2.3.24. PSTMGETPAR,1500

Queries the firmware version information.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PSTMSETPAR,1500,<VersionInfo>*<Checksum><CR><LF>
```

Parameter included in the result:

Field	Format	Unit	Description
<VersionInfo>	String	-	Firmware version information.

- If failed, the module returns:

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

Example:

```
$PSTMGETPAR,1500*27
$PSTMSETPAR,1500,L26ADRNR02A01V02*0A
```

2.3.25. PSTMSETPAR,1122

Switches the NMEA 0183 message format. The setting can only take effect if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling.

Type:

Set

Synopsis:

```
$PSTMSETPAR,1122,<NMEA_Format>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<NMEA_Format>	Hexadecimal	-	NMEA 0183 message format. 0x02 = NMEA 0183 V3.01 (only for L26-DR (ADRC)) 0x04 = NMEA 0183 V4.10 0x0C = NMEA 0183 V3.01

Result:

- If successful, the module returns:

```
$PSTMSETPAROK,1122*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PSTMSETPARERROR*<Checksum><CR><LF>
```

Example:

```
$PSTMSETPAR,1122,0x04*57
$PSTMSETPAROK,1122*33
```

2.3.26. PSTMGETPAR,1122

Gets the NMEA 0183 message format.

Type:

Get

Synopsis:

```
$PSTMGETPAR,1122*<Checksum><CR><LF>
```

Parameter:

None

Result:

- If successful, the module returns:

```
$PSTMSETPAR,1122,<NMEA_Format>*<Checksum><CR><LF>
```

Parameter included in the result:

Field	Format	Unit	Description
<NMEA_Format>	Hexadecimal	-	NMEA 0183 message format. 0x02 = NMEA 0183 V3.01, only for L26-DR (ADRC) 0x04 = NMEA 0183 V4.10 0x0C = NMEA 0183 V3.01

- If failed, the module returns:

```
$PSTMSETPARERROR*<Checksum><CR><LF>
```

Example:

```
$PSTMGETPAR,1122*23
$PSTMSETPAR,1122,0x0c*00
```

2.3.27. PSTMSETPAR,1300

Configures the output message rate for the Low Latency Interface (LLI) feature. The setting can only take effect if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling. Only L26-DR (AA, ADR), L26-P, L26-T, L26-T (D), and LC98S support this command.

Type:

Set

Synopsis:

```
$PSTMSETPAR,1300,<Output_Rate>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Output_Rate> [1)]	Numeric	-	NMEA message output rate. 0.1 = 10 Hz 0.2 = 5 Hz 0.5 = 2 Hz 0 = 1 Hz

Result:

- If successful, the module returns:

```
$PSTMSETPAROK,1300*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PSTMSETPARERROR*<Checksum><CR><LF>
```

Example:

```
//Set RMC message 5 Hz output:
//First, get the values of <ListLow> and <ListHigh> of the current NMEA list 0 by issuing $PSTMGETPAR,1201*21 and $PSTMGETPAR,1228*2A. Then, adjust the values of <ListLow> and <ListHigh> in the $PSTMCFGMSGL command by disabling the bits corresponding to the RMC message in NMEA list 0. Subsequently, enabling the bits corresponding to the RMC message in NEMA list 2.
//Get low 32-bit NMEA message list 0:
$PSTMGETPAR,1201*21
//Response:
$PSTMSETPAR,1201,0x00180056*5B
//Get high 32-bit message list 0:
$PSTMGETPAR,1228*2A
//Response:
$PSTMSETPAR,1228,0x6ec20010*59
//The bitmask of RMC message is 0x40, low 32 bits. Then, 0x00180056 - 0x40 = 0x00180016.
//Set the message list 0:
$PSTMCFGMSGL,0,1,00180016,6ec20010*41
//Response:
$PSTMCFGMSGLOK*49
//Set the message list 2:
$PSTMCFGMSGL,2,1,00000040,0*7A
//Response:
$PSTMCFGMSGLOK*49
//Enable the LLI:
$PSTMSETPAR,1227,40000000,1*04
//Response:
$PSTMSETPAROK,1227*35
//Set the RMC message output rate to 5 Hz:
$PSTMSETPAR,1300,0.2*35
//Response:
$PSTMSETPAROK,1300*31
//Save the configuration:
$PSTMSAVEPAR*58
//Response:
$PSTMSAVEPAROK*5C
//Reset the system:
$PSTMSRR*49
```

NOTE

1. [1)] For the output rate supported by each module, refer to the product specifications.
2. This command can be used to configure the output rate of all output messages except **$PSTMDRSENMSG**.
3. When configuring multi-Hz output, it is recommended to change the baud rate to 460800 bps or above and configure the corresponding output rate based on the message name (for example, satellite and constellation related messages are still output at 1 Hz, while messages related to navigation are output at multi-Hz) to avoid data loss.
4. When configuring multi-Hz output, the LLI feature must be enabled with **$PSTMSETPAR,1227,40000000,1*04**.
5. For the L26-DR (ADR) module, when configuring multi-Hz output of PVT solution related messages (**RMC**, **GGA**, **VTG**, etc.), the corresponding DR fix rate must be configured using the following commands:
   1) When configuring 2 Hz output, configure the DR fix rate to 2 Hz:
      $PSTMSETPAR,1600,200000,1*03
   2) When configuring 5 Hz output, configure the DR fix rate to 5 Hz:
      $PSTMSETPAR,1600,500000,1*04

   Then, after issuing the **$PSTMSAVEPAR** command, use **$PSTMSRR** to reset the system for the setting to take effect. To switch between multi-Hz outputs, such as switching from 2 Hz to 5 Hz output, send **$PSTMSETPAR,1600,F00000,2*74** to clear the DR fix rate mask value before configuring the DR fix rate.

2.3.28. PSTMSAVEPAR

Saves the current configuration data block, including changed parameters, into the NVM backup memory.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

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

- If failed, the module returns:

$PSTMSAVEPARERROR*<Checksum><CR><LF>

Example:

$PSTMSAVEPAR*58
$PSTMSAVEPAROK*5C

2.3.29. PSTMRESTOREPAR

Restores the factory setting configurations. The configuration data block stored in the NVM backup memory, if present, will be invalidated. Any changed parameter will be lost. System rebooting is needed to complete factory setting restoration and to get system running on default configurations.

Type:

Command

Synopsis:

$PSTMRESTOREPAR*<Checksum><CR><LF>

Parameter:

None

Result:

- If successful, the module returns:

$PSTMRESTOREPAROK*<Checksum><CR><LF>

- If failed, the module returns:

$PSTMRESTOREPARERROR*<Checksum><CR><LF>

Example:

$PSTMRESTOREPAR*11
$PSTMRESTOREPAROK*15

2.3.30. PSTMANTENNASTATUS

Reports antenna status (normal, open, or short-circuited). It also reports the information about the operating mode of antenna detection and the type of antenna (external or internal). LC98S does not support this message.

Type:

Output

Synopsis:

```
$PSTMANTENNASTATUS,<AntStatus>,<OpMode>,<RF_Path>,<PwrSwitch>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<AntStatus>	Numeric	-	Current antenna status. -1 = Antenna uninitialized 0 = Normal 1 = Open 2 = Short-circuited
<OpMode>	Numeric	-	Operating mode. 0 = Auto – the antenna is managed automatically by the software logic 1 = Manual – the antenna's on or off state or RF switching is controlled by commands
<RF_Path>	Numeric	-	Current RF path. 0 = External antenna 1 = Internal antenna (not supported)
<PwrSwitch>	Numeric	-	Antenna power status. 0 = On 1 = Off

Example:

```
$PSTMANTENNASTATUS,0,0,0,0*51
```

NOTE

By default, the output of this message is enabled on the L26-DR series and L26-T series modules and disabled on the L26-P module. Therefore, for L26-P, execute the following commands after **$PSTMCFGMSGL** to ensure that **$PSTMANTENNASTATUS** is output accurately.

//Set the sensing type to ADC mode:

$PSTMSETPAR,1226,3481401E*62

//Response:

$PSTMSETPAROK,1226*34

//Set the GPIO port of the power switch:

$PSTMSETPAR,1242,00000018*17

//Response:

$PSTMSETPAROK,1242*36

```
//Set GPIO mode:
$PSTMSETPAR,1243,00000001*1E
//Response:
$PSTMSETPAROK,1243*37
//Set power on:
$PSTMSETPAR,1244,00000001*19
//Response:
$PSTMSETPAROK,1244*30
//Save the configuration:
$PSTMSAVEPAR*58
//Response:
$PSTMSAVEPAROK*5C
//Reset the system:
$PSTMSRR*49
```

2.3.31. PSTMCFGAJM

Configures the Adaptive Notch Filter (ANF) operation mode. The setting can only take effect if you issue **$PSTMSAVEPAR** and then reset the system with **$PSTMSRR**. Once saved, the configurations will remain unchanged even after a power cycling.

Type:

Set

Synopsis:

```
$PSTMCFGAJM,<GPS_Mode>,<GLONASS_Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GPS_Mode>	Numeric	-	ANF mode for GPS path. 0 = Disabled 2 = Auto insertion mode (recommended)
<GLONASS_Mode>	Numeric	-	ANF mode for GLONASS/BDS path. 0 = Disabled 2 = Auto insertion mode (recommended)

Result:

- If successful, the module returns:

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

- If failed, the module returns:

$PSTMCFGAJMERROR*<Checksum><CR><LF>

Example:

$PSTMCFGAJM,2,2*1E
$PSTMCFGAJMOK*1A

2.3.32. PSTMNOTCHSTATUS

Reports information on the Adaptive Notch Filter (ANF) status. When ANF is disabled, all parameters are set to zero. Frequency/power values are relevant only when Notch Filter is locked.

Type:

Output

Synopsis:

$PSTMNOTCHSTATUS,<Kfreq_Now_Hz_GPS>,<Lock_En_GPS>,<Pwr_GPS>,<Ovfs_GPS>,<Mode_GPS>,<Kfreq_Now_Hz_GLONASS>,<Lock_En_GLONASS>,<Pwr_GLONASS>,<Ovfs_GLONASS>,<Mode_GLONASS>*<Checksum><CR><LF>

Parameter:

Field	Format	Unit	Description
<Kfreq_Now_Hz_GPS>	Numeric	Hz	Actual value of notch frequency estimation (GPS path).
<Lock_En_GPS>	Numeric	-	Frequency lock flag (GPS path). 0 = Unlocked. No interference detected. 1 = Locked. Interference detected.
<Pwr_GPS>	Numeric	-	Internal power estimation of Band Pass Filter (GPS path). Dimensionless quantity.
<Ovfs_GPS>	Numeric	-	Internal mask output used to calculate overflow flag status. Overflow flag status (3 digits) = **<Ovfs_GPS>** - 1000 × Frequency lock flag
<Mode_GPS>	Numeric	-	ANF mode (GPS path). 0 = Disabled 2 = Auto insertion mode (recommended)
<Kfreq_Now_Hz_GLONASS>	Numeric	Hz	Actual value of notch frequency estimation (GLONASS/BDS path).
<Lock_En_GLONASS>	Numeric	-	Frequency lock flag (GLONASS/BDS path). 0 = Unlocked. No interference detected. 1 = Locked. Interference detected.

Field	Format	Unit	Description
<Pwr_GLONASS>	Numeric	-	Internal power estimation of band pass filter (GLONASS/BDS path). Dimensionless quantity.
<Ovfs_GLONASS>	Numeric	-	Internal mask output used to calculate overflow flag status. Overflow flag status (3 digits) = **<Ovfs_GLONASS>** - 1000 × Frequency lock flag
<Mode_GLONASS>	Numeric	-	ANF mode (GLONASS/BDS path): 0 = Disabled 2 = Auto insertion mode (recommended)

Example:

```
$PSTMNOTCHSTATUS,3616176,0,2187,0,2,7050638,0,3873,0,2*5E
```

2.3.33. PSTMDRSENMSG

Outputs the IMU raw data. Only L26-DR (UDR, ADR, ADRC) and L26-P modules support this message.

Type:

Output

Synopsis:

```
$PSTMDRSENMSG,<MsgID>[,<…>]*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgID>	Numeric	-	Message ID. 24 = IMU temperature 30 = IMU accelerometer 31 = IMU gyroscope
<…>	-	-	This field varies with the message type. See *Chapters 2.3.33.1 IMU Temperature Message (<MsgID> = 24)*, *2.3.33.2 IMU Accelerometer Message (<MsgID> = 30)*, and *2.3.33.3 IMU Gyroscope Message (<MsgID> = 31)* for details.

2.3.33.1. IMU Temperature Message (<MsgID> = 24)

Outputs the IMU temperature.

Type:

Output

Synopsis:

```
$PSTMDRSENMSG,24,<TimeStamp>,<Temperature>,<Validity>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TimeStamp>	Numeric	Microseconds	CPU tick count since the power on.
<Temperature>	Numeric	-	IMU temperature. Real temperature in degrees Celsius: Degrees Celsius = **<Temperature>** / 256 + 25.0
<Validity>	Numeric	-	Validity. 0 = Temperature is invalid. 1 = Temperature is valid.

Example:

```
$PSTMDRSENMSG,24,17186159,-787,1*2B
```

2.3.33.2. IMU Accelerometer Message (<MsgID> = 30)

Outputs the IMU accelerometer data.
FS = ±2g
Sensitivity = 0.061mg/LSB

Type:

Output

Synopsis:

```
$PSTMDRSENMSG,30,<TimeStamp>,<X_ACC>,<Y_ACC>,<Z_ACC>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TimeStamp>	Numeric	Microseconds	CPU tick count since power on.
<X_ACC>	Numeric	-	Raw signed 16-bit integer X-axis acceleration data in sensor frame.

Field	Format	Unit	Description
<Y_ACC>	Numeric	-	Raw signed 16-bit integer Y-axis acceleration data in sensor frame.
<Z_ACC>	Numeric	-	Raw signed 16-bit integer Z-axis acceleration data in sensor frame.

Example:

```
$PSTMDRSENMSG,30,17370342,-2442,2272,16295*34
$PSTMDRSENMSG,30,17380596,-2443,2267,16305*39
```

2.3.33.3. IMU Gyroscope Message (<MsgID> = 31)

Outputs the IMU gyroscope data.
FS = ±125 dps
Sensitivity = 4.375 mdps/LSB

Type:

Output

Synopsis:

```
$PSTMDRSENMSG,31,<TimeStamp>,<X_GYRO>,<Y_GYRO>,<Z_GYRO>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TimeStamp>	Numeric	Microseconds	CPU tick count since power on.
<X_GYRO>	Numeric	-	Raw signed 16-bit integer X-axis angular rate data in sensor frame.
<Y_GYRO>	Numeric	-	Raw signed 16-bit integer Y-axis angular rate data in sensor frame.
<Z_GYRO>	Numeric	-	Raw signed 16-bit integer Z-axis angular rate data in sensor frame.

Example:

```
$PSTMDRSENMSG,31,17370342,44,-5,-53*17
$PSTMDRSENMSG,31,17380596,61,-5,-50*13
```

2.3.34. PSTMTG

This message is intended solely for Quectel's internal debugging purposes.

2.3.35. PSTMTS

This message is intended solely for Quectel's internal debugging purposes.

2.3.36. PSTMPPSDATA

Outputs the PPS (Pulse Per Second) data.

Type:

Output

Synopsis:

```
$PSTMPPSDATA,<OnOff>,<PPS_Valid>,<Synch_Valid>,<Out_Mode>,<Reference_Time>,<Ref_Constellation>,<Pulse_Duration>,<Pulse_Delay>,<GPS_Delay>,<GLONASS_Delay>,<BDS_Delay>,<Galileo_Delay>,<Pulse_Polarity>,<FixCondition>,<SatTh>,<ElevationMask>,<ConstellationMask>,<RefSec>,<FixStatus>,<UsedSats>,<GPS_UTC_Delta_S>,<GPS_UTC_Delta_Ns>,<GLONASS_UTC_Delta_Ns>,<Galileo_UTC_Delta_Ns>,<QuantizationError>,<PPS_ClockFreq>,<TcxoClockFreq><BDS_UTC_Delta_S>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<OnOff>	Numeric	-	PPS feature status. 0 = Off 1 = On
<PPS_Valid>	Numeric	-	PPS validity flag. 0 = Invalid 1 = Valid
<Synch_Valid>	Numeric	-	PPS synchronization validity. 0 = Invalid 1 = Valid
<Out_Mode>	Numeric	-	PPS output mode. 0 = PPS always generated 1 = PPS generated on even seconds 2 = PPS generated on odd seconds
<Reference_Time>	Numeric	-	PPS reference time. 0 = UTC 1 = GPS time

Field	Format	Unit	Description
			2 = GLONASS time 3 = UTC (SU) 4 = GPS time from GLONASS 5 = BDS time 6 = UTC (NTSC) 7 = Galileo time 8 = UTC (GST) 9 = GPS time from Galileo
<Ref_Constellation>	Numeric	-	Refence constellation. 0 = GPS 1 = GLONASS 3 = Galileo 7 = BDS
<Pulse_Duration>	Numeric	Second	Pulse duration.
<Pulse_Delay>	Numeric	Nanosecond	Pulse delay.
<GPS_Delay>	Numeric	Nanosecond	GPS path RF delay.
<GLONASS_Delay>	Numeric	Nanosecond	GLONASS path RF delay.
<BDS_Delay>	Numeric	Nanosecond	BDS path RF delay.
<Galileo_Delay>	Numeric	Nanosecond	Galileo path RF delay.
<Pulse_Polarity>	Numeric	-	Pulse polarity. 0 = Not inverted 1 = Inverted
<FixCondition>	Numeric	-	GNSS fix condition for PPS signal generation. 0 or 1 = No fix 2 = 2D fix 3 = 3D fix
<SatTh>	Numeric	-	Minimum number of satellites required to participate in timing correction for generating PPS signal.
<ElevationMask>	Numeric	Degree	Minimum satellite elevation for time correction.
<ConstellationMask>	Numeric	-	Selected constellation(s) for time correction. Bit 0 = GPS Bit 1 = GLONASS Bit 3 = Galileo Bit 7 = BDS

Field	Format	Unit	Description
<RefSec>	Numeric	Second	Seconds at which the reported PPS data is applied. According to the reference time configuration it could be UTC, GPS, GLONASS or BDS time seconds.
<FixStatus>	Numeric	-	GNSS position fix status when the time has been corrected.
<UsedSats>	Numeric	-	Satellites used for correcting time.
<GPS_UTC_Delta_S>	Numeric	Second	UTC-GPS leap seconds.
<GPS_UTC_Delta_Ns>	Numeric	Nanosecond	UTC-GPS delta time.
<GLONASS_UTC_Delta_Ns>	Numeric	Nanosecond	UTC-GLONASS delta time.
<Galileo_UTC_Delta_Ns>	Numeric	Nanosecond	UTC-Galileo delta time.
<QuantizationError>	Numeric (scientific notation format)	Second	Quantization error.
<PPS_ClockFreq>	Numeric	Hz	PPS clock frequency.
<TcxoClockFreq>	Numeric	Hz	TCXO clock frequency.
<BDS_UTC_Delta_S>	Numeric	Second	UTC-BDS leap seconds.

Example:

```
$PSTMPPSDATA,1,0,0,0,0,0,0.500000,0,633,420,420,633,0,0,0,0,0,53,3,5,18,0,0,0,1.217e-08,65473921.09,25999985.21,4*2C
```

NOTE

1. In **<Reference_Time>**:
   - **UTC (SU)**, the Universal Time Coordinated of Russia, is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to UTC (SU) downloaded from GLONASS satellites.
   - **GPS time from GLONASS** is calculated based on the GLONASS time and the correction parameters of GLONASS time relative to GPS time downloaded from GLONASS satellites.
   - If the software is configured to work in GLONASS-only mode, **UTC (SU)** is identical to **UTC** and **GPS time from GLONASS** is identical to **GPS time**.
   - **GPS time from Galileo** is calculated based on the Galileo time and the correction parameters of Galileo time relative to GPS time downloaded from Galileo satellites.

2. In **<Ref_Constellation>**, the reference constellation reports which reference time has been used for generating the PPS signal.

2.3.37. PSTMUTC

Reports the UTC time, date, and time offset parameters. It is not supported for Galileo constellation.

Type:

Output

Synopsis:

```
$PSTMUTC,<UTC_Time>,<UTC_Date>,<UTC_TimeStamp>,<GPS_UTC_Leap>,<GPS_UTC_Validity>,
<GLONASS_UTC_Leap>,<GLONASS_UTC_Validity>,<BDS_UTC_Leap>,<BDS_UTC_Validity>,<Galile
o_UTC_Leap>,<Galileo_UTC_Validity>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<UTC_Time>	hhmmss.sss	-	UTC time of fix, example: 160836.000. “sss” is the fraction of seconds.
<UTC_Date>	ddmmyyyy	-	Date of fix.
<UTC_TimeStamp>	Numeric	Second	UTC time expressed as number of seconds since January 6, 1980.
<GPS_UTC_Leap>	Numeric	Second	UTC to GPS time offset.
<GPS_UTC_Validity>	Numeric	-	UTC to GPS time offset validity. 0 = Invalid 1 = Read from NVM 2 = Valid (downloaded from sky)
<GLONASS_UTC_Leap>	Numeric	Second	UTC to GLONASS time offset (always 0).
<GLONASS_UTC_Validity>	Numeric	-	UTC to GLONASS time offset validity. 0 = Invalid 1 = Read from NVM 2 = Valid (downloaded from sky)
<BDS_UTC_Leap>	Numeric	Second	UTC to BDS time offset.
<BDS_UTC_Validity>	Numeric	-	UTC to BDS time offset validity. 0 = Invalid 1 = Read from NVM 2 = Valid (downloaded from sky)

Field	Format	Unit	Description
<Galileo_UTC_Leap>	Numeric	Second	UTC to GPS time offset.
<Galileo_UTC_Validity>	Numeric	-	UTC to GPS time offset validity. 0 = Invalid 1 = Read from NVM 2 = Valid (downloaded from sky)

Example:

```
$PSTMUTC,063216.000,15022022,1328941936,18,2,00,2,04,0,18,2*60
```

2.3.38. PSTMSBAS

Outputs SBAS satellite data.

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<Status>	Numeric	-	SBAS status. 0 = No SBAS used 1 = SBAS used
<SatTrk>	Numeric	-	SBAS satellite tracking status. 0 = SBAS satellite not tracked 1 = SBAS satellite tracked, ongoing decoding 2 = SBAS satellite tracked and decoded. Differential mode is on
<SatID>	Numeric	-	SBAS satellite ID.
<Elev>	Numeric	Degree	SBAS satellite elevation.
<Azim>	Numeric	Degree	SBAS satellite azimuth.
<Sig>	Numeric	dB-Hz	SBAS satellite signal strength C/N_0.

Example:

```
$PSTMSBAS,1,1,137,51,161,41*1B
```

NOTE

By default, the SBAS feature is enabled on the L26-DR series, L26-P and L26-T series modules and disabled on the LC98S module. Therefore, for LC98S, it is necessary to send **$PSTMCFGMSGL** and **$PSTMSBASONOFF** commands to configure the output of the **$PSTMSBAS** message.

2.3.39. PSTMCPU

Outputs the real-time CPU usage and the CPU speed setting.

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<CPU_Usage>	Numeric	-	CPU usage in percentage (%).
<PLL_ON_OFF>	Numeric	-	PLL enabling or disabling status. 0 = PLL disabled 1 = PLL enabled -1 = Not supported
<CPU_Speed>	Numeric	MHz	CPU clock frequency. Values: 49, 98, 196 MHz.

Example:

```
$PSTMCPU,70.47,-1,196*78
```

2.3.40. PSTMPRES

This message is intended solely for Quectel's internal debugging purposes.

2.3.41. PSTMVRES

This message is intended solely for Quectel's internal debugging purposes.

2.3.42. PSTMPV

This message is intended solely for Quectel's internal debugging purposes.

2.3.43. PSTMNAVM

This message is intended solely for Quectel's internal debugging purposes.

2.3.44. PSTMPOSHOLD

Reports the Position Hold status and position.

Type:

Output

Synopsis:

```
$PSTMPOSHOLD,<OnOff>,<Lat>,<N/S>,<Lon>,<E/W>,<Alt>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<OnOff>	Numeric	-	Position Hold status. 0 = Disabled 1 = Enabled
<Lat>	ddmm.mmmmm	-	Latitude in degrees. dd: Degrees (00–90) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes
<N/S>	Character	-	North-south direction. N = North S = South
<Lon>	dddmm.mmmmm	-	Longitude in degrees. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmm: Decimal fraction of minutes
<E/W>	Character	-	East-west direction. E = East W = West
<Alt>	Numeric	Meter	Height above mean sea level. Range: -1500 to 100000.

Example:

```
$PSTMPOSHOLD,0,9000.00000,N,00000.00000,E,-6356765.31*68
```

2.3.45. PSTMTRAIMSTATUS

Reports the TRAIM algorithm status. Please note that all TRAIM-related messages are enabled/disabled collectively by the same mask.

Type:

Output

Synopsis:

```
$PSTMTRAIMSTATUS,<TraimEnabled>,<TraimSolution>,<Alarm>,<AveError>,<UsedSats>,<RemovedSats>,<RefSecond>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = TRAIM disabled 1 = TRAIM enabled
<TraimSolution>	Numeric	-	T-RAIM algorithm status. 0 = Under alarm 1 = Over alarm 2 = Unknown
<Alarm>	Numeric	Nanosecond	Time error threshold.
<AveError>	Numeric	Nanosecond	Average time error.
<UsedSats>	Numeric	-	Number of satellites used for the timing correction.
<RemovedSats>	Numeric	-	Number of satellites removed by the timing correction.
<RefSecond>	Numeric	-	Second at which the PPS signal is generated based on reported TRAIM status.

Example:

```
$PSTMTRAIMSTATUS,1,1,15,-26,6,2,0*78
```

2.3.46. PSTMTRAIMUSED

Reports the satellite used for timing correction.

Type:

Output

Synopsis:

```
$PSTMTRAIMUSED,<TraimEnabled>,<UsedSats>{,<SatID>}*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = Disabled 1 = Enabled
<UsedSats>	Numeric	-	Number of satellites used for timing correction.
Start of repeat block. Repeat **<UsedSats>** times.			
<SatID>	Numeric	-	Satellite ID.
End of repeat block.			

Example:

```
$PSTMTRAIMUSED,1,6,8,7,21,9,16,30*68
```

2.3.47. PSTMTRAIMRES

Reports the time error residuals for satellites used for timing correction.

Type:

Output

Synopsis:

```
$PSTMTRAIMRES,<TraimEnabled>,<UsedSats>{,<Resi>}*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = Disabled 1 = Enabled
<UsedSats>	Numeric	-	Number of satellites used for timing correction.

Field	Format	Unit	Description
Start of repeat block. Repeat **<UsedSats>** times.			
<Resi>	Numeric	-	Time error residuals for satellites reported in **$PSTMTRAIMUSED**. Each residual corresponds to the satellite in the same message position.
End of repeat block.			

Example:

```
$PSTMTRAIMRES,1,6,-12,4,12,13,-12,-5*37
```

2.3.48. PSTMTRAIMREMOVED

Reports the satellite removed in the timing correction algorithm.

Type:

Output

Synopsis:

```
$PSTMTRAIMREMOVED,<TraimEnabled>,<RemSats>{,<SatID>}*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<TraimEnabled>	Numeric	-	TRAIM status. 0 = Disabled 1 = Enabled
<RemSats>	Numeric	-	Number of satellites removed by the timing correction.
Start of repeat block. Repeat **<RemSats>** times.			
<SatID>	Numeric	-	Removed satellite ID.
End of repeat block.			

Example:

```
$PSTMTRAIMREMOVED,1,2,27,4*29
```

2.3.49. PSTMSETPAR,1285,1

Enables/disables outputting **RMC** messages that follow the CarPlay specification. When the positioning mode is "E" (dead reckoning), the **<Status>** field in the **RMC** message is "V" (indicating that DR positioning information is valid) if the function is disabled; if the function is enabled, the **<Status>** field in the **RMC** message is "A" (indicating that DR positioning information is valid).

Type:

Set

Synopsis:

```
$PSTMSETPAR,1285,1,<CarPlay_Specification>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<CarPlay_Specification>	Numeric	-	1 = Enable 2 = Disable

Result:

- If successful, the module returns:

```
$PSTMSETPAROK,1285*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PSTMSETPARERROR*<Checksum><CR><LF>
```

Example:

```
$PSTMSETPAR,1285,1,1*39
$PSTMSETPAROK,1285*3D
```

NOTE

Only some software versions of the L26-DR (ADR) module support this function. If you want to use this function, contact Quectel Technical Support (support@quectel.com).

2.3.50. PSTMSETPAR,1667,0x200000

Sets the module heading mode. When set to "absolute heading", the heading is aligned with the direction of travel, and it changes during reverse driving. When set to "heading aligned with vehicle front", the heading direction is the direction of the vehicle's front, and it does not change during reverse driving.

Type:

Set

Synopsis:

```
$PSTMSETPAR,1667,0x200000,<Heading_Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Heading_Mode>	Numeric	-	Heading mode. 1 = Absolute heading 2 = Heading aligned with vehicle front

Result:

- If successful, the module returns:

```
$PSTMSETPAROK,1667*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PSTMSETPARERROR*<Checksum><CR><LF>
```

Example:

```
$PSTMSETPAR,1667,0x200000,1*4A
$PSTMSETPAROK,1667*35
```

NOTE

Only some software versions of the L26-DR (ADR) module support this function. If you want to use this function, contact Quectel Technical Support (support@quectel.com).

2.4. PQTM Messages

This chapter explains PQTM messages (proprietary NMEA messages defined by Quectel) supported by L26-T series module.

2.4.1. PQTMLS

Output leap second forecast information. Currently only GPS and BDS are supported.

Type:

Output

Synopsis:

```
$PQTMLS,<MsgVer>,<TOW>,<LS_Ref>,<WN>,<LS>,<Flag>,<LSF_Ref>,<Reserved>,<WNLSF>,<DN>
,<LSF>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 1 = Version 1 (Always 1 for this message).
<TOW>	Numeric	Second	Time of week.
<LS_Ref>	Hexadecimal	-	Referenced constellation by the current leap second information. 0 = No source 1 = GPS 4 = BDS
<WN>	Numeric	-	UTC reference week number.
<LS>	Numeric	Second	Current number of leap seconds since the beginning of GPS time (January 6, 1980). It reflects how far ahead GPS time is compared to UTC time. BDS has 14 fewer leap seconds than GPS. Note that this field is empty if **<Flag>** = 0.
<Flag>	Numeric	-	Valid marker for future occurrences of leap seconds. 0 = Invalid 1 = Available
<LSF_Ref>	Hexadecimal	-	Referenced constellation by the leap second forecast information. 0 = No source 1 = GPS 4 = BDS Note that this field is empty if **<Flag>** = 0.
<Reserved>	-	-	Reserved. This field is always empty.
<WNLSF>	Numeric	-	Week number of the new leap second. Note that this field is empty if **<Flag>** = 0.
<DN>	Numeric	-	Day of the week when the new leap second takes effect. GPS: 1 to 7 from Sunday to Saturday; BDS: 0 to 6 from Sunday to Saturday. Note that this field is empty if **<Flag>** = 0.

Field	Format	Unit	Description
<LSF>	Numeric	Second	Leap second count after future leap second changes. Note that this field is empty if **<Flag>** = 0.

Example:

```
$PQTMLS,1,432756,1,242,18,1,1,,247,1,19*1F
```

NOTE

1. To enable the output of **$PQTMLS** message, execute the following commands in sequence:

   //Enable **$PSTMNVAM** message:
   $PSTMSETPAR,1227,10,1*01
   //Response:
   $PSTMSETPAROK,1227*35
   //Enable **$PQTMLS** message:
   $PSTMSETPAR,1228,20,1*0D
   //Response:
   $PSTMSETPAROK,1228*3A
   //Save the configuration:
   $PSTMSAVEPAR*58
   //Response:
   $PSTMSAVEPAROK*5C
   //Reset the system:
   $PSTMSRR*49

   Note that the above commands will also enable the output of **$PSTMNAVM** message. **$PSTMNAVM** message is intended solely for Quectel's internal debugging purposes.
2. GPS Week is a time system used internally by the GPS system. Time zero is: 01/06/1980 00:00:00. Every 1024 weeks (7168 days) is a cycle. The first GPS weekly cycle commenced on 08/22/1999 00:00:00, signifying the reset of the week count to 0. After this point, weeks are counted again and the week numbering follows the rule where Sunday is designated as 1 and is sequentially recorded as 1–7.
3. The starting time of BDS satellite navigation time system is 01/01/2006 00:00:00 UTC. The system utilizes week and intra-week seconds counts. The week counting rule is: Sunday is designated as 0 and is sequentially recorded as 0–6.
4. **<LSF>** minus **<LS>** can have one of the following three values, respectively:
   - +1 = Positive leap second;
   - -1 = Negative leap second;
   - 0 = No future leap second event scheduled or no information available.

3 Appendix A References

Table 14: Related Documents

Document Name
[1] Quectel_L26-DR_Series_Hardware_Design
[2] Quectel_L26-P&L26-T_Hardware_Design
[3] Quectel_L26-T(D)_Hardware_Design

Table 15: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
ANF	Adaptive Notch Filter
BDS	BeiDou Navigation Satellite System
C/N_0	Carrier-to-Noise-Density Ratio
DOP	Dilution of Precision
DR	Dead Reckoning
EHPE	Equivalent Horizontal Position Error
FW	Firmware
Galileo	Galileo Satellite Navigation System (EU)
GGA	Global Positioning System Fix Data
GLL	Geographic Position – Latitude and Longitude
GLONASS	Global Navigation Satellite System (Russia)

Abbreviation	Description
GNS	GNSS Fix Data
GNSS	Global Navigation Satellite System
GPIO	General-Purpose Input/Output
GPS	Global Positioning System
GSA	GPS DOP and Active Satellites
GST	GNSS Pseudorange Error Statistics
GST	Galileo System Time
GSV	GPS Satellites in View
HDOP	Horizontal Dilution of Precision
IMU	Inertial Measurement Unit
LLI	Low Latency Interface
LSB	Least Significant Bit
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
NVM	Non-Volatile Memory
PDOP	Position Dilution of Precision
PLL	Phase Locked Loop
PPS	Pulse Per Second
PRN	Pseudo Random Noise
PQTM	Quectel Proprietary Message
PSTM	ST Proprietary Message
QZSS	Quasi-Zenith Satellite System
RAIM	Receiver Autonomous Integrity Monitoring
RLM	Return Link Message
RLS	Return Link Service

Abbreviation	Description
RMC	Recommended Minimum Specific GNSS Data
RTC	Real-Time Clock
SBAS	Satellite-Based Augmentation System
TCXO	Temperature Compensated Crystal Oscillator
TOW	Time of Week
TRAIM	Time-Receiver Autonomous Integrity Monitoring
UART	Universal Asynchronous Receiver/Transmitter
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision
VTG	Course Over Ground & Ground Speed
ZDA	Time & Date

4 Appendix B GNSS (NMEA) Numbering

Table 16: GNSS Satellites (NMEA) Numbering

GNSS Type	System ID	Satellite ID	Signal ID
GPS	1	V3.01: 1–32 V4.10: 1–32	1 = L1 C/A
GLONASS	2	V3.01: 65–92 V4.10: 65–99	1 = L1 C/A
Galileo	3	V3.01: 301–336 V4.10: 1–36	6 = L1-A 7 = L1-BC
BDS	4	V3.01: 141–177 V4.10: 1–37	1 = B1I 2 = B1Q
QZSS	5	V3.01: 183–202 V4.10: 1–32	1 = L1 C/A
SBAS	-	V3.01: 33–51 V4.10: 33–64	-

NOTE

The table above is only applicable to standard NMEA messages.

5 Appendix C Special Characters

Table 17: Special Characters

Special Character	Definition
<...>	Parameter name. Angle brackets do not appear in the message.
[...]	Optional field of a message. Square brackets do not appear in the message.
{…}	Repeated field of a message. Curly brackets do not appear in the message.
Underline	Default setting of a parameter.