LG69T (AM,AP) GNSS Protocol Specification

GNSS Module Series

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About the Document

Document Information	
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Revision History

Version	Date	Description
-	2023-06-25	Creation of the document
1.0	2023-04-25	First official release
1.1	2023-07-14	1. Updated the document name 2. Updated the <Alt>, <DiffAge> and <DiffStation> fields in GGA message. (*Chapter 2.2.2*) 3. Updated the status of GST message which is supported by LG69T (AM) currently. (*Chapter 2.2.7*) 4. Added the note that most PQTM messages will take effect immediately, and the configuration will not be automatically saved. (*Chapter 2.3*) 5. Added notes that the module needs to be rebooted for the related PQTM messages to take effect. (*Chapters 2.3.6*, *2.3.7* and *2.3.15*) 6. Updated the status of $PQTMCFGFIXRATE message which is only supported by LG69T (AM) currently. (*Chapter 2.3.7*) 7. Changed the default value of <ALT_DP> field in $PQTMCFGNMEADP message. (*Chapter 2.3.8*) 8. Added some proprietary NMEA messages and standard RTCM3 messages whose output rate can be set/obtained by $PQTMCFGMSGRATE message. (*Chapter 2.3.9*) 9. Updated the value of <StopBit> field in $PQTMCFGUART message.

Version	Date	Description
		(*Chapter 2.3.10*) 10. Added the $PQTMCFGPPS message, messages related to Odometer, Geofence and Antenna features and $PQTMGNSSTEMP message. (*Chapters 2.3.15, 2.3.16, 2.3.17, 2.3.18 and 2.3.19*)
1.2	2024-04-29	1. Added a note that when using $PQTMCFGFIXRATE to configure <Interval>, all values of the <Rate> in the $PQTMCFGMSGRATE will be restored to the default values (*Chapters 2.3.7*). 2. Extended $PQTMCFGMSGRATE function from setting/getting message output rate of current port to both current and specified ports and supported more message output rate configuration (*Chapter 2.3.9*). 3. Added a note that $PQTMCFGPPS is only applicable to LG69T (AM) module (*Chapter 2.3.15*).
1.3	2025-04-02	1. Updated the range of <UTC_DP> to 0–9 for LG69T (AP) in $PQTMFCNMMEADP (*Chapter 2.3.8*). *2.* Updated the message output range of GSA and the default value of message output rate for $PQTMODO, $PQTMGEOFENCESTATUS, $PQTMANTENNASTATUS, $PQTMGNSSTEMP, $PQTMPVT, RTCM3-MSM7 to 0 and added the $PQTMSTD message output rate information (*Table 5*). 3. Added a note to specify that the <Interval> value of LG69T (AP) is fixed at 100 ms (*Chapter 2.3.9*). 4. Added $PQTMANTENNASTATUS (V2), $PQTMGNSSTEMP (V2), $PQTMTAR, $PQTMCFGATTBIAS, $PQTMCFGHEADINGHOT, $PQTMHEADINGSAVE and $PQTMSTD (*Chapters 2.3.18.3*, *2.3.19.2*, *2.3.20* and *2.3.21*).

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1 Introduction

Quectel LG69T (AM, AP) GNSS modules support GPS, Galileo, BDS and QZSS constellations. Concurrent tracking of GPS L1 C/A, GPS L5, Galileo E1, Galileo E5a, BDS B1, BDS B2a, QZSS L1 and QZSS L5 frequency bands enables fast and accurate acquisition and makes these modules ideal solutions for positioning and navigation in various vertical markets.

This document describes the software commands necessary 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 or RTCM protocol format.

The LG69T (AM, AP) GNSS modules support the following protocols:

Table 1: Supported Protocols

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

NOTE

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

2 NMEA Protocol

2.1. Structure of NMEA Protocol Messages

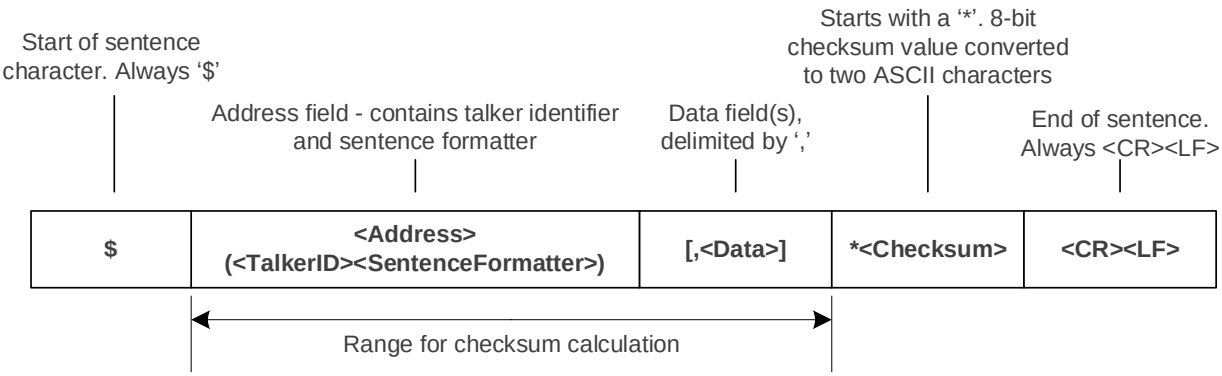

Figure 1: Structure of NMEA Protocol Messages

Table 2: 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 3: NMEA Talker ID*. The sentence formatter identifies the data type and the string format of the successive fields. **In Proprietary Messages:** In proprietary messages, this field consists of the proprietary character **P** followed by a three-character Manufacturer's Mnemonic Code, used to identify the TALKER issuing a proprietary sentence, and any additional characters as required.

Field	Description
<Data>	Data fields, delimited by 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 3: NMEA Talker ID

GNSS Constellation Configuration	TalkerID (NMEA 0183 V4.11)
GPS	GP
Galileo	GA
BDS	GB
QZSS	GQ
Combination of Multiple Satellite Systems	GN

NMEA Checksum Sample Code:

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

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

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

    return result;
}
```

2.2. Standard Messages

This chapter outlines the standard NMEA 0183 V4.11 messages supported by the LG69T (AM, AP).

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 3: NMEA Talker ID*.
RMC	String, 3 characters	-	RMC	Recommended Minimum Specific GNSS Data.
<UTC>	hhmmss.sss	-	094138.900	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.mmmmmm	-	3149.324578	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	North-south direction.

Field	Format	Unit	Example	Description
				N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11706.979371	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that this field is empty in case of an invalid value.
<SOG>	Numeric	Knot	0.000	Speed over ground. Variable length. Note that this field is empty in case of an invalid value.
<COG>	Numeric	Degree	-	Course over ground. Variable length. Maximum value: 359.99. Note that this field is empty in case of an invalid value.
<Date>	ddmmyy	-	131222	Date. dd: Day of month mm: Month yy: Year
<MagVar>	-	-	-	Magnetic variation. Not supported.
<MagVarDir>	-	-	-	Direction of magnetic variation. Not supported.
<ModeInd>	Character	-	R	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. E = Estimated (dead reckoning/previous position) mode. F = Float RTK. Satellite system used

Field	Format	Unit	Example	Description
				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	-	*3B	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNRMC,094138.900,A,3149.324578,N,11706.979371,E,0.000,,131222,,,R,V*3B
$GNRMC,000000.000,V,,,,,,010170,,,N,V*2E
```

NOTE

The meaning of **E** in **<ModeInd>** varies depending on the module:

- For LG69T (AM) module, it represents Estimated (previous position) mode.
- For LG69T (AP) module, it represents Estimated (dead reckoning) mode.

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 **$**.

Field	Format	Unit	Example	Description
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 3: NMEA Talker ID*.
GGA	String, 3 characters	-	GGA	Global Positioning System Fix Data.
<UTC>	hhmmss.sss	-	114555.400	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<Lat>	ddmm.mmmmmm	-	3149.325753	Latitude: dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11706.979576	Longitude: ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	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, estimated (velocity) mode, fix valid 3 = GPS PPS Mode, fix valid 4 = Real Time Kinematic (RTK). System used in RTK mode with

Field	Format	Unit	Example	Description
				fixed integers 5 = Float RTK. Satellite system used in RTK mode, floating integers 6 = Estimated (dead reckoning/previous position) mode
<NumSatUsed>[1)]	Numeric, 2 digits	-	37	Number of satellites in use.
<HDOP>	Numeric	-	0.45	Horizontal dilution of precision. Maximum value: 99.99.
<Alt>	Numeric	Meter	129.400	Altitude above mean-sea-level (geoid). Note that this field is empty in case of an invalid value.
M	Character	-	M	Unit of <Alt>. “M” = Meter.
<Sep>	Numeric	Meter	0.0	Geoid separation (the difference between the earth ellipsoid surface and the mean-sea-level (geoid) surface defined by the reference datum used in the position solution). Note that this field is empty in case of an invalid value.
M	Character	-	M	Unit of <Sep>. “M” = Meter.
<DiffAge>	-	-	-	Differential GPS data age. Note that this field is empty in case of an invalid value.
<DiffStation>	-	-	-	Differential reference station ID. Note that this field is empty in case of an invalid value.
<Checksum>	Hexadecimal	-	*44	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGGA,114555.400,3149.325753,N,11706.979576,E,1,37,0.45,129.400,M,0.0,M,,*44
$GNGGA,000000.000,,,,,0,00,99.99,,M,,M,,*48
```

NOTE

1. The NMEA 0183 specification indicates that the **GGA** message is GPS specific. However, when the receiver is configured for multi-constellations, the content of 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.
3. The meaning of **6** in **<Quality>** varies depending on the module:
   - For LG69T (AM) module, it represents Estimated (previous position) mode.
   - For LG69T (AP) module, it represents Estimated (dead reckoning) mode.

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	-	GA	Talker identifier. See *Table 3: 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	-	06	Total number of satellites in view.
Start of repeat block. Repeat times: 0–4.				
<SatID>	Numeric	-	01	Satellite ID.

Field	Format	Unit	Example	Description
				See *Table 9: GNSS Satellites (NMEA) Numbering*.
<SatElev>	Numeric	Degree	43	Satellite elevation. Range: 00–90. Note that this field is empty in case of an invalid value.
<SatAz>	Numeric	Degree	166	Satellite azimuth, with true north as the reference plane. Range: 000–359. Note that this field is empty in case of an invalid value.
<SatCN0>	Numeric	dB-Hz	43	Satellite C/N_0. Range 00–99. Null when not tracking.
End of repeat block.				
<SignalID>	Numeric	-	7	GNSS signal ID. See *Table 9: GNSS Satellites (NMEA) Numbering*.
<Checksum>	Hexadecimal	-	*79	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GAGSV,2,1,06,01,43,166,43,12,38,261,38,24,24,318,37,26,28,046,38,7*79
$GAGSV,2,2,06,31,67,279,45,33,66,351,46,7*7E
$GAGSV,1,1,00,1*75
```

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 3: NMEA Talker ID*.
GSA	String, 3 characters	-	GSA	GNSS DOP and Active Satellites.
<Mode>	Character	-	A	A = Automatic, allowed to automatically switch to 2D/3D mode.
<FixMode>	Numeric	-	3	Fix mode. 1 = Fix not available 2 = 2D 3 = 3D
Start of repeat block. Repeat times: 12.				
<SatID>	Numeric	-	01	ID numbers of satellites used in solution. See *Table 9: GNSS Satellites (NMEA) Numbering*. Note that this field is empty in case of an invalid value.
End of repeat block.				
<PDOP>	Numeric	-	0.82	Position dilution of precision. Maximum value: 99.99. Note that this field is 99.99 in case of an invalid value.
<HDOP>	Numeric	-	0.45	Horizontal dilution of precision. Maximum value: 99.99. Note that this field is 99.99 in case of an invalid value.
<VDOP>	Numeric	-	0.68	Vertical dilution of precision. Maximum value: 99.99. Note that this field is 99.99 in case of an invalid value.
<SystemID>	Numeric	-	1	GNSS system ID. See *Table 9: GNSS Satellites (NMEA) Numbering*.
<Checksum>	Hexadecimal	-	*01	Checksum.

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

Example:

```
$GNGSA,A,3,01,04,07,08,09,16,21,26,27,30,,,0.82,0.45,0.68,1*01
$GNGSA,A,3,02,07,13,15,19,21,27,30,34,,,,0.82,0.45,0.68,3*0F
$GNGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99,1*33
```

NOTE

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

2.2.5. VTG

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

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Example	Description
$	Character	-	$	Each NMEA message starts with **$**.
<TalkerID>	String, 2 characters	-	GN	Talker identifier. See *Table 3: NMEA Talker ID*.
VTG	String, 3 characters	-	VTG	Course Over Ground & Ground Speed.
<COGT>	Numeric	Degrees	-	Course over ground, in true north direction. Maximum value: 359.99. Note that this field is empty in case of an invalid value.
T	Character	-	T	Fixed field: true.
<COGM>	Numeric	Degrees	-	Course over ground (magnetic). Not supported.

Field	Format	Unit	Example	Description
M	Character	-	M	Fixed field: magnetic.
<SOGN>	Numeric	Knots	0.000	Speed over ground in knots. Note that this field is empty in case of an invalid value.
N	Character	-	N	Fixed field: knot.
<SOGK>	Numeric	km/h	0.000	Speed over ground in kilometers per hour. Note that this field is empty in case of an invalid value.
K	Character	-	K	Fixed field: kilometers per hour.
<ModeInd>	Character	-	R	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. E = Estimated (dead reckoning/ previous position) mode. F = Float RTK. Satellite system used in RTK mode with floating integers. N = Data not valid. R = Real Time Kinematic (RTK). Satellite system used in RTK mode with fixed integers.
<Checksum>	Hexadecimal	-	*2E	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNVTG,,T,,M,0.000,N,0.000,K,R*2E
$GNVTG,,T,,M,,N,,K,N*32
```

NOTE

The meaning of **E** in **<ModeInd>** varies depending on the module:

- For LG69T (AM) module, it represents Estimated (previous position) mode.
- For LG69T (AP) module, it represents Estimated (dead reckoning) mode.

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 3: NMEA Talker ID*.
GLL	String, 3 characters	-	GLL	Geographic Position – Latitude/Longitude.
<Lat>	ddmm.mmmmmm	-	3149.324576	Latitude. dd: Degrees (00–90) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<N/S>	Character	-	N	North-south direction. N = North S = South Note that this field is empty in case of an invalid value.
<Lon>	dddmm.mmmmmm	-	11706.979370	Longitude. ddd: Degrees (000–180) mm: Minutes (00–59) mmmmmm: Decimal fraction of minutes Note that this field is empty in case of an invalid value.
<E/W>	Character	-	E	East-west direction. E = East W = West Note that this field is empty in case of an invalid value.

Field	Format	Unit	Example	Description
<UTC>	hhmmss.sss	-	110827.800	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 = Invalid data
<ModeInd>	Character	-	R	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. E = Estimated (dead reckoning/ previous position) mode. F = Float RTK. Satellite system used in RTK mode with floating integers. N = Data not valid. R = Real Time Kinematic (RTK). Satellite system used in RTK mode with fixed integers.
<Checksum>	Hexadecimal	-	*5D	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example:

```
$GNGLL,3149.324576,N,11706.979370,E,110827.800,A,R*5D
$GNGLL,,,,,000000.000,V,N*64
```

NOTE

The meaning of **E** in **<ModeInd>** varies depending on the module:

- For LG69T (AM) module, it represents Estimated (previous position) mode.
- For LG69T (AP) module, it represents Estimated (dead reckoning) mode.

2.2.7. 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 3: NMEA Talker ID*.
GST	String, 3 characters	-	GST	GNSS Pseudorange Error Statistics.
<UTC>	hhmmss.sss	-	110404.000	Position fix UTC. hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<RMS_D>	Numeric	Meter	0.73	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	0.34	Standard deviation of semi-major axis of error ellipse. Note that this field is empty in case of an invalid value.
<MinorD>	Numeric	Meter	0.34	Standard deviation of semi-minor axis of error ellipse. Note that this field is empty in case of an invalid value.
<Orient>	Numeric	Degree	106.53	Orientation of semi-major axis of error ellipse. Note that this field is empty in case of

Field	Format	Unit	Example	Description
				an invalid value.
<LatD>	Numeric	Meter	0.11	Standard deviation of latitude error. Note that this field is empty in case of an invalid value.
<LonD>	Numeric	Meter	0.11	Standard deviation of longitude error. Note that this field is empty in case of an invalid value.
<AltD>	Numeric	Meter	0.12	Standard deviation of altitude error. Note that this field is empty in case of an invalid value.
<Checksum>	Hexadecimal	-	*4F	Checksum.
<CR><LF>	Character	-	-	Carriage return and line feed.

Example

```
$GNGST,110404.000,0.73,0.34,0.34,106.53,0.11,0.11,0.12*4F
$GNGST,000000.000,,,,,,,*57
```

2.3. PQTM Messages

This chapter explains the **PQTM** messages (proprietary NMEA messages defined by Quectel) supported by LG69T (AM, AP) modules.

Table 4: Error Codes

Field	Format	Unit	Description
<ErrCode>	Numeric	-	Error code. 1 = Invalid parameters. 2 = Execution failed.

NOTE

Unless otherwise specified, most **PQTM** messages mentioned in this document will take effect immediately, and the configuration will not be automatically saved.

2.3.1. PQTMCOLD

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

Type:

Command

Synopsis:

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

Parameter:

None

Result:

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

Example:

```
$PQTMCOLD*1C
```

2.3.2. PQTMWARM

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

Type:

Command

Synopsis:

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

Parameter:

None

Result:

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

Example:

```
$PQTMWARM*11
```

2.3.3. PQTMHOT

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

Type:

Command

Synopsis:

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

Parameter:

None

Result:

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

Example:

```
$PQTMHOT*4B
```

2.3.4. PQTMSRR

Performs a system reset. The receiver will be rebooted.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

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

Example:

```
$PQTMSRR*4B
```

2.3.5. PQTMVERNO

Queries the firmware version information.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

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

Parameters included in the result:

Field	Format	Unit	Description
<VerStr>	String	-	Firmware version
<BuildDate>	yyyy/mm/dd	-	Firmware build date yyyy: Year mm: Month dd: Day
<BuildTime>	hh:mm:ss	-	Firmware build time hh: Hour (00–23) mm: Minute (00–59) ss: Second (00–59)

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
$PQTMVERNO*58
$PQTMVERNO,LG69TAMNR01A01S_RQN,2022/12/14,20:09:50*3E
```

2.3.6. PQTMCFGCNST

Sets/gets the GNSS constellation configuration.

Type:

Set/Get

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<GPS>	Numeric	-	Enable/disable GPS. 0 = Disable 1 = Enable
<Reserved>	Numeric	-	Fixed at 0.
<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 1 = Enable
<Reserved>	Numeric	-	Fixed at 0.

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGCNST,OK*78
//Get:
$PQTMCFGCNST,OK,<GPS>,<Reserved>,<Galileo>,<BDS>,<QZSS>,<Reserved>*<Checksum><CR><LF>
```

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
//Set GNSS constellation configuration to GPS + Galileo + BDS + QZSS:
$PQTMCFGCNST,W,1,0,1,1,1,0*2B
$PQTMCFGCNST,OK*78
//Save configuration:
$PQTMSAVEPAR*5A

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

NOTE

After issuing the **Set** command, you need to save the configuration first and then reboot the module for the command to take effect.

2.3.7. PQTMCFGFIXRATE

Sets/gets the position fix interval.

Type:

Set/Get

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<Interval>	Numeric	ms	Fix interval. 100 200 500 1000

NOTE

1. After issuing the **Set** command, you need to save the configuration first and then reboot the module for the command to take effect.
2. This command is only applicable to LG69T (AM) module. The fix interval of LG69T (AP) module is fixed at 100 ms and cannot be altered with this command.
3. When using **$PQTMCFGFIXRATE** to configure **<Interval>**, all values of the **<Rate>** in the **$PQTMCFGMSGRATE** will be restored to the default values.

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGFIXRATE,OK*27
//Get:
$PQTMCFGFIXRATE,OK,<Interval>*<Checksum><CR><LF>
```

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
//Set the position fix interval to 1000 ms:
$PQTMCFGFIXRATE,W,1000*59
$PQTMCFGFIXRATE,OK*27
//Save configuration:
$PQTMSAVEPAR*5A

//Get the position fix interval:
$PQTMCFGFIXRATE,R*71
$PQTMCFGFIXRATE,OK,1000*0A
```

2.3.8. PQTMCFGNMEADP

Sets/gets the decimal places for the **<UTC>, <Lat>, <Lon>, <HDOP>, <Alt>, <PDOP>, <HDOP>, <VDOP>, <SOGK>, <COG>, <COGT>** fields in 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	-	Configuration of the number of decimal places for UTC seconds in standard NMEA messages. Range: 0–3 (LG69T (AM)); 0–9 (LG69T (AP)). Default value: 3. 0 = No fractional part. Other Values: Actual decimal place(s), e.g., 1 represents the tenth place.
<POS_DP>	Numeric	-	Configuration of the number of decimal places for latitude and longitude in standard NMEA messages. Range: 0–8. Default value: 6. 0 = No fractional part. Other Values: Actual decimal place(s), e.g., 1 represents the tenth place.
<ALT_DP>	Numeric	-	Configuration of the number of decimal places for altitude and geoidal separation in standard NMEA messages. Range: 0–3. Default value: 3. 0 = No fractional part. Other Values: Actual decimal place(s), e.g., 1 represents the tenth place.
<DOP_DP>	Numeric	-	Configuration of the number of decimal places for DOP in standard NMEA messages. Range: 0–3. Default value: 2. 0 = No fractional part. Other Values: Actual decimal place(s), e.g., 1

Field	Format	Unit	Description
			represents the tenth place.
<SPD_DP>	Numeric	-	Configuration of the number of decimal places for speed in standard NMEA messages. Range: 0–3. Default value: 3. 0 = No fractional part. Other Values: Actual decimal place(s), e.g., 1 represents the tenth place.
<COG_DP>	Numeric	-	Configuration of the number of decimal places for COG in standard NMEA messages. Range: 0–3. Default value: 2. 0 = No fractional part. Other Values: Actual decimal place(s), e.g., 1 represents the tenth place.

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGNMEADP,OK*61
//Get:
$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 4: Error Codes*.

Example:

```
//Set the decimal places of NMEA messages to default values:
$PQTMCFGNMEADP,W,3,6,3,2,3,2*37
$PQTMCFGNMEADP,OK*61

//Get decimal places of NMEA messages:
$PQTMCFGNMEADP,R*37
$PQTMCFGNMEADP,OK,3,6,3,2,3,2*64
```

2.3.9. PQTMCFGMSGRATE

Sets/gets the message output rate of the current or specific port.

Type:

Set/Get

Synopsis:

```
//Set the message output rate of the current port:
$PQTMCFGMSGRATE,W,<MsgName>,<Rate>[,<MsgVer>]*<Checksum><CR><LF>
//Get the message output rate of the current port:
$PQTMCFGMSGRATE,R,<MsgName>[,<MsgVer>]*<Checksum><CR><LF>
//Set the message output rate of the specific port:
$PQTMCFGMSGRATE,W,<PortType>,<PortID>,<MsgName>,<Rate>[,<MsgVer>]*<Checksum><CR><LF>
//Get the message output rate of the specific port:
$PQTMCFGMSGRATE,R,<PortType>,<PortID>,<MsgName>[,<MsgVer>]*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<PortType>	Numeric	-	Port type. 1 = UART
<PortID>	Numeric	-	Port ID. 1 = UART1 2 = UART2
<MsgName>	String	-	Message name, see *Table 5: Supported Messages* for details.
<Rate>	Numeric	-	Message output rate. For standard NMEA messages, **PQTMODO**, **PQTMGEOFENCESTATUS**, **PQTMANTENNASTATUS** and **PQTMGNSSTEMP**, the range of **<Rate>** is 0–20, among them: 0 = Output disabled N = Output once every N position fix(es) The meaning of **<Rate>** values for other messages and the relationship between **<Interval>** values of **PQTMCFGFIXRATE** and **<Rate>** values are specified in *Table 5: Supported Messages*.
<MsgVer>	Numeric	-	Message version. See the NOTE 1 below for details.

Table 5: Supported Messages

Message Name	Message Output Rate (<Rate>)	
	LG69T (AM)	LG69T (AP)
RMC	0–20 (Default: 1)	0–20 (Default: 1)
GGA	0–20 (Default: 1)	0–20 (Default: 1)
GSV	(The default value of **<Rate>** is always 10 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 10, 20. If **<Interval>** is set to 200, **<Rate>** can be 0, 5, 10, 15, 20. If **<Interval>** is set to 500, **<Rate>** can be 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. If **<Interval>** is set to 1000, **<Rate>** range: 0–20.	0, 10, 20 (Default: 10)
GSA	0–20 (Default: 10)	0, 10, 20 (Default: 10)
VTG	0–20 (Default: 1)	0–20 (Default: 1)
GLL	0–20 (Default: 10)	0–20 (Default: 10)
GST	0–20 (Default: 1)	0–20 (Default: 1)
PQTMODO	(The default value of **<Rate>** is always 0 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 10, 20. If **<Interval>** is set to 200, **<Rate>** can be 0, 5, 10, 15, 20. If **<Interval>** is set to 500, **<Rate>** can be 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. If **<Interval>** is set to 1000, **<Rate>** range: 0–20.	0, 1, 2, 5, 10 (Default: 0)
PQTMGEOFENCESTATUS	(The default value of **<Rate>** is always 0 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 10, 20. If **<Interval>** is set to 200, **<Rate>** can be 0, 5, 10, 15, 20. If **<Interval>** is set to 500, **<Rate>** can be 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. If **<Interval>** is set to 1000, **<Rate>** range: 0–20.	0, 10, 20 (Default: 0)
PQTMANTENNASTATUS	(The default value of **<Rate>** is always 0 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 10, 20. If **<Interval>** is set to 200, **<Rate>** can be 0, 5, 10, 15, 20.	0, 10, 20 (Default: 0)

Message Name	Message Output Rate (<Rate>)	
	LG69T (AM)	**LG69T (AP)**
	If **<Interval>** is set to 500, **<Rate>** can be 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. If **<Interval>** is set to 1000, **<Rate>** range: 0–20.	
PQTMGNSSTEMP	(The default value of **<Rate>** is always 0 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 10, 20. If **<Interval>** is set to 200, **<Rate>** can be 0, 5, 10, 15, 20. If **<Interval>** is set to 500, **<Rate>** can be 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. If **<Interval>** is set to 1000, **<Rate>** range: 0–20.	0, 10, 20 (Default: 0)
PQTMPVT	(The default value of **<Rate>** is always 0 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 10, 20. If **<Interval>** is set to 200, **<Rate>** can be 0, 5, 10, 15, 20. If **<Interval>** is set to 500, **<Rate>** can be 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. If **<Interval>** is set to 1000, **<Rate>** range: 0–20.	0 = Output disabled 1 = Output when available
PQTMDRPVA	–	0 = Output disabled 1 = Output when available
PQTMSENMSG	–	0 = Output disabled 10 = Output 10 messages per second 20 = Output 20 messages per second 50 = Output 50 messages per second 100 = Output 100 messages per second
PQTMVEHMSG	–	0 = Output disabled 1 = Output when available
PQTMTAR	–	0 = Output disabled 1 = Output when available
PQTMSTD	(The default value of **<Rate>** is always 0 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 10, 20. If **<Interval>** is set to 200, **<Rate>** can be 0, 5, 10, 15, 20. If **<Interval>** is set to 500, **<Rate>** can be 0, 2, 4, 6,	0 = Output disabled 1 = Output when available

Message Name	Message Output Rate (<Rate>)	
	LG69T (AM)	LG69T (AP)
	8, 10, 12, 14, 16, 18, 20. If **<Interval>** is set to 1000, the range of **<Rate>** is 0–20.	
RTCM3-MSM7	(The default value of **<Rate>** is always 0 regardless of the setting of **<Interval>**.) If **<Interval>** is set to 100, **<Rate>** can be 0, 1, 2, 5, 10. If **<Interval>** is set to 200, **<Rate>** can be 0, 1, 2, 5. If **<Interval>** is set to 500, **<Rate>** can be 0, 1, 2. If **<Interval>** is set to 1000, **<Rate>** can be 0 or 1.	0, 1, 2, 5, 10 (Default: 0)
RTCM3-EPH	0 = Output disabled 1 = Output when available	0 = Output disabled 1 = Output when available
RTCM3-1006	0 = Output disabled 1 = Output when available	0 = Output disabled 1 = Output when available

NOTE

1. The **<Interval>** value of LG69T (AP) is fixed at 100 ms and cannot be altered with **$PQTMCFGFIXRATE**.
2. When you set/get the standard NMEA messages or standard RTCM3 messages, **<MsgVer>** can be omitted. When you set or get the output rate of proprietary NMEA message, **<MsgVer>** should be configured to specify message version, otherwise an error will be returned.
3. For details on **$PQTMPVT**, **$PQTMDRPVA**, **$PQTMSENMSG** and **$PQTMVEHMSG** messages, see *document [1] application note*.
4. For details on **RTCM3-MSM7**, **RTCM3-EPH** and **RTCM3-1006** messages, see *Table 6: Supported RTCM3 Messages*.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

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

//Get the output rate of GGA message on the current port:
$PQTMCFGMSGRATE,R,GGA*12
$PQTMCFGMSGRATE,OK,GGA,1*59

//Set the output rate of $PQTMSENMSG message on the current port:
$PQTMCFGMSGRATE,W,PQTMSENMSG,100,2*4C
$PQTMCFGMSGRATE,OK*29

//Get the output rate of $PQTMSENMSG message on the current port:
$PQTMCFGMSGRATE,R,PQTMSENMSG,2*54
PQTMCFGMSGRATE,OK,PQTMSENMSG,100,2*1F

//Set the output rate of GGA message on UART1 to once every position fix:
$PQTMCFGMSGRATE,W,1,1,GGA,1*0A
$PQTMCFGMSGRATE,OK*29

//Get the output rate of GGA message on UART1:
$PQTMCFGMSGRATE,R,1,1,GGA*12
$PQTMCFGMSGRATE,OK,1,1,GGA,1*59

//Set the output rate of $PQTMSENMSG message on UART1:
$PQTMCFGMSGRATE,W,1,1,PQTMSENMSG,100,2*4C
$PQTMCFGMSGRATE,OK*29

//Get the output rate of $PQTMSENMSG message on the URAT 1:
$PQTMCFGMSGRATE,R,1,1,PQTMSENMSG,2*54
PQTMCFGMSGRATE,OK,1,1,PQTMSENMSG,100,2*1F
```

2.3.10. PQTMCFGUART

Sets/gets the baud rate and related configuration of the UART interface.

Type:

Set/Get

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<Index>	Numeric	-	UART index. 1 = UART1 2 = UART2 If the parameter is specified, set/get the configuration of specific UART interface. If the parameter is omitted, set/get the configuration of current UART interface.
<BaudRate>	Numeric	bps	UART baud rate. 115200 230400 460800 921600
<DataBit>	Numeric	bit	UART data bit. 8 = 8 bits
<Parity>	Numeric	-	Parity. 0 = No parity
<StopBit>	Numeric	-	Stop bits. 1 = 1 stop bit
<FlowCtrl>	Numeric	-	Flow control. 0 = None

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGUART,OK*60
//Get:
$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 4: Error Codes*.

Example:

```
//Set the baud rate on current UART interface:
$PQTMCFGUART,W,460800*15
$PQTMCFGUART,OK*60

//Set the baud rate on UART1:
$PQTMCFGUART,W,1,460800*08
$PQTMCFGUART,OK*60

//Set all parameters on current UART interface:
$PQTMCFGUART,W,460800,8,0,1,0*1C
$PQTMCFGUART,OK*60

//Set all parameters on UART1:
$PQTMCFGUART,W,1,460800,8,0,1,0*01
$PQTMCFGUART,OK*60

//Get the configuration of current UART interface:
$PQTMCFGUART,R*36
$PQTMCFGUART,OK,1,460800,8,0,1,0*52

//Get the configuration of UART1.
$PQTMCFGUART,R,1*2B
$PQTMCFGUART,OK,1,460800,8,0,1,0*52
```

2.3.11. PQTMSAVEPAR

Saves the configurations set via **PQTM** commands into NVM.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

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

2.3.12. PQTMRESTOREPAR

Restores all configurations to default values.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

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

2.3.13. PQTMDEBUGON

Enables debug log output.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

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

2.3.14. PQTMDEBUGOFF

Disables debug log output.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

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

2.3.15. PQTMCFGPPS

Configures the 1PPS feature.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGPPS,W,<Index>,<Enable>,<Duration>,<Mode>,<Polarity>,<Interval>*<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
<Duration>	Numeric	Millisecond	Pulse duration. (Default: 100) Range: 0–900
<Mode>	Numeric	-	Configure when to output PPS 1 = Always output 2 = In 2D fix 3 = In 3D fix
<Polarity>	Numeric	-	Pulse polarity. 0 = Low 1 = High
<Interval>	Numeric	-	PPS generation interval. 0 = Every second 1 = Odd seconds 2 = Even seconds

NOTE

1. If pulse polarity is configured to low (**<Polarity>** = 0), the PPS generation interval can only be every second (**<Interval>** = 0).
2. This command is only applicable to LG69T (AM) module.
3. After issuing the **Set** command, you need to save the configuration first and then reboot the module for the command to take effect.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

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

//Save configuration:
$PQTMSAVEPAR*5A
```

2.3.16. Odometer

2.3.16.1. PQTMCFGODO

Sets/gets 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: 0).

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
$PQTMCFGODO,W,1,10.5*4E
$PQTMCFGODO,OK*36
```

2.3.16.2. PQTMRESETODO

Resets the traveled distance calculated 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 4: Error Codes*.

Example:

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

2.3.16.3. PQTMODO

Outputs odometer information.

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 1 = Version 1 (Always 1 for this version.)
<Time>	hhmmss.sss	-	UTC time. hh: Hour (00–23) mm: Minute (00–59) ss: Second (00–59) sss: Decimal fraction of seconds
<State>	Numeric	-	Odometer status. 0 = Disabled 1 = Enabled
<Dist>	Numeric	Meter	Distance since last reset. The distance equal to the traveled distance plus the initial distance configured via **<InitDist>** in **$PQTMCFGODO**.

Example:

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

NOTE

<Dist> in **$PQTMODO** represents the sum of **<InitDist>** value set in **$PQTMCFGODO** and accumulated mileage. The accumulated mileage 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 mileage and the new **<InitDist>** value, as shown below:
<Dist> = Accumulated Mileage + **<InitDist>**.

2.3.17. Geofence

2.3.17.1. PQTMCFGGEOFENCE

Sets/gets geofence feature.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGGEOFENCE,W,<Index>,<Status>[,<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
<Status>	Numeric	-	Enable/disable geofence function. 0 = Disable 1 = Enable
<Reserved>	Numeric	-	Always 0.
<Shape>	Numeric	-	Geofence shape. 0 = A circle defined by its center and radius 1 = A circle defined by a center and a point on the circle 2 = Triangle 3 = Quadrangle (such as square, rectangle, trapezium, etc.)
<Lat0>	Numeric	Degree	Latitude of first point.
<Lon0>	Numeric	Degree	Longitude of first point.
<Lat1/Radius>	Numeric	Degree/ Meter	If the geofence shape is a circle defined by its center and radius (**<Shape> = 0**), 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 second point.
<Lat2>	Numeric	Degree	Latitude of third point.

Field	Format	Unit	Description
<Lon2>	Numeric	Degree	Longitude of third point.
<Lat3>	Numeric	Degree	Latitude of fourth point.
<Lon3>	Numeric	Degree	Longitude of fourth point.

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGGEOFENCE,OK*<Checksum><CR><LF>
//Get:
$PQTMCFGGEOFENCE,OK,<Index>,<Status>,<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 4: Error Codes*.

Example:

```
//Set a geofence determined by its center and radius:
$PQTMCFGGEOFENCE,W,0,1,0,0,31.451248,117.451245,100.5*18
$PQTMCFGGEOFENCE,OK*74

//Get geofence feature:
$PQTMCFGGEOFENCE,R,0*3E
$PQTMCFGGEOFENCE,OK,0,1,0,0,31.451248,117.451245,100.5*4B

//Disable geofence feature:
$PQTMCFGGEOFENCE,W,0,0*27
$PQTMCFGGEOFENCE,OK*74
```

NOTE

1. If the geofence shape and parameters have been set, and you want to disable the geofence function, the fields after **<Status>** can be omitted.
2. The points in the shape of the Geofence should be set in clockwise or counterclockwise order.
3. When **<Shape>** is set to 1, the first point represents the center of the circle.

2.3.17.2. PQTMGEOFENCESTATUS

Outputs the Geofences status.

Type:

Output

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 1 = Version 1 (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
Start of repeat block. Repeat times: 4.			
<StateN>	Numeric	-	State of geofence N. Range of N: 0–3. 0 = Unknow. 1 = Inside geofence. 2 = Outside geofence.
End of repeat block.			

Example:

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

2.3.18. Antenna

2.3.18.1. PQTMCFGANTENNA

Sets/gets the antenna working mode.

Type:

Set/Get

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<Power>	Numeric	-	Antenna power supply. 0 = Power off 1 = Power on
<Mode>	Numeric	-	Antenna working mode. 0 = Automatic mode

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGANTENNA,OK*<Checksum><CR><LF>
//Get:
$PQTMCFGANTENNA,OK,<Power>,<Mode>*<Checksum><CR><LF>
```

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
$PQTMCFGANTENNA,W,0,0*7E
$PQTMCFGANTENNA,OK*2D
```

2.3.18.2. PQTMANTENNASTATUS (V1)

Reports the antenna status.

Type:

Output

Synopsis:

```
$PQTMANTENNASTATUS,<MsgVer>,<Status>,<PowerInd>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 1 = Version 1 (Always 1 for this version.)
<Status>	Numeric	-	Antenna status. 0 = Unknow 1 = Normal 2 = Open circuit 3 = Short circuit
<PowerInd>	Numeric	-	Antenna power indicator. 0 = Power off 1 = Power on 2 = Unknow

Example:

```
$PQTMANTENNASTATUS,1,1,1*4E
```

2.3.18.3. PQTMANTENNASTATUS (V2)

Reports the antenna status.

Type:

Output

Synopsis:

```
$PQTMANTENNASTATUS,<MsgVer>,<Ant1Status>,<Ant1PowerInd>,<Ant2Status>,<Ant2PowerInd>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 2 = Version 2 (Always 2 for this message version.)
<Ant1Status>	Numeric	-	Antenna 1 status. 0 = Unknow

Field	Format	Unit	Description
			1 = Normal 2 = Open circuit 3 = Short circuit
<Ant1PowerInd>	Numeric	-	Antenna 1 power indicator. 0 = Power off 1 = Power on 2 = Unknow
<Ant2Status>	Numeric	-	Antenna 2 status. 0 = Unknow 1 = Normal 2 = Open circuit 3 = Short circuit
<Ant2PowerInd>	Numeric	-	Antenna 2 power indicator. 0 = Power off 1 = Power on 2 = Unknow

Example:

```
$PQTMANTENNASTATUS,2,1,1,1,1*4D
```

NOTE

This message is only applicable to the Moving Base scenario.

2.3.19. GNSSTEMP

2.3.19.1. PQTMGNSSTEMP (V1)

Reports the GNSS receiver temperature.

Type:

Output

Synopsis:

```
$PQTMGNSSTEMP,<MsgVer>,<Time>,<Temp>,<Status>*<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
<Temp>	Numeric	°C	GNSS receiver temperature.
<Status>	Numeric	-	Thermal sensor calibration status. 0 = Not calibrated 1 = Calibrated

Example:

```
$PQTMGNSSTEMP,1,083737.000,40,1*0F
```

2.3.19.2. PQTMGNSSTEMP (V2)

Reports the GNSS receiver temperature.

Type:

Output

Synopsis:

```
$PQTMGNSSTEMP,<MsgVer>,<Time>,<Temp1>,<Status1>,<Temp2>,<Status2>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 2 = Version 2 (Always 2 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

Field	Format	Unit	Description
<Temp1>	Numeric	°C	GNSS receiver 1 temperature.
<Status1>	Numeric	-	Thermal sensor 1 calibration status. 0 = Not calibrated 1 = Calibrated
<Temp2>	Numeric	°C	GNSS receiver 2 temperature.
<Status2>	Numeric	-	Thermal sensor 2 calibration status. 0 = Not calibrated 1 = Calibrated

Example:

```
$PQTMGNSSTEMP,2,083737.000,40,1,40,1*39
```

NOTE

This message is only is only applicable to the Moving Base scenario.

2.3.20. Moving Base

2.3.20.1. PQTMTAR

Outputs the UTC and attitude of the module (Base station).

Type:

Output

Synopsis:

```
$PQTMTAR,<MsgVer>,<Time>,<Quality>,<Res1>,<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)

Field	Format	Unit	Description
			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, estimated (velocity) mode, 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, floating integers 6 = Estimated (dead reckoning/previous position) mode
<Res1>	-	-	Reserved. Always null.
<Length>	Numeric	Meter	Base line length.
<Pitch>	Numeric	Degree	Pitch angle. Range: -90.000000 to 90.000000. Note that this field is empty in case of an invalid value.
<Roll>	Numeric	Degree	Roll angle. Range: -180.000000 to 180.000000. Note that this field is empty in case of an invalid value.
<Heading>	Numeric	Degree	Heading angle. Range: 0.000000 to 359.999999. Note that this field is empty in case of an invalid value.
<Acc_Pitch>	Numeric	Degree	Vehicle pitch accuracy. Note that this field is empty in case of an invalid value.
<Acc_Roll>	Numeric	Degree	Vehicle roll 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	-	Number of satellites used in heading solution.

Example:

```
$PQTMTAR,1,165034.000,4,,0.860,1.124780,,50.968541,0.254125,,0.012547,21*59
```

2.3.20.2. PQTMCFGATTBIAS

Sets/gets the heading angle output mode and bias.

Type:

Set/Get

Synopsis:

```
//Set:
$PQTMCFGATTBIAS,W,<HeadingMode>,<HeadingBias>*<Checksum><CR><LF>
//Get:
$PQTMCFGATTBIAS,R*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<HeadingMode>	Numeric	-	Heading angle output mode. Range: [0, 360) 0 = Clockwise rotation (positive direction)
<HeadingBias>	Numeric	Degree	Heading angle output bias. Range is [0, 360).

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGATTBIAS,OK*<Checksum><CR><LF>
//Get:
$PQTMCFGATTBIAS,OK,<HeadingMode>,<HeadingBias>*<Checksum><CR><LF>
```

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
//Set:
$PQTMCFGATTBIAS,W,0,90.0*5E
$PQTMCFGATTBIAS,OK*33

//Get:
$PQTMCFGATTBIAS,R*7C
$PQTMCFGATTBIAS,OK,0,90.0*0D
```

2.3.20.3. PQTMCFGHEADINGHOT

Sets/gets the Moving base hot start feature.

Type:

Set/Get

Synopsis:

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

Parameter:

Field	Format	Unit	Description
<Mode>	Numeric	-	Enable/disable the Moving base hot start mode. 0 = Disable Moving base hot start. 1 = Enable Moving base hot start.

Result:

- If successful, the module returns:

```
//Set:
$PQTMCFGHEADINGHOT,OK*<Checksum><CR><LF>
//Get:
$PQTMCFGHEADINGHOT,OK,<Mode>*<Checksum><CR><LF>
```

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
//Set:
$PQTMCFGHEADINGHOT,W,1*27
$PQTMCFGHEADINGHOT,OK*69

//Get:
$PQTMCFGHEADINGHOT,R*3F
$PQTMCFGHEADINGHOT,OK,1*74
```

NOTE

After issuing this command, it is necessary to save the parameters and restart the module for the command to be effective.

2.3.20.4. PQTMHEADINGSAVE

Saves the Moving Base heading angle data.

Type:

Command

Synopsis:

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

Parameter:

None.

Result:

- If successful, the module returns:

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

- If failed, the module returns:

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

For details about **<ErrCode>**, see *Table 4: Error Codes*.

Example:

```
$PQTMHEADINGSAVE*51
$PQTMHEADINGSAVE,OK*79
```

NOTE

Before utilizing this command, ensure that the Moving base hot start is enabled and the module is in calibration mode.

2.3.21. PQTMSTD

Outputs the time, position deviations, velocity deviations and attitude deviations information.

Type:

Output

Synopsis:

```
$PQTMSTD,<MsgVer>,<UTC>,<WN>,<TOW>,<STD_Lat>,<STD_Lon>,<STD_Alt>,<STD_Sep>,<STD_VelN>,<STD_VelE>,<STD_VelD>,<STD_Spd>,<STD_Roll>,<STD_Pitch>,<STD_Heading>*<Checksum><CR><LF>
```

Parameter:

Field	Format	Unit	Description
<MsgVer>	Numeric	-	Message version. 1 = Version 1 (Always 1 for this version.)
<UTC>	hhmmss.sss	-	Position fix UTC: hh: Hours (00–23) mm: Minutes (00–59) ss: Seconds (00–59) sss: Decimal fraction of seconds
<WN>	Numeric	-	Week Number, counting from 01/06/1980 00:00:00
<TOW>	Numeric	ms	Milliseconds of Week. Range:0–604799999.
<STD_Lat>	Numeric	Meter	Standard deviation of latitude error. Note that this field is empty in case of an invalid value.
<STD_Lon>	Numeric	Meter	Standard deviation of longitude error. Note that this field is empty in case of an invalid value.
<STD_Alt>	Numeric	Meter	Standard deviation of altitude above mean-sea-level error. Note that this field is empty in case of an invalid value.

Field	Format	Unit	Description
<STD_Sep>	Numeric	Meter	Standard deviation of geoidal separation error. Note that this field is empty in case of an invalid value.
<STD_VelN>	Numeric	m/s	Standard deviation of north direction velocity error. Note that this field is empty in case of an invalid value.
<STD_VelE>	Numeric	m/s	Standard deviation of east direction velocity error. Note that this field is empty in case of an invalid value.
<STD_VelD>	Numeric	m/s	Standard deviation of down direction velocity error. Note that this field is empty in case of an invalid value.
<STD_Spd>	Numeric	m/s	Standard deviation of ground speed error. Note that this field is empty in case of an invalid valuer.
<STD_Roll>	Numeric	Degree	Standard deviation of roll angle ground. Note that this field is empty in case of an invalid value.
<STD_Pitch>	Numeric	Degree	Standard deviation of pitch angle ground. Note that this field is empty in case of an invalid value.
<STD_Heading>	Numeric	Degree	Standard deviation of heading angle ground. Note that this field is empty in case of an invalid value.

Example:

```
$PQTMSTD,1,051623.300,2183,290413000,0.68,1.75,0.79,0.65,0.07,0.11,0.07,0.09,0.12,0.11,0.34*7E
```

3 RTCM Protocol

LG69T (AM, AP) modules support 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 to input the real-time differential correction data and transfer GNSS raw measurement data and is available from *https://www.rtcm.org/*.

Table 6: Supported RTCM3 Messages

Message Type	Type	Message Name
1005	Input	Stationary RTK Reference Station ARP
1006	Input/Output	Stationary RTK Reference Station ARP with Antenna Height
1019	Input/Output	GPS Ephemerides
1042	Input/Output	BDS Satellite Ephemeris Data
1044	Input/Output	QZSS Ephemerides
1046	Input/Output	Galileo I/NAV Satellite Ephemeris Data
1074	Input	GPS MSM4
1077	Input/Output	GPS MSM7
1094	Input	Galileo MSM4
1097	Input/Output	Galileo MSM7
1114	Input	QZSS MSM4
1117	Input/Output	QZSS MSM7
1124	Input	BDS MSM4
1127	Input/Output	BDS MSM7

4 Appendix A References

Table 7: Related Documents

Document Name
[1] Quectel_LG69T(AM,AP)_DR&RTK_Application_Note

Table 8: Terms and Abbreviations

Abbreviation	Description
2D	2 Dimension
3D	3 Dimension
BDS	Beidou Navigation Satellite System
COG	Course over Ground
COGM	Course over Ground (in Magnetic North Course Direction)
COGT	Course over Ground (in True North Course Direction)
DOP	Dilution of Precision
Galileo	Galileo Satellite Navigation System (EU)
GGA	Global Positioning System Fix Data
GLL	Geographic Position - Latitude and Longitude
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GNSS DOP and Active Satellites
GSV	GNSS Satellites in View
HDOP	Horizontal Dilution of Precision

Abbreviation	Description
NMEA	National Marine Electronics Association
NVM	Non-volatile Memory
PDOP	Position Dilution of Precision
PPS	Pulse Per Second
RMC	Recommended Minimum Specific GNSS Data
RTCM	Radio Technical Commission for Maritime Services
RTK	Real-Time Kinematic
SBAS	Satellite-Based Augmentation System
SNR	Signal to Noise Ratio
SPS	Standard Positioning Service
UTC	Universal Time Coordinated
UART	Universal Asynchronous Receiver/Transmitter
VDOP	Vertical Dilution of Precision
VTG	Course Over Ground & Ground Speed

5 Appendix B GNSS Satellites (NMEA) Numbering

Table 9: GNSS Satellites (NMEA) Numbering

GNSS Type	System ID	Satellite ID	Signal ID
GPS	1	1–32	1 = L1 C/A 8 = L5-Q
Galileo	3	1–36	1 = E5a 7 = L1
BDS	4	1–64	1 = B1I 5 = B2-a
QZSS	5	1–10	1 = L1 C/A 8 = L5-Q

NOTE

The table above is only applicable to standard NMEA messages.

6 Appendix C Special Characters

Table 10: 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.