LG290P (03)&LG580P (03)

GNSS Protocol Specification

GNSS Module Series

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About the Document

Document Information	
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Revision History

Version	Date	Description
-	2023-12-18	Creation of the document
1.0	2024-09-02	First official release
1.1.0	2024-12-27	1. Added applicable LG580P (03) module and related contents. 2. Added a table of modules and support frequency bands (*Table 1*). 3. Added new standard NMEA0183 messages (*Chapters 2.2.7* to *2.2.12*). 4. Updated PQTMCFGMSGRATE message (*Chapter 2.3.15*). 5. Updated the table of supported messages (*Table 6*). 6. Changed <Heading> to <COG> in (*Chapter 2.3.16*). 7. Added a note that if $PQTMRESETODO is sent when the position is lost, the odometer will no longer accumulate the current lost position period distance until two new positioning points are regained (*Chapter 2.3.34*). 8. Added the default values for LG580P (03) module (*Chapter 2.3.36*). 9. Added PQTMCFGSBAS, PQTMCFGNMEATID, PQTMTAR, PQTMCFGBLD, PQTMCFGRTKSRCTYPE and PQTMSN messages (*Chapters 2.3.40*, *2.3.41*, *2.3.42*, *2.3.43*, *2.3.44* and *2.3.45*). 10. Added a chapter of special message (*Chapter 2.4.1*). 11. Added QGC protocol chapter (*Chapter 3*).

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1 Introduction

Quectel LG290P (03) and LG580P (03) GNSS module supports GPS, GLONASS, Galileo, BDS, QZSS and NavIC (IRNSS) constellations, providing fast and accurate acquisition and making this module an ideal solution for positioning and navigation in various vertical markets.

Table 1: Modules and Support Frequency Bands

Module	Frequency Band
LG290P (03)/ LG580P (03)	GPS L1 C/A, GPS L1C [1)], GPS L2C, GPS L5-Q, GLONASS G1 C/A [2)], GLONASS G2 C/A [2)], Galileo E1, Galileo E5a, Galileo E5b, Galileo E6 [2)], BDS B1I, BDS B1C, BDS B2a, BDS B2b, BDS B2I, BDS B3I [2)], QZSS L1 C/A, QZSS L1C [1)], QZSS L2C, QZSS L5-Q, QZSS L6 [2)], NavIC L5

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 (PQTM commands). To report GNSS information, the module supports message outputting in NMEA 0183 protocol and RTCM protocol format.

The LG290P (03) and LG580P (03) module supports the following protocols:

Table 2: Supported Protocol

Protocol	Type
NMEA 0183 V4.11	Output, ASCII, standard
	Input/output, ASCII, proprietary
RTCM 10403.3	Input/output, binary

NOTE

1. [1)] The LG290P (03) and LG580P (03) modules support GPS L1C and QZSS L1C frequency band which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.
2. [2)] The LG580P (03) module supports GLONASS G1 C/A, GLONASS G2 C/A, Galileo E6, BDS B3I

and QZSS L6 frequency bands which are still under development. Contact Quectel Technical Support (support@quectel.com) for details.

3. Quectel assumes no responsibility if commands other than the ones listed herein are used.

2 NMEA Protocol

2.1. Structure of NMEA Protocol Messages

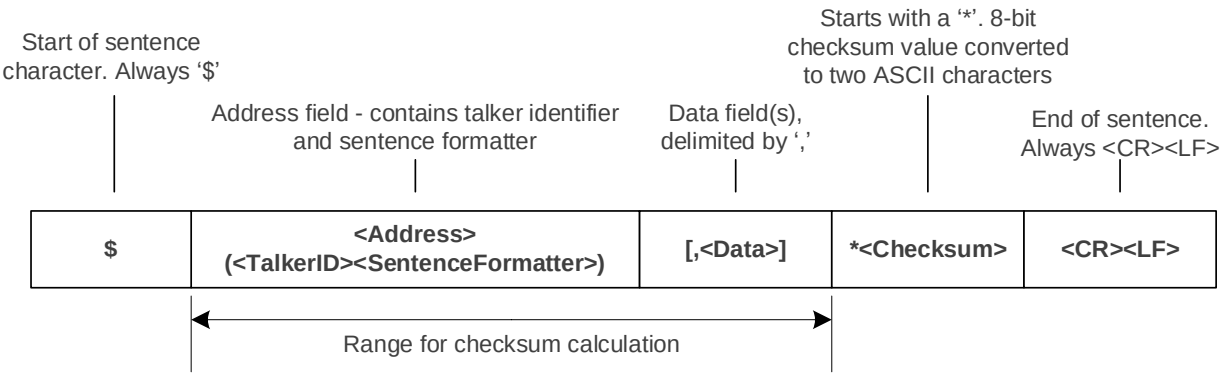

Figure 1: Structure of NMEA Protocol Messages

Table 3: Structure of NMEA Protocol Messages

Field	Description
$	Start of the sentence (Hex 0x24).
<Address>	**In Standard Messages:** In standard messages, this field consists of a two-character talker identifier (TalkerID) and a three-character sentence formatter (SentenceFormatter). The talker identifier identifies the type of talker. For more information on the TalkerID, 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

Field	Description
	proprietary sentence, and any additional characters as required.
<Data>	Data fields, delimited by the data field delimiter **‘,’**. Variable length (depending on the 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	TalkerID (NMEA 0183 V4.11)
GPS	GP
GLONASS	GL
Galileo	GA
BDS	GB
QZSS	GQ
NavIC (IRNSS)	GI
Combination of Multiple Satellite Systems	GN

NMEA Checksum Sample Code:

```
// pData is the data array whose 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 V4.11 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
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 4: NMEA Talker ID.*
RMC	String, 3 characters	-	RMC	Recommended Minimum Specific GNSS Data.
<UTC>	hhmmss.sss	-	025159.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Status>	Character	-	A	Positioning system status. A = Data valid. V = Navigation receiver warning.
<Lat>	ddmm.mmmmmmmm	-	3149.29993210	Latitude. dd: Degrees (00–90)

Field	Format	Unit	Example	Description
				mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmmmm	-	11706.91264104	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that this field is empty in case of an invalid value.
<SOG>	Numeric	Knot	0.001	Speed over ground. Variable length. Note that this field is empty in case of an invalid value.
<COG>	Numeric	Degree	043.43	Course over ground. Variable length. Maximum value: 359.9. Note that this field is empty in case of an invalid value.
<Date>	ddmmyy	-	291123	Date. dd: Day of month mm: Month yy: Year
<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

Field	Format	Unit	Example	Description
				used in differential mode in position fix. Corrections from ground stations or Satellite Based Augmentation System (SBAS). E = Estimated (dead reckoning) mode. F = Float RTK. Satellite system used in RTK mode with floating integers. N = No fix. Satellite system not used in position fix, or fix not valid. R = Real Time Kinematic (RTK). Satellite system used in RTK mode with fixed integers.
<NavStatus>	Character	-	V	Navigational status. Not supported. Always "V" (Navigational status not valid).
<Checksum>	Hexadecimal	-	*33	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

$GNRMC,025159.000,A,3149.29993210,N,11706.91264104,E,0.001,043.43,291123,,,A,V*33

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
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 4: NMEA Talker ID.*

Field	Format	Unit	Example	Description
GGA	String, 3 characters	-	GGA	Global Positioning System Fix Data.
<UTC>	hhmmss.sss	-	025159.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Lat>	ddmm.mmmmmmmm	-	3149.29993210	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmmmm	-	11706.91264104	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	East-west 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. 2 = Differential GPS, SPS Mode, or Satellite Based Augmentation. System (SBAS), fix valid. 3 = GPS PPS Mode, fix valid. 4 = Real Time Kinematic (RTK) System used in RTK mode with fixed integers. 5 = Float RTK. Satellite system used

Field	Format	Unit	Example	Description
				in RTK mode, floating integers.
<NumSatUsed>[1)]	Numeric, 2 digits	-	16	Number of satellites in use.
<HDOP>	Numeric	-	1.26	Horizontal dilution of precision.
<Alt>	Numeric	Meter	97.250	Altitude above mean-sea-level (geoid).
M	Character	-	M	Unit of **<Alt>**. "M" = Meter.
<Sep>	Numeric	Meter	-4.945	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).
M	Character	-	M	Unit of **<Sep>**. "M" = Meter.
<DiffAge>	Numeric	Second	-	Differential GPS data age. Note that this field is empty in case of an invalid value.
<DiffStation>	Numeric	-	-	Differential reference station ID. Range: 0000–4095. Note that this field is empty in case of an invalid value.
<Checksum>	Hexadecimal	-	*5A	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGGA,025159.000,3149.29993210,N,11706.91264104,E,1,16,1.26,97.250,M,-4.945,M,,*5A
```

NOTE

1. The NMEA 0183 specification indicates that the **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. 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
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GP	Talker identifier. See *Table 4: NMEA Talker ID.*
GSV	String, 3 characters	-	GSV	GNSS Satellites in View.
<TotalNumSen>	Numeric	-	2	Total number of sentences. Range: 1–9.
<SenNum>	Numeric	-	1	Sentence number. Range: 1–**<TotalNumSen>**.
<TotalNumSat>	Numeric	-	05	Total number of satellites in view.
Start of repeat block. Repeat times: 1–4.				
<SatID>	Numeric	-	10	Satellite ID. See *Table 16: GNSS Satellites (NMEA) Numbering*.
<SatElev>	Numeric	Degree	77	Satellite elevation. Range: 00–90. Note that this field is empty in case of an invalid value.
<SatAz>	Numeric	Degree	300	Satellite azimuth, with true north as the reference plane. Range: 000–360. Note that this field is empty in case of an invalid value.
<SatCN0>	Numeric	dB-Hz	36	Satellite C/N_0. Range: 00–99.

Field	Format	Unit	Example	Description
				Null when not tracking.
End of repeat block.				
<SignalID>	Numeric	-	1	GNSS signal ID. See *Table 16: GNSS Satellites (NMEA) Numbering*.
<Checksum>	Hexadecimal	-	*67	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GPGSV,2,1,05,10,77,300,36,12,40,082,31,23,58,153,35,25,46,137,33,1*67
$GPGSV,2,2,05,32,45,316,34,1*52
$GPGSV,2,1,05,10,77,300,31,12,40,082,25,23,58,153,29,25,46,137,28,6*65
$GPGSV,2,2,05,32,45,316,25,6*55
$GPGSV,1,1,04,10,77,300,32,23,58,153,30,25,46,137,30,32,45,316,26,8*61
$GLGSV,1,1,03,67,57,036,37,68,30,328,34,78,53,184,27,1*4B
$GLGSV,1,1,03,67,57,036,31,68,30,328,27,78,53,184,31,3*4A
```

NOTE

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, respectively.

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
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 4: NMEA Talker ID.*
GSA	String, 3 characters	-	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	-	10	ID numbers of satellites used in solution. See *Table 16: GNSS Satellites (NMEA) Numbering*.
End of repeat block.				
<PDOP>	Numeric	-	2.38	Position dilution of precision. Maximum value: 99.99.
<HDOP>	Numeric	-	1.26	Horizontal dilution of precision. Maximum value: 99.99.
<VDOP>	Numeric	-	2.01	Vertical dilution of precision. Maximum value: 99.99.
<SystemID>	Numeric	-	1	GNSS system ID. See *Table 16: GNSS Satellites (NMEA) Numbering*.
<Checksum>	Hexadecimal	-	*0B	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGSA,A,3,10,12,23,25,32,,,,,,,,2.38,1.26,2.01,1*0B
$GNGSA,A,3,67,68,78,,,,,,,,,,2.38,1.26,2.01,2*0D
$GNGSA,A,3,21,,,,,,,,,,,,2.38,1.26,2.01,3*0F
$GNGSA,A,3,06,13,16,32,37,41,,,,,,,2.38,1.26,2.01,4*08
$GNGSA,A,3,,,,,,,,,,,,,2.38,1.26,2.01,5*0A
$GNGSA,A,3,03,,,,,,,,,,,,2.38,1.26,2.01,6*0A
```

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 satellites 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
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 4: NMEA Talker ID.*
VTG	String, 3 characters	-	VTG	Course Over Ground & Ground Speed.
<COGT>	Numeric	Degrees	043.43	Course over ground, in true north direction.
T	Character	-	T	Fixed field: true.
<COGM>	Numeric	Degrees	-	Course over ground (magnetic). Not supported.
M	Character	-	M	Fixed field: magnetic.
<SOGN>	Numeric	Knots	0.001	Speed over ground in knots.
N	Character	-	N	Fixed field: knot.
<SOGK>	Numeric	km/h	0.001	Speed over ground in kilometers per hour.
K	Character	-	K	Fixed field: kilometers per hour
<ModeInd>	Character	-	A	Mode indicator. A = Autonomous mode. Satellite system used in non-differential mode in position fix

Field	Format	Unit	Example	Description
				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 is not used for positioning, or positioning is invalid
<Checksum>	Hexadecimal	-	*23	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNVTG,043.43,T,,M,0.001,N,0.001,K,A*23
```

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
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 4: NMEA Talker ID.*
GLL	String, 3 characters	-	GLL	Geographic Position – Latitude/Longitude.
<Lat>	ddmm.mmmmmmmm	-	3149.29993210	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes

Field	Format	Unit	Example	Description
				Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmmmm	-	11706.91264104	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that this field is empty in case of an invalid value.
<UTC>	hhmmss.sss	-	025159.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<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	-	*45	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGLL,3149.29993210,N,11706.91264104,E,025159.000,A,A*45
```

2.2.7. GBS

GNSS Satellite Fault Detection. This sentence is used to support Receiver Autonomous Integrity Monitoring (RAIM). Given that a GNSS receiver is tracking enough satellites to perform integrity checks of the positioning quality of the position solution a sentence is needed to report the output of this process to other systems to advise the system user.

Type:

Output

Synopsis:

```
$<TalkerID>GBS,<UTC>,<LatExpErr>,<LonExpErr>,<AltExpErr>,<FailSatID>,<FailPr>,<EstBias>,<StdBias>,<SystemID>,<SignalID>*<Checksum><CR><LF>
```

Parameter:

Field	Format		Unit	Example	Description
$	Character		-	$	Each NMEA message starts with **$**.
<TalkerID>	String, characters	2	-	GN	Talker identifier. See *Table 4: NMEA Talker ID.*
GBS	String, characters	3	-	GBS	GNSS Satellite Fault Detection.
<UTC>	hhmmss.sss		-	054915.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<LatExpErr>	Numeric		meter	0.6	Expected error in latitude. Null if invaild.
<LonExpErr>	Numeric		meter	0.5	Expected error in longitude. Null if invaild.
<AltExpErr>	Numeric		meter	1.4	Expected error in altitude. Null if invaild.
<FailSatID>	Numeric		-	27	ID number of most likely failed satellite. Null if invalid.
<FailPr>	Numeric		-		Probability of missed detection for most likely failed satellite.

Field	Format	Unit	Example	Description
				Null if invalid.
<EstBias>	Numeric	meter	33.2	Estimate of bias in meters on most likely failed satellite. Null if invalid.
<StdBias>	Numeric	meter	20.2	Standard deviation of bias estimate. Null if invalid.
<SystemID>	Numeric	-	1	GNSS system ID. See *Table 16: GNSS Satellites (NMEA) Numbering*.
<SignalID>	Hexdecimal	-	1	GNSS signal ID. See *Table 16: GNSS Satellites (NMEA) Numbering*.
<Checksum>	Hexadecimal	-	*62	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGBS,054915.000,0.6,0.5,1.4,27,,33.2,20.2,1,1*62
```

2.2.8. GNS

GNSS Fix Data. Fix data for single or combined satellite navigation systems (GNSS). This sentence provides fix data for GPS, GLONASS, BDS, QZSS, NavIC (IRNSS) and possible future satellite systems, and systems combining these.

Type:

Output

Synopsis:

```
$<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, 2 characters	-	GN	Talker identifier. See *Table 4: NMEA Talker ID.*

Field	Format	Unit	Example	Description
GNS	String, 3 characters	-	GNS	GNSS Fix Data.
<UTC>	hhmmss.sss	-	020602.900	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Lat>	ddmm.mmmmmmmm	-	2516.14836731	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmmmm	-	11020.046795558	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that this field is empty in case of an invalid value.
<ModeInd>	Character	-	DDDDDD	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. F = Float RTK. Satellite system used in RTK mode with floating integers.

Field	Format	Unit	Example	Description
				N = No fix. Satellite system not used in position fix, or fix not valid. R = Real Time Kinematic (RTK). Satellite system used in RTK mode with fixed integers.
<NumSatUsed>	Numeric	-	54	Number of satellites in use. Range: 00-99.
<HDOP>	Numeric	-	0.29	Horizontal dilution of precision. The maximum value: 99.99. 99.99 if invalid.
<Alt>	Numeric	Meter	173	Antenna altitude above mean sea level (geoid). Note that this field is empty in case of an invalid value.
<Sep>	Numeric	Meter	-20.052	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).
<DiffAge>	Numeric	-	-	Differential GPS data age. Note that this field is empty in case of an invalid value or not support.
<DiffStation>	Numeric	-	-	Differential reference station ID. Note that this field is empty in case of an invalid value or not support.
<NavStatus>	Character	-	V	Navigational status. Not supported. Always “V” (Navigational status not valid).
<Checksum>	Hexadecimal	-	*09	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGNS,020602.900,2516.14836731,N,11020.04679558,E,DDDDDD,54,0.29,173.293,-20.052,,,V*09
```

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:

```
$<TalkerID>GST,<UTC>,<RMS_D>,<MajorD>,<MinorD>,<Orient>,<LatD>,<LonD>,<AltD>*<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.*
GST	String, 3 characters	-	GST	GNSS Pseudorange Error Statistics.
<UTC>	hhmmss.sss	-	114643.000	Position fix UTC. hh: Hour (00–23) mm: Minute (00–59) ss: Second (00–59) sss: Decimal fraction of second
<RMS_D>	Numeric	Meter	5.4	RMS value of the standard deviation of the range inputs to the navigation process. Note that this field is empty in case of an invalid value.
<MajorD>	Numeric	Meter	2.3	Standard deviation of semi-major axis of error ellipse. Note that this field is empty in case of an invalid value.
<MinorD>	Numeric	Meter	2.1	Standard deviation of semi-minor axis of error ellipse. Note that this field is empty in case of an invalid value.
<Orient>	Numeric	Degree	19.6	Orientation of semi-major axis of error ellipse. Note that this field is empty in case of an invalid value.
<LatD>	Numeric	Meter	2.3	Standard deviation of latitude error. Note that this field is empty in case of an invalid value.
<LonD>	Numeric	Meter	2.1	Standard deviation of longitude error.

Field	Format	Unit	Example	Description
				Note that this field is empty in case of an invalid value.
<AltD>	Numeric	Meter	8.3	Standard deviation of altitude error. Note that this field is empty in case of an invalid value.
<Checksum>	Hexadecimal	-	*48	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
//Unfixed.
$GNGST,000001.000,,,,,,*48
//fixed.
$GNGST,114643.000,5.4,2.3,2.1,19.6,2.3,2.1,8.3*48
```

2.2.10. ZDA

Time & Date. UTC, day, month, year and local time zone.

Type:

Output

Synopsis:

```
$<TalkerID>ZDA,<UTC>,<Day>,<Month>,<Year>,<LocalHour>,<LocalMin>*<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.*
ZDA	String, 3 characters	-	ZDA	Time & Date. UTC, day, month, year and local time zone.
<UTC>	hhmmss.sss	-	102210.014	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds

Field	Format	Unit	Example	Description
<Day>	Numeric	Day	23	Day of month. Range: 01–31.
<Month>	Numeric	Month	12	Month. Range: 01–12.
<Year>	Numeric	Year	2021	Year.
<LocalHour>	Numeric	-	00	Local zone hours, 00 to ±13 hours. Null if invalid.
<LocalMin>	Numeric	-	00	Local zone minutes, 00 to +59 minutes. Null if invalid.
<Checksum>	Hexadecimal	-	*4E	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNZDA,102210.014,23,12,2021,00,00*4E
```

2.2.11. HDT

Actual vessel heading in degrees true produced by any device or system producing true heading.

Type:

Output

Synopsis:

```
$<TalkerID>HDT,<Heading>,T*<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.*
HDT	String, 3 characters	-	HDT	Actual vessel heading in degrees true produced by any device or system producing true heading.
<Heading>	Numeric	Degree	15.621	Actual vessel heading. Range: [0, 360) Null if invalid.

Field	Format	Unit	Example	Description
T	Character	-	T	Fixed field. Always T.
<Checksum>	Hexadecimal	-	*1A	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNHDT,15.621,T*1A
```

NOTE

This message only applies to LG580P (03).

2.2.12. THS

True Heading and Status.

Type:

Output

Synopsis:

```
$<TalkerID>THS,<Heading>,<Mode>*<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.*
THS	String, 3 characters	-	THS	True Heading and Status.
<Heading>	Numeric	Degree	15.621	Actual vessel heading. Range: [0, 360) Null if invalid.
<Mode>	Character	-	A	Mode indication. A = Autonomous E = Estimated (dead reckoning) V = Data not valid (including standby)

Field	Format	Unit	Example	Description
<Checksum>	Hexadecimal	-	*18	Checksum
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNTHS,15.621,A*18
```

NOTE

This message only applies to LG580P (03).

2.3. PQTM Messages

This chapter explains the PQTM messages (proprietary NMEA messages defined by Quectel) supported by LG290P (03) and LG580P (03) modules.

Table 5: Error Codes

Field	Format	Unit	Description
<ErrCode>	Numeric	-	Error code. 1 = Invalid parameters 2 = Failed execution 3 = Unsupported command

NOTE

To avoid uncertainties, you need to send **$PQTMSAVEPAR*5A** to save the configuration after setting parameters through the Set type command, and then restart the module to ensure that all configurations take effect. Otherwise, the module will restore default values after powering on.

2.3.1. PQTMVER

Outputs the firmware version.

Type:

Output

Synopsis:

```
$PQTMVER,<MsgVer>,<VerName>,<VerStr>,<BuildDate>,<BuildTime>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<VerName>	String	-	Version name. Fixed at “MODULE”.
<VerStr>	String	-	Main version string.
<BuildDate>	yyyy/mm/dd	-	Firmware build date. yyyy: Year mm: Month dd: Day of month
<BuildTime>	hh:mm:ss	-	Firmware build time. hh: Hours mm: Minutes ss: Seconds

Example:

```
$PQTMVER,1,MODULE,LG290P03AANR01A03S,2024/04/30,10:53:07*32
```

NOTE

Upon each successful startup, the module will output this message first.

2.3.2. PQTMCOLD

Performs a cold start.

Type:

Command

Synopsis:

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

Parameter:

None

Example:

```
$PQTMCOLD*1C
```

2.3.3. PQTMWARM

Performs a warm start.

Type:

Command

Synopsis:

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

Parameter:

None

Example:

```
$PQTMWARM*11
```

2.3.4. PQTMHOT

Performs a hot start.

Type:

Command

Synopsis:

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

Parameter:

None

Example:

```
$PQTMHOT*4B
```

2.3.5. PQTMSRR

Performs a system reset and reboots the receiver.

Type:

Command

Synopsis:

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

Parameter:

None

Example:

```
$PQTMSRR*4B
```

2.3.6. PQTMUNIQID

Queries the module unique ID.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMUNIQID,OK,<Length>,<ID>*<Checksum><CR><LF>
```

Parameter included in the result:

Field	Format	Unit	Description
<Length>	Numeric	Byte	Length of module unique ID.

Field	Format	Unit	Description
<ID>	Hexadecimal	-	Module unique ID.

- If failed, the module returns:

```
$PQTMUNIQID,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMUNIQID*16
$PQTMUNIQID,OK,16,81D62010EE0AF375BDF5952CDC3757A1*3E
```

2.3.7. PQTMSAVEPAR

Saves the configurations into NVM.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMSAVEPAR,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMSAVEPAR,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMSAVEPAR*5A
$PQTMSAVEPAR,OK*72
```

2.3.8. PQTMRESTOREPAR

Restores the parameters configured by all commands to their default values. This command takes effect after restarting.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMRESTOREPAR,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMRESTOREPAR,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMRESTOREPAR*13
$PQTMRESTOREPAR,OK*3B
```

2.3.9. PQTMVERNO

Queries the firmware version.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMVERNO,<VerStr>,<BuildDate>,<BuildTime>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<VerStr>	String	-	Firmware version.
<BuildDate>	yyyy/mm/dd	-	Firmware build date. yyyy: Year mm: Month dd: Day of month
<BuildTime>	hh:mm:ss		Firmware build time. hh: Hours mm: Minutes ss: Seconds

- If failed, the module returns:

```
$PQTMVERNO,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMVERNO*58
$PQTMVERNO,LG290P03AANR01A03S,2024/04/30,10:53:07*18
```

2.3.10. PQTMCFGUART

Sets/gets the UART interface.

Type:

Set/Get

Synopsis:

```
//Set the current UART interface:
$PQTMCFGUART,W,<BaudRate>[,<DataBit>,<Parity>,<StopBit>,<FlowCtrl>]*<Checksum><CR><LF>
//Set the specified UART interface:
$PQTMCFGUART,W,<Index>,<BaudRate>[,<DataBit>,<Parity>,<StopBit>,<FlowCtrl>]*<Checksum><CR><LF>
```

```
//Get the configuration on the current UART interface or a specified UART interface:
$PQTMCFGUART,R[,<Index>]*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Index>	Numeric	-	UART interface index. 1 = UART1 2 = UART2 3 = UART3
<BaudRate>	Numeric	bps	UART baud rate. 9600 115200 230400 460800 921600
<DataBit>	Numeric	bit	UART data bit. 8 = 8 bits
<Parity>	Numeric	-	Parity. 0 = No parity 1 = Odd parity 2 = Even parity 3 = Mark 4 = Space
<StopBit>	Numeric	-	Stop bit(s). 1 = 1 stop bit 2 = 2 stop bits
<FlowCtrl>	Numeric	-	Flow control. 0 = None

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGUART,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGUART,OK,<Index>,<BaudRate>,<DataBit>,<Parity>,<StopBit>,<FlowCtrl>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGUART,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Configure the baud rate on the current UART interface:
$PQTMCFGUART,W,115200*18
$PQTMCFGUART,OK*60

//Configure the baud rate on UART1:
$PQTMCFGUART,W,1,115200*05
$PQTMCFGUART,OK*60
//Configure all parameters on the current UART interface:
$PQTMCFGUART,W,115200,8,0,1,0*11
$PQTMCFGUART,OK*60

//Configure all parameters on UART1:
$PQTMCFGUART,W,1,115200,8,0,1,0*0C
$PQTMCFGUART,OK*60

//Get the configuration on the current UART interface:
$PQTMCFGUART,R*36
$PQTMCFGUART,OK,1,115200,8,0,1,0*5F

//Get the configuration on UART1.
$PQTMCFGUART,R,1*2B
$PQTMCFGUART,OK,1,115200,8,0,1,0*5F
```

NOTE

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

2.3.11. PQTMCFGPPS

Sets/gets the PPS feature.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGPPS,W,<Index>,<Enable>,<Duration>,<Mode>,<Polarity>,<Reserved>*<Checksum><CR><LF>
//Get:
$PQTMCFGPPS,R,<Index>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Index>	Numeric	-	PPS index. 1 = PPS1
<Enable>	Numeric	-	Enable/disable PPS output. 0 = Disable 1 = Enable Note that if **<Enable>** is set to 0, the fields after **<Enable>** should be omitted.
<Duration>	Numeric	ms	Pulse duration. Range: 0–900 (Default value: 100)
<Mode>	Numeric	-	PPS output mode. 1 = PPS always output 2 = PPS output only in 2D/3D fix mode
<Polarity>	Numeric	-	Pulse polarity. 0 = Low 1 = High
<Reserved>	Numeric	-	Reserved. Always 0.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGPPS,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGPPS,OK,<Index>,<Enable>,<Duration>,<Mode>,<Polarity>,<Reserved>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGPPS,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set PPS1 feature:
$PQTMCFGPPS,W,1,1,100,1,1,0*73
$PQTMCFGPPS,OK*21

//Get PPS1 feature:
$PQTMCFGPPS,R,1*6A
$PQTMCFGPPS,OK,1,1,100,1,1,0*20

//Disable PPS1 feature:
$PQTMCFGPPS,W,1,0*73
$PQTMCFGPPS,OK*21
```

2.3.12. PQTMCFGPROT

Sets/gets the input and output protocol for a specified port.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGPROT,W,<PortType>,<PortID>,<InputProt>,<OutputProt>*<Checksum><CR><LF>
//Get:
$PQTMCFGPROT,R,<PortType>,<PortID>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PortType>	Numeric	-	Port type. 1 = UART
<PortID>	Numeric	-	Port ID. If **<PortType>** is set to 1, the **<PortID>** range: 1–3 1 = UART1 2 = UART2 3 = UART3
<InputProt>	Hexadecimal	-	Input protocol.(32 bit) Bit 0 = NMEA Bit 2 = RTCM3

Field	Format	Unit	Description
			When the port is UART1 to UART3, default input protocols are NMEA and RTCM3 (corresponding value: 00000005).
<OutputProt>	Hexadecimal	-	Output protocol. (32 bit) Bit 0 = NMEA Bit 2 = RTCM3 When the port is UART1 to UART 3, default output protocols are NMEA and RTCM3 (corresponding value: 00000005).

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGPROT,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGPROT,OK,<PortType>,<PortID>,<InputProt>,<OutputProt>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGPROT,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGPROT,W,1,1,00000005,00000005*38
$PQTMCFGPROT,OK*6B

//Get:
$PQTMCFGPROT,R,1,1*3D
$PQTMCFGPROT,OK,1,1,00000005,00000005*6B
```

2.3.13. PQTMCFGNMEADP

Sets/gets the decimal places of standard NMEA messages.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGNMEADP,W,<UTC_DP>,<POS_DP>,<ALT_DP>,<DOP_DP>,<SPD_DP>,<COG_DP>*<Checksum><CR><LF>
//Get:
$PQTMCFGNMEADP,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<UTC_DP>	Numeric	-	Number of decimal places for UTC seconds in Standard NMEA messages. Range: 0–3. Default value: 3. 0 = No fractional part
<POS_DP>	Numeric	-	Number of decimal places for latitude and longitude in Standard NMEA messages. Range: 0–8. Default value: 8. 0 = No fractional part
<ALT_DP>	Numeric	-	Number of decimal places for altitude and geoidal separation in Standard NMEA messages. Range: 0–3. Default value: 3. 0 = No fractional part
<DOP_DP>	Numeric	-	Number of decimal places for DOP in Standard NMEA messages. Range: 0–3. Default value: 2. 0 = No fractional part
<SPD_DP>	Numeric	-	Number of decimal places for speed in Standard NMEA messages. Range: 0–3. Default value: 3. 0 = No fractional part
<COG_DP>	Numeric	-	Number of decimal places for COG in Standard NMEA messages. Range: 0–3. Default value: 2. 0 = No fractional part

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGNMEADP,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGNMEADP,OK,<UTC_DP>,<POS_DP>,<ALT_DP>,<DOP_DP>,<SPD_DP>,<COG_DP>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGNMEADP,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGNMEADP,W,3,8,3,2,3,2*39
$PQTMCFGNMEADP,OK*61

//Get:
$PQTMCFGNMEADP,R*37
$PQTMCFGNMEADP,OK,3,8,3,2,3,2*6A
```

2.3.14. PQTMEPE

Outputs the estimated position error.

Type:

Output

Synopsis:

```
$PQTMEPE,<MsgVer>,<EPE_North>,<EPE_East>,<EPE_Down>,<EPE_2D>,<EPE_3D>*<Checksum>
<CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 2 for this version.
<EPE_North>	Numeric	Meter	Estimated north error.
<EPE_East>	Numeric	Meter	Estimated east error.
<EPE_Down>	Numeric	Meter	Estimated down error.
<EPE_2D>	Numeric	Meter	Estimated 2D positioning error.
<EPE_3D>	Numeric	Meter	Estimated 3D positioning error.

Example:

```
$PQTMEPE,2,1.000,1.000,1.000,1.414,1.732*52
```

2.3.15. PQTMCFGMSGRATE

Sets/gets the message output rate on the current interface or the specific interface.

Type:

Set/Get

Synopsis:

```
//Configure the message rate on current interface:
$PQTMCFGMSGRATE,W,<MsgName>,<Rate>[,<MsgVer/Offset>]*<Checksum><CR><LF>
//Configure the message rate for a specific interface:
$PQTMCFGMSGRATE,W,<PortType>,<PortID>,<MsgName/MsgID>,<Rate>[,<MsgVer/Offset>]*<Checksum><CR><LF>
//Read the message rate configuration on current interface:
$PQTMCFGMSGRATE,R,<MsgName>[,<MsgVer/Offset>]*<Checksum><CR><LF>
//Read the message rate configuration for a specific interface:
$PQTMCFGMSGRATE,R,<PortType>,<PortID>,<MsgName/MsgID>[,<MsgVer/Offset>]*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PortType>	Numeric	-	Port type. 1 = UART
<PortID>	Numeric	-	Port ID. 1 = UART1. 2 = UART2. 3 = UART3.
<MsgName/MsgID>	String/Hex	-	Message name. See *Table 6: Supported Messages*.
<Rate>	Numeric	-	Message output rate. 0 = Not output. N = Output once every N position fix(es). For details on the range of N, See *Table 6: Supported Messages*.
<MsgVer/Offset>	Numeric	-	● The parameter is the message version for PQTM messages. ● The parameter is the time offset for RTCM MSM messages. For illustration of time offset, see *Figure 2: RTCM MSM Time Offset*. ● The parameter is omitted for others messages, such as standard NMEA messages, **RTCM3-1005**, **RTCM3-1006**, **RTCM3-1019** and so on. Range: ● Range of PQTM message version depends on the

Field	Format	Unit	Description
			specific message. ● Range of RTCM3 MSM time offset: 0 to **<Rate>** - 1.

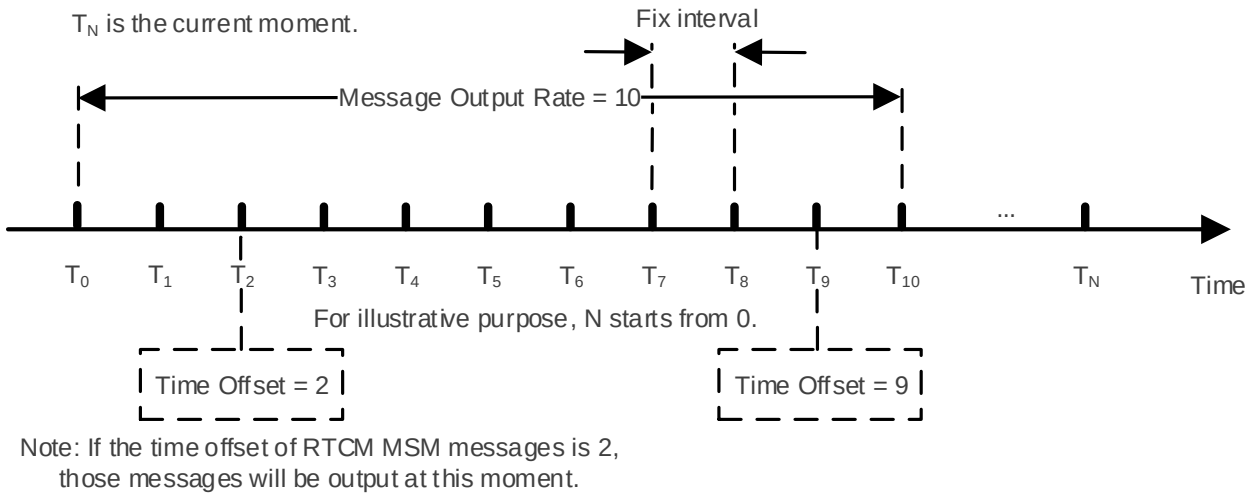

Figure 2: RTCM MSM Time Offset

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGMSGRATE,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGMSGRATE,OK,[<PortType>,<PortID>,]<MsgName>,<Rate>[,<MsgVer/Offset>]*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGMSGRATE,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set the output rate of GGA message to once every position fix:
$PQTMCFGMSGRATE,W,GGA,1*0A
$PQTMCFGMSGRATE,OK*29

//Get the output rate of GGA message:
```

$PQTMCFGMSGRATE,R,GGA*12

$PQTMCFGMSGRATE,OK,GGA,1*59

//Set the output rate of **PQTMEPE** (version 2) message to once every position fix:

$PQTMCFGMSGRATE,W,PQTMEPE,1,2*1D

$PQTMCFGMSGRATE,OK*29

//Get the output rate of **PQTMEPE** (version 2) message:

$PQTMCFGMSGRATE,R,PQTMEPE,2*05

$PQTMCFGMSGRATE,OK,PQTMEPE,1,2*4E

//Set the output rate of **RTCM3-1005** message to once every position fix:

$PQTMCFGMSGRATE,W,RTCM3-1005,1*59

$PQTMCFGMSGRATE,OK*29

//Get the output rate of **RTCM3-1005** message:

$PQTMCFGMSGRATE,R,RTCM3-1005*41

$PQTMCFGMSGRATE,OK,RTCM3-1005,1*0A

//Set the output rate of **RTCM3 GPS MSM** message to once every position fix and time offset to 0:

$PQTMCFGMSGRATE,W,RTCM3-107X,1,0*2F

$PQTMCFGMSGRATE,OK*29

//Get the output rate of **RTCM3 GPS MSM** message:

$PQTMCFGMSGRATE,R,RTCM3-107X*2B

$PQTMCFGMSGRATE,OK,RTCM3-107X,1,0*7C

//Set the output rate of **RTCM GPS EPH** message to once every position fix:

$PQTMCFGMSGRATE,W,RTCM3-1019,1*54

$PQTMCFGMSGRATE,OK*29

//Get the output rate of **RTCM GPS EPH** message:

$PQTMCFGMSGRATE,R,RTCM3-1019*4C

$PQTMCFGMSGRATE,OK,RTCM3-1019,1*07

//Set the UART1 output rate of **GGA** message to once every position fix on:

$PQTMCFGMSGRATE,W,1,1,GGA,1*0A

$PQTMCFGMSGRATE,OK*29

//Get the UART1 output rate of **GGA** message:

$PQTMCFGMSGRATE,R,1,1,GGA*12

$PQTMCFGMSGRATE,OK,1,1,GGA,1*59

//Set the UART1 output rate of **RAW-PPPB2B** message to once every position fix on:

$PQTMCFGMSGRATE,W,1,1,0AB2,1,1*57

$PQTMCFGMSGRATE,OK*29

//Get the UART1 output rate of **RAW-PPPB2B** message

$PQTMCFGMSGRATE,R,1,1,0AB2,1*4F

$PQTMCFGMSGRATE,OK,1,1,0AB2,1,1*04

Table 6: Supported Messages

Message	Description	Range (N)
RMC	-	1
GGA	-	1
GSV	-	1
GSA	-	1
VTG	-	1
GLL	-	1
GBS	-	1
GNS	-	1
GST	-	1
ZDA	-	1
HDT	-	1
THS	-	1
PQTMEPE	-	1
PQTMVEL	-	1
PQTMGEOFENCESTATUS	-	1
PQTMTXT	-	1

Message	Description	Range (N)
PQTMSVINSTATUS	-	1
PQTMPVT	-	1
PQTMDOP	-	1
PQTMPL	-	1
PQTMODO	-	1
PQTMTAR	-	1
RTCM3-1005	-	1–1200
RTCM3-1006	-	1–1200
RTCM3-107X	GPS-MSM	1–1200
RTCM3-108X	GLONASS-MSM	1–1200
RTCM3-109X	Galileo-MSM	1–1200
RTCM3-111X	QZSS-MSM	1–1200
RTCM3-112X	BDS-MSM	1–1200
RTCM3-113X	NavIC/IRNSS-MSM	1–1200
RTCM3-1019	GPS-EPH	1
RTCM3-1020	GLONASS-EPH	1
RTCM3-1041	NavIC/IRNSS-EPH	1
RTCM3-1042	BDS-EPH	1
RTCM3-1044	QZSS-EPH	1
RTCM3-1046	Galileo I/NAV-EPH	1
RAW-PPPB2B (0AB2)	-	1
RAW-QZSSL6 (0AB6)	-	1
RAW-HASE6 (0AE6)	-	1

NOTE

1. If the configuration message is a PQTM message, use **<MsgVer>** field to specify the message

version, otherwise an error will be returned.
2. If the configuration message is a standard NMEA message/RTCM message (excluding RTCM MSM message), or it is unnecessary to set the message version, the **<MsgVer>** field can be omitted.
3. All RTCM MSM messages have the same **<Rate>** value and only the last setting is valid. For details on RTCM MSM messages, see *Chapter 4 RTCM Protocol*. The epoch time is aligned to **<FixInterval>** × **<Rate>**. For details on **<FixInterval>**, see *Chapter 2.3.28 PQTMCFGFIXRATE*.
4. The output time for RTCM MSM messages is influenced by the **<Offset>** value via the formula: Output Time = **<FixInterval>** × **<Rate>** + **<FixInterval>** × **<Offset>**. If the **<Offset>** in other previously configured messages exceeds the range from 0 to **<Rate>** - 1 due to reconfiguring **<Rate>** in new messages, it is necessary to change the **<Offset>** in the conflicting messages to 0. This process is automatically implemented by software.
5. The RTCM EPH message output rate is independent of the **<FixInterval>**.
6. The message output rate of **GSA** and **GSV** messages is fixed at 1 Hz and independent of **<FixInterval>**.
7. When the PPP raw message (**RAW-PPPB2B, RAW-QZSSL6, RAW-HASE6**) updated, once the **<Rate>** of **$PQTMCFGMSGRATE** command is one, they will be pushed by the module.
8. The LG580P (03) modules support the PPP raw message (**RAW-PPPB2B, RAW-QZSSL6, RAW-HASE6**) which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.

2.3.16. PQTMVEL

Outputs the velocity information.

Type:

Output

Synopsis:

```
$PQTMVEL,<MsgVer>,<Time>,<VelN>,<VelE>,<VelD>,<GrdSpd>,<Spd>,<COG>,<GrdSpdAcc>,<SpdAcc>,<HeadingAcc>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<Time>	hhmmss.sss	-	UTC time. hh: Hours (0–23) mm: Minutes (0–59) ss: Seconds (0–59) sss: Decimal fraction of seconds

Field	Format	Unit	Description
<VelN>	Numeric	m/s	North velocity.
<VelE>	Numeric	m/s	East velocity.
<VelD>	Numeric	m/s	Down velocity.
<GrdSpd>	Numeric	m/s	2D speed.
<Spd>	Numeric	m/s	3D speed.
<COG>	Numeric	Degree	Course over ground. The maximum value is 359.999. (This field can be empty when COG is invalid).
<GrdSpdAcc>	Numeric	m/s	Estimated 2D speed accuracy.
<SpdAcc>	Numeric	m/s	Estimated 3D speed accuracy.
<HeadingAcc>	Numeric	Degree	Estimated heading accuracy.

Example:

```
$PQTMVEL,1,154512.100,1.251,2.452,1.245,2.752,3.021,180.512,0.124,0.254,0.250*67
```

2.3.17. PQTMCFGGEOFENCE

Sets/gets geofence feature.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGGEOFENCE,W,<Index>,<Mode>,<Reserved>,<Shape>,<Lat0>,<Lon0>,<Lat1/Radius>[,<Lon1>,<Lat2>,<Lon2>,<Lat3>,<Lon3>]*<Checksum><CR><LF>
//Get:
$PQTMCFGGEOFENCE,R,<Index>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Index>	Numeric	-	Geofence index. Range: 0–3

Field	Format	Unit	Description
<Mode>	Numeric	-	Geofence mode. 0 = Disable 1 = Enable
<Reserved>	Numeric	-	Reserved. Always 0.
<Shape>	Numeric	-	Geofence shape. 0 = Circle defined by the center and the radius 1 = Circle defined by the center and a point on the circle 2 = Triangle 3 = Quadrangle (such as square, rectangle, trapezium)
<Lat0>	Numeric	Degree	Latitude of the first point.
<Lon0>	Numeric	Degree	Longitude of the first point.
<Lat1/Radius>	Numeric	Degree/Meter	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>	Numeric	Degree	Longitude of the second point.
<Lat2>	Numeric	Degree	Latitude of the third point.
<Lon2>	Numeric	Degree	Longitude of the third point.
<Lat3>	Numeric	Degree	Latitude of the fourth point.
<Lon3>	Numeric	Degree	Longitude of the fourth point.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGGEOFENCE,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGGEOFENCE,OK,<Index>,<Mode>,<Reserved>,<Shape>,<Lat0>,<Lon0>,<Lat1/Radius>[,<Lon1>,<Lat2>,<Lon2>,<Lat3>,<Lon3>]*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGGEOFENCE,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set and enable a geofence.
$PQTMCFGGEOFENCE,W,0,1,0,0,31.451248,117.451245,100.5*18
$PQTMCFGGEOFENCE,OK*74

//Disable a geofence.
$PQTMCFGGEOFENCE,W,0,0*27
$PQTMCFGGEOFENCE,OK*74

//Get the configuration of a geofence.
$PQTMCFGGEOFENCE,R,0*3E
//Geofence is enabled whose shape is a circle defined by the center and the radius.
$PQTMCFGGEOFENCE,OK,0,1,0,0,31.451248,117.451245,100.5*4B

//Get the configuration of a geofence.
$PQTMCFGGEOFENCE,R,0*3E
//Geofence is disabled.
$PQTMCFGGEOFENCE,OK,0,0*74
```

NOTE

1. When the geofence is disabled, the fields after **<Mode>** in the Set command should be omitted. If geofence has been disabled, the fields after **<Mode>** in the module response will be omitted when retrieving the configuration of the geofence. See the example above for details.
2. If the number of input points exceeds the number of points that the shape should have, an error will be returned.
3. The latitude range is [-90,+90], where negatives indicate south latitude. The longitude range is [-180,+180], where negative values indicate west longitude.

2.3.18. PQTMGEOFENCESTATUS

Outputs the geofence status.

Type:

Output

Synopsis:

```
$PQTMGEOFENCESTATUS, <MsgVer>,<Time>{,<StateN>}*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<Time>	hhmmss.sss	-	UTC time. hh: Hours (0–23) mm: Minutes (0–59) ss: Seconds (0–59) sss: Decimal fraction of seconds
Start of repeat block. Repeat times: 4.			
<StateN>	Numeric	-	Geofence state: (N is the number of **<State>**. Range of N: 0–3.) 0 = Unknow 1 = Inside the geofence 2 = Outside the geofence Note: If the module did not get a fixed, the **<StateN>** should be 0.
End of repeat block.			

Example:

```
$PQTMGEOFENCESTATUS,1,124521.000,1,2,2,2*27
```

2.3.19. PQTMGNSSSTART

Starts GNSS engine.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMGNSSSTART,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMGNSSSTART,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMGNSSSTART*51
$PQTMGNSSSTART,OK*79
```

2.3.20. PQTMGNSSSTOP

Stops GNSS engine.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMGNSSSTOP,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMGNSSSTOP,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMGNSSSTOP*09
$PQTMGNSSSTOP,OK*21
```

2.3.21. PQTMTXT

Outputs short text messages. Long text messages can be transmitted by multiple messages.

Type:

Output

Synopsis:

```
$PQTMTXT,<MsgVer>,<TotalNumSen>,<SenNum>,<TextID>,<Text>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<TotalNumSen>	Numeric	-	Total number of sentences. Range: 01–99.
<SenNum>	Numeric	-	Sentence number. Range: 01–**<TotalNumSen>**.
<TextID>	Numeric	-	Text identifier. 01 = Notice 02 = Warning 03 = Error
<Text>	String	-	Text message. Up to 57 characters including any code delimiters.

Example:

```
//Outputs debug data.
$PQTMTXT,1,01,01,01,0x105f0cf810417c00*1B
```

2.3.22. PQTMCFGSVIN

Sets/gets the Survey-in feature. This feature can determine the antenna location either by Survey-in mode or Fixed mode.

In order to work as a base station, the module external antenna should be mounted on a static point (try to mount it with a clear sky visibility). The antenna accurate coordinate location can be acquired through a self-survey process. The Survey-in mode (**<Mode>** = 1) determines the receiver's position by building a weighted mean of all valid 3D positioning solutions. You can set values of **<CFG_CNT>** and **<3D_AccLimit>** to define the minimum positioning times and 3D position standard deviation used for the position estimation. The Fixed mode (**<Mode>** = 2) requires user to manually enter the receiver position coordinates. Any error in the base station position will translate directly into rover position error.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGSVIN,W,<Mode>,<CFG_CNT>,<3D_AccLimit>,<ECEF_X>,<ECEF_Y>,<ECEF_Z>*<Checksum><CR><LF>
//Get:
$PQTMCFGSVIN,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Receiver mode. 0 = Disable 1 = Survey-in mode 2 = Fixed mode (APR position is given in ECEF Coordinate)
<CFG_CNT>	Numeric	-	Minimum positioning times in Survey-in mode. Range: 0–86400.
<3D_AccLimit>	Numeric	Meter	Limit 3D positioning accuracy in Survey-in mode. If this field is 0, it means there is no limit on 3D positioning accuracy.
<ECEF_X>	Numeric	Meter	WGS84 ECEF X coordinate.
<ECEF_Y>	Numeric	Meter	WGS84 ECEF Y coordinate.
<ECEF_Z>	Numeric	Meter	WGS84 ECEF Z coordinate.

Result:

- If successful, the module returns:

```
//Response to Set command :
$PQTMCFGSVIN,OK*<Checksum><CR><LF>
//Response to Get command :
$PQTMCFGSVIN,OK,<Mode>,<CFG_CNT>,<3D_AccLimit>,<ECEF_X>,<ECEF_Y>,<ECEF_Z>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGSVIN,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGSVIN,W,1,3600,1.2,-2519265.0514,4849534.9045,3277834.6432*01
$PQTMCFGSVIN,OK*70

//Get:
$PQTMCFGSVIN,R*26
$PQTMCFGSVIN,OK,1,3600,1.2,-2519265.0514,4849534.9045,3277834.6432*52
```

NOTE

For more examples about Survey-in feature, please refer to *document [1] application note*.

2.3.23. PQTMSVINSTATUS

Outputs the Survey-in status.

Type:

Output

Synopsis:

```
$PQTMSVINSTATUS,<MsgVer>,<TOW>,<Valid>,<Res0>,<Res1>,<Obs>,<CfgDur>,<MeanX>,<MeanY>,<MeanZ>,<MeanAcc>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<TOW>	Numeric	ms	GPS time of week.
<Valid>	Numeric	-	Survey-in position validity flag. 0 = Invalid 1 = In-progress 2 = Valid
<Res0>	Numeric	-	Reserved. Always null.
<Res1>	Numeric	-	Reserved.
<Obs>	Numeric	-	Number of position observations used during

Field	Format	Unit	Description
			Survey-in.
<CfgDur>	Numeric	-	Same as **<CFG_CNT>** field (minimum positioning times in Survey-in mode) configured via **PQTMCFGSVIN** command.
<MeanX>	Numeric	Meter	Current Survey-in mean position along X axis of ECEF coordinate system.
<MeanY>	Numeric	Meter	Current Survey-in mean position along Y axis of ECEF coordinate system.
<MeanZ>	Numeric	Meter	Current Survey-in mean position along Z axis of ECEF coordinate system.
<MeanAcc>	Numeric	Meter	Current Survey-in mean position accuracy.

Example:

```
$PQTMSVINSTATUS,1,1000,1,,01,20,100,-2484434.3645,4875976.9741,3266161.3412,1.2415*3C
```

NOTE

The module must be Base station mode to execute this command. For details on base station mode, see *Chapter 2.3.25 PQTMCFGRCVRMODE*.

2.3.24. PQTMPVT

Outputs the PVT (GNSS only) result.

Type:

Output

Synopsis:

```
$PQTMPVT,<MsgVer>,<TOW>,<Date>,<Time>,<Res>,<FixType>,<NumSV>,<LeapS>,<Lat>,<Lon>,<Alt>,<Sep>,<VelN>,<VelE>,<VelD>,<Spd>,<Heading>,<HDOP>,<PDOP>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<TOW>	Numeric	ms	Time of week.

Field	Format	Unit	Description
<Date>	YYYYMMDD	-	UTC date. YYYY: Year MM: Month DD: Day of month
<Time>	hhmmss.sss	-	UTC time. hh: Hours (0–23) mm: Minutes (0–59) ss: Seconds (0–59) sss: Decimal fraction of seconds
<Res>	Numeric	-	Reserved.
<FixType>	Numeric	-	Fix mode. 0 = No fix. 1 = Reserved. 2 = 2D fix. 3 = 3D fix.
<NumSV>	Numeric	-	Number of satellites in use.
<LeapS>	Numeric	Second	Leap seconds. Null if this field is invalid.
<Lat>	Numeric	Degree	Latitude. Null if this field is invalid.
<Lon>	Numeric	Degree	Longitude. Null if this field is invalid.
<Alt>	Numeric	Meter	Altitude above mean sea level. Null if this field is invalid.
<Sep>	Numeric	Meter	Geoidal separation (the difference between the WGS84 earth ellipsoid surface and the mean-sea-level surface). Null if this field is invalid.
<VelN>	Numeric	m/s	North velocity. Null if this field is invalid.
<VelE>	Numeric	m/s	East velocity. Null if this field is invalid.
<VelD>	Numeric	m/s	Down velocity. Null if this field is invalid.
<Spd>	Numeric	m/s	Ground speed. Null if this field is invalid.
<Heading>	Numeric	Degree	Heading. Null if this field is invalid.
<COG>	Numeric	Degree	Course over ground. Null if invalid.
<HDOP>	Numeric	-	Horizontal dilution of precision. 99.99 if this field is invalid.
<PDOP>	Numeric	-	Position (3D) dilution of precision. 99.99 if this field is invalid.

Example:

```
//No fix:
$PQTMPVT,1,1000,20221225,163355.000,,0,00,,,,,,,,,99.99,99.99*79
//3D fix:
$PQTMPVT,1,31075000,20221225,083737.000,,3,09,18,31.12738291,117.26372910,34.212,5.267,3.212,2.928,0.238,4.346,34.12,2.16,4.38*51
```

2.3.25. PQTMCFGRCVRMODE

Sets/gets the receiver working mode.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGRCVRMODE,W,<Mode>*<Checksum><CR><LF>
/Get:
$PQTMCFGRCVRMODE,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Receiver working mode. 0 = Unknow 1 = Rover. When set to this mode, the receiver will restore to default NMEA message output state. 2 = Base station. When set to this mode, the receiver will automatically disable NMEA message output and enable RTCM MSM4 and **RTCM3-1005** message output.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGRCVRMODE,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGRCVRMODE,OK,<Mode>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGRCVRMODE,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGRCVRMODE,W,2*29
$PQTMCFGRCVRMODE,OK*64

//Get:
$PQTMCFGRCVRMODE,R*32
$PQTMCFGRCVRMODE,OK,2*7A
```

NOTE

After switching the module's working mode, save the configuration and then reset the module. Otherwise, it will continue to operate in the original mode.

2.3.26. PQTMDEBUGON

Enables debug log output. The debug state can be saved by **PQTMSAVEPAR** command.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMDEBUGON,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMDEBUGON,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMDEBUGON*48
$PQTMDEBUGON,OK*60
```

2.3.27. PQTMDEBUGOFF

Disables debug log output. The debug state can be saved by **PQTMSAVEPAR** command.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMDEBUGOFF,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMDEBUGOFF,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMDEBUGOFF*06
$PQTMDEBUGOFF,OK*2E
```

2.3.28. PQTMCFGFIXRATE

Sets/gets the fix interval.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGFIXRATE,W,<FixInterval>*<Checksum><CR><LF>
//Get:
$PQTMCFGFIXRATE,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<FixInterval>	Numeric	ms	Fix interval.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGFIXRATE,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGFIXRATE,OK,<FixInterval>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGFIXRATE,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGFIXRATE,W,1000*59
$PQTMCFGFIXRATE,OK*27

//Get:
$PQTMCFGFIXRATE,R*71
$PQTMCFGFIXRATE,OK,1000*0A
```

NOTE

The fix rate of the module is 1 Hz and cannot be changed in Base station mode. In Rover mode, the fix rate is 10 Hz before changing the default value. For details on base station and Rover, see *Chapter 2.3.25 PQTMCFGRCVRMODE*.

2.3.29. PQTMCFGRTK

Sets/gets the RTK mode.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGRTK,W,<DiffMode>,<RelMode>*<Checksum><CR><LF>
//Get:
$PQTMCFGRTK,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<DiffMode>	Numeric	-	Differential mode. 0 = Disable RTK/RTD feature. Differential data is not used. 1 = Auto mode. 2 = RTD only mode. Only pseudoranges is used.
<RelMode>	Numeric	-	Absolute/relative mode. 1 = Absolute mode, ensure absolute position accuracy. 2 = Relative mode, ensure relative position accuracy. Note: This field only takes effect when **<DiffMode>** = 1 and the module enters the RTK only mode.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGRTK,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGRTK,OK,<DiffMode>,<RelMode>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGRTK,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGRTK,W,1,1*6C
$PQTMCFGRTK,OK*3F

//Get:
$PQTMCFGRTK,R*69
$PQTMCFGRTK,OK,1,1*3F
```

2.3.30. PQTMCFGCNST

Sets/gets the constellation configuration.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGCNST,W,<GPS>,<GLONASS>,<Galileo>,<BDS>,<QZSS>,<NavIC>*<Checksum><CR><LF>
//Get:
$PQTMCFGCNST,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GPS>	Numeric	-	Enable/disable GPS. 0 = Disable 1 = Enable
<GLONASS>	Numeric	-	Enable/disable GLONASS. 0 = Disable 1 = Enable
<Galileo>	Numeric	-	Enable/disable Galileo. 0 = Disable 1 = Enable
<BDS>	Numeric	-	Enable/disable BDS. 0 = Disable 1 = Enable
<QZSS>	Numeric	-	Enable/disable QZSS. 0 = Disable

Field	Format	Unit	Description
			1 = Enable
<NavIC>	Numeric	-	Enable/disable NavIC. 0 = Disable. 1 = Enable.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGCNST,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGCNST,OK,<GPS>,<GLONASS>,<Galileo>,<BDS>,<QZSS>,<NavIC>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$ PQTMCFGCNST,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set the constellation configuration.
$PQTMCFGCNST,W,1,1,1,1,0,0*2B
$PQTMCFGCNST,OK*78

//Get the constellation configuration.
$PQTMCFGCNST,R*2E
$PQTMCFGCNST,OK,1,1,1,1,0,0*78
```

NOTE

The LG580P (03) module supports GLONASS which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.

2.3.31. PQTMDOP

Outputs dilution of precision.

Type:

Output

Synopsis:

```
$PQTMDOP,<MsgVer>,<TOW>,<GDOP>,<PDOP>,<TDOP>,<VDOP>,<HDOP>,<NDOP>,<EDOP>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<TOW>	Numeric	ms	Time of week. Null if this field is invalid.
<GDOP>	Numeric	-	Geometric dilution of precision. 99.99 if this field is invalid.
<PDOP>	Numeric	-	Position (3D) dilution of precision. 99.99 if this field is invalid.
<TDOP>	Numeric	-	Time dilution of precision. 99.99 if this field is invalid.
<VDOP>	Numeric	-	Vertical dilution of precision. 99.99 if this field is invalid.
<HDOP>	Numeric	-	Horizontal dilution of precision. 99.99 if this field is invalid.
<NDOP>	Numeric	-	Northing dilution of precision. 99.99 if this field is invalid.
<EDOP>	Numeric	-	Easting dilution of precision. 99.99 if this field is invalid.

Example:

```
//Fixed:
$PQTMDOP,1,570643000,1.01,0.88,0.49,0.73,0.50,0.36,0.35*7C

//No fix:
$PQTMDOP,1,,99.99,99.99,99.99,99.99,99.99,99.99,99.99*70
```

2.3.32. PQTMPL

Outputs protection level information.

Type:

Output

Synopsis:

```
$PQTMPL,<MsgVer>,<TOW>,<PUL>,<Res1>,<Res2>,<PL_PosN>,<PL_PosE>,<PL_PosD>,<PL_VelN>,<PL_VelE>,<PL_VelD>,<Res3>,<Res4>,<PL_Time>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. Always 1 for this version.
<TOW>	Numeric	ms	Time of week. Null if this field is invalid.
<PUL>	Numeric	%	Probability of uncertainty level per epoch.
<Res1>	Numeric	-	Reserved. Always 1.
<Res2>	Numeric	-	Reserved. Always 1.
<PL_PosN>	Numeric	mm	Protection level of north position. Null if this field is invalid.
<PL_PosE>	Numeric	mm	Protection level of east position. Null if this field is invalid.
<PL_PosD>	Numeric	mm	Protection level of down position. Null if this field is invalid.
<PL_VelN>	Numeric	mm/s	Protection level of north velocity. Null if this field is invalid.
<PL_VelE>	Numeric	mm/s	Protection level of east velocity. Null if this field is invalid.
<PL_VelD>	Numeric	mm/s	Protection level of down velocity. Null if this field is invalid.
<Res3>	Numeric		Reserved. Always null.
<Res4>	Numeric		Reserved. Always null.
<PL_Time>	Numeric	ns	Protection level of time. Null if this field is invalid.

Example:

```
$PQTMPL,1,55045200,5.00,1,1,2879,2718,4766,5344,4323,10902,,,*1C
```

2.3.33. PQTMCFGODO

Sets/gets the odometer feature.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGODO,W,<State>,<InitDist>*<Checksum><CR><LF>
//Get:
$PQTMCFGODO,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<State>	Numeric	-	Odometer feature state. 0 = Disabled 1 = Enabled
<InitDist>	Numeric	Meter	Initial distance. Default value: 0.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGODO,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGODO,OK,<State>,<InitDist>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGODO,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set odometer feature:
$PQTMCFGODO,W,1,10.5*4E
$PQTMCFGODO,OK*36
```

```
//Get odometer feature:
$PQTMCFGODO,R*60
$PQTMCFGODO,OK,1,10.5*1D
```

2.3.34. PQTMRESETODO

Resets the accumulated distance recorded by the odometer.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

```
$PQTMRESETODO,OK*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMRESETODO,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMRESETODO*09
$PQTMRESETODO,OK*21
```

NOTE

1. Reset the accumulated distance recorded by the odometer with **PQTMRESETODO** command or power off the module. Disabling the odometer feature with **PQTMCFGODO** command when the module is still working will stop distance calculation, but it cannot reset the distance to zero.
2. If this command is sent when the position is lost, the odometer will no longer accumulate the current lost position period distance until two new positioning points are regained.

2.3.35. PQTMODO

Outputs the odometer information.

Type:

Output

Synopsis:

```
$PQTMODO,<MsgVer>,<Time>,<State>,<Dist>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Character	-	Message version. Always 1 for this version.
<Time>	hhmmss.sss	-	UTC time. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<State>	Numeric	-	Odometer status. 0 = Disabled 1 = Enabled
<Dist>	Numeric	Meter	Distance since last reset. The distance equals to the accumulated distance and the initial distance configured via **<InitDist>** in **PQTMCFGODO** command.

Example:

```
$PQTMODO,1,120635.000,1,112.3*6E
```

NOTE

1. **<Dist>** in **PQTMODO** represents the sum of **<InitDist>** value set in **PQTMCFGODO** and accumulated distance. The accumulated distance starts from 0 m and resets to 0 m after a power outage or when cleared with **PQTMRESETODO**. If **<InitDist>** value in the **PQTMCFGODO** is modified, the actual **<Dist>** output in **PQTMODO** will reflect the sum of the accumulated distance and the new **<InitDist>** value, as shown below:
   <Dist> = Accumulated Distance + **<InitDist>**.
2. Accumulated distance cannot be saved to NVM.

2.3.36. PQTMCFGSIGNAL

Sets/gets GNSS signal mask.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGSIGNAL,W,<GPS_Sig>,<GLO_Sig>,<GAL_Sig>,<BDS_Sig>,<QZS_Sig>,<NAC_Sig>*<Checksum><CR><LF>
//Get:
$PQTMCFGSIGNAL,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<GPS_Sig>	Hexadecimal	-	GPS signal mask. 0 = Disable 1 = Enable Bit 0 = L1 C/A Bit 1 = L2C Bit 2 = L5-Q Default value: 0x07
<GLO_Sig>	Hexadecimal	-	GLONASS signal mask. 0 = Disable 1 = Enable Bit 0 = G1 C/A Bit 1 = G2 C/A For LG290P (03), default value: 0x03 For LG580P (03), default value: 0x00
<GAL_Sig>	Hexadecimal	-	Galileo signal mask. 0 = Disable 1 = Enable Bit 0 = E1 Bit 1 = E5a Bit 2 = E5b Bit 3 = E6 For LG290P (03), default value: 0x0F For LG580P (03), default value: 0x07
<BDS_Sig>	Hexadecimal	-	BDS signal mask. 0 = Disable

Field	Format	Unit	Description
			1 = Enable Bit 0 = B1I Bit 1 = B2I Bit 2 = B3I Bit 3 = B1C Bit 4 = B2a Bit 5 = B2b For LG290P (03), default value: 0x3F For LG580P (03), default value: 0x3B
<QZS_Sig>	Hexadecimal	-	QZSS signal mask. 0 = Disable 1 = Enable Bit 0 = L1 C/A Bit 1 = L2C Bit 2 = L5-Q Default value: 0x07
<NAC_Sig>	Hexadecimal	-	NavIC signal mask. 0 = Disable 1 = Enable Bit 0 = L5 Default value: 0x01

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGSIGNAL,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGSIGNAL,OK,<GPS_Sig>,<GLO_Sig>,<GAL_Sig>,<BDS_Sig>,<QZS_Sig>,<NAC_Sig>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGSIGNAL,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set GNSS signal mask:
$PQTMCFGSIGNAL,W,7,3,F,3F,7,1*0E
$PQTMCFGSIGNAL,OK*6C
```

```
//Get GNSS signal mask:
$PQTMCFGSIGNAL,R*3A
$PQTMCFGSIGNAL,OK,07,03,0F,3F,07,01*6D
```

NOTE

1. The L1 frequency bands of LG290P (03) and LG580P (03) module cannot be disabled.
2. The LG290P (03) and LG580P (03) module also supports GPS L1C and QZSS L1C frequency band which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.
3. The LG580P (03) module supports GLONASS G1 C/A, GLONASS G2 C/A, Galileo E6, BDS B3I and QZSS L6 frequency bands which are still under development. Contact Quectel Technical Support (support@quectel.com) for details.
4. The priority of GNSS configuration commands: **PQTMCFGCNST** > **PQTMCFGSIGNAL** > **PQTMCFGSAT**. For instance, if the GPS constellation is disabled by **PQTMCFGCNST** command, the enabling of GPS constellation and the frequency bands in **PQTMCFGSIGNAL** and **PQTMCFGSAT** commands will be ineffective.

2.3.37. PQTMCFGSAT

Sets/gets GNSS satellite mask.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGSAT,W,<SystemID>,<SignalID>,<MaskLow>[,MaskHigh]*<Checksum><CR><LF>
//Get:
$PQTMCFGSAT,R,<SystemID>,<SignalID>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<SystemID>	Numeric	-	GNSS system ID. 1 = GPS 2 = GLONASS 3 = Galileo 4 = BDS 5 = QZSS 6 = NavIC

Field	Format	Unit	Description
<SignalID>	Hexadecimal	-	GNSS signal ID. For GPS: 1 = L1 C/A 2 = L2C 3 = L5-Q For GLONASS: 1 = G1 C/A 2 = G2 C/A For Galileo: 1 = E1 2 = E5a 3 = E5b 4 = E6 For BDS: 1 = B1I 2 = B2I 3 = B3I 4 = B1C 5 = B2a 6 = B2b For QZSS: 1 = L1 C/A 2 = L2C 3 = L5-Q For NavIC: 1 = L5
<MaskLow>	Hexadecimal	-	GNSS satellite low 32-bit mask, Bit 0 for the satellite PRN 1. 0 = Disable 1 = Enable Range: GPS: 0–0xFFFFFFFF GLONASS: 0–0x3FFF Galileo: 0–0xFFFFFFFF BDS: 0–0xFFFFFFFF QZSS: 0–0x3FF NavIC: 0–0x7FFF

Field	Format	Unit	Description
			Default value: GPS L1 C/A: 0xFFFFFFFF GPS L2C: 0xFFC36FFD GPS L5-Q: 0xAFC227AD GLONASS G1 C/A: 0x00003FFF GLONASS G2 C/A: 0x00003FFF Galileo E1: 0x67967FDF Galileo E5a: 0x67967FDF Galileo E5b: 0x67967FDF Galileo E6: 0x67967FDF BDS B1I: 0xBFFCBFFF BDS B2I: 0x0000BFFF BDS B3I: 0xBFFCBFFF BDS B1C: 0xBFFC0000 BDS B2a: 0xBFFC0000 BDS B2b: 0xBFFC0000 QZSS L1 C/A: 0x0000004E QZSS L2C: 0x0000004E QZSS L5-Q: 0x0000004E NavIC L5: 0x000001FF
<MaskHigh>	Hexadecimal	-	GNSS satellite high 32-bit mask, Bit 0 for the satellite PRN 33. (Only available for BDS and Galileo. It should be omitted for other GNSS systems). 0 = Disable 1 = Enable Range: GPS: None GLONASS: None Galileo: 0–0x0F BDS: 0–0xFFFFFFFF QZSS: None NavIC: None Default value: Galileo E1: 0x0000000B Galileo E5a: 0x0000000B Galileo E5b: 0x0000000B Galileo E6: 0x0000000B BDS B1I: 0x1C003FFF BDS B2I: 0x00000000 BDS B3I: 0x1C003FFF BDS B1C: 0x00003FFF

Field	Format	Unit	Description
			BDS B2a: 0x00003FFF BDS B2b: 0x1C003FFF

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGSAT,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGSAT,OK,<SystemID>,<SignalID>,<MaskLow>[,<MaskHigh>]*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGSAT,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set GPS L1 C/A:
$PQTMCFGSAT,W,1,1,FFFFFFFF*4B
$PQTMCFGSAT,OK*34

//Get GPS L1 C/A:
$PQTMCFGSAT,R,1,1*62
$PQTMCFGSAT,OK,1,01,FFFFFFFF*28

//Set BDS B1I:
$PQTMCFGSAT,W,4,1,BFFCBFFF,1C003FFF*60
$PQTMCFGSAT,OK*34

//Get BDS B1I:
$PQTMCFGSAT,R,4,1*67
$PQTMCFGSAT,R,4,01,BFFCBFFF,1C003FFF*55
```

NOTE

1. The LG290P (03) and LG580P (03) modules support GPS L1C and QZSS L1C frequency band which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.
2. The LG580P (03) module supports GLONASS G1 C/A, GLONASS G2 C/A, Galileo E6, BDS B3I

and QZSS L6 frequency bands which are still under development. Contact Quectel Technical Support (support@quectel.com) for details.

2.3.38. PQTMCFGRSID

Sets/gets the reference station ID.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGRSID,W,<ID>*<Checksum><CR><LF>
//Get:
$PQTMCFGRSID,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<ID>	Numeric	-	Reference station ID. Range: 0–4095. Default value: 290.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGRSID,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGRSID,OK,<ID>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGRSID,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGRSID,W,1024*06
$PQTMCFGRSID,OK*7E
```

```
//Get:
$PQTMCFGRSID,R*28
$PQTMCFGRSID,OK,1024*55
```

2.3.39. PQTMCFGRTCM

Sets/gets RTCM.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGRTCM,W,<MSM_Type>,<MSM_Mode>,<MSM_ElevThd>,<Reserved>,<Reserved>,<EPH_Mode>,<EPH_Interval>*<Checksum><CR><LF>
//Get:
$PQTMCFGRTCM,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MSM_Type>	Numeric	-	RTCM MSM type. Range: 3–7 (corresponding to RTCM MSM3–MSM7). Default value: 4.
<MSM_Mode>	Numeric	-	RTCM MSM output mode when no satellite is searched. Always 0. 0 = Not output RTCM MSM message when no satellite is searched.
<MSM_ElevThd>	Numeric	Degree	Satellite elevation threshold to report measurements by RTCM MSM messages. Range: [-90,90]. Default value: -90 (means no limitation).
<Reserved>	Numeric	-	Reserved. Default value: 07.
<Reserved>	Numeric	-	Reserved. Default value: 06.
<EPH_Mode>	Numeric	-	Ephemeris output mode. 0 = Disable 1 = Output when updating 2 = Output when updating and at regular intervals defined by **<EPH_Interval>** 3 = Output on each epoch

Field	Format	Unit	Description
<EPH_Interval>	Numeric	Second	Ephemeris output interval. Only available when **<EPH_Mode>** = 2. Range: 0–7200. Default value: 0.

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGRTCM,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGRTCM,OK,<MSM_Type>,<MSM_Mode>,<MSM_ElevThd>,<Reserved>,<Reserved>,<EPH_Mode>,<EPH_Interval>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGRTCM,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set RTCM feature
$PQTMCFGRTCM,W,4,0,-90,07,06,1,0*25
$PQTMCFGRTCM,OK*7A
```

2.3.40. PQTMCFGSBAS

Configures SBAS.

Type:

Set/Get

Synopsis:

```
//Write:
$PQTMCFGSBAS,W,<Value>*<Checksum><CR><LF>
//Read:
$PQTMCFGSBAS,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Value>	Hexadecimal	-	Value of SBAS configuration. (The corresponding bit = 0 means disabled; 1 means enabled) Bit 0 = WAAS Bit 1 = SDCM Bit 2 = EGNOS Bit 3 = BDSBAS Bit 4 = MSAS Bit 5 = GAGAN Bit 6 = KASS Bit 7 = ASECNA Bit 8 = SouthPAN Default: 0x003F

Result:

- If successful, the module returns:

```
//Write:
$PQTMCFGSBAS,OK*<Checksum><CR><LF>
//Read:
$PQTMCFGSBAS,OK,<Value>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGSBAS,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGSBAS,W,003F*7B
$PQTMCFGSBAS,OK*71

//Get:
$PQTMCFGSBAS,R*27
$PQTMCFGSBAS,OK,003F*28
```

2.3.41. PQTMCFGNMEATID

Configures the NMEA Talker ID.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGNMEATID,W,<Main_TalkerID>,<GSV_TalkerID>*<Checksum><CR><LF>

//Get:
$PQTMCFGNMEATID,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Main_TalkerID>	Character	-	The main Talker ID, which is used for all NMEA standard messages other than GSV. 00 = Auto mode. The main talker ID is determined by the GNSS constellation configuration. If it is not "00", use a specific two characters as talker ID.
<GSV_TalkerID>	Numeric	-	GSV Talker ID. 0 = Determined by the GNSS constellation configuration 1 = Same value as the **<Main_TalkerID>**

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGNMEATID,OK*<Checksum><CR><LF>
//Get:
$PQTMCFGNMEATID,OK,<Main_TalkerID>,<GSV_TalkerID>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGNMEATID,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGNMEATID,W,GP,0*58
$PQTMCFGNMEATID,OK*2C
//Get:
```

```
$PQTMCFGNMEATID,R*7A
$PQTMCFGNMEATID,OK,GP,0*0B

//Set:
$PQTMCFGNMEATID,W,00,0*4F
$PQTMCFGNMEATID,OK*2C
//Get:
$PQTMCFGNMEATID,R*7A
$PQTMCFGNMEATID,OK,00,0*1C
```

2.3.42. PQTMTAR

Outputs the time and attitude. The attitude computation in this message is computed from the two-antenna system.

Type:

Output

Synopsis:

```
$PQTMTAR,<MsgVer>,<Time>,<Quality>,<Res>,<Length>,<Pitch>,<Roll>,<Heading>,<Acc_Pitch>,<Acc_Roll>,<Acc_Heading>,<UsedSV>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 1 = Version 1 (Always 1 for this message version.)
<Time>	hhmmss.sss	-	UTC time. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Quality>	Numeric	-	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. 3 = GPS PPS Mode, fix valid. 4 = Real Time Kinematic (RTK). System used in RTK mode with fixed integers. 5 = Float RTK. Satellite system used in RTK mode,

Field	Format	Unit	Description
			floating integers.
<Res>	-	-	Reserved. Always null.
<Length>	Numeric	Meter	Base line length.
<Pitch>	Numeric	Degree	Pitch angle. Note that this field is empty in case of an invalid value. Range: -90.000000 to 90.000000
<Roll>	Numeric	Degree	Roll angle. Note that this field is empty in case of an invalid value. Range: -180.000000 to 180.000000
<Heading>	Numeric	Degree	Heading. Note that this field is empty in case of an invalid value. Range: 0.000000–360.000000
<Acc_Pitch>	Numeric	Degree	Vehicle roll accuracy. Note that this field is empty in case of an invalid value.
<Acc_Roll>	Numeric	Degree	Vehicle pitch accuracy. Note that this field is empty in case of an invalid value.
<Acc_Heading>	Numeric	Degree	Vehicle heading accuracy. Note that this field is empty in case of an invalid value.
<UsedSV>	Numeric	-	Satellite number which used in heading solution.

Example:

```
$PQTMTAR,1,165034.000,4,,0.860,1.124780,1.254125,50.968541,0.254125,0.125485,0.012547,21*52
```

NOTE

1. This message only applies to LG580P (03).
2. More information for the direction of **<Heading>** in the **$PQTMTAR** message, please refer to the *document [2] application note* .

2.3.43. PQTMCFGBLD

Configures the baseline distance between the two antennas.

Type:

Set/Get

Synopsis:

```
//Write:
$PQTMCFGBLD,W,<Distance>*<Checksum><CR><LF>
//Read:
$PQTMCFGBLD,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<Distance>	Numeric	Meter	Baseline distance. Default 0.000. (When the baseline distance is 0, the baseline distance will calculate by software.)

Result:

- If successful, the module returns:

```
//Write:
$PQTMCFGBLD,OK*38
//Read:
$PQTMCFGBLD,OK,<Distance>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGBLD,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGBLD,W,1.000*68
$PQTMCFGBLD,OK*38

//Get:
$PQTMCFGBLD,R*6E
```

```
$PQTMCFGBLD,OK,1.000*3B
```

NOTE

This command only applies to LG580P (03).

2.3.44. PQTMCFGRTKSRCTYPE

Configures RTK differential source type.

Type:

Set/Get

Synopsis:

```
//Write:
$PQTMCFGRTKSRCTYPE,W,<SrcType>*<Checksum><CR><LF>
//Read:
$PQTMCFGRTKSRCTYPE,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<SrcType>	Numeric	-	RTK differential source type. 0 = Auto 1 = Normal 2 = Wide Lane

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMCFGRTKSRCTYPE,OK*<Checksum><CR><LF>
//Response to Get command:
$PQTMCFGRTKSRCTYPE,OK,<SrcType>*<Checksum><CR><LF>
```

- If failed, the module returns:

```
$PQTMCFGRTKSRCTYPE,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
//Set:
$PQTMCFGRTKSRCTYPE,W,1*2B
$PQTMCFGRTKSRCTYPE,OK*65
//Get:
$PQTMCFGRTKSRCTYPE,R*33
$PQTMCFGRTKSRCTYPE,OK,1*78
```

NOTE

The LG580P (03) modules support this command which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.

2.3.45. PQTMSN

Reads the SN of module.

Type:

Command

Synopsis:

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

Result:

- If successful, the module returns:

```
//Response to Set command:
$PQTMSN,OK,<Reversed>,<Length>,<SN>*<Checksum><CR><LF>
```

Field	Format	Unit	Description
<Reversed>	Numeric	-	Fixed as 1.
<Length>	Numeric	-	The length of the SN.
<SN>	String	-	The SN srting.

- If failed, the module returns:

```
$PQTMSN,ERROR,<ErrCode>*<Checksum><CR><LF>
```

For details about **<ErrCode>**, see *Table 5: Error Codes*.

Example:

```
$PQTMSN*05
$PQTMSN,OK,1,16,ESG5241364AUIDE5*3C
```

NOTE

The LG580P (03) modules support this command which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.

2.4. Special Message

2.4.1. Antenna2 Standard Message

For outputting the receiver information which from Antenna2 for dual antenna module, the format follow below:

Type:

Output

Synopsis:

```
$PQTM<Name>,<MsgVer>,<NMEA_Msg>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
$	Character	-	Each NMEA message starts with **$**.
<Name>	String, characters	-	3 characters standard NMEA name.
<MsgVer>	Numeric	-	Message version. Always 2 means antenna 2 information.
<NMEA_Msg>	String	-	Standard NMEA0183 message content. The content follows standard NMEA messages. See below examples for details.
<Checksum>	Hexadecimal	-	Checksum.
<CR><LF>	Character	-	Carriage return and line feed.

Example:

```
//RMC
$PQTMRMC,2,GNRMC,024022.000,A,3149.33250501,N,11706.91294841,E,8.061,359.99,130823,,,A,V
*46
//GSV
$PQTMGSV,2,GPGSV,2,1,08,05,11,123,37,10,37,319,42,12,17,137,41,15,32,061,41,1*0C
$PQTMGSV,2,GPGSV,2,2,08,18,49,213,43,23,70,349,43,24,68,057,44,32,19,272,39,1*06
$PQTMGSV,2,GPGSV,1,1,01,18,49,213,41,6*3B
$PQTMGSV,2,GPGSV,1,1,03,10,37,319,32,24,68,057,37,32,19,272,26,8*3D
$PQTMGSV,2,GLGSV,2,1,06,74,49,140,29,73,44,061,37,88,12,325,32,87,30,285,34,1*10
$PQTMGSV,2,GLGSV,2,2,06,71,43,046,35,72,41,334,32,1*16
$PQTMGSV,2,GLGSV,1,1,02,71,43,046,35,72,41,334,32,3*10
$PQTMGSV,2,GAGSV,1,1,02,08,60,345,41,13,45,258,41,7*19
$PQTMGSV,2,GAGSV,1,1,02,08,60,345,34,13,45,258,33,1*18
$PQTMGSV,2,GBGSV,2,1,07,06,65,285,33,08,67,193,33,09,52,263,31,13,72,235,36,1*1F
$PQTMGSV,2,GBGSV,2,2,07,16,67,295,35,23,59,103,37,32,63,359,37,1*23
$PQTMGSV,2,GBGSV,1,1,03,16,67,295,35,23,59,103,37,32,63,359,37,3*25
$PQTMGSV,2,GBGSV,1,1,03,16,67,295,35,23,59,103,37,32,63,359,37,5*23
$PQTMGSV,2,GBGSV,1,1,03,16,67,295,35,23,59,103,37,32,63,359,37,8*2E
$PQTMGSV,2,GBGSV,1,1,03,16,67,295,35,23,59,103,37,32,63,359,37,B*54
$PQTMGSV,2,GQGSV,1,1,02,01,67,066,41,02,38,131,40,1*04
$PQTMGSV,2,GQGSV,1,1,02,01,67,066,41,02,38,131,40,6*03
$PQTMGSV,2,GQGSV,1,1,02,01,67,066,34,02,38,131,30,8*08
$PQTMGSV,2,GIGSV,1,1,01,01,67,066,40,1*20
//GSA
$PQTMGSA,2,GNGSA,A,3,02,05,06,09,12,17,19,20,25,,,,1.65,0.82,1.43,1*70
$PQTMGSA,2,GNGSA,A,3,85,71,,,,,,,,,,1.65,0.82,1.43,2*78
$PQTMGSA,2,GNGSA,A,3,07,13,21,26,,,,,,,,1.65,0.82,1.43,3*70
$PQTMGSA,2,GNGSA,A,3,07,08,10,12,13,19,22,35,,,,,1.65,0.82,1.43,4*74
$PQTMGSA,2,GNGSA,A,3,03,,,,,,,,,,,,1.65,0.82,1.43,5*77
$PQTMGSA,2,GNGSA,A,3,01,,,,,,,,,,,,1.65,0.82,1.43,6*76
```

NOTE

This message only applies to LG580P (03).

3 QGC Protocol

QGC protocol is a proprietary protocol defined by Quectel. This paper introduces the QGC protocol transmitted through the UART interface of LG290P (03). The UART interface allows direct transmission of QGC messages.

3.1. QGC Protocol Message Structure

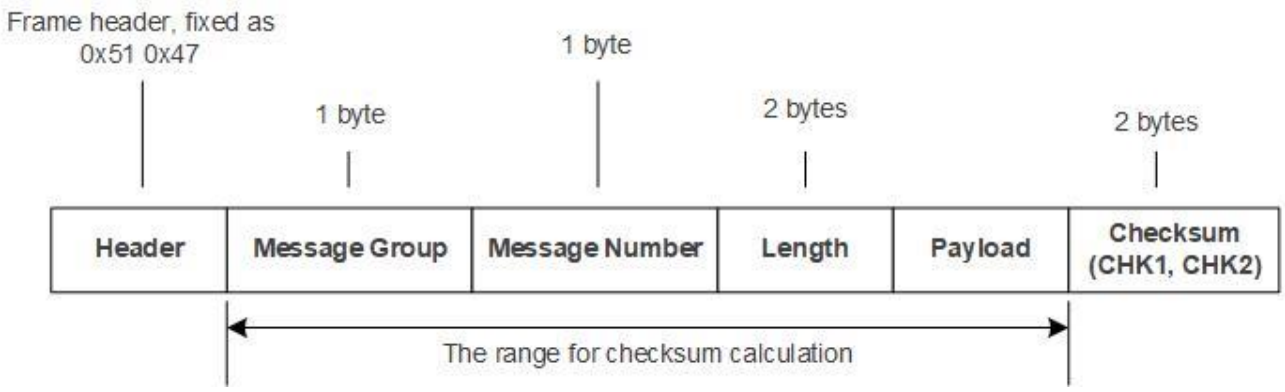

Figure 3: Structure of QGC Protocol Messages

Table 7: Structure of QGC Protocol Message

Field	Description
Header	QGC protocol frame header consisting of 2 bytes: 0x51, 0x47.
Message Group	1-byte message group. See *Table 9: Message Group and Message Number Overview* for details.
Message Number	1-byte message number. See *Table 9: Message Group and Message Number Overview* for details.
Length	Payload field length. It does not include the Header, Message Group, Message Number, Length or Checksum fields. The length format is a little-endian unsigned 16-bit integer.
Payload	Message payload, with a variable number of bytes. Data items are in little-endian format.
Checksum	2-byte checksum (CHK1 and CHK2).

```
// Buffer is the data array whose checksum needs to be calculated:
uint16_t Ql_Checksum(const unsigned char *Data, unsigned int Length)
{
    int16_t result = 0;
    uint8_t chk1 = 0;
    uint8_t chk2 = 0;
    unsigned int i = 0;

    if((NULL == Data) || (Length < 4))
```

```
    {
        return 0;
    }

    for(i = 0; i < Length; i++)
    {
        chk1 = chk1 + Data[i];
        chk2 = chk2 + chk1;
    }

    result = (chk1 << 8) + chk2;
}
```

Table 8: Data Type of QGC Protocol

Name	Data Type	Size (Byte)	Range
U1	unsigned char	1	[0,255]
S1	signed char	1	[-128,127]
U2	unsigned short int	2	[0,65535]
S2	signed short int	2	[-32768,32767]
U4	unsigned int	4	[0,4294967295]
S4	signed int	4	[-2147483648,2147483647]
U8	unsigned long long int	8	[0,2^64-1]
S8	signed long long int	8	[-2^63,2^63-1]
X1	8 bits field	1	BIT7-BIT0
X2	16 bits field	2	BIT15-BIT0
X4	32 bits field	4	BIT31-BIT0
X8	64 bits field	8	BIT63-BIT0
R4	single precision float	4	[-1*2^127,2^127]
R8	double precision float	8	[-1*2^1023,2^1023]

Table 9: Message Group and Message Number Overview

Message Name	Message Group	Message Number	Type	Description
GQC Message				
RAW-PPPB2B	0x0A	0xB2	Output	BDS PPPB2B binary raw messages.
RAW-QZSSL6	0x0A	0xB6	Output	QZSSL6 binary raw messages.
RAW-HASE6	0x0A	0xE6	Output	Galileo HASE6 binary raw messages.

3.2. Raw Messages

3.2.1. RAW-PPPB2B (0x0A 0xB2)

Outputs B2b PPP data.

Type:

Output

Structure:

Header	Message Group	Message Number	Length	Payload	Checksum
0x51 0x47	0x0A	0xB2	0x55 0x00	See *Table 10: RAW-PPPB2B Message Payload*	CHK1 CHK2

Table 10: RAW-PPPB2B Message Payload

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U1	-	MsgVer	-	Fixed as 1.
1	U1[4]	-	Reserved	-	Always 0.
5	U1	-	PRN	-	PRN number.
6	X1	-	Flag	-	The flag of PPP service. BIT5: Indicate PPP service status of the current satellite. 0 = Normal 1 = Abnormal
7	U1[17]	-	Reserved	-	Always 0.
24	U1[61]	-	MsgData	-	Message data, 486 bits since message type ID to message CRC, the first bit corresponds to the highest bit of MsgData[0], and only the high 6 bits of MsgData[60] are valid.

Example:

```
51 47 0A B2 55 00 01 00 00 00 00 3C 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 10 35 FC
49 04 40 01 3F 77 04 00 11 00 04 40 01 10 00 44 00 11 00 05 80 00 5F 6B 84 00 11 00 07 7D 63 10 00 78
```

```
17 0F FD D1 02 57 10 00 44 00 11 00 04 40 01 10 00 58 7F 00 01 81 36 B0
```

NOTE

The LG580P (03) modules support this message which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.

3.2.2. RAW-QZSSL6(0x0A 0xB6)

Outputs QZSS L6 data.

Type:

Output

Structure:

Header	Message Group	Message Number	Length	Payload	Checksum
0x51 0x47	0x0A	0xB6	0x12 0x01	See *Table 11: RAW-QZSSL6 Message Payload*	CHK1 CHK2

Table 11: RAW-QZSSL6 Message Payload

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U1	-	MsgVer	-	Fixed as 1.
1	U1[4]	-	Reserved	-	Always 0.
5	U1	-	PRN	-	PRN number.
6	X1	-	Flag	-	Message flag. BIT1-0: Reed-Solomon decoding status. 00 = The original data frame did not pass RS verification, and even after error correction, it did not pass RS verification. 01 = The original data frame passes RS verification. 10 = The original data frame did not pass RS verification, but after error correction, it passed RS verification. 11 = Reserved. BIT7: Message type. 0 = L6E message.

Byte Offset	Data Type	Scaling	Name	Unit	Description
					1 = L6D message.
7	U1[17]	-	Reserved	-	Always 0.
24	U1[250]	-	MsgData	-	Message data, 2000bits since header to the end of RS code, the first bit corresponds to the highest bit of MsgData[0].

Example:

51 47 0A B6 12 01 01 00 00 00 00 C3 81 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 1A CF FC 1D C3 A9 7F 48 AB 08 92 88 C0 3A A8 40 30 02 02 93 DF DF F5 D5 DE 43 1C 00 00 02 04 80 04 70 00 00 00 00 82 40 7F 49 E8 11 08 04 7F ED 40 0E 9F E2 01 8B 02 B1 02 5C 00 5C 06 2F B1 9F EA BF EA BF F6 00 5D 07 7B F1 03 E8 A7 F5 10 6E DF D2 5A 04 A2 3B FD 0D FC 40 30 0E FC 5C 02 20 0B C8 BF 0B 03 98 0D 60 5F 0A 80 D4 03 98 BF 68 FF DF 03 82 87 D5 4F BA 01 8C D7 F0 88 4B FE D4 31 F4 34 08 A0 3A 19 FC E7 F0 10 01 17 7C 3A FD B8 23 04 BF B5 1F F2 FF E8 93 F7 4C 01 C0 04 13 BE D9 00 2B FE A2 77 DE D0 08 7F D8 4E FA BD FF 70 03 09 DF 89 BF FA 00 CA 5F CD 1F B5 FD CD 2F D1 B0 0D FF 8E 97 BF 17 F6 80 55 FD 29 A0 4A 20 01 FE 80 28 00 05 C0 A7 F3 00 15 9C CD E1 8B C4 EE 2D E8 5C D1 F1 28 F9 A2 81 83 DF EB 8E 1B 5F FE 18 F7 D9 21 54 33 1C 5C 10 02 5B

NOTE

The LG580P (03) modules support this message which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.

3.2.3. RAW-HASE6(0x0A 0xE6)

Outputs Galileo HAS E6 data.

Type:

Output

Structure:

Header	Message Group	Message Number	Length	Payload	Checksum
0x51 0x47	0x0A	0xE6	24+53*Page	See *Table 12: RAW-HASE6 Message Payload*.	CHK1 CHK2

Table 12: RAW-HASE6 Message Payload

Byte Offset	Data Type	Scaling	Name	Unit	Description
0	U1	-	MsgVer	-	Fixed as 1.
1	U1[3]	-	Reserved	-	Always 0.
4	U1	-	PRN	-	PRN number.
5	X1	-	Status	-	HAS Status. BIT1-0: HAS working mode. 00 = Testing mode 01 = Operational mode BIT7-2: Reserved.
6	U1	-	MsgType	-	Data packet type. 0x01 = MT1
7	U1	-	Reserved	-	Always 0.
8	U1	-	Page	-	The pages of message data.
9	U1[15]	-	Reserved		Always 0.
24	U1[K]	-	MsgData	-	Message data, K = 53 * Page. Include HAS message type and message body.

Example:

51 47 0A E6 82 00 01 00 00 00 22 01 01 00 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 38 B2 00 E8 50 E9 A0 5E 7F C6 0D 00 31 FF 2E 00 00 5B FE 50 2C C0 E1 00 00 2F 77 E0 0B 20 C6 E5 3F 49 79 F0 10 50 11 F8 CB EB 7F 31 04 67 D0 80 F2 05 C0 0E 81 B2 00 E8 50 E9 A0 5E 7F C6 0D 00 31 FF 2E 00 00 5B FE 50 2C C0 E1 00 00 2F 77 E0 0B 20 C6 E5 3F 49 79 F0 10 50 11 F8 CB EB 7F 31 04 67 D0 80 F2 05 C0 0E 81 C8 C1 AD

NOTE

The LG580P (03) modules support this message which is still under development. Contact Quectel Technical Support (support@quectel.com) for details.

4 RTCM Protocol

The LG290P (03) GNSS module supports the RTCM protocol that is in accordance with *RTCM Standard 10403.3 Differential GNSS (Global Navigation Satellite Systems) Services - Version 3*. This protocol is used for transferring GNSS raw measurement data and is available from https://www.rtcm.org/.

Table 13: Supported RTCM3 Messages

Message Type	Mode	Message Name
1005	Input/Output	Stationary RTK Reference Station ARP
1006	Input/Output	Stationary RTK Reference Station ARP with height
1019	Input/Output	GPS Ephemerides
1020	Input/Output	GLONASS Ephemerides
1041	Input/Output	NavIC/IRNSS Ephemerides
1042	Input/Output	BDS Satellite Ephemeris Data
1044	Input/Output	QZSS Ephemerides
1046	Input/Output	Galileo I/NAV Satellite Ephemeris Data
1073	Input/Output	GPS MSM3
1074	Input/Output	GPS MSM4
1075	Input/Output	GPS MSM5
1076	Input/Output	GPS MSM6
1077	Input/Output	GPS MSM7
1083	Input/Output	GLONASS MSM3
1084	Input/Output	GLONASS MSM4
1085	Input/Output	GLONASS MSM5

Message Type	Mode	Message Name
1086	Input/Output	GLONASS MSM6
1087	Input/Output	GLONASS MSM7
1093	Input/Output	Galileo MSM3
1094	Input/Output	Galileo MSM4
1095	Input/Output	Galileo MSM5
1096	Input/Output	Galileo MSM6
1097	Input/Output	Galileo MSM7
1113	Input/Output	QZSS MSM3
1114	Input/Output	QZSS MSM4
1115	Input/Output	QZSS MSM5
1116	Input/Output	QZSS MSM6
1117	Input/Output	QZSS MSM7
1123	Input/Output	BDS MSM3
1124	Input/Output	BDS MSM4
1125	Input/Output	BDS MSM5
1126	Input/Output	BDS MSM6
1127	Input/Output	BDS MSM7
1133	Input/Output	NavIC/IRNSS MSM3
1134	Input/Output	NavIC/IRNSS MSM4
1135	Input/Output	NavIC/IRNSS MSM5
1136	Input/Output	NavIC/IRNSS MSM6
1137	Input/Output	NavIC/IRNSS MSM7

5 Appendix A References

Table 14: Related Documents

Document Name
[1] Quectel_LG290P(03)_Base_Station_Mode_Application_Note
[2] Quectel_LG580P(03)_Dual-Antenna_Heading_Application_Note

Table 15: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
ARP	Antenna Reference Point
ASECNA	Agency for Aviation Security and Navigation in Africa and Madagascar
BDS	Beidou Navigation Satellite System
BDSBAS	BDS Satellite-based Augmentation 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
EGNOS	European Geostationary Navigation Overlay Service
EPH	Ephemeris
GAGAN	GPS and GEO Augmented Navigation

Abbreviation	Description
GGA	Global Positioning System Fix Data
GLL	Geographic Position - Latitude/Longitude
GLONASS	Global Navigation Satellite System (Russia)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GNSS DOP and Active Satellites
GSV	GNSS Satellites in View
HAS	High Accuracy Service
HDOP	Horizontal Dilution of Precision
IRNSS	Indian Regional Navigation Satellite System
KASS	Korean Augmentation Satellite System
MSAS	Multi-functional Satellite Augmentation System
MSM	Multiple Signal Messages
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
PRN	Pseudo-Random Noise
QZSS	Quasi-Zenith Satellite System
RMC	Recommended Minimum Specific GNSS Data
RTD	Real-Time Differential
RTK	Real-Time Kinematic
SBAS	Satellite-Based Augmentation System

Abbreviation	Description
SOG	Speed over Ground
SDCM	System for Differential Corrections and Monitoring
SouthPAN	Southern Positioning Augmentation System
SPS	Standard Positioning Service
TXT	Text
UART	Universal Asynchronous Receiver/Transmitter
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision
VTG	Course Over Ground and Ground Speed
WAAS	Wide Area Augmentation System

6 Appendix B GNSS (NMEA) Numbering

Table 16: GNSS Satellites (NMEA) Numbering

GNSS Type	System ID	Satellite ID	Signal ID
GPS	1	1–32	1 = L1 C/A 6 = L2C 8 = L5-Q
GLONASS	2	65–96	1 = G1 C/A 3 = G2 C/A
Galileo	3	1–36	1 = E5a 2 = E5b 5 = E6 7 = E1
BDS	4	1–64	1 = B1I 3 = B1C 5 = B2a 6 = B2b 8 = B3I B = B2I
QZSS	5	1–10	1 = L1 C/A 6 = L2C 8 = L5-Q
NavIC (IRNSS)	6	1–15	1 = L5
SBAS	-	33–64	-

NOTE

The table above is only applicable to standard NMEA messages.

7 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.