LC79D (A) GNSS Protocol Specification

GNSS Module Series

Version: 1.1

Date: 2022-05-20

Status: Released

At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:

Quectel Wireless Solutions Co., Ltd.
Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China
Tel: +86 21 5108 6236
Email: info@quectel.com

Or our local offices. For more information, please visit:
http://www.quectel.com/support/sales.htm.

For technical support, or to report documentation errors, please visit:
http://www.quectel.com/support/technical.htm.
Or email us at: support@quectel.com.

Legal Notices

We offer information as a service to you. The provided information is based on your requirements and we make every effort to ensure its quality. You agree that you are responsible for using independent analysis and evaluation in designing intended products, and we provide reference designs for illustrative purposes only. Before using any hardware, software or service guided by this document, please read this notice carefully. Even though we employ commercially reasonable efforts to provide the best possible experience, you hereby acknowledge and agree that this document and related services hereunder are provided to you on an “as available” basis. We may revise or restate this document from time to time at our sole discretion without any prior notice to you.

Use and Disclosure Restrictions

License Agreements

Documents and information provided by us shall be kept confidential, unless specific permission is granted. They shall not be accessed or used for any purpose except as expressly provided herein.

Copyright

Our and third-party products hereunder may contain copyrighted material. Such copyrighted material shall not be copied, reproduced, distributed, merged, published, translated, or modified without prior written consent. We and the third party have exclusive rights over copyrighted material. No license shall be granted or conveyed under any patents, copyrights, trademarks, or service mark rights. To avoid ambiguities, purchasing in any form cannot be deemed as granting a license other than the normal non-exclusive, royalty-free license to use the material. We reserve the right to take legal action for noncompliance with abovementioned requirements, unauthorized use, or other illegal or malicious use of the material.

Trademarks

Except as otherwise set forth herein, nothing in this document shall be construed as conferring any rights to use any trademark, trade name or name, abbreviation, or counterfeit product thereof owned by Quectel or any third party in advertising, publicity, or other aspects.

Third-Party Rights

This document may refer to hardware, software and/or documentation owned by one or more third parties ("third-party materials"). Use of such third-party materials shall be governed by all restrictions and obligations applicable thereto.

We make no warranty or representation, either express or implied, regarding the third-party materials, including but not limited to any implied or statutory, warranties of merchantability or fitness for a particular purpose, quiet enjoyment, system integration, information accuracy, and non-infringement of any third-party intellectual property rights with regard to the licensed technology or use thereof. Nothing herein constitutes a representation or warranty by us to either develop, enhance, modify, distribute, market, sell, offer for sale, or otherwise maintain production of any our products or any other hardware, software, device, tool, information, or product. We moreover disclaim any and all warranties arising from the course of dealing or usage of trade.

Privacy Policy

To implement module functionality, certain device data are uploaded to Quectel's or third-party's servers, including carriers, chipset suppliers or customer-designated servers. Quectel, strictly abiding by the relevant laws and regulations, shall retain, use, disclose or otherwise process relevant data for the purpose of performing the service only or as permitted by applicable laws. Before data interaction with third parties, please be informed of their privacy and data security policy.

Disclaimer

a) We acknowledge no liability for any injury or damage arising from the reliance upon the information.
b) We shall bear no liability resulting from any inaccuracies or omissions, or from the use of the information contained herein.
c) While we have made every effort to ensure that the functions and features under development are free from errors, it is possible that they could contain errors, inaccuracies, and omissions. Unless otherwise provided by valid agreement, we make no warranties of any kind, either implied or express, and exclude all liability for any loss or damage suffered in connection with the use of features and functions under development, to the maximum extent permitted by law, regardless of whether such loss or damage may have been foreseeable.
d) We are not responsible for the accessibility, safety, accuracy, availability, legality, or completeness of information, advertising, commercial offers, products, services, and materials on third-party websites and third-party resources.

About the Document

Document Information	
Title	**LC79D (A) GNSS Protocol Specification**
Subtitle	GNSS Module Series
Document Type	GNSS Protocol Specification
Document Status	Released

Revision History

Version	Date	Description
1.0	2019-12-11	Initial
1.1	2022-05-20	1. Added types for all messages. 2. Deleted the chapter of Commands. 3. Added the chapter of Structure of NMEA Protocol Messages. 4. Updated the contents and parameters of RMC, GGA, GSV, GSA, VTG and GLL sentences. 5. Deleted PQSTARTGNSS, PQSTOPGNSS, PQSETASSTIME, PQSETASSPOS and PQSETASSGNSS messages. 6. Added PQCFGEAMASK and PQCFGCLAMPING messages. 7. Deleted the chapter of Default Configurations. 8. Added the chapter of GNSS Numbering.

Contents

Table Index

1 Introduction

Quectel LC79D (A) GNSS module supports GPS, GLONASS, Galileo, BDS, QZSS and NavIC (IRNSS) constellations. The tracking of GPS L1 C/A, GPS L5-Q, GLONASS L1 C/A, Galileo E1, Galileo E5a, BDS B1I, QZSS L1 C/A, QZSS L5-Q and NavIC L5-SPS frequency bands provides fast and accurate acquisition and makes this module an ideal solution for positioning and navigation in 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 Quectel (PQ commands). To report GNSS information, the module supports output messages in NMEA 0183 standard protocol.

NOTE

Quectel assumes no responsibility if commands other than the ones listed in this document are used.

2 NMEA Protocol

2.1. Structure of NMEA Protocol Messages

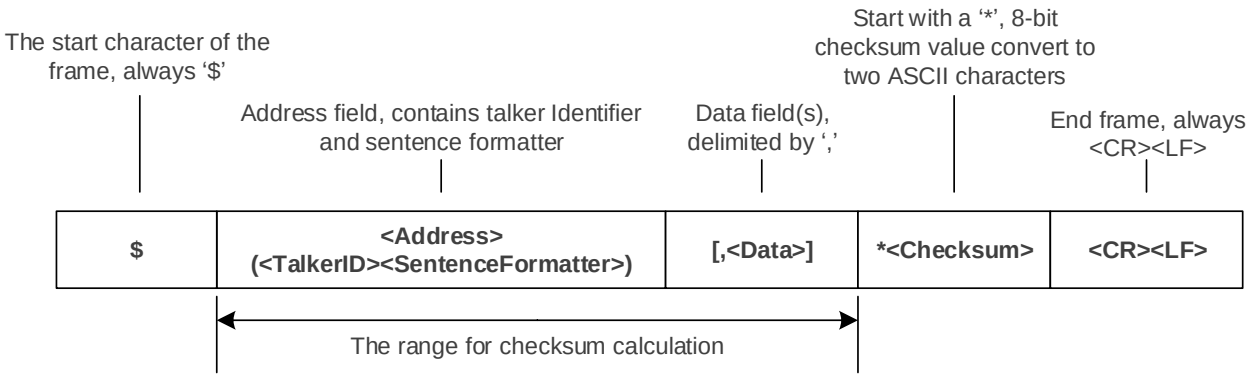

Figure 1: Structure of the NMEA Protocol Message

Table 1: Structure of the NMEA Protocol Message

Field	Description
$	Start of the sentence (Hex 0x24).
<Address>	**In Standard Messages:** In NMEA standard messages, this field consists of a two-character talker identifier (TalkerID) and a three-character sentence formatter (SentenceFormatter). The talker identifier serves to define the nature of the data being transmitted. For more information on the TalkerID, see *Table 2: NMEA Talker ID*. The sentence formatter is used to define data format and type. **In Proprietary Messages:** In NMEA 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.
<Data>	Data fields, delimited by comma (,). Variable length (depends on the NMEA message type).

<Checksum>	The checksum field follows the checksum delimiter character *****. The checksum is the 8-bit exclusive OR of all characters in the sentence, including the comma (**,**) delimiter, between but not including the **$** and the ***** delimiters.
<CR><LF>	End of the sentence (Hex 0x0D 0x0A).

Table 2: NMEA Talker ID

GNSS Constellation Configuration	TalkerID (NMEA V4.11)
GPS	GP
GLONASS	GL
Galileo	GA
BDS	GB
QZSS	GQ
NavIC (IRNSS)	GI
Combination of Multiple Satellite Systems	GN

2.2. Standard Messages

This chapter explains the NMEA 0183 V4.11 standard messages supported by the module.

2.2.1. RMC

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

Type:

Output

Synopsis:

```
$<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
$	-	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 2: NMEA Talker ID.*
RMC	String, 3 characters	-	RMC	Recommended Minimum Specific GNSS Data.
<UTC>	hhmmss.ss	-	060512.00	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) ss: Decimal fraction of seconds
<Status>	Character	-	A	Positioning system status: A = Data valid V = Invalid D = Differential
<Lat>	ddmm.mmmmmm	-	3150.788156	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	Latitude direction: N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11711.922383	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	Longitude direction: E = East W = West Note that this field is empty in case of an 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	-	Course over ground. Variable length. Maximum value: 359.9. Note that this field is empty in case of an invalid value.
<Date>	ddmmyy	-	311019	Date: dd: Day of month mm: Month yy: Year
<MagVar>	-	-	-	Magnetic variation. Not supported.
<MagVarDir>	-	-	-	The direction of magnetic variation. Not supported.
<ModeInd>	Character	-	A	Mode indicator: A = Autonomous mode. Satellite system used in non-differential mode in position fix M = Manual input mode N = No fix. Satellite system not used in position fix, or fix not valid.
<NavStatus>	Character	-	V	Navigational status. Not supported. Always “V” (Navigational status not valid). (NMEA V4.11)
<Checksum>	Hexadecimal	-	*1B	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNRMC,000010.00,V,,,,,,020712,,,N,V*1E
$GNRMC,060512.00,A,3150.788156,N,11711.922383,E,0.0,,311019,,,A,V*1B
```

2.2.2. GGA

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

Type:

Output

Synopsis:

```
$<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
$	-	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 2: NMEA Talker ID.*
GGA	String, 3 characters	-	GGA	Global Positioning System Fix Data.
<UTC>	hhmmss.ss	-	062735.00	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) ss: Decimal fraction of seconds
<Lat>	ddmm.mmmmmm	-	3150.788156	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	Latitude direction: N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11711.922383	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	Longitude direction: E = East W = West Note that this field is empty in case of an invalid value.

<Quality>	Numeric, 1 digit	-	1	GPS quality indicator: 0 = Fix not available or invalid 1 = GPS SPS Mode, fix valid 3 = GPS PPS Mode, fix valid
<NumSatUsed>[1)]	Numeric, 2 digits	-	12	Number of satellites in use.
<HDOP>	Numeric	-	2.0	Horizontal dilution of precision.
<Alt>	Numeric	m	90.0	Altitude above mean-sea-level (geoid). Note that this field is empty in case of an invalid value.
M	Character	-	M	-
<Sep>	Numeric	m	-	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 this field is empty in case of an invalid value.
M	Character	-	M	-
<DiffAge>	-	-	-	Differential GPS data age. Not supported.
<DiffStation>	-	-	-	Differential reference station ID. Not supported.
<Checksum>	Hexadecimal	-	*55	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGGA,000010.00,,,,,0,00,99.0,,M,,M,,*49
$GNGGA,062735.00,3150.788156,N,11711.922383,E,1,12,2.0,90.0,M,,M,,*55
```

NOTE

1. The NMEA 0183 specification indicates that the GGA message is GPS specific. However, when the receiver is configured for multi-constellations, the content of 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. 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 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:

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

Parameter:

Field	Format	Unit	Example	Description
$	-	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GP	Talker identifier. See *Table 2: NMEA Talker ID.*
GSV	String, 3 characters	-	GSV	GNSS Satellites in View.
<TotalNumSen>	Numeric	-	3	Total number of sentences. Range: 1–9.
<SenNum>	Numeric	-	1	Sentence number. Range: 1–**<TotalNumSen>**.
<TotalNumSat>	Numeric	-	11	Total number of satellites in view. Maximum value: 32.
Start of repeat block. Repeat times: 1–4.				
<SatID>	Numeric	-	05	Satellite ID. See *Table 4: GNSS Numbering.*
<SatElev>	Numeric	Degree	09	Satellite elevation. Range: 00–90. Note that this field is empty in case of an invalid value.
<SatAz>	Numeric	Degree	116	Satellite azimuth, with true north as the reference plane. Range: 000–359. Note that this field is empty in case of an invalid value.
<SatCN0>	Numeric	dB-Hz	27	Satellite C/N_0. Range 00–99. Null when not tracking.

End of repeat block.				
<SignalID>	Numeric	-	1	GNSS signal ID. See *Table 4: GNSS Numbering.*
<Checksum>	Hexadecimal	-	*68	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GPGSV,3,1,11,05,09,116,27,10,24,312,44,12,09,141,28,13,14,055,41,1*68
$GPGSV,3,2,11,15,45,045,49,20,52,323,46,24,76,125,26,27,,,19,1*51
$GPGSV,3,3,11,10,24,312,43,24,76,125,13,27,,,19,8*63
$GLGSV,2,1,07,78,45,071,45,77,10,028,39,79,,,16,69,38,327,48,1*43
$GLGSV,2,2,07,84,35,279,21,85,09,331,32,67,09,083,44,1*4D
$GQGSV,2,1,03,01,66,079,38,02,45,132,19,1*6A
$GQGSV,2,2,03,01,66,079,35,8*56
$GBGSV,1,1,04,206,67,338,43,211,13,303,31,216,65,322,41,219,15,096,39,1*71
$GIGSV,1,1,02,03,38,233,23,07,,,25,1*44
```

NOTE

GN cannot be used for GSV sentences. If satellites of multiple constellations are in view, use separate GSV sentences with the corresponding Talker ID for each constellation.

2.2.4. GSA

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

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Example	Description
$	-	-	$	Each NMEA message starts with **$**.

<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 2: NMEA Talker ID.*
GSA	String, 3 characters	-	GSA	GNSS DOP and Active Satellites.
<Mode>	Character	-	A	M = Manual, forced to operate in 2D or 3D mode A = Automatic, allowed to automatically switch to 2D/3D
<FixMode>	Numeric	-	3	1 = Fix not available 2 = 2D 3 = 3D
Start of repeat block. Repeat times: 12.				
<SatID>	Numeric	-	10	ID numbers of satellites used in solution. See *Table 4: GNSS Numbering.* Note that this field is empty in case of an invalid value.
End of repeat block.				
<PDOP>	Numeric	-	2.5	Position dilution of precision. Maximum value: 99.0.
<HDOP>	Numeric	-	2.0	Horizontal dilution of precision. Maximum value: 99.0.
<VDOP>	Numeric	-	1.5	Vertical dilution of precision. Maximum value: 99.0.
<SystemID>	Numeric	-	1	GNSS system ID. See *Table 4: GNSS Numbering.*
<Checksum>	Hexadecimal	-	*35	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGSA,A,3,10,13,15,20,,,,,,,,2.5,2.0,1.5,1*35
$GNGSA,A,3,67,69,77,78,85,,,,,,,,2.5,2.0,1.5,2*3F
$GNGSA,A,3,,,,,,,,,,,,,2.5,2.0,1.5,3*32
$GNGSA,A,3,,,,,,,,,,,,,2.5,2.0,1.5,4*35
$GNGSA,A,3,01,,,,,,,,,,,,2.5,2.0,1.5,5*35
$GNGSA,A,3,,,,,,,,,,,,,2.5,2.0,1.5,6*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 for navigation, only the IDs of the first 12 are output.

2.2.5. VTG

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

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Example	Description
$	-	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 2: NMEA Talker ID.*
VTG	String, 3 characters	-	VTG	Course Over Ground & Ground Speed.
<COGT>	Numeric	Degree	-	Course over ground, in true north course direction. Not supported.
T	Character	-	T	Course over ground. (degrees true, fixed field).
<COGM>	Numeric	Degree	-	Course over ground (magnetic). Not supported.
M	Character	-	M	Course over ground. (degrees magnetic, fixed field).
<SOGN>	Numeric	Knot	0.0	Speed over ground in knots. Note that this field is empty in case of an invalid value.
N	Character	-	N	Speed over ground (knots, fixed field).
<SOGK>	Numeric	km/h	0.0	Speed over ground in kilometers per hour. Note that this field is empty in case of an invalid value.
K	Character	-	K	Speed over ground. (kilometers per hour, fixed field).
<ModeInd>	Character	-	A	Mode indicator: A = Autonomous mode. Satellite system used in non-differential mode in position fix

				M = Manual input mode N = No fix. Satellite system not used in position fix, or fix not valid.
<Checksum>	Hexadecimal	-	*3D	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNVTG,,T,,M,0.0,N,0.0,K,A*3D
```

2.2.6. GLL

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

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Example	Description
$	-	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 2: NMEA Talker ID*
GLL	String, 3 characters	-	GLL	Geographic Position – Latitude/Longitude.
<Lat>	ddmm.mmmmmm	-	3150.788156	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	Latitude direction: N = North S = South Note that this field is empty in case of an invalid value.

<Lon>	dddmm.mmmmmm	-	11711.922383	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	Longitude direction: E = East W = West Note that this field is empty in case of an invalid value.
<UTC>	hhmmss.ss	-	062735.00	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) ss: Decimal fraction of seconds
<Status>	Character	-	A	Positioning system status: V = Invalid A = Autonomous D = Differential
<ModeInd>	Character	-	A	Mode indicator: A = Autonomous mode. Satellite system used in non-differential mode in position fix M = Manual input mode N = No fix. Satellite system not used in position fix, or fix not valid.
<Checksum>	Hexadecimal	-	*76	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGLL,,,,,000010.00,V,N*55
$GNGLL,3150.788156,N,11711.922383,E,062735.00,A,A*76
```

2.3. PQ Messages

This chapter explains the PQ messages (proprietary NMEA messages defined by Quectel) supported by LC79D (A).

2.3.1. PQCOLD

Performs a cold start.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

Cold start initialization and GNSS engine restart.

Example:

```
$PQCOLD*05
```

2.3.2. PQWARM

Performs a warm start.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

Warm start initialization and GNSS engine restart.

Example:

```
$PQWARM*08
```

2.3.3. PQHOT

Performs a hot start.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

Hot start initialization and GNSS engine restart.

Example:

```
$PQHOT*52
```

2.3.4. PQSRR

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

Type:

Command

Synopsis:

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

Parameter:

None

Result:

The GNSS firmware is rebooted and no message is sent as a reply.

Example:

```
$PQSRR*52
```

2.3.5. PQSETSLEEP

Enables/disables sleep mode.

Type:

Set

Synopsis:

```
$PQSETSLEEP,<Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Sleep mode: 0 = Disable sleep mode (default) 1 = Enable sleep mode

Result:

- If successful, the module returns:

```
$PQSETSLEEPOK*08
```

- If failed, the module returns:

```
$PQSETSLEEPERROR*54
```

Example:

```
$PQSETSLEEP,1*11
$PQSETSLEEPOK*08
```

NOTE

1. In sleep mode, the UART is inaccessible.
2. When sleep mode is enabled with **$PQSETSLEEP,1*11** and GNSS engine is stopped, the module can enter sleep mode by pulling down AP_REQ pin.

2.3.6. PQGETSLEEP

Gets the status of sleep mode.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQSLEEP,<Mode>*<Checksum><CR><LF>
```

The parameter included in the result above is listed below:

Field	Format	Unit	Description
<Mode>	Numeric	-	Sleep mode status: 0 = The sleep mode is disabled (default). 1 = The sleep mode is enabled.

- If failed, the module returns:

```
$PQGETSLEEPERROR*40
```

Example:

```
$PQGETSLEEP*18
$PQSLEEP,1*53
```

2.3.7. PQSETGLP

Enables/disables GNSS Low Power (GLP) mode. GLP is the best power-saving mode for acquisition and tracking. It helps the module to achieve a balance between performance and power consumption according to signal condition.

Type:

Set

Synopsis:

```
$PQSETGLP,<Mode>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	GLP mode: 0 = Disable GLP mode (default) 1 = Enable GLP mode

Result:

- If successful, the module returns:

```
$PQSETGLPOK*1C
```

- If failed, the module returns:

```
$PQSETGLPERROR*40
```

Example:

```
$PQSETGLP,1*05
$PQSETGLPOK*1C
```

NOTE

The GNSS engine will be restarted if this command is executed successfully.

2.3.8. PQGETGLP

Gets the status of GLP mode.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQGLP,<Mode>*<Checksum><CR><LF>
```

The parameter included in the result above is listed below:

Field	Format	Unit	Description
<Mode>	Numeric	-	GLP mode status: 0 = The GLP mode is disabled (default). 1 = The GLP mode is enabled.

- If failed, the module returns:

```
$PQGETGLPERROR*54
```

Example:

```
$PQGETGLP*0C
$PQGLP,1*47
```

2.3.9. PQSETBAUD

Configures NMEA port baud rate.

Type:

Set

Synopsis:

```
$PQSETBAUD,<Baudrate>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Baudrate>	Numeric	bps	Supported baud rates: 115200 (default) 230400 460800 921600

Result:

- If successful, the module returns:

```
$PQSETBAUDOK*55
```

- If failed, the module returns:

```
$PQSETBAUDERROR*09
```

Example:

```
$PQSETBAUD,115200*7A
$PQSETBAUDOK*55
```

2.3.10. PQSETCNST

Configures the GNSS constellation mask.

Type:

Set

Synopsis:

```
$PQSETCNST,<Mask>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mask>	Numeric	-	It is a bit mask where each bit enables (1 = enable) or disables (0 = disable) a specific constellation independently: bit 0: Enable/disable GPS constellation bit 1: Enable/disable GLONASS constellation bit 2: Enable/disable Galileo constellation bit 3: Enable/disable BDS constellation bit 4: Enable/disable NavIC constellation bit 5: Enable/disable QZSS constellation

Result:

- If successful, the module returns:

```
$PQSETCNSTOK*4D
```

- If failed, the module returns:

```
$PQSETCNSTERROR*11
```

Example:

```
$PQSETCNST,63*60
$PQSETCNSTOK*4D
```

NOTE

The GNSS engine will be restarted if the command is executed successfully.

2.3.11. PQGETCNST

Gets the information of GNSS constellation mask.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQCNST,<Mask>*<Checksum><CR><LF>
```

The parameter included in the result above is listed below:

Field	Format	Unit	Description
<Mask>	Numeric	-	It is a bit mask where each bit enables (1 = enable) or disables (0 = disable) a specific constellation independently: bit 0: GPS constellation is enabled/disabled. bit 1: GLONASS constellation is enabled/disabled. bit 2: Galileo constellation is enabled/disabled. bit 3: BDS constellation is enabled/disabled. bit 4: NAVIC constellation is enabled/disabled. bit 5: QZSS constellation is enabled/disabled.

- If failed, the module returns:

```
$PQGETCNSTERROR*05
```

Example:

```
$PQGETCNST*5D
$PQCNST,63*22
```

2.3.12. PQSETL5BIAS

Configures the L5 bias value. This value is used for correcting the L5 delay, and it can be acquired by connecting the module to QGNSS tool in open sky conditions.

Type:

Set

Synopsis:

```
$PQSETL5BIAS,<Bias>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Bias>	Numeric	-	L5 bias value.

Result:

- If successful, the module returns:

```
$PQSETL5BIASOK*27
```

- If failed, the module returns:

```
$PQSETL5BIASERROR*7B
```

Example:

```
$PQSETL5BIAS,14.6*12
$PQSETL5BIASOK*27
$PQSAVEPAR*43
$PQSAVEPAROK*47
```

NOTE

The configuration takes effect after rebooting, and it must be saved by **$PQSAVEPAR** (see ***Chapter 2.3.26*** for details) before rebooting.

2.3.13. PQGETL5BIAS

Gets the current L5 bias value.

Type:

Get

Synopsis:

```
$PQGETL5BIAS*<Checksum><CR><LF>
```

Parameter:

None

Result:

- If successful, the module returns:

```
$PQL5BIAS,<Bias>*<Checksum><CR><LF>
```

The parameter included in the result above is listed below:

Field	Format	Unit	Description
<Bias>	Numeric	-	L5 bias value.

- If failed, the module returns:

```
$PQGETL5BIASERROR*6F
```

Example:

```
$PQGETL5BIAS*37
$PQL5BIAS,14.600000*60
```

2.3.14. PQCFGODO

Sets or gets odometer configurations.

Type:

Set/Get

Synopsis:

```
$PQCFGODO,<RW>,<Auto_Start>,<MSG_Mode>,<InitVal>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<RW>	Numeric, 1 digit	-	Read or write odometer configurations. 0 = Read odometer configurations 1 = Configure odometer
<Auto_Start>	Numeric, 1 digit	-	Enable or disable odometer to start automatically. 0 = Disable (default) 1 = Enable
<MSG_Mode>	Numeric, 1 digit	-	Message report mode. 0 = Do not output odometer message periodically 1 = Output odometer message periodically (default)
<InitVal>	Numeric	-	Odometer initial value. Default value: 0.

Result:

- If successful, the module returns:

```
$PQCFGODOOK*03
```

- If failed, the module returns:

```
$PQCFGODOERROR*5F
```

Example:

```
$PQCFGODO,1,0,1,0*07
$PQCFGODOOK*03
```

2.3.15. PQREQODO

Requests the current odometer configuration information.

Type:

Query

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQODO,<Odo_Val>*<Checksum><CR><LF>
```

The parameter included in the result above is listed below:

Field	Format	Unit	Description
<Odo_Val>	Numeric	-	The current odometer value.

- If failed, the module returns:

```
$PQREQODOERROR*5B
```

Example:

```
$PQREQODO*03
$PQODO,0.0*47
```

2.3.16. PQRESETODO

Resets odometer. This command will clear the current odometer value.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQRESETODOOK*14
```

- If failed, the module returns:

```
$PQRESETODOERROR*48
```

Example:

```
$PQRESETODO*10
$PQRESETODOOK*14
```

2.3.17. PQSTARTODO

Starts odometer.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQSTARTODOOK*01
```

- If failed, the module returns:

```
$PQSTARTODOERROR*5D
```

Example:

```
$PQSTARTODO*05
$PQSTARTODOOK*01
```

2.3.18. PQSTOPODO

Stops odometer.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQSTOPODOOK*59
```

- If failed, the module returns:

```
$PQSTOPODOERROR*05
```

Example:

```
$PQSTOPODO*5D
$PQSTOPODOOK*59
```

2.3.19. PQCFGGEOFENCE

Sets or gets geofence configurations.

Type:

Set/Get

Synopsis:

```
$PQCFGGEOFENCE,<RW>,<GeoID>,<GeoMode>,<GeoShape>,<Lat0>,<Lon0>,<Lat1/Radius>{,<Lon1>,<Lat2>,<Lon2>,<Lat3>,<Lon3>}*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<RW>	Numeric, 1 digit	-	Read or write geofence configurations. 0 = Read geofence configurations 1 = Configure geofence
<GeoID>	Numeric, 1 digit	-	Geofence ID. Range: 0-2.
<GeoMode>	Numeric, 1 digit	-	Geofence message report mode. 0 = Do not report 1 = Report when entering the geo-fence 2 = Report when leaving the geo-fence 3 = Report when entering or leaving the geo-fence
<GeoShape>	Numeric, 1 digit	-	The shape of geofence. 0 = Circle with a radius

			1 = Circle with one point on circle 2 = Triangle 3 = Quadrangle (such as square, rectangle trapezium, etc.)
<Lat0>	Float	-	The latitude of the first point.
<Lon0>	Float	-	The longitude of the first point.
<Lat1/Radius>	Float	-	If the geofence shape is a circle with a certain radius, this value will be the radius of the circle, otherwise this value will be the latitude of the second point.
<Lon1>	Float	-	The longitude of the second point.
<Lat2>	Float	-	The latitude of the third point.
<Lon2>	Float	-	The longitude of the third point.
<Lat3>	Float	-	The latitude of the fourth point.
<Lon3>	Float	-	The longitude of the fourth point.

Result:

- If successful, the module returns:

```
$PQCFGGEOFENCEOK*41
```

- If failed, the module returns:

```
$PQCFGGEOFENCEERROR*1D
```

Example:

```
//If the geofence shape is a circle with a radius:
$PQCFGGEOFENCE,1,0,3,0,31.5863,117.5686,2000*59
$PQCFGGEOFENCEOK*41

//If the geofence shape is circle with one point on circle:
$PQCFGGEOFENCE,1,0,3,1,31.5863,117.5686,36.5548,118.4523*47
$PQCFGGEOFENCEOK*41
```

2.3.20. PQSETGEOFENCE

Enables/disables geofence.

Type:

Set

Synopsis:

```
$PQSETGEOFENCE,<GeoEn>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GeoEn>	Numeric, 1 digit	-	Enable or disable geofence. 0 = Disable geofence (default) 1 = Enable geofence

Result:

- If successful, the module returns:

```
$PQSETGEOFENCEOK*41
```

- If failed, the module returns:

```
$PQSETGEOFENCEERROR*1D
```

Example:

```
$PQSETGEOFENCE,0*59
$PQSETGEOFENCEOK*41
```

2.3.21. PQGETGEOFENCE

Gets the status of geofence.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQGEOFENCE,<GeoEn>*<Checksum><CR><LF>
```

The parameter included in the result above is listed below:

Field	Format	Unit	Description
<GeoEn>	Numeric, 1 digit	-	The status of geofence. 0 = Geofence is disabled (default). 1 = Geofence is enabled.

- If failed, the module returns:

```
$PQGETGEOFENCEERROR*09
```

Example:

```
$PQGETGEOFENCE*51
$PQGEOFENCE,0*1B
```

2.3.22. PQREQGEOFENCE

Requests if the current position is inside or outside the geofence.

Type:

Query

Synopsis:

```
$PQREQGEOFENCE,<GeoID>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GeoID>	Numeric, 1 digit	-	Geofence ID. Range: 0-2.

Result:

- If successful, the module returns:

```
$PQGEOFENCESTATUS,<GeoID>,<GeoStatus>*<Checksum><CR><LF>
```

The parameters included in the result above are listed below:

Field	Format	Unit	Description
<GeoID>	Numeric, 1 digit	-	Geofence ID. Range: 0-2.
<GeoStatus>	Numeric, 1 digit	-	If the current position is inside or outside the geofence: 0 = Unknow 1 = Inside 2 = Outside

- If failed, the module returns:

```
$PQREQGEOFENCEERROR*19
```

Example:

```
$PQREQGEOFENCE,0*5D
$PQGEOFENCESTATUS,0,0*13
```

2.3.23. PQCFGNMEAMSG

Sets or gets the type of output NMEA messages.

Type:

Set/Get

Synopsis:

```
$PQCFGNMEAMSG,<RW>,<NMEA_GGA>,<NMEA_RMC>,<NMEA_GSV>,<NMEA_GSA>,<NMEA_GLL>,<NMEA_VTG>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<RW>	Numeric, 1 digit	-	Read or write NMEA message configurations. 0 = Read NMEA message configurations 1 = Configure NMEA message
<NMEA_GGA>	Numeric, 1 digit	-	0 = Disable GGA messages 1 = Enable GGA messages

<NMEA_RMC>	Numeric, 1 digit	-	0 = Disable RMC messages 1 = Enable RMC messages
<NMEA_GSV>	Numeric, 1 digit	-	0 = Disable GSV messages 1 = Enable GSV messages
<NMEA_GSA>	Numeric, 1 digit	-	0 = Disable GSA messages 1 = Enable GSA messages
<NMEA_GLL>	Numeric, 1 digit	-	0 = Disable GLL messages 1 = Enable GLL messages
<NMEA_VTG>	Numeric, 1 digit	-	0 = Disable VTG messages 1 = Enable VTG messages

Result:

- If successful, the module returns:

```
$PQCFGNMEAMSGOK*19
```

- If failed, the module returns:

```
$PQCFGNMEAMSGERROR*45
```

Example:

```
$PQCFGNMEAMSG,1,1,1,1,1,1,1*00
$PQCFGNMEAMSGOK*19
```

2.3.24. PQCFGEAMASK

Sets or gets estimate accuracy. This function is used to change TTFF (negative correlation).

Type:

Set/Get

Synopsis:

```
$PQCFGEAMASK,<RW>,<EA_Mask>*<CheckSum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<RW>	Numeric, 1 digit	-	Set or get EA_Mask value. 0 = Get EA_Mask value 1 = Set EA_Mask value
<EA_Mask>	Numeric, 3 digits	m	EA_Mask (estimate accuracy) is negatively correlated with TTFF

	Range: 50–400 (default value: 100)

Result:

- If successful, the module returns:

```
$PQCFGEAMASKOK*57
```

- If failed, the module returns:

```
$PQCFGEAMASKERROR*0B
```

Example:

```
$PQCFGEAMASK,1,200*50
$PQCFGEAMASKOK*57
```

2.3.25. PQCFGCLAMPING

Sets or gets clamping function status. If the actual speed is very slow, output position remains the same and the output speed will be zero.

Type:

Set/Get

Synopsis:

```
$PQCFGCLAMPING,<RW>,<Enable>*<CheckSum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<RW>	Numeric, 1 digit	-	Set or get clamping function status. 0 = Get clamping function status 1 = Set clamping function status
<Enable>	Numeric, 1 digit	-	0 = Disable clamping function(default) 1 = Enable clamping function

Result:

- If successful, the module returns:

```
$PQCFGCLAMPINGOK*54
```

- If failed, the module returns:

```
$PQCFGCLAMPINGERROR*08
```

Example:

```
$PQCFGCLAMPING,1,1*50
$PQCFGCLAMPINGOK*54
```

2.3.26. PQSAVEPAR

Saves configurations of GNSS commands into NVM.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQSAVEPAROK*47
```

- If failed, the module returns:

```
$PQSAVEPARERROR*1B
```

Example:

```
$PQSAVEPAR*43
$PQSAVEPAROK*47
```

2.3.27. PQRESTOREPAR

Restores all configurations to default values.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQRESTOREPAROK*0E
```

- If failed, the module returns:

```
$PQRESTOREPARERROR*52
```

Example:

```
$PQRESTOREPAR*0A
$PQRESTOREPAROK*0E
```

3 Appendix A References

Table 3: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
BDS	BDS Navigation Satellite System
C/N_0	Carrier-to-Noise-Density Ratio
COG	Course over Ground
COGM	Course over Ground (in Magnetic North Course Direction)
COGT	Course over Ground (in True North Course Direction)
DOP	Dilution of Precision
Galileo	Galileo Satellite Navigation System (EU)
GGA	Global Positioning System Fix Data
GLL	Geographic Position - Latitude and Longitude
GLONASS	Global Navigation Satellite System (Russian)
GLP	GNSS Low Power
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GPS DOP and Active Satellites
GSV	GNSS Satellites in View
HDOP	Horizontal Dilution of Precision
IRNSS	Indian Regional Navigation Satellite System

NavIC	Navigation with Indian Constellation
NMEA	NMEA (National Marine Electronics Association) 0183 Interface Standard
NVM	Non-Volatile Memory
PDOP	Position Dilution of Precision
PPS	Pulse Per Second
QZSS	Quasi-Zenith Satellite System
RMC	Recommended Minimum Specific GNSS Data
SNR	Signal-to-Noise Ratio
SOG	Speed over Ground
SPS	Standard Positioning Service
TTFF	Time to First Fix
UART	Universal Asynchronous Receiver/Transmitter
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision
VTG	Course Over Ground & Ground Speed

4 Appendix B GNSS Numbering

Table 4: GNSS Numbering

GNSS Type	System ID	Satellite ID	Signal ID
GPS	1	1–32	1 = L1 C/A 8 = L5-Q
GLONASS	2	65–96	1 = L1 C/A
Galileo	3	101–136	1 = E5a 6 = E1
BDS	4	201–236	1 = B1I
QZSS	5	1–10	1 = L1 C/A 8 = L5-Q
NavIC (IRNSS)	6	1–15	1 = L5-SPS