EG060K&Ex120K&EM06xK Series GNSS Application Note

LTE-A Module Series

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

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About the Document

Revision History

Version	Date	Author	Description
-	2024-07-12	Franco WANG	Creation of the document
1.0	2024-08-27	Franco WANG	First official release

Contents

Table Index

1 Introduction

Quectel EG060K series, EG120K series, EM120K-GL, EM060K series and EM061K-GL modules integrate the multi-GNSS engine which supports GPS, BDS, QZSS, Galileo, GLONASS systems and also XTRA (that is gpsOneXTRA) assistance technology. The high-performance GNSS engine is suitable for various application scenarios with low cost and accurate positioning requirements, and supports location tracking without any network assistance. This makes Quectel EG060K series, EG120K series, EM120K-GL, EM060K series and EM061K-GL modules widely used in the following fields such as turn-by-turn navigation, asset tracking, personnel tracking, location-aware games, as well as home and fleet management.

1.1. Applicable Modules

Table 1: Applicable Modules

Module Series	Module
-	EG060K Series
Ex120K	EG120K Series
	EM120K-GL
EM06xK	EM060K Series
	EM061K-GL

1.2. GNSS Turning On/Off Procedures

The GNSS of EG060K series, EG120K series, EM120K-GL, EM060K series and EM061K-GL modules support location calculation without any network assistance. GNSS turning on/off procedures are shown below:

Step 1: Configure GNSS parameters through **AT+QGPSCFG**.

Step 2: Turn on GNSS through **AT+QGPS**.

Step 3: Obatin the positioning information in any of the following three ways after turning on GNSS and fixing position successfully:

1) NMEA sentences are outputted to "usbnmea" port by default and can be obtained by reading the port.
2) Obtain positioning information such as latitude, longitude, height, GNSS positioning mode, time, number of satellites directly through **AT+QGPSLOC**.
3) Set **AT+QGPSCFG="nmeasrc",1** to enable acquisition of specified NMEA sentences through **AT+QGPSGNMEA**. The specified NMEA sentences cannot be acquired through **AT+QGPSGNMEA** if **AT+QGPSCFG="nmeasrc",0** is set.

Step 4: Turn off GNSS through **AT+QGPSEND**.

1.3. Supported NMEA Sentence Types

The default NMEA sentences of the modules are compatible with NMEA 0183 protocol, and five kinds of prefixes are available to differentiate NMEA sentences of different satellite systems, as illustrated below.

GNSS Multi-constellations NMEA sentences have the prefix “GN”:

- GNGSA – GNSS DOP and active satellites
- GNGNS – GNSS fix data

GPS NMEA sentences have the prefix "GP":

- GPGGA – Global positioning system fix data, such as time, position, etc.
- GPRMC – Recommended minimum specific GNSS data
- GPGSV – GNSS satellites in view, such as number of satellites in view, satellite ID numbers, etc.
- GPGSA – GNSS DOP and active satellites
- GPVTG – Course over ground and ground speed

GLONASS NMEA sentences have the prefix "GL":

- GLGSV – GNSS satellites in view, such as number of satellites in view, satellite ID numbers, etc.

Galileo NMEA sentences have the prefix "GA":

- GAGGA – Global positioning system fix data, such as time, position, etc.
- GARMC – Recommended minimum specific GNSS data
- GAGSV – GNSS satellites in view, such as number of satellites in view, satellite ID numbers, etc.
- GAGSA – GNSS DOP and active satellites
- GAVTG – Course over ground and ground speed

BDS NMEA sentences have the prefix "PQ":

- PQGSV – GNSS satellites in view, such as number of satellites in view, satellite ID numbers, etc.
- PQGSA – GNSS DOP and active satellites

QZSS NMEA sentences have the prefix "PQ":

- PQGSV – GNSS satellites in view, such as number of satellites in view, satellite ID numbers, etc.
- PQGSA – GNSS DOP and active satellites

NOTE

BDS and QZSS NMEA sentences of the modules have the prefix "PQ", which is an extended sentence based on NMEA 0183 V4.10 protocol.

1.4. XTRA Assistance Introduction

XTRA assistance technology enhances the performance of GNSS, and provides simplified GNSS assistance delivery, including ephemeris, almanac, ionosphere, UTC, health and coarse time assistance for GNSS engine. After activating XTRA assistance, the TTFF can be reduced by 18–30 s (or more in harsh environments with weak signals). The assistance data which is obtained from one of the XTRA assistance web servers needs to be updated before expiration.

Before using this function, please make sure the valid XTRA assistance data is available first. It is necessary to download a new XTRA binary file which contains the valid XTRA assistance data from one of the XTRA assistance web servers through URLs listed below.

- **The files named with suffix "xtra2.bin" are for GPS + GLONASS:**

http://xtrapath4.izatcloud.net/xtra2.bin
http://xtrapath5.izatcloud.net/xtra2.bin
http://xtrapath6.izatcloud.net/xtra2.bin

- **The files named with suffix "xtra3grc.bin" are for GPS + GLONASS + BDS:**

http://xtrapath4.izatcloud.net/xtra3grc.bin
http://xtrapath5.izatcloud.net/xtra3grc.bin
http://xtrapath6.izatcloud.net/xtra3grc.bin

- **The files named with suffix "xtra3grcej.bin" are for GPS + GLONASS + BDS + Galileo:**

http://xtrapath4.izatcloud.net/xtra3grcej.bin
http://xtrapath5.izatcloud.net/xtra3grcej.bin
http://xtrapath6.izatcloud.net/xtra3grcej.bin

NOTE

Not all applicable modules of this document support GPS + GLONASS + BDS + Galileo system data files with the suffix "xtra3grcej.bin". Please contact Quectel Technical Supports for details.

XTRA assistance data needs to be updated regularly. The status of XTRA data files can be queried through **AT+QGPSXTRADATA?** before updating.

The operation procedures of XTRA assistance are shown as follows:

Step 1: XTRA assistance is enabled by default. If it is disabled, enable it through **AT+QGPSXTRA=1**.

Step 2: Query and confirm the current validity of XTRA data file through **AT+QGPSXTRADATA?**. If the data is invalid, perform ***Step 3–6****;* if the data is valid, turn on GNSS engine according to the procedures described in ***Chapter 1.2*** directly.

Step 3: Download file with suffix "xtra2.bin" or "xtra3grc.bin" or "xtra3grcej.bin" to the module via URLs listed above.

Step 4: Inject the correct XTRA time to GNSS engine through **AT+QGPSXTRATIME**.

Step 5: Inject the valid XTRA data file to GNSS engine through **AT+QGPSXTRADATA**.

Step 6: Turn on GNSS engine according to the procedures described in ***Chapter 1.2.***

NOTE

1. GNSS engine needs to be turned off before ***Step 1***.
2. For more detailed information of the AT commands mentioned above, please refer to ***Chapters 2.3.7***, ***2.3.8*** and ***2.3.9***.

2 Description of GNSS AT Commands

2.1. AT Command Introduction

2.1.1. Definitions

- **<CR>** Carriage return character.
- **<LF>** Line feed character.
- **<...>** Parameter name. Angle brackets do not appear on command line.
- **[...]** Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on the command line. When an optional parameter is not given in a command, the new value equals its previous value or the default settings, unless otherwise specified.
- **Underline** Default setting of a parameter.

2.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. In tables presenting commands and responses throughout this document, only the commands and responses are presented, and **<CR>** and **<LF>** are deliberately omitted.

Table 2: Types of AT Commands

Command Type	Syntax	Description
Test Command	**AT+<cmd>=?**	Test the existence of corresponding command and return information about the type, value, or range of its parameter.
Read Command	**AT+<cmd>?**	Check the current parameter value of a corresponding command.
Write Command	**AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]**	Set user-definable parameter value.
Execution Command	**AT+<cmd>**	Return a specific information parameter or perform a specific action.

2.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you learn about the use of the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendations or suggestions about how to design a program flow or what status to set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there is a correlation among these examples, or that they should be executed in a given sequence.

2.3. AT Commands Description

2.3.1. AT+QGPSCFG Configure GNSS

This command queries and configures various GNSS settings, including the output port and output types of NMEA sentences, etc.

AT+QGPSCFG Configure GNSS	
Test Command **AT+QGPSCFG=?**	Response **+QGPSCFG: "outport",(**list of supported **<out_port>**s**)** **+QGPSCFG: "nmeasrc",(**list of supported **<NMEA_src>**s**)** **+QGPSCFG: "gpsnmeatype",(**list of supported **<GPS_NMEA_type>**s**)** **+QGPSCFG: "glonassnmeatype",(**list of supported **<GLONASS_or_GNSS_NMEA_type>**s**)** **+QGPSCFG: "galileonmeatype",(**list of supported **<Galileo_NMEA_type>**s**)** **+QGPSCFG: "beidounmeatype",(**list of supported **<BeiDou_NMEA_type>**s**)** **+QGPSCFG: "gnssconfig",(**list of supported **<GNSS_config>**s**)** **+QGPSCFG: "autogps",(**list of supported **<autoGPS>**s**)** **+QGPSCFG: "dpoenable",(**list of supported **<DPO_enable>**s**)** **+QGPSCFG: "plane",(**list of supported **<plane>**s**)** **+QGPSCFG: "suplver",(**list of supported **<SUPL_version>**s**)** **+QGPSCFG: "lbsapn",(**list of supported **<srvsystem>**s**),(**list of supported **<PDP>**s**),<APN>** **+QGPSCFG: "agpsposmode",(**list of supported **<AGPS_posmode>**s**)** **+QGPSCFG: "agnssprotocol",(**list of supported **<AGPS_LP>**s**),(**list of supported **<AGLONASS_LP>**s**)**

	OK

2.3.1.1. AT+QGPSCFG="outport" Configure Output Port of NMEA Sentences

This command configures the output port of NMEA sentences.

AT+QGPSCFG="outport" Configure Output Port of NMEA Sentences	
Write Command **AT+QGPSCFG="outport"[,<out_port>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "outport",<out_port>** **OK** If the optional parameter is specified, configure the output port of NMEA sentences. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<out_port>	String type. Configure output port of NMEA sentences. "none" Close NMEA sentence output "usbnmea" Output through USB NMEA port "uartdebug" Output through Debug UART port
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.2. AT+QGPSCFG="nmeasrc" Enable/Disable Acquisition of NMEA Sentences Through AT+QGPSGNMEA

This command enables/disables acquisition of NMEA sentences through **AT+QGPSGNMEA**.

AT+QGPSCFG="nmeasrc" Enable/Disable Acquisition of NMEA Sentences Through AT+QGPSGNMEA	
Write Command **AT+QGPSCFG="nmeasrc"[,<NMEA_src>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "nmeasrc",<NMEA_src>** **OK** If the optional parameter is specified, configure whether to enable acquisition of NMEA sentences through **AT+QGPSGNMEA**: **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<NMEA_src>	Integer type. Set whether to acquire the original NMEA sentences through **AT+QGPSGNMEA**. If enabled, after executing **AT+QGPSGNMEA,** NMEA sentences are outputted through the AT port as a return value. 0 Disable 1 Enable
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.3. AT+QGPSCFG="gpsnmeatype" Configure Output Type of GPS NMEA Sentences

This command configures the type of GPS NMEA sentences that will be outputted.

AT+QGPSCFG="gpsnmeatype"	Configure Output Type of GPS NMEA Sentences
Write Command **AT+QGPSCFG="gpsnmeatype"[,<GPS_NMEA_type>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "gpsnmeatype",<GPS_NMEA_type>** **OK** If the optional parameter is specified, configure the output type of GPS NMEA sentences. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<GPS_NMEA_type>	Integer type. Configure output type of GPS NMEA sentences by XOR operation. 0 Disable 1 GPGGA 2 GPRMC 4 GPGSV 8 GPGSA 16 GPVTG 31 All the five types of sentences
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.4. AT+QGPSCFG="glonassnmeatype" Configure Output Type of GLONASS or GNSS Multi-constellations NMEA Sentences

This command configures the output type of GLONASS or GNSS Multi-constellations NMEA sentences.

AT+QGPSCFG="glonassnmeatype" Configure Output Type of GLONASS or GNSS Multi-constellations NMEA Sentences	
Write Command **AT+QGPSCFG="glonassnmeatype"[,<GLONASS_or_GNSS_NMEA_type>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "glonassnmeatype",<GLONASS_or_GNSS_NMEA_type>** **OK** If the optional parameter is specified, configure the output type of GLONASS or GNSS Multi-constellations NMEA sentences. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<GLONASS_or_GNSS_NMEA_type>	Integer type. Configure output type of GLONASS or GNSS Multi-constellations NMEA sentences by XOR operation. 0 Disable 1 GLGSV 2 GNGSA 4 GNGNS
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.5. AT+QGPSCFG="galileonmeatype" Configure Output Type of Galileo NMEA Sentences

This command configures the output type of Galileo NMEA sentences.

AT+QGPSCFG="galileonmeatype" Configure Output Type of Galileo NMEA Sentences	
Write Command **AT+QGPSCFG="galileonmeatype"[,<Galileo_NMEA_type>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "galileonmeatype",<Galileo_NMEA_type>** **OK** If the optional parameter is specified, configure the output type of Galileo NMEA sentences. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<Galileo_NMEA_type>	Integer type. Configure output type of Galileo NMEA sentences by XOR operation. 0 Disable 1 GAGGA 2 GARMC 4 GAGSV 8 GAGSA 16 GAVTG
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.6. AT+QGPSCFG="beidounmeatype" Configure Output Type of BDS and QZSS NMEA Sentences

This command configures the output type of BDS and QZSS NMEA sentences.

AT+QGPSCFG="beidounmeatype" Configure Output Type of BDS and QZSS NMEA Sentences	
Write Command **AT+QGPSCFG="beidounmeatype"[,<BeiDou_NMEA_type>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "beidounmeatype",<BeiDou_NMEA_type>** **OK** If the optional parameter is specified, configure the output type of BDS and QZSS NMEA sentences. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<BeiDou_NMEA_type>	Integer type. Configure output type of BDS and QZSS NMEA sentences by XOR operation. 0 Disable 1 PQGSA 2 PQGSV
<errcode>	The error code of operation. See ***Chapter 4*** for details.

NOTE

This command configures the output type of BDS and QZSS NMEA sentences synchronously. For example, **AT+QGPSCFG="beidounmeatype",1** indicates to configure the output type of BDS and QZSS NMEA sentences as PQGSA synchronously.

Table 3: Format of PQGSV and PQGSA Sentences

Type	Format
PQGSV	$PQGSV,<TNS>,<SN>,<TNSV>,<SVID1>,<ED1>,<AD1>,<SNR1>,...,<SVID4>,<ED4>,<AD4>,<SNR4>,<SigID>,<SysID>*<CS>
PQGSA	$PQGSA,<MODE1>,<MODE2>,<SVID1>,…,<SVID12>,<PDOP>,<HDOP>,<VDOP>,<SysID>*<CS>

Parameter

<TNS>	Total number of sentences. Range: 1–9.
<SN>	Sentence number. Range: 1–9.
<TNSV>	Total number of satellites in view. Range: 0–36.
<SVID>	Satellite ID.
<ED>	Elevation degrees. Maximum: 90°.
<AD>	Azimuth degrees. Range: 000°–359°.
<SNR>	Signal-to-noise ratio. Range: 00–99. Unit: dB-Hz. Null if not tracked.
<SigID>	Signal ID. Taking QZSS as an example, 1 indicates 1 C/A; 8 indicates L5-Q. Please refer to NMEA 0183 for details.
<SysID>	System ID. 4 BDS 5 QZSS
<CS>	Checksum.
<MODE1>	Fix mode 1. M Manual mode, force to 2D or 3D positioning A Automatic mode, automatically switch to 2D or 3D positioning.
<MODE2>	Fix mode 2. 1 No positioning 2 2D positioning 3 3D positioning.
<PDOP>	Position dilution of precision.
<HDOP>	Horizontal dilution of precision.
<VDOP>	Vertical dilution of precision.

2.3.1.7. AT+QGPSCFG="gnssconfig" Configure Enabled GNSS Constellations

This command configures the enabled GNSS constellations of the module.

AT+QGPSCFG="gnssconfig"	Configure Enabled GNSS Constellations
Write Command **AT+QGPSCFG="gnssconfig"[,<GNSS_config>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "gnssconfig",<GNSS_config>** **OK** If the optional parameter is specified, configure the enabled GNSS constellations. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<GNSS_config>	Integer type. Configure enabled GNSS constellations. GPS is always ON. 0 GLONASS OFF/BDS and QZSS OFF/Galileo OFF 1 GLONASS ON/BDS and QZSS ON/Galileo ON 2 GLONASS ON/BDS and QZSS ON/Galileo OFF 3 GLONASS ON/BDS and QZSS OFF/Galileo ON 4 GLONASS ON/BDS and QZSS OFF/Galileo OFF 5 GLONASS OFF/BDS and QZSS ON/Galileo ON 6 GLONASS OFF/BDS and QZSS OFF/Galileo ON 7 GLONASS OFF/BDS and QZSS ON/Galileo OFF
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.8. AT+QGPSCFG="autogps" Enable/Disable GNSS to Run Automatically

This command enable or disable the automatic running of GNSS after the module is rebooted.

AT+QGPSCFG="autogps" Enable/Disable GNSS to Run Automatically	
Write Command **AT+QGPSCFG="autogps"[,<autoGPS>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "autogps",<autoGPS>** **OK** If the optional parameter is specified, enable or disable automatic running of GNSS: **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<autoGPS>	Integer type. Enable or disable GNSS to run automatically after the module is powered on. 0 Disable 1 Enable
<errcode>	The error code of operation. See ***Chapter 4*** for details.

NOTE

GNSS can only run automatically in standalone mode.

2.3.1.9. AT+QGPSCFG="dpoenable" Enable/Disable DPO Mode

This command enables or disables the DPO mode.

AT+QGPSCFG="dpoenable" Enable/Disable DPO Mode	
Write Command **AT+QGPSCFG="dpoenable"[,<DPO_enable>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "dpoenable",<DPO_enable>** **OK** If the optional parameter is specified, enable or disable the DPO mode. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<DPO_enable>	Integer type. Enable or disable DPO. 0 Disable DPO 1 Enable DPO with dynamic duty cycle 2 Enable DPO only when the module is not connected to an external power supply (that is, the module is running on battery)
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.10. AT+QGPSCFG="plane" Configure Plane Mode Used by MO AGPS Session

This command configures the plane mode (control plane or user plane) to be used by the Mobile-Originated (MO) AGPS session.

AT+QGPSCFG="plane" Configure Plane Mode Used by MO AGPS Session	
Write Command **AT+QGPSCFG="plane"[,<plane>]**	Response If the optional parameter is omitted, query the current setting.

	+QGPSCFG: "plane",<plane> **OK** If the optional parameter is specified, configure the plane mode used by MO AGPS session: **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<plane>	Integer type. Plane mode used by MO AGPS session. 0 User plane without SSL 1 User plane with SSL 2 Control plane
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.11. AT+QGPSCFG="suplver" Configure SUPL Protocol Version

This command configures the SUPL version in an SI (SET Initiated) session, and the most likely used SUPL version in an NI (Network Initiated) session.

AT+QGPSCFG="suplver" Configure SUPL Protocol Version	
Write Command **AT+QGPSCFG="suplver"[,<SUPL_version>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "suplver",<SUPL_version>** **OK** If the optional parameter is specified, configure the SUPL protocol version: **OK** If there is any error:

	ERROR Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<SUPL_version>	Integer type. SUPL protocol version. 1 SUPL V1.0 2 SUPL V2.0 3 SUPL V2.0.2
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.12. AT+QGPSCFG="lbsapn" Configure LBS APN

This command configures LBS APN.

AT+QGPSCFG="lbsapn" Configure LBS APN	
Write Command **AT+QGPSCFG="lbsapn"[,<srvsystem>,<PDP>,<APN>]**	Response If the optional parameters are omitted, query the current setting. **+QGPSCFG: "lbsapn",<srvsystem>,<PDP>,<APN>** **OK** If the optional parameters are specified, configure the LBS APN: **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<srvsystem>	Integer type. Configure the serving system of LBS APN by XOR operation. Range:

	0–31. 0 Disable 1 CDMA 2 HDR 4 GSM 8 WCDMA 16 LTE
<PDP>	Integer type. PDP type of the LBS APN profile. 0 Disable 1 IPv4 2 IPv6 3 IPv4v6 4 PPP
<APN>	String type. Access point name.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.1.13. AT+QGPSCFG="agpsposmode" Configure AGNSS Positioning Mode

This command configures the AGNSS positioning mode.

AT+QGPSCFG="agpsposmode"	Configure AGNSS Positioning Mode
Write Command **AT+QGPSCFG="agpsposmode"[,<AGPS_posmode>]**	Response If the optional parameter is omitted, query the current setting. **+QGPSCFG: "agpsposmode",<AGPS_posmode>** **OK** If the optional parameter is specified, configure the AGNSS positioning mode: **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<AGPS_posmode>	Integer type. AGNSS positioning mode. Each bit indicates a specified mode and see the following figure for details. Only bit 16 is relevant to enabling of autonomous fallback for SUPL-MSB. Setting bit to 1 enables the corresponding mode. Range: 0–33554431. Default value: 33488767 or 775.

Bit value	Description
Bit 0	Standalone
Bit 1	UP MS-based
Bit 2	UP MS-assisted
Bit 3	CP MS-based (2G)
Bit 4	CP MS-assisted (2G)
Bit 5	CP UE-based (3G)
Bit 6	CP UE-assisted (3G)
Bit 7	UP network measurement report (2G)
Bit 8	UP MS-based (4G)
Bit 9	UP MS-assisted (4G)
Bit 10	CP MS-based (4G)
Bit 11	CP MS-assisted (4G)
Bit 16	Enabling of autonomous fallback for SUPL-MSB
Bit 17	A-GLONASS UP MS-based for 3G
Bit 18	A-GLONASS UP MS-assisted for 3G
Bit 19	A-GLONASS CP MS-based for 3G
Bit 20	A-GLONASS CP MS-assisted for 3G
Bit 21	A-GLONASS UP MS-based for 4G
Bit 22	A-GLONASS UP MS-assisted for 4G
Bit 23	A-GLONASS CP MS-based for 4G
Bit 24	A-GLONASS CP MS-assisted for 4G

<errcode>	The error code of operation. See ***Chapter 4*** for details.

NOTE

When the China Unicom/China Telecom/China Mobile (U)SIM card is inserted, the default value of **<AGPS_posmode>** is 775. When any other card is inserted, the default value of **<AGPS_posmode>** is 33488767.

2.3.1.14. AT+QGPSCFG="agnssprotocol" Configure AGNSS Positioning Protocol

This command configures the AGPS LPP positioning protocol and AGLONASS positioning protocol.

AT+QGPSCFG="agnssprotocol" Configure AGNSS Positioning Protocol	
Write Command **AT+QGPSCFG="agnssprotocol"[,<AGPS_LP>,<AGLONASS_LP>]**	Response If the optional parameters are omitted, query the current setting. **+QGPSCFG: "agnssprotocol",<AGPS_LP>,<AGLONASS_L**

	P> **OK** If the optional parameters are specified, configure AGPS LPP positioning protocol and AGLONASS positioning protocol. **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect after the module is rebooted. The configuration is saved to NVRAM automatically.

Parameter

<AGPS_LP>	Integer type. Configure the AGPS LPP positioning protocol by XOR operation. 0 Disable ALL 1 User Plane LPP 2 Control Plane LPP 3 User Plane LPP and Control Plane LPP
<AGLONASS_LP>	Integer type. Configure AGLONASS positioning protocol by XOR operation. Default value: 1286. 0 Disable ALL 1 Control Plane RRLP 2 Control Plane RRC 4 Control Plane LPP 256 User Plane RRLP 1024 User Plane LPP
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.2. AT+QGPSDEL Delete Assistance Data

This command deletes assistance data to perform cold start, hot start and warm start of GNSS. The command can only be executed when GNSS is turned off. After deleting the assistance data through this command, you can enforce the cold start of GNSS through **AT+QGPS**. Hot/warm start can also be performed if the corresponding conditions are satisfied.

AT+QGPSDEL Delete Assistance Data	
Test Command **AT+QGPSDEL=?**	Response **+QGPSDEL: (**list of supported **<delete_type>**s**)** **OK**
Write Command **AT+QGPSDEL=<delete_type>**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	-

Parameter

<delete_type>	Integer type. The type of GNSS assistance data to be deleted. 0 Delete all assistance data. Enforce cold start after starting GNSS. 1 Do not delete any data. Perform hot start if the conditions are satisfied after starting GNSS. 2 Delete some related data. Perform warm start if the conditions are satisfied after starting GNSS. 3 Delete the XTRA assistance data injected into GNSS engine.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.3. AT+QGPS Turn On GNSS

The command turns on GNSS.

AT+QGPS Turn On GNSS	
Test Command **AT+QGPS=?**	Response **+QGPS: (**list of supported **<GNSS_mode>**s**),(**list of supported **<fix_maxtime>**s**),(**list of supported **<accuracy_level>**s**),(**list of supported **<fix_interval_s>**s**)** **OK**
Read Command Read current GNSS state **AT+QGPS?**	Response **+QGPS: <GNSS_state>**

	OK
Write Command **AT+QGPS=<GNSS_mode>[,<fix_maxtime>[,<accuracy_level>[,<fix_interval_s>]]]**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configurations are not saved.

Parameter

<GNSS_state>	Integer type. GNSS state. 0 GNSS OFF 1 GNSS ON
<GNSS_mode>	Integer type. GNSS working mode. 1 Standalone 2 MSB 3 MSA 4 Quick positioning
<fix_maxtime>	Integer type. Maximum positioning time, which includes the response time of GNSS receiver while measuring the GNSS pseudo range and the upper time limit of GNSS satellite searching. It also includes the time for demodulating the ephemeris data and calculating the position. Range: 1–255. Default value: 30. Unit: second.
<accuracy_level>	Integer type. Horizontal accuracy level. 1 Low accuracy 2 Medium accuracy 3 High accuracy
<fix_interval_s>	Integer type. Interval time between each positioning. Range: 1–4. Default value: 1. Unit: second.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.4. AT+QGPSEND Turn Off GNSS

This command turns off GNSS.

AT+QGPSEND Turn Off GNSS	
Test Command	Response

AT+QGPSEND=?	**OK**
Execution Command **AT+QGPSEND**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	-

Parameter

<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.5. AT+QGPSLOC Acquire Positioning Information

This command acquires positioning information. Before executing the command, turn on GNSS through **AT+QGPS**. If GNSS positioning fails, **+CME ERROR: <errcode>** is returned to indicate the corresponding situation.

AT+QGPSLOC Acquire Positioning Information	
Test Command **AT+QGPSLOC=?**	Response **+QGPSLOC: <UTC>,<latitude>,<longitude>,<HDOP>,<altitude>,<fix>,<COG>,<spkm>,<spkn>,<date>,<nsat>** **OK**
Write Command **AT+QGPSLOC=<mode>**	Response **+QGPSLOC: <UTC>,<latitude>,<longitude>,<HDOP>,<altitude>,<fix>,<COG>,<spkm>,<spkn>,<date>,<nsat>** **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms

Characteristics	-

Parameter

<mode>	Integer type. Latitude and longitude display format. 0 **<latitude>,<longitude>** format: ddmm.mmmmN/S,dddmm.mmmmE/W 1 **<latitude>,<longitude>** format: ddmm.mmmmmm,N/S,dddmm.mmmmmm,E/W 2 **<latitude>,<longitude>** format: (-)dd.ddddd,(-)ddd.ddddd
<UTC>	UTC time. Format: hhmmss.ss.
<latitude>	Latitude. If **<mode>** is 0: Format: ddmm.mmmmN/S dd Degree. Range: 00–89 mm.mmmm Minute. Range: 00.0000–59.9999 N/S North latitude/South latitude If **<mode>** is 1: Format: ddmm.mmmmmm,N/S dd Degree. Range: 00–89 mm.mmmmmm Minute. Range: 00.000000–59.999999 N/S North latitude/South latitude If **<mode>** is 2: Format: (-)dd.ddddd dd.ddddd Degree. Range: -89.99999–89.99999 - South latitude
<longitude>	Longitude. If **<mode>** is 0: Format: dddmm.mmmmE/W ddd Degree. Range: 000–179 mm.mmmm Minute. Range: 00.0000–59.9999 E/W East longitude/West longitude If **<mode>** is 1: Format: dddmm.mmmmmm,E/W ddd Degree. Range: 000–179 mm.mmmmmm Minute. Range: 00.000000–59.999999 E/W East longitude/West longitude If **<mode>** is 2: Format: (-)ddd.ddddd ddd.ddddd Degree. Range: -179.99999–179.99999 - West longitude

<HDOP>	Horizontal precision. Range: 0.5–99.9.
<altitude>	Altitude of the antenna away from the sea level. Accurate to one decimal place. Unit: meter.
<fix>	Integer type. GNSS positioning mode. 2 2D positioning 3 3D positioning
<COG>	Course Over Ground based on true north. Format: x.x. Unit: degree. Range: 0.0–359.9.
<spkm>	Speed over ground. Format: x.x. Unit: km/h. Accurate to one decimal place.
<spkn>	Speed over ground. Format: x.x. Unit: knots. Accurate to one decimal place.
<date>	UTC time when fixing position. Format: ddmmyy. dd Day mm Month yy Year
<nsat>	Number of active satellites. Range: 0–80.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.6. AT+QGPSGNMEA Acquire NMEA Sentences

This command acquires NMEA sentences. Before using this command, turn on GNSS through **AT+QGPS**, and set **<NMEA_src>** to 1 to enable acquisition of NMEA sentences through **AT+QGPSGNMEA**.

The sentence output can be disabled through **AT+QGPSCFG="gpsnmeatype",0**, **AT+QGPSCFG="glonassnmeatype",0**, **AT+QGPSCFG="galileonmeatype",0** and **AT+QGPSCFG="beidounmeatype",0**. If sentence output is disabled, **AT+QGPSGNMEA** can still be used to acquire NMEA sentences on condition that the GNSS has already acquired sentences through this command after its activation.

AT+QGPSGNMEA Acquire NMEA Sentences	
Test Command **AT+QGPSGNMEA=?**	Response **+QGPSGNMEA: (**list of supported **<NMEA_type>**s**)** **OK**
Write Command Query GGA sentence **AT+QGPSGNMEA="GGA"**	Response **[+QGPSGNMEA: <GGA_sentence>]** **[…]** **OK** If there is any error: **ERROR** Or

	+CME ERROR: <errcode>
Write Command Query RMC sentence **AT+QGPSGNMEA="RMC"**	Response **[+QGPSGNMEA: <RMC_sentence>]** **[…]** **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Write Command Query GSV sentence **AT+QGPSGNMEA="GSV"**	Response **[+QGPSGNMEA: <GSV_sentence>]** **[…]** **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Write Command Query GSA sentence **AT+QGPSGNMEA="GSA"**	Response **[+QGPSGNMEA: <GSA_sentence>]** **[…]** **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Write Command Query VTG sentence **AT+QGPSGNMEA="VTG"**	Response **[+QGPSGNMEA: <VTG_sentence>]** **[…]** **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Write Command	Response

Query GNS sentence **AT+QGPSGNMEA="GNS"**	**[+QGPSGNMEA: <GNS_sentence>]** **[…]** **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	-

Parameter

<NMEA_type>	NMEA sentence type. "GGA" GGA sentence "RMC" RMC sentence "GSV" GSV sentence "GSA" GSA sentence "VTG" VTG sentence "GNS" GNS sentence
<GGA_sentence>	GGA sentence.
<RMC_sentence>	RMC sentence.
<GSV_sentence>	GSV sentence.
<GSA_sentence>	GSA sentence.
<VTG_sentence>	VTG sentence.
<GNS_sentence>	GNS sentence.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.7. AT+QGPSXTRA Enable/Disable XTRA Assistance

This command enables or disables XTRA assistance.

AT+QGPSXTRA Enable/Disable XTRA Assistance	
Test Command **AT+QGPSXTRA=?**	Response **+QGPSXTRA: (**list of supported **<XTRA_enable>**s**)** **OK**
Read Command **AT+QGPSXTRA?**	Response **+QGPSXTRA: <XTRA_enable>**

	OK
Write Command **AT+QGPSXTRA=<XTRA_enable>**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<XTRA_enable>	Integer type. Enable or disable XTRA assistance. 0 Disable 1 Enable
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.8. AT+QGPSXTRATIME Inject XTRA Time

This command injects XTRA time to GNSS engine. Before using the command, enable XTRA assistance through **AT+QGPSXTRA=1**. After the feature is activated, the GNSS engine asks for XTRA time and assistance data file. Before injecting XTRA data file, inject XTRA time first through this command.

AT+QGPSXTRATIME Inject XTRA Time	
Test Command **AT+QGPSXTRATIME=?**	Response **+QGPSXTRATIME: <xtratime>,<uncrtn>** **OK**
Write Command **AT+QGPSXTRATIME=<xtratime>,<uncrtn>**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is not saved.

Parameter

<xtratime>	String type. Time to be injected. The time type is UTC time. Format: "YYYY/MM/DD,hh:mm:ss". For example, "2019/01/05,08:30:30".
<uncrtn>	Integer type. Uncertainty of time. It indicates the time difference between sending a request to the SNTP server and receiving a response from the SNTP server. Default value: 3500. Unit: ms.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.9. AT+QGPSXTRADATA Inject XTRA Data File

This command injects a XTRA assistance data file to GNSS engine. Before executing this command, please enable the XTRA assistance through **AT+QGPSXTRA=1**, then store the valid XTRA data file in UFS of the module through **AT+QFUPL** and inject the XTRA time to GNSS engine through **AT+QGPSXTRATIME**.

After finishing all these operations, you can execute **AT+QGPSXTRADATA** to inject the XTRA assistance data file to GNSS engine. After executing this command successfully, you can delete the XTRA data file from UFS through **AT+QFDEL**. Whether the XTRA data file is injected successfully can be queried through **AT+QGPSXTRADATA?**.

AT+QGPSXTRADATA Inject XTRA Data File	
Test Command **AT+QGPSXTRADATA=?**	Response **+QGPSXTRADATA: <xtradatafilename>** **OK**
Read Command Query the status of XTRA data files **AT+QGPSXTRADATA?**	Response **+QGPSXTRADATA: <XTRA_data_durtime>,<injected_data_time>** **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Write Command **AT+QGPSXTRADATA=<xtradatafilename>**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**

Maximum Response Time	1 s
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<xtradatafilename>	String type. Name of the XTRA data file to be injected, for example, "UFS:xtra2.bin" or "UFS:xtra3grc.bin".
<XTRA_data_durtime>	Integer type. Valid time of the injected XTRA data file. Unit: minute. 0 No XTRA file or the file is overdue 1440 For 1-day XTRA data file 4320 For 3-day XTRA data file 10080 For 7-day XTRA data file
<injected_data_time>	String type. Starting time of the validity period of the injected XTRA data file. Format: "YYYY/MM/DD,hh:mm:ss", for example, "2016/01/03,15:34:50".
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.10. AT+QGPSSUPLURL Configure SUPL Server URL

This command configures the SUPL server URL.

AT+QGPSSUPLURL Configure SUPL Server URL	
Test Command **AT+QGPSSUPLURL=?**	Response **+QGPSSUPLURL: <suplurl>** **OK**
Read Command Query the current SUPL server URL **AT+QGPSSUPLURL?**	Response **+QGPSSUPLURL: <suplurl>** **OK**
Write Command **AT+QGPSSUPLURL=<suplurl>**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately.

	The configuration is saved to NVRAM automatically.

Parameter

<suplurl>	String type. SUPL server address. The address format is "**<URL>:<port_number>**", where the **<port_number>** can be omitted, for example, "supl.example.com", " 192.0.2.2" or "supl.example.com:7275". When the **<port_number>** is omitted, the default value (7275) is used.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

2.3.11. AT+QGPSSUPLCA Inject SUPL Certificate

This command injects SUPL certificate. The certificate file to be injected should be put into file system by **AT+QFUPL**. The certificate is obtained from the operator or the server provider.

AT+QGPSSUPLCA Inject SUPL Certificate	
Test Command **AT+QGPSSUPLCA=?**	Response **+QGPSSUPLCA: <suplca>,<certid>** **OK**
Write Command **AT+QGPSSUPLCA=<suplca>[,<certid>]**	Response **OK** If there is any error: **ERROR** Or **+CME ERROR: <errcode>**
Maximum Response Time	300 ms
Characteristics	-

Parameter

<suplca>	String type. Name of the SUPL certificate.
<certid>	Integer type. SUPL certificate ID. Range: 0–9. Default value: 0.
<errcode>	The error code of operation. See ***Chapter 4*** for details.

3 Examples

3.1. Turn On/Off GNSS

Default parameters are used in this example to turn on GNSS. After turning on GNSS, NMEA sentences are outputted from "usbnmea" port by default; and GNSS can be turned off through **AT+QGPSEND**.

```
AT+QGPS=1                       //Set GNSS working mode to standalone and turn on GNSS.
OK
//After turning on GNSS, NMEA sentences are outputted from "usbnmea" port by default.
AT+QGPSLOC=0                    //Obtain positioning information.
+QGPSLOC: 061951.00,3150.7223N,11711.9293E,0.7,62.2,2,0.0,0.0,0.0,110513,09

OK
AT+QGPSEND                      //Turn off GNSS.
OK
```

3.2. Application of GNSS <NMEA_src>

When GNSS is turned on and **<NMEA_src>** is set to 1, NMEA sentences can be acquired directly through **AT+QGPSGNMEA**.

```
AT+QGPSCFG="nmeasrc",1  //Set <NMEA_src> to 1 to enable acquisition of NMEA sentences through
                        AT+QGPSGNMEA.
OK
AT+QGPSGNMEA="GGA"      //Obtain GGA sentence.
+QGPSGNMEA: $GPGGA,103647.00,3150.721154,N,11711.925873,E,1,02,4.7,59.8,M,-2.0,M,,*77

OK

AT+QGPSCFG="nmeasrc",0  //Set <NMEA_src> to 0 to disable acquisition of NMEA sentences
                        through AT+QGPSGNMEA.
OK
AT+QGPSGNMEA="GGA"      //Obtain GGA sentence.
+CME ERROR: 507         //Because acquisition of NMEA sentences through AT+QGPSGNMEA
                        is disabled, the GGA sentences cannot be obtained.
```

3.3. Operation Procedures of XTRA Assistance

This example shows the operation procedures of XTRA assistance. For information about FILE commands used to upload a file to UFS or delete a file from UFS, please refer to ***document [1]***.

```
AT+QGPSXTRA=1                                   //If XTRA assistance is disabled, enable it first and then perform the following procedures.
OK
//The XTRA assistance function is activated immediately.
//If XTRA data file is valid (query through AT+QGPSXTRADATA?), turn on GNSS engine directly.
//If XTRA data file is invalid (query through AT+QGPSXTRADATA?), perform the following procedures.
//Users can download the XTRA data file to PC (or MCU) from URLs listed in Chapter 1.4.
AT+QFUPL="UFS:xtra2.bin",59748,60               //Upload the XTRA file with a size of 59748 bytes to the module within 60 seconds by sending the command through QCOM. For more details about QCOM tool, please refer to document [2].
OK
AT+QGPSXTRATIME="2019/01/05,08:30:30",3500      //Inject XTRA time to GNSS engine. The accuracy of the injected UTC time should be within 3.5 s.
OK
AT+QGPSXTRADATA="UFS:xtra2.bin"                 //Inject XTRA data file.
OK                                              //The XTRA data file is injected to GNSS engine successfully.
AT+QGPS=1                                       //Turn on GNSS engine.
OK
```

NOTE

1. After the module is rebooted after a power-off, the XTRA time and XTRA data files need to be reinjected.
2. Before re-uploading the *xtra2.bin* file to the UFS of the module, you need to execute **AT+QFDEL="UFS:xtra2.bin"** to delete the *xtra2.bin* file from UFS first.

3.4. Operation Procedures of AGNSS

This example shows the operation steps of the AGNSS function under the premise of successful network injection. Please turn on the AGNSS function through **AT+QGPSCFG="agpsposmode"** before use. For information about FILE commands used to upload a file to UFS or delete a file from UFS, please refer to ***document [1]***.

```
AT+QGPSDEL=0                                    //Delete all the assistance data.
OK
```

```
AT+QGPSCFG="plane",1                    //Set the plane mode used by MO AGPS session as user plane with SSL. If no certificate is needed for the service, configure the plane mode through AT+QGPSCFG="plane",0.
OK
AT+CFUN=1,1                             //Restart the module.
OK
AT+QGPSSUPLURL="supl.example.com:7275"  //Set the URL and port of SUPL service. The "supl.example.com" is an example which should be replaced by a real URL; and 7275 is the default port of SUPL service.
OK
AT+QFUPL="UFS:supl.example.com.der",893 //Upload CA certificate. The "supl.example.com.der" is an example which should be replaced by a real CA certificate; and 893 is the size of "supl.example.com.der", which should be replaced by the size of the real CA certificate. This step can be omitted if the service requires no certificate.
OK
AT+QGPSSUPLCA="UFS:supl.example.com.der" //Inject CA certificate. The "supl.example.com.der" is an example which should be replaced by a real CA certificate.
OK
AT+QGPS=2                               //Turn on GNSS in MSB mode. This step needs to be performed after completing the configuration of network. After turning on GNSS, positioning can be completed in 10 seconds through the module. If there is a large time deviation, it indicates that the AGNSS does not take effect.
OK
```

NOTE

Before re-uploading the *supl.example.com.der* file to the UFS of the module, you need to execute **AT+QFDEL="UFS:supl.example.com.der"** to delete the *supl.example.com.der* file from UFS first.

4 Summary of Error Codes

The **<errcode>** indicates an error related to GNSS operation. The details about **<errcode>** are described in the following table.

Table 4: Summary of Error Codes

Numeric <errcode> Value	Verbose <errcode> Value
501	Invalid parameter(s)
502	Operation not supported
503	GNSS subsystem busy
504	Session is ongoing
505	Session not active
506	Operation timeout
507	Function not enabled
508	Time information error
509	XTRA not enabled
510	XTRA file open error
511	Bad CRC for XTRA data file
512	Validity time is out of range
513	Internal resource error
514	GNSS locked
515	End by E911
516	Not fixed now
517	CMUX port is not opened
549	Unknown error

5 Appendix References

Table 5: Related Documents

Document Name
[1] Quectel_EG06xK&Ex120K&EM060K_Series_FILE_Application_Note
[2] Quectel_QCOM_User_Guide

Table 6: Terms and Abbreviations

Abbreviation	Description
AGPS	Assisted Global Positioning System
AGNSS	Assisted Global Navigation Satellite System
APN	Access Point Name
BDS	BeiDou Navigation Satellite System
CDMA	Code-Division Multiple Access
CMUX	Connection Multiplexing
COG	Course Over Ground
CRC	Cyclic Redundancy Check
DOP	Dilution of Precision
DPO	Dynamic Power Optimization
Galileo	Galileo Satellite Navigation System
GGA	Global Positioning System Fix Data
GLONASS	Global Navigation Satellite System
GNS	Global Network Service

GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSA	GPS DOP and Active Satellites
GSM	Global System for Mobile Communications
GSV	Satellites in View
HDOP	Horizontal Dilution of Precision
HDR	High Data Rate
ID	Identifier
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
LBS	Location Based Services
LPP	LTE Positioning Protocol
LTE	Long-Term Evolution
MCU	Micro Control Unit
ME	Mobile Equipment
MO	Mobile-Originated
MS	Mobile Station
MSA	Mobile Station Assisted
MSB	Mobile Station Based
NMEA	National Marine Electronics Association 0183 Interface Standard
NVRAM	Non-Volatile Random Access Memory
PC	Private Computer
PDOP	Position Dilution of Precision
PDP	Packet Data Protocol
PPP	Point to Point Protocol

RMC	Recommended Minimum Specific GNSS Data
RRC	Radio Resource Control
RRLP	Radio Resource Location Services Protocol
SET	SUPL Enabled Terminal
SNR	Signal Noise Ratio
SNTP	Simple Network Time Protocol
SSL	Secure Sockets Layer
SUPL	Secure User Plane Location
TTFF	Time to First Fix
UART	Universal Asynchronous Receiver & Transmitter
UFS	User File System
URL	Uniform Resource Locator
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
UTC	Universal Time Code
VDOP	Vertical Dilution of Precision
VTG	Course Over Ground and Ground Speed
WCDMA	Wideband Code Division Multiple Access
XTRA	An Auxiliary Positioning Technology Provided by Qualcomm