

RG50xQ&RM5xxQ Series

GNSS Application Note

5G Module Series

Version: 1.2

Date: 2022-03-02

Status: Released



At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:

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

Or our local offices. For more information, please visit:

<http://www.quectel.com/support/sales.htm>.

For technical support, or to report documentation errors, please visit:

<http://www.quectel.com/support/technical.htm>.

Or email us at: support@quectel.com.

Legal Notices

We offer information as a service to you. The provided information is based on your requirements and we make every effort to ensure its quality. You agree that you are responsible for using independent analysis and evaluation in designing intended products, and we provide reference designs for illustrative purposes only. Before using any hardware, software or service guided by this document, please read this notice carefully. Even though we employ commercially reasonable efforts to provide the best possible experience, you hereby acknowledge and agree that this document and related services hereunder are provided to you on an “as available” basis. We may revise or restate this document from time to time at our sole discretion without any prior notice to you.

Use and Disclosure Restrictions

License Agreements

Documents and information provided by us shall be kept confidential, unless specific permission is granted. They shall not be accessed or used for any purpose except as expressly provided herein.

Copyright

Our and third-party products hereunder may contain copyrighted material. Such copyrighted material shall not be copied, reproduced, distributed, merged, published, translated, or modified without prior written consent. We and the third party have exclusive rights over copyrighted material. No license shall be granted or conveyed under any patents, copyrights, trademarks, or service mark rights. To avoid ambiguities, purchasing in any form cannot be deemed as granting a license other than the normal non-exclusive, royalty-free license to use the material. We reserve the right to take legal action for noncompliance with abovementioned requirements, unauthorized use, or other illegal or malicious use of the material.

Trademarks

Except as otherwise set forth herein, nothing in this document shall be construed as conferring any rights to use any trademark, trade name or name, abbreviation, or counterfeit product thereof owned by Quectel or any third party in advertising, publicity, or other aspects.

Third-Party Rights

This document may refer to hardware, software and/or documentation owned by one or more third parties (“third-party materials”). Use of such third-party materials shall be governed by all restrictions and obligations applicable thereto.

We make no warranty or representation, either express or implied, regarding the third-party materials, including but not limited to any implied or statutory, warranties of merchantability or fitness for a particular purpose, quiet enjoyment, system integration, information accuracy, and non-infringement of any third-party intellectual property rights with regard to the licensed technology or use thereof. Nothing herein constitutes a representation or warranty by us to either develop, enhance, modify, distribute, market, sell, offer for sale, or otherwise maintain production of any our products or any other hardware, software, device, tool, information, or product. We moreover disclaim any and all warranties arising from the course of dealing or usage of trade.

Privacy Policy

To implement module functionality, certain device data are uploaded to Quectel’s or third-party’s servers, including carriers, chipset suppliers or customer-designated servers. Quectel, strictly abiding by the relevant laws and regulations, shall retain, use, disclose or otherwise process relevant data for the purpose of performing the service only or as permitted by applicable laws. Before data interaction with third parties, please be informed of their privacy and data security policy.

Disclaimer

- a) We acknowledge no liability for any injury or damage arising from the reliance upon the information.
- b) We shall bear no liability resulting from any inaccuracies or omissions, or from the use of the information contained herein.
- c) While we have made every effort to ensure that the functions and features under development are free from errors, it is possible that they could contain errors, inaccuracies, and omissions. Unless otherwise provided by valid agreement, we make no warranties of any kind, either implied or express, and exclude all liability for any loss or damage suffered in connection with the use of features and functions under development, to the maximum extent permitted by law, regardless of whether such loss or damage may have been foreseeable.
- d) We are not responsible for the accessibility, safety, accuracy, availability, legality, or completeness of information, advertising, commercial offers, products, services, and materials on third-party websites and third-party resources.

Copyright © Quectel Wireless Solutions Co., Ltd. 2022. All rights reserved.

About the Document

Revision History

Version	Date	Author	Description
-	2020-12-31	Amos ZHANG/ Tery SHI	Creation of the document
1.0	2021-01-28	Amos ZHANG/ Tery SHI	First official release
1.1	2021-11-24	Remy SHI/ Don XU	<ol style="list-style-type: none"> 1. Updated supported NMEA sentences (Chapter 1.3) 2. Updated description of AT+QGPSCFG="glonassnmeatype" (Chapter 2.3.1.4) 3. Updated description of AT+QGPSCFG="beidoumeatype" and updated NMEA sentences corresponding to <BeiDou_NMEA_type> (Chapter 2.3.1.6) 4. Added the enabling of QZSS in description of <GNSS_config> in AT+QGPSCFG="gnssconfig" (Chapter 2.3.1.7) 5. Added the default value of <srvsystem> and <PDP> in AT+QGPSCFG="lbsapn" (Chapter 2.3.1.12) 6. Updated the value of <AGPS_LP> in AT+QGPSCFG="agnssprotocol" (Chapter 2.3.1.14) 7. Added AT+QGPSCFG="multibandconfig" (Chapter 2.3.1.15) 8. Modified the format of <COG>, <spkm> and <spkn> and the range of <nsat> in AT+QGPSLOC (Chapter 2.3.5) 9. Deleted the Read Command in AT+QGPSSUPLCA (Chapter 2.3.11) 10. Modified the operation examples of XTRA assistance (Chapter 3.3) 11. Added the operation examples of AGNSS function (Chapter 3.4)

1.2	2022-03-02	Modified the default value of <plane> in AT+QGPSCFG="plane" (Chapter 2.3.1.10).
-----	------------	---

Contents

About the Document.....	3
Contents.....	5
Table Index.....	7
1 Introduction	8
1.1. Applicable Modules.....	8
1.2. GNSS Turning On/Off Procedures.....	9
1.3. Supported NMEA Sentence Types	9
1.4. XTRA Assistance Introduction	10
2 Description of GNSS AT Commands	12
2.1. AT Command Introduction	12
2.1.1. Definitions.....	12
2.1.2. AT Command Syntax	12
2.2. Declaration of AT Command Examples	13
2.3. AT Commands Description	13
2.3.1. AT+QGPSCFG Configure GNSS.....	13
2.3.1.1. AT+QGPSCFG="outport" Configure Output Port of NMEA Sentences	14
2.3.1.2. AT+QGPSCFG="nmeasrc" Enable/Disable Acquisition of NMEA Sentences Through AT+QGPSGNMEA.....	15
2.3.1.3. AT+QGPSCFG="gpsnmeatype" Configure Output Type of GPS NMEA Sentences	16
2.3.1.4. AT+QGPSCFG="glonassnmeatype" Configure Output Type of GLONASS or GNSS Multi-constellations NMEA Sentences.....	17
2.3.1.5. AT+QGPSCFG="galileonmeatype" Configure Output Type of Galileo NMEA Sentences	18
2.3.1.6. AT+QGPSCFG="beidoumeatype" Configure Output Type of BeiDou and QZSS NMEA Sentences	19
2.3.1.7. AT+QGPSCFG="gnssconfig" Configure Enabled GNSS Constellations	20
2.3.1.8. AT+QGPSCFG="autogps" Enable/Disable GNSS to Run Automatically.....	21
2.3.1.9. AT+QGPSCFG="dpoenable" Enable/Disable DPO Mode	22
2.3.1.10. AT+QGPSCFG="plane" Configure Plane Mode Used by MO AGPS Session.....	23
2.3.1.11. AT+QGPSCFG="suplver" Configure SUPL Protocol Version	24
2.3.1.12. AT+QGPSCFG="lbsapn" Configure LBS APN	25
2.3.1.13. AT+QGPSCFG="agpsposmode" Configure AGNSS Positioning Mode.....	26
2.3.1.14. AT+QGPSCFG="agnssprotocol" Configure AGNSS Positioning Protocol.....	27
2.3.1.15. AT+QGPSCFG="multibandconfig" Configure GNSS Multiband	28
2.3.2. AT+QGPSDEL Delete Assistance Data	29
2.3.3. AT+QGPS Turn On GNSS	30
2.3.4. AT+QGPSEND Turn Off GNSS.....	31
2.3.5. AT+QGPSLOC Acquire Positioning Information	32

2.3.6.	AT+QGPSGNMEA Acquire NMEA Sentences	34
2.3.7.	AT+QGPSXTRA Enable/Disable XTRA Assistance	36
2.3.8.	AT+QGPSXTRATIME Inject XTRA Time.....	37
2.3.9.	AT+QGPSXTRADATA Inject XTRA Data File	38
2.3.10.	AT+QGSSUPLURL Configure SUPL Server URL.....	39
2.3.11.	AT+QGSSUPLCA Inject SUPL Certificate	40
3	Examples	41
3.1.	Turn On/Off GNSS	41
3.2.	Application of GNSS <NMEA_src>.....	41
3.3.	Operation Procedures of XTRA Assistance	42
3.4.	Operation Procedures of AGNSS	42
4	Summary of Error Codes	44
5	Appendix References	45

Table Index

Table 1: Applicable Modules.....	8
Table 2: Types of AT Commands	12
Table 3: Summary of Error Codes.....	44
Table 4: Related Documents	45
Table 5: Terms and Abbreviations	45

1 Introduction

Quectel RG50xQ and RM5xxQ series modules integrate the multi-GNSS engine which supports GPS, BeiDou, 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. Applicable Modules

Table 1: Applicable Modules

Module Series	Module
RG50xQ	RG500Q Series
	RG501Q Series
	RG502Q Series
RM5xxQ	RM500Q Series
	RM502Q-AE
	RM505Q-AE
	RM510Q-GL

NOTE

RG502Q-GT is not embedded with GNSS engine.

1.2. GNSS Turning On/Off Procedures

The GNSS of RG50xQ and RM5xxQ 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**.

1.3. 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

BeiDou NMEA sentences have the prefix "PQ" or "GB":

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

QZSS NMEA sentences have the prefix "PQ" or "GQ":

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

NOTE

For module software version prior to August 6, 2021, the output BeiDou and QZSS NMEA sentences have the prefix "PQ", and they are the extended sentences based on the NMEA 0183 V4.10 protocol; For module software version after August 6, 2021, the output BeiDou 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.

1.4. 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 + BeiDou:

<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 + BeiDou + 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 **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 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 2: 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 you should design a program flow or what status you should set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there exists a correlation among these examples and 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: "beidoumeatype",(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)

	<p>+QGPSCFG: "multibandconfig",(range of supported <multiband>s)</p> <p>OK</p>
--	--

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	Response
AT+QGPSCFG="outport"[,<out_port>]	<p>If the optional parameter is omitted, query the current configuration:</p> <p>+QGPSCFG: "outport",<out_port></p> <p>OK</p> <p>If the optional parameter is specified, configure the output port of 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	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
	"usb ⁿ nmea"	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>]	<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. 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

<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 <u>1</u> 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 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 <u>31</u> 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	Response
AT+QGPSCFG="glonassnmeatype"[, <GLONASS_or_GNSS_NMEA_type>]	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. 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>]	<p>Response</p> <p>If the optional parameter is omitted, query the current configuration: +QGPSCFG: "galileonmeatype",<Galileo_NMEA_type></p> <p>OK</p> <p>If the optional parameter is specified, configure the output type of Galileo NMEA sentences: OK</p> <p>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

<Galileo_NMEA_type>	Integer type. Configure output type of Galileo NMEA sentences by XOR operation. <ul style="list-style-type: none"> <u>0</u> 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 BeiDou and QZSS NMEA Sentences

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

AT+QGPSCFG="beidoumeatype" Configure Output Type of BeiDou and QZSS NMEA Sentences	
Write Command AT+QGPSCFG="beidoumeatype"[,<BeiDou_NMEA_type>]	Response If the optional parameter is omitted, query the current configuration: +QGPSCFG: "beidoumeatype",<BeiDou_NMEA_type> OK If the optional parameter is specified, configure the output type of BeiDou and QZSS 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

<BeiDou_NMEA_type>	Integer type. Configure output type of BeiDou and QZSS NMEA sentences by XOR operation. <u>0</u> Disable 1 PQGSA/GBGSA and PQGSA/GQGSA 2 PQGSV/GBGSV and PQGSV/GQGSV
<errcode>	The error code of operation. See Chapter 4 for details.

NOTE

This command configures the output type of BeiDou and QZSS NMEA sentences synchronously. For example, **AT+QGPSCFG="beidoumeatype",1** indicates to configure the output type of BeiDou NMEA sentences as PQGSA/GBGSA and configure the output type of QZSS NMEA sentences as PQGSA/GQGSA 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/BeiDou and QZSS OFF/Galileo OFF 1 GLONASS ON/BeiDou and QZSS ON/Galileo ON 2 GLONASS ON/BeiDou and QZSS ON/Galileo OFF 3 GLONASS ON/BeiDou and QZSS OFF/Galileo ON 4 GLONASS ON/BeiDou and QZSS OFF/Galileo OFF 5 GLONASS OFF/BeiDou and QZSS ON/Galileo ON 6 GLONASS OFF/BeiDou and QZSS OFF/Galileo ON 7 GLONASS OFF/BeiDou 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	
Write Command AT+QGPSCFG="dpoenable" [<DPO_enable>]	<p>Response</p> <p>If the optional parameter is omitted, query the current configuration: +QGPSCFG: "dpoenable", <DPO_enable></p> <p>OK</p> <p>If the optional parameter is specified, enable/disable the DPO mode: 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

<DPO_enable>	<p>Integer type. Enable/disable DPO.</p> <p>0 Disable DPO</p> <p>1 Enable DPO with dynamic duty cycle</p> <p><u>2</u> Enable DPO only when the module is not connected to an external power supply (not 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	
Write Command AT+QGPSCFG="suplver"[,<SUPL_ version>]	Response If the optional parameter is omitted, query the current configuration: +QGPSCFG: "suplver",<SUPL_version> OK If the optional parameter is specified, configure the SUPL protocol version: 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

<SUPL_version>	Integer type. SUPL protocol version. 1 SUPL Version 1.0 2 SUPL Version 2.0 3 SUPL Version 2.0.2
<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 configuration: +QGPSCFG: "lbsapn", <srvsystem>, <PDP>, <APN> OK If the optional parameters are specified, configure the LBS APN: 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

<srvsystem>	Integer type. Serving system on which this LBS APN should be used by XOR operation. Range: 0–31. <ul style="list-style-type: none"> <u>0</u> Disable 1 CDMA 2 HDR 4 GSM 8 WCDMA 16 LTE
<PDP>	Integer type. PDP type of the LBS APN profile. <ul style="list-style-type: none"> <u>0</u> 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 configuration: +QGPSCFG: "agpsposmode", <AGPS_posmode> OK If the optional parameter is specified, configure the AGNSS positioning mode: 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_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 3 User Plane LPP and Control Plane 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 If the optional parameter is specified, configure the GNSS

	multiband: 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

<multiband>	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. 0 Disable 1 GPS L5 2 Galileo E5a 4 Beidou B2a
<errcode>	The error code of operation. See Chapter 4 for details.

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.

2.3.2. 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: (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 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>	Integer type. Horizontal accuracy level. 1 Low accuracy 2 Medium accuracy 3 High accuracy
<fix_rate>	Integer type. Interval time between each positioning. Range: 100–65535. Default value: 1000. Unit: ms.
<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.mmmmN/S,dddmm.mmmmE/W
 1 **<latitude>,<longitude>** format: ddmm.mmmmmm,N/S,dddmm.mmmmmm,E/W
 2 **<latitude>,<longitude>** format: (-)dd.dddd,(-)ddd.dddd

<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: 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>

<p>Write Command Query GSV sentence AT+QGPSGNMEA="GSV"</p>	<p>Response [+QGPSGNMEA: <GSV_sentence>] [...]</p> <p>OK Or ERROR</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
<p>Write Command Query GSA sentence AT+QGPSGNMEA="GSA"</p>	<p>Response [+QGPSGNMEA: <GSA_sentence>] [...]</p> <p>OK Or ERROR</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
<p>Write Command Query VTG sentence AT+QGPSGNMEA="VTG"</p>	<p>Response [+QGPSGNMEA: <VTG_sentence>] [...]</p> <p>OK Or ERROR</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
<p>Write Command Query GNS sentence AT+QGPSGNMEA="GNS"</p>	<p>Response [+QGPSGNMEA: <GNS_sentence>] [...]</p> <p>OK Or ERROR</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
<p>Maximum Response Time</p>	<p>300 ms</p>
<p>Characteristics</p>	<p>/</p>

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/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 <u>1</u> 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 Inject XTRA time AT+QGPSXTRATIME=<xtratime>,<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 configuration is not saved.

Parameter

<xtratime>	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_filename> 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_filename>	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_filename	String type. Name of the XTRA data file to be injected, for example, "xtra2.bin" or "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: <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+QGSEND**.

```

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+QSEND //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,103647.000,3150.721154,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+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 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 URL
http://xtrapath4.izatcloud.net/xtra3grcej.bin or other URLs listed in Chapter 1.4.
AT+QFUPL="xtra3grcej.bin",59748,60 //Select a XTRA file and upload it to module
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.

OK
AT+QGPSXTRADATA="UFS:xtra3grcej.bin" //Inject XTRA data file to GNSS engine
//The XTRA data file is injected to GNSS
engine successfully.

OK
AT+QFDEL="UFS:xtra3grcej.bin" //Delete XTRA data file from UFS. This step
is optional.

OK
AT+QGPS=1 //Turn on GNSS engine.

OK

```

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 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.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 3: 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 4: Related Documents

Document Name
[1] Quectel_RG50xQ&RM5xxQ_Series_FILE_Application_Note
[2] Quectel_QCOM_User_Guide

Table 5: 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
