

LG69T (AS) GNSS Protocol Specification

GNSS Module Series

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About the Document

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1 Introduction

Quectel LG69T (AS) GNSS module supports 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 provides fast and accurate acquisition and makes this module an ideal solution to be used as a base station and to generate RTK corrections.

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 output messages in RTCM protocol format.

NOTE

Only use the commands listed in this document. Quectel assumes no responsibility if other commands are used.

2 NMEA Protocol

2.1. Structure of NMEA Protocol Messages

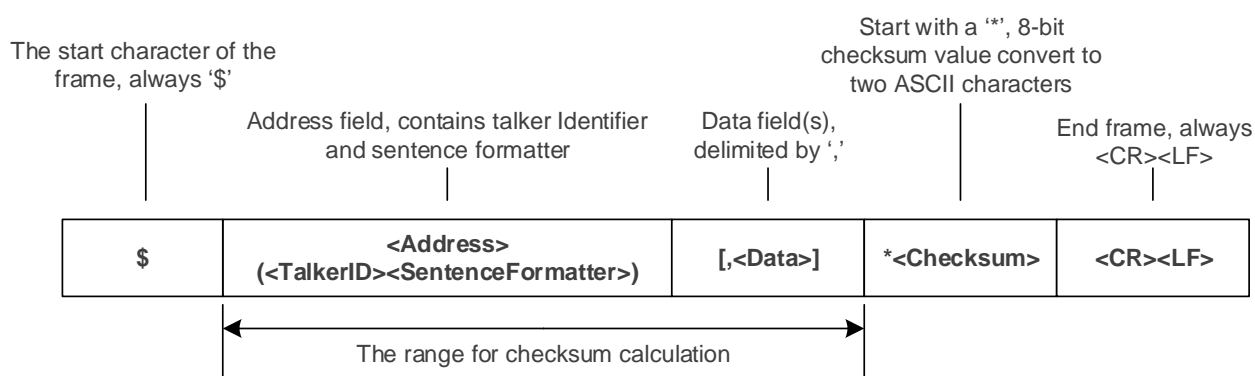


Figure 1: Structure of NMEA Protocol Messages

Table 1: Structure of NMEA Protocol Messages

| Field | Description |
|------------|---|
| \$ | Start of the sentence (Hex 0x24). |
| <Address> | In Proprietary Messages: In NMEA proprietary messages, this field consists of the proprietary character P followed by a three-character Manufacturer's Mnemonic Code, used to identify the TALKER issuing a proprietary sentence, and any additional characters as required. |
| <Data> | Data fields, delimited by comma (,). Variable length (depends on the NMEA message type). |
| <Checksum> | The checksum field follows the checksum delimiter character *. The checksum is the 8-bit exclusive OR of all characters in the sentence, including the comma (,) delimiter, between but not including the \$ and the * delimiters. |
| <CR><LF> | End of the sentence (Hex 0x0D 0x0A). |

2.2. PQTM Messages

This chapter explains the PQTM messages (proprietary NMEA messages defined by Quectel) supported by LG69T (AS).

2.2.1. PQTMSRR

Executes a system reset.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

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

Example:

```
$PQTMSRR*4B
```

2.2.2. PQTMCFGPORT

Sets a communication port or gets a communication port configuration.

Type:

Set/Get

Synopsis:

```
$PQTMCFGPORT,<RW>,<PortType>,<ProtocolType>{,<Par1>,<Par2>,...,<ParN>}*<Checksum><CR><LF>
```

Parameter:

| Field | Format | Unit | Description |
|----------------|------------------|------|--|
| <RW> | Decimal, 1 digit | - | 0 = Read current configuration 1 = Configure the communication port |
| <PortType> | Decimal, 1 digit | - | 0 = UART1 1 = UART2 |
| <ProtocolType> | Decimal | - | Bit 0 = NMEA command input Bit 1 = NMEA message output Bit 2 = RTCM output |
| <ParN> | - | - | The content of <ParN> depends on the port type (<PortType>). If the port is the UART port, <ParN> is the baud rate configuration. For more details, see Chapter 2.2.2.1 . |

2.2.2.1. UART Configuration (<PortType> = 0 or 1)

Sets the UART port.

Type:

Set

Synopsis:

```
$PQTMCFGPORT,<RW>,<PortType>,<ProtocolType>{,<BaudRate>}*<Checksum><CR><LF>
```

Parameter:

| Field | Format | Unit | Description |
|------------|---------|------|---|
| <BaudRate> | Decimal | bps | UART port baud rate. Support below: 115200 230400 460800 921600 |

Example:

```
$PQTMCFGPORT,0,0*43
$PQTMPORT,0,0,3,460800*38
$PQTMCFGPORT,1,0,1,460800*79
$PQTMCFGPORTOK*47
```

NOTE

If **<RW>** = 0, the parameters after **<PortType>** will be omitted. If **<RW>** = 1, the parameters after **<PortType>** shall be specified.

2.2.3. PQTMSSETRECVMODE

Sets the receiver mode. The base station needs to work in static mode and there are two ways to enter static mode: Survey-in mode and Fixed mode.

The Survey-in mode (**<Mode>** = 1) determines the receiver’s position by building a weighted mean of all valid 3D position solutions. User can set the **<Duration>** value to define the minimum observation time independent of the actual number of fixes used for the position estimate.

The Fixed mode (**<Mode>** = 2) requires user to manually enter the receiver position coordinates. Any error in the base station position will directly translate into rover position error.

Type:

Set

Synopsis:

```
$PQTMSSETRECVMODE,<Mode>,<Duration>,<AntHeight>,<ECEF_X>,<ECEF_Y>,<ECEF_Z>*<Check sum><CR><LF>
```

Parameter:

| Field | Format | Unit | Description |
|-------------|---------|--------|---|
| <Mode> | Numeric | - | Receiver mode. 0 = None 1 = Survey-in (default) 2 = Fixed with ECEF coordinate |
| <Duration> | Numeric | Second | Survey-in minimum duration. Range: 0–60000. |
| <AntHeight> | Numeric | Meter | Antenna height. Range: 0–6.5535. |
| <ECEF_X> | Numeric | Meter | WGS84 ECEF X coordinate of ARP position. |
| <ECEF_Y> | Numeric | Meter | WGS84 ECEF Y coordinate of ARP position. |
| <ECEF_Z> | Numeric | Meter | WGS84 ECEF Z coordinate of ARP position. |

Example:

```
$PQTMSETRECVMODE,1,90,0,0,0,0*63
$PQTMSETRECVMODEOK*5F
```

2.2.4. PQTMGETRECVMODE

Gets the receiver mode.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- In case of no errors, the returned message is:

```
$PQTMRECVMODE,<Mode>,<Duration>,<AntHeight>,<ECEF_X>,<ECEF_Y>,<ECEF_Z>*<Checksum>
<CR><LF>
```

The parameters included in the result above are listed below:

| Field | Format | Unit | Description |
|-------------|---------|--------|---|
| <Mode> | Numeric | - | Receiver mode. 0 = None 1 = Survey-in 2 = Fixed with ECEF coordinate |
| <Duration> | Numeric | Second | Survey-in minimum duration. Range: 0–60000. |
| <AntHeight> | Numeric | Meter | Antenna height. Range: 0–6.5535. |
| <ECEF_X> | Numeric | Meter | WGS84 ECEF X coordinate of ARP position. |
| <ECEF_Y> | Numeric | Meter | WGS84 ECEF Y coordinate of ARP position. |
| <ECEF_Z> | Numeric | Meter | WGS84 ECEF Z coordinate of ARP position. |

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

```
$PQTMRECVMODEERROR*41
```

Example:

```
$PQTMGETRECVMODE*4F
$PQTMRECVMODE,1,90,0.0000,0.0000,0.0000,0.0000*21
```

2.2.5. PQTMSETMSMMODE

Sets the RTCM MSM messages Type.

Type:

Set

Synopsis:

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

Parameter:

| Field | Format | Unit | Description |
|--------|---------|------|---|
| <Mode> | Numeric | - | The mode of MSM messages. 4 = MSM4 (default) 7 = MSM7 |

Example:

```
$PQTMSETMSMMODE,4*12
$PQTMSETMSMMODEOK*0E
```

2.2.6. PQTMGETMSMMODE

Gets the RTCM MSM messages Type.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- In case of no errors, the returned message is:

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

The parameter included in the result above is listed below:

| Field | Format | Unit | Description |
|--------|---------|------|---|
| <Mode> | Numeric | - | The mode of MSM messages. 4 = MSM4 7 = MSM7 |

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

```
$PQTMGETMSMMODEERROR*46
```

Example:

```
$PQTMGETMSMMODE*1E
$PQTMMSMMODE,4*50
```

2.2.7. PQTMSETCONSTMASK

Sets the GNSS constellation mask.

Type:

Set

Synopsis:

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

Parameter:

| Field | Format | Unit | Description |
|--------|---------|------|--|
| <Mask> | Numeric | - | The bit mask of GNSS constellation. Bit 0 = GPS Bit 2 = Galileo Bit 3 = BDS Bit 4 = QZSS |

Result:

- In case of no errors, the returned message is:

```
$PQTMSETCONSTMASKOK*0F
```

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

```
$PQTMSETCONSTMASKERROR*53
```

Example:

```
$PQTMSETCONSTMASK,29*2C
$PQTMSETCONSTMASKOK*0F
```

2.2.8. PQTMGETCONSTMASK

Gets the GNSS constellation mask.

Type:

Get

Synopsis:

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

Parameter:

None

Result:

- In case of no errors, the returned message is:

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

The parameter included in the result above is listed below

| Field | Format | Unit | Description |
|--------|---------|------|--|
| <Mask> | Numeric | - | The bit mask of GNSS constellation. Bit 0 = GPS Bit 2 = Galileo Bit 3 = BDS Bit 4 = QZSS |

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

```
$PQTMGETCONSTMASKERROR*47
```

Example:

```
$PQTMGETCONSTMASK*1F
$PQTMCONSTMASK,29*6E
```

2.2.9. PQTMSAVEPAR

Saves configurations of GNSS commands into NVM.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- In case of no errors, the returned message is:

```
$PQTMSAVEPAROK*5E
```

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

```
$PQTMSAVEPARERROR*02
```

Example:

```
$PQTMSAVEPAR*5A
$PQTMSAVEPAROK*5E
```


2.2.10. PQTMRSTOREPAR

Restores all configurations to default values.

Type:

Command

Synopsis:

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

Parameter:

None

Result:

- In case of no errors, the returned message is:

```
$PQTMRESTOREPAROK*17
```

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

```
$PQTMRESTOREPARERROR*4B
```

Example:

```
$PQTMRESTOREPAR*13
$PQTMRESTOREPAROK*17
```

2.2.11. PQTMMVERNO

Queries the firmware version.

Type:

Query

Synopsis:

```
//Query the main version string
$PQTMVERNO*<Checksum><CR><LF>
//Query the sub version string
$PQTMVERNO,SUB*<Checksum><CR><LF>
```

Parameter:

None

Result:

The firmware version string is returned.

Example:

```
$PQTMVERNO*58  
$PQTMVERNO, LG69TASNR01A02, 2021/12/30, 17:38:07*63  
  
$PQTMVERNO, SUB*30  
$PQTMVERNO, SUB, V03*49
```

3 RTCM Protocol

This chapter explains the RTCM protocol supported by LG69T (AS).

3.1. Supported RTCM Messages

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

4 Appendix References

Table 2: Related Document

| Document Name |
|---|
| [1] Quectel_LG69T(AM,AQ,AS)_Hardware_Design |

Table 3: Terms and Abbreviations

| Abbreviation | Description |
|--------------|--|
| ARP | Antenna Reference Point |
| BDS | BDS Navigation Satellite System |
| ECEF | Earth-Centered, Earth-Fixed |
| Galileo | Galileo Satellite Navigation System (EU) |
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning System |
| MSM | Multiple Signal Messages |
| NMEA | National Marine Electronics Association |
| NVM | Non-Volatile Memory |
| QZSS | Quasi-Zenith Satellite System |
| RTCM | Radio Technical Commission for Maritime Services |
| RTK | Real-Time Kinematic |
| UTC | Universal Time Coordinated |
| WGS84 | World Geodetic System 1984 |