

RG650E&RG650V Series

GNSS Application Note

5G Module Series

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About the Document

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1 Introduction

The 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 the following applicable modules widely used in fields such as turn-by-turn navigation, asset tracking, personnel tracking, location-aware games, as well as home and fleet management.

1.1. GNSS Turning On/Off Procedures

The GNSS of RG650E and RG650V series 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: Obtain the positioning information in any of the following three ways after turning on GNSS and fixing position successfully:

- 1) NMEA sentences are outputted to "usbntmea" 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**.

1.2. Supported NMEA Sentence Types

The default NMEA sentences of the modules are compatible with NMEA 0183 protocol, and various 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 "GB":

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

QZSS NMEA sentences have the prefix "GQ":

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

NOTE

The output BDS NMEA sentences have the prefix "GB", and the output BQZSS NMEA sentences have the prefix "GQ", and they are the standard sentences based on the NMEA 0183 V4.11 protocol.

1.3. XTRA Assistance Technology 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 environment 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, 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 "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>

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 **Steps 3–6**; if the data is valid, turn on GNSS engine according to the procedures described in **Chapter 1.1**.

Step 3: Download file with suffix "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 1.1**.

NOTE

1. GNSS engine needs to be turned off before **Step 1**.
2. For more details of the AT commands above, see **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 the 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 1: Types of AT Commands

Command Type	Syntax	Description
Test Command	AT+<cmd>=?	Test the existence of the corresponding command and return information about the type, value, or range of its parameter.
Read Command	AT+<cmd>?	Check the current parameter value of the 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 how to use the AT commands introduced herein. The examples, however, should not be taken as Quectel's recommendation 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",(range of supported <GPS_NMEA_type>s) +QGPSCFG: "glonassnmeatype",(range of supported <GLONASS_or_GNSS_NMEA_type>s) +QGPSCFG: "galileonmeatype",(range of supported <Galileo_NMEA_type>s) +QGPSCFG: "beidou_nmeatype",(range of supported <Beidou_NMEA_type>s) +QGPSCFG: "gnssconfig",(range of supported <GNSS_config>s) +QGPSCFG: "autogps",(list of supported <autoGPS>s) +QGPSCFG: "dpoenable",(range of supported <DPO_enable>s) +QGPSCFG: "plane",(range of supported <plane>s) +QGPSCFG: "suplver",(range of supported <SUPL_version>s) +QGPSCFG: "lbsapn",(range of supported <srvsystem>s),(range of supported <PDP>s),<APN> +QGPSCFG: "agpsposmode",(range of supported <AGPS_posmode>s) +QGPSCFG: "agnssprotocol",(range of supported <AGPS_LP>s),(range of supported <AGLONASS_LP>s) +QGPSCFG: "multibandconfig",(range of supported <m

ultiband>s)

OK

NOTE

Only some of the applicable modules of this document supports the configuration of GNSS multiband through AT command. Please contact Quectel Technical Support for details.

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>]	<p>Response</p> <p>If the optional parameter is omitted, query the current configuration: +QGPSCFG: "outport",<out_port></p> <p>OK</p> <p>If the optional parameter is specified, configure the output port of NMEA sentences: OK Or ERROR</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
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 or 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>]	<p>Response</p> <p>If the optional parameter is omitted, query the current configuration: +QGPSCFG: "nmeasrc",<NMEA_src></p> <p>OK</p> <p>If the optional parameter is specified, configure whether to enable acquisition of NMEA sentences through AT+QGPSGNMEA.</p> <p>OK</p> <p>Or</p> <p>ERROR</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
Maximum Response Time	300 ms
Characteristics	<p>The command takes effect immediately.</p> <p>The configuration is saved to NVRAM automatically.</p>

Parameter

<NMEA_src>	<p>Integer type. Set whether to acquire the original NMEA sentences through AT+QGPSGNMEA (see Chapter 2.3.6 for details). If enabled, after executing AT+QGPSGNMEA, NMEA sentences are outputted through the AT port as a return value.</p> <p>0 Disable</p> <p><u>1</u> Enable</p>
<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 configuration: +QGPSCFG: "gpsnmeatype",<GPS_NMEA_type> OK If the optional parameter is specified, configure the output type of GPS NMEA sentences: OK Or ERROR If there is any error related to ME functionality: +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 configuration: +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 Or ERROR If there is any error related to ME functionality: +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. <u>0</u> 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	
<p>Write Command</p> <p>AT+QGPSCFG="galileonmeatype"[,<Galileo_NMEA_type>]</p>	<p>Response</p> <p>If the optional parameter is omitted, query the current configuration:</p> <p>+QGPSCFG: "galileonmeatype",<Galileo_NMEA_type></p> <p>OK</p> <p>If the optional parameter is specified, configure the output type of Galileo NMEA sentences:</p> <p>OK</p> <p>Or</p> <p>ERROR</p> <p>If there is any error related to ME functionality:</p> <p>+CME ERROR: <errcode></p>
Maximum Response Time	300 ms
Characteristics	<p>The command takes effect immediately.</p> <p>The configuration is saved to NVRAM automatically.</p>

Parameter

<Galileo_NMEA_type>	<p>Integer type. Configure output type of Galileo NMEA sentences by XOR operation.</p> <table> <tr><td>0</td><td>Disable</td></tr> <tr><td>1</td><td>GAGGA</td></tr> <tr><td>2</td><td>GARMC</td></tr> <tr><td>4</td><td>GAGSV</td></tr> <tr><td>8</td><td>GAGSA</td></tr> <tr><td>16</td><td>GAVTG</td></tr> </table>	0	Disable	1	GAGGA	2	GARMC	4	GAGSV	8	GAGSA	16	GAVTG
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="beidoumeatype" Configure Output Type of BDS and QZSS NMEA Sentences

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

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

Parameter

<BeiDou_NMEA_type>	<p>Integer type. Configure output type of BDS and QZSS NMEA sentences by XOR operation.</p> <p><u>0</u> Disable</p> <p>1 GBGSA</p> <p>2 GBGSV and GQGSV</p>
<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.

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 configuration: +QGPSCFG: "gnssconfig",<GNSS_config> OK If the optional parameter is specified, configure the enabled GNSS constellations: OK Or ERROR If there is any error related to ME functionality: +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 <u>1</u> 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 enables/disables 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 configuration: +QGPSCFG: "autogps",<autoGPS> OK If the optional parameter is specified, enables/disables the automatic running of GNSS: OK Or ERROR If there is any error related to ME functionality: +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/disable GNSS to run automatically after the module is powered on. <u>0</u> 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/disables the DPO mode.

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

Parameter

<DPO_enable>	<p>Integer type. Enable/disable DPO.</p> <p>0 Disable DPO</p> <p>1 Enable DPO with dynamic duty cycle</p> <p>2 Enable DPO only when the module is not connected to an external power supply (running on battery)</p>
<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 configuration: +QGPSCFG: "plane",<plane> OK If the optional parameter is specified, configure the plane mode used by MO AGPS session: OK Or ERROR If there is any error related to ME functionality: +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	
<p>Write Command</p> <p>AT+QGPSCFG="suplver"[,<SUPL_version>]</p>	<p>Response</p> <p>If the optional parameter is omitted, query the current configuration:</p> <p>+QGPSCFG: "suplver",<SUPL_version></p> <p>OK</p> <p>If the optional parameter is specified, configure the SUPL protocol version:</p> <p>OK</p> <p>Or</p> <p>ERROR</p> <p>If there is any error related to ME functionality:</p> <p>+CME ERROR: <errcode></p>
Maximum Response Time	300 ms
Characteristics	<p>The command takes effect after the module is rebooted.</p> <p>The configuration is saved to NVRAM automatically.</p>

Parameter

<SUPL_version>	Integer type. SUPL protocol version.
1	SUPL Version 1.0
2	SUPL Version 2.0
3	SUPL Version 2.0.2
4	SUPL Version 2.0.4
<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>]	<p>Response</p> <p>If the optional parameters are omitted, query the current configuration: +QGPSCFG: "lbsapn",<srvsystem>,<PDP>,<APN></p> <p>OK</p> <p>If the optional parameters are specified, configure the LBS APN: OK Or ERROR</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
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. Serving system on which this LBS APN should be used 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. For example, "3GNET" or "CMNET", etc.
<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	
<p>Write Command</p> <p>AT+QGPSCFG="agpsposmode"[,<AGPS_posmode>]</p>	<p>Response</p> <p>If the optional parameter is omitted, query the current configuration:</p> <p>+QGPSCFG: "agpsposmode",<AGPS_posmode></p> <p>OK</p> <p>If the optional parameter is specified, configure the AGNSS positioning mode:</p> <p>OK</p> <p>Or</p> <p>ERROR</p> <p>If there is any error related to ME functionality:</p> <p>+CME ERROR: <errcode></p>
Maximum Response Time	300 ms
Characteristics	<p>The command takes effect after the module is rebooted.</p> <p>The configuration is saved to NVRAM automatically.</p>

Parameter

<AGPS_posmode>	Integer type. AGNSS positioning mode. Each bit indicates a specified mode and see 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: 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 a 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 configuration:

+QGPSCFG: "agnssprotocol",<AGPS_LP>,<AGLONASS_LP>

OK

If the optional parameters are specified, configure the AGPS LPP positioning protocol and AGLONASS positioning

	protocol: OK Or ERROR If there is any error related to ME functionality: +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. AGPS LPP positioning protocol by XOR operation. 0 Disable ALL 1 User Plane LPP 2 Control Plane LPP 4 User Plane NR5G(LPP) 8 Control Plane NR5G(LPP)
<AGLONASS_LP>	Integer type. AGLONASS positioning protocol by XOR operation. Default: 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.

2.3.1.15. AT+QGPSCFG="multibandconfig" Configure GNSS Multiband

This command configures the GNSS multiband.

AT+QGPSCFG="multibandconfig" Configure GNSS Multiband

Write Command AT+QGPSCFG="multibandconfig" [<multiband>]	Response If the optional parameter is omitted, query the current configuration: +QGPSCFG: "multibandconfig",<multiband> OK
--	---

	<p>If the optional parameter is specified, configure the GNSS multiband:</p> <p>OK</p> <p>Or</p> <p>ERROR</p> <p>If there is any error related to ME functionality:</p> <p>+CME ERROR: <errcode></p>
Maximum Response Time	300 ms
Characteristics	<p>The command takes effect after the module is rebooted.</p> <p>The configuration is saved to NVRAM automatically.</p>

Parameter

<multiband>	<p>Integer type. GNSS multiband (in addition to L1) by XOR operation. Enable the corresponding band when bit is set to 1; disable the corresponding band when bit is set to 0.</p> <p>0 Disable</p> <p>1 GPS L5</p> <p>2 Galileo E5a</p> <p>4 BDS B2a</p> <p>32 QZSS L5</p>
<errcode>	The error code of operation. See Chapter 4 for details.

NOTE

Only some of the applicable modules in this document support the configuration of GNSS multiband through AT command. Please contact Quectel Technical Supports 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	Response
AT+QGPSDEL=?	+QGPSDEL: (range of supported <delete_type>s)
	OK

Write Command AT+QGPSDEL=<delete_type>	Response OK Or ERROR If there is any error related to ME functionality: +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: (range of supported <GNSS_mode>s),(range of supported <fix_maxtime>s),(range of supported <accuracy>s),(range of supported <fix_rate>s) OK
Read Command Read current GNSS state AT+QGPS?	Response +QGPS: <GNSS_state> OK
Write Command AT+QGPS=<GNSS_mode>[,<fix_maxtime>[,<accuracy>[,<fix_rate>]]]	Response OK Or ERROR If there is any error related to ME functionality:

	+CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	-

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, the upper time limit of GNSS satellite searching and the time for demodulating the ephemeris data and calculating the position. Range: 1–255. Default value: 30. Unit: second.
<accuracy>	Integer type. Horizontal accuracy level. 1 Low accuracy 2 Medium accuracy 3 High accuracy
<fix_rate>	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 AT+QGPSEND=?	Response OK
Execution Command AT+QGPSEND	Response OK Or ERROR If there is any error related to ME functionality: +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>,(list of supported <fix>s),<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 Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	-

Parameter

<mode>	Integer type. Latitude and longitude display format. 0 <latitude>,<longitude> format: ddmm.mmmmmN/S,dddmm.mmmmmE/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.

	<p>If <mode> is 0:</p> <p>Format: ddmm.mmmmN/S</p> <p>dd Degree. Range: 00–89</p> <p>mm.mmmm Minute. Range: 00.0000–59.9999</p> <p>N/S North latitude/South latitude</p>
	<p>If <mode> is 1:</p> <p>Format: ddmm.mmmmmm,N/S</p> <p>dd Degree. Range: 00–89</p> <p>mm.mmmmmm Minute. Range: 00.000000–59.999999</p> <p>N/S North latitude/South latitude</p>
	<p>If <mode> is 2:</p> <p>Format: (-)dd.ddddd</p> <p>dd.ddddd Degree. Range: -89.99999–89.99999</p> <p>- South latitude</p>
<longitude>	<p>Longitude.</p> <p>If <mode> is 0:</p> <p>Format: dddmm.mmmmE/W</p> <p>ddd Degree. Range: 000–179</p> <p>mm.mmmm Minute. Range: 00.0000–59.9999</p> <p>E/W East longitude/West longitude</p>
	<p>If <mode> is 1:</p> <p>Format: dddmm.mmmmmm,E/W</p> <p>ddd Degree. Range: 000–179</p> <p>mm.mmmmmm Minute. Range: 00.000000–59.999999</p> <p>E/W East longitude/West longitude</p>
	<p>If <mode> is 2:</p> <p>Format: (-)ddd.ddddd</p> <p>ddd.ddddd Degree. Range: -179.99999–179.99999</p> <p>- West longitude</p>
<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 satellites. Range: 00–80. Fixed as two-digit number.
<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="beidoumeatype",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 Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Write Command Query RMC sentence AT+QGPSGNMEA="RMC"	Response [+QGPSGNMEA: <RMC_sentence>] [...] OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>

Write Command Query GSV sentence AT+QGPSGNMEA="GSV"	Response [+QGPSGNMEA: <GSV_sentence>] [...] OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Write Command Query GSA sentence AT+QGPSGNMEA="GSA"	Response [+QGPSGNMEA: <GSA_sentence>] [...] OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Write Command Query VTG sentence AT+QGPSGNMEA="VTG"	Response [+QGPSGNMEA: <VTG_sentence>] [...] OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Write Command Query GNS sentence AT+QGPSGNMEA="GNS"	Response [+QGPSGNMEA: <GNS_sentence>] [...] OK Or ERROR If there is any error related to ME functionality: +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 Or ERROR If there is any error related to ME functionality: +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/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: <XTRA_time>,<uncrtn> OK
Write Command Inject XTRA time AT+QGPSXTRATIME=<XTRA_time>,<uncrtn>	Response OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configurations are not saved.

Parameter

<XTRA_time>	String type. UTC time to be injected. 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: <XTRA_data_file_name> OK
Read Command Query the status of XTRA data files AT+QGPSXTRADATA?	Response +QGPSXTRADATA: <XTRA_data_durtime>,<injected_data_time> OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Write Command AT+QGPSXTRADATA=<XTRA_data_file_name>	Response OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Maximum Response Time	1 s
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<XTRA_data_file_name>	String type. Name of the XTRA data file to be injected, for example, "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 injected XTRA data file
	4320	For 3-day injected XTRA data file
	10080	For 7-day injected 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: <SUPL_URL> OK
Read Command Query the current SUPL server URL. AT+QGPSSUPLURL?	Response +QGPSSUPLURL: <SUPL_URL> OK
Write Command AT+QGPSSUPLURL=<SUPL_URL>	Response OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configuration is saved to NVRAM automatically.

Parameter

<SUPL_URL>	String type. SUPL server address. The address format is "<URL>:<port_number>", where the <port_number> can be omitted, for example "supl.server.com", "123.123.123.123" or "supl.server.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: <SUPL_CA>,(range of supported <certID>s) OK
Write Command AT+QGPSSUPLCA=<SUPL_CA>[,<certID>]	Response OK Or ERROR If there is any error related to ME functionality: +CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	-

Parameter

<SUPL_CA>	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 "usbntmea" 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 "usbntmea" 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+QGPSTNMEA**.

```
AT+QGPSCFG="nmeasrc",1 //Set <NMEA_src> to 1 to enable acquisition of NMEA
                           sentences through AT+QGPSTNMEA.
OK
AT+QGPSTNMEA="GGA" //Obtain GGA sentence.
+QGPSTNMEA: $GPGGA,103647.000,3150.721154,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+QGPSTNMEA.
OK
AT+QGPSTNMEA="GGA" //Obtain GGA sentence.
+CME ERROR: 507 //Because acquisition of NMEA sentences through
                  AT+QGPSTNMEA 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 contact Quectel Technical Support.

<p>AT+QGPSXTRA=1</p> <p>OK</p> <p>//The XTRA assistance is activated immediately.</p> <p>//If XTRA data file is valid (query through AT+QGPSXTRADATA?), turn on GNSS engine directly.</p> <p>//If XTRA data file is invalid (query through AT+QGPSXTRADATA?), perform the following procedures.</p> <p>//Users can download the XTRA data file to PC (or MCU) from URL http://xtrapath4.izatcloud.net/xtra3grcej.bin or other URLs listed in Chapter 1.3.</p> <p>AT+QFUPL="xtra3grcej.bin",59748,60</p> <p>OK</p> <p>AT+QGPSXTRATIME="2019/01/05,08:30:30",3500</p> <p>OK</p> <p>AT+QGPSXTRADATA="UFS:xtra3grcej.bin"</p> <p>OK</p> <p>AT+QFDEL="UFS:xtra3grcej.bin"</p> <p>OK</p> <p>AT+QGPS=1</p> <p>OK</p>	<p>//If XTRA assistance is disabled, enable it first and then perform the following procedures.</p> <p>//Select a XTRA file and upload it to module through QCOM. For more details about QCOM tool, see document [1].</p> <p>//Inject XTRA time to GNSS engine. Ensure that the injected UTC time accuracy is kept within 3.5 seconds.</p> <p>//Inject XTRA data file to GNSS engine</p> <p>//The XTRA data file is injected to GNSS engine successfully.</p> <p>//Delete XTRA data file from UFS. This step is optional.</p> <p>//Turn on GNSS engine.</p>
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3.4. Operation Procedures of AGNSS

This example shows the operation procedures of AGNSS. 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 contact Quectel Technical Support.

<p>AT+QGPSDEL=0</p> <p>OK</p> <p>AT+QGPSCFG="plane",1</p>	<p>//Delete all the assistance data.</p> <p>//Set the plane mode used by MO AGPS session as user plane with SSL. If no certificate is needed for the</p>
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	service, configure the plane mode through AT+QGPSCFG="plane",0.
OK	
AT+CFUN=1,1	//Restart the module.
OK	
AT+QGPSSUPLURL="supl.xxxx.com:7275"	//Set the URL and port of SUPL service. The "supl.xxxx.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.xxxx.com.der",893	//Upload CA certificate. The "supl.xxxx.com.der" is an example which should be replaced by a real CA certificate; and 893 is the size of "supl.xxxx.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.xxxx.com.der"	//Inject CA certificate. The "supl.xxxx.com.der" is an example which should be replaced by a real CA certificate.
OK	
AT+QFDEL="UFS:supl.xxxx.com.der"	//Delete the certificate from UFS. This step is optional.
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	

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 2: 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 3: Related Documents

Document Name
[1] Quectel_QCOM_User_Guide

Table 4: Terms and Abbreviations

Abbreviation	Description
AGPS	Assisted Global Positioning System
AGNSS	Assisted Global Navigation Satellite System
APN	Access Point Name
BeiDou	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
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
VTG	Course Over Ground and Ground Speed
WCDMA	Wideband Code Division Multiple Access
XTRA	An Auxiliary Positioning Technology Provided by Qualcomm