

BG96 GNSS Application Note

LPWA Module Series

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About the Document

Revision History

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1.0	2017-11-23	Matt YE/ Vita LV	Initial
1.1	2018-02-12	Matt YE/ Vita LV	<ol style="list-style-type: none"> Added geo-fence related AT commands in Chapter 2.10. Modified an error in the example in Chapter 3.3. Added the example for operation of geo-fence function in Chapter 3.4.
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9. Modified the format of <UTC> in Chapter 2.3.5.
 10. Modified the description of <nsat> in Chapter 2.3.5.
 11. Added a note of the example in Chapter 3.3.
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1 Introduction

Quectel BG96 module integrates a GNSS engine which supports GPS, BeiDou, Galileo, GLONASS and QZSS systems, and it also supports gpsOneXTRA Assistance technology. The high performance GNSS engine is suitable for various applications where the lowest cost and accurate positioning are required, and it supports position tracking without any network assistance. The GNSS of the module can be applied in the following applications: turn-by-turn navigation, asset tracking, personnel tracking, location-based games, as well as home and fleet management.

1.1. GNSS Turning On/Off Procedure

The GNSS of the module supports location calculation without any network assistance. GNSS turning on/off procedure are shown below:

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

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

Step 3: Obtaining the positioning information in any of the following three ways after GNSS is turned on and position is fixed successfully:

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

Step 4: GNSS can be turned off in two ways:

- 1) If **<fix_count>** of **AT+QGPS** is set to 0 in **Step 2**, GNSS gets position continuously, and it can be turned off through **AT+QGPSEND**.
- 2) If **<fix_count>** of **AT+QGPS** is not set to 0 in **Step 2**, GNSS is turned off automatically once **<fix_count>** reaches the specified value.

1.2. Supported NMEA Sentences Type

The NMEA sentences are compliant with NMEA 0183 standard protocol, and various kinds of prefixes are available to differentiate NMEA sentences of different satellite systems, as illustrated below:

GPS NMEA sentences have the prefix "GP":

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

GLONASS sentences have the prefixes "GL" and "GN":

- GLGSV – GNSS satellites in view, such as the number of satellites in view and the satellite ID numbers
- GNGSA – GNSS DOP and active satellites
- GNGNS – GNSS fix data

Galileo sentences have the prefixes "GA" and "GN":

- GAGSV – GNSS satellites in view, such as number of satellites in view and satellite ID numbers
- GNGSA – GNSS DOP and active satellites
- GNGNS – GNSS fix data

BeiDou sentences have the prefix "PQ":

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

QZSS sentences have the prefix "PQ":

- PQGSA – GNSS DOP and active satellites

1.3. Introduction of gpsOneXTRA Assistance

gpsOneXTRA 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 gpsOneXTRA Assistance, the TTFF (Time to First Fix) 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 gpsOneXTRA Assistance web servers on the network needs to be updated once a day (or every couple of days).

Before using this feature, please ensure the valid gpsOneXTRA assistance data is available. The gpsOneXTRA binary file, which contains the assistance data, can be downloaded from the gpsOneXTRA Assistance web server through URLs listed below. The module supports the following two kinds of files.

- *xtra2.bin* files for GPS and GLONASS. The file size is about 60 KB.
- *xtra3grc.bin* files for GPS, GLONASS and BeiDou. The file size is about 25 KB.

1.3.1. URLs for Downloading gpsOneXTRA File through AT+QHTTPGET

When you download gpsOneXTRA files with **AT+QHTTPGET** (see **document [4]** for details), use the URLs listed below. It is recommended to use this method to download gpsOneXTRA files, and an example is provided in **Chapter 3.3.1**.

<http://xtrapath1.izatcloud.net/xtra2.bin>

<http://xtrapath2.izatcloud.net/xtra2.bin>

<http://xtrapath3.izatcloud.net/xtra2.bin>

<http://xtrapath1.izatcloud.net/xtra3grc.bin>

<http://xtrapath2.izatcloud.net/xtra3grc.bin>

<http://xtrapath3.izatcloud.net/xtra3grc.bin>

1.3.2. URLs for Downloading gpsOneXTRA File through MCU/Browser

When you download gpsOneXTRA files through a browser or your own MCU, use the URLs listed below.

<http://xtrapath4.izatcloud.net/xtra2.bin>

<http://xtrapath5.izatcloud.net/xtra2.bin>

<http://xtrapath6.izatcloud.net/xtra2.bin>

<http://xtrapath4.izatcloud.net/xtra3grc.bin>

<http://xtrapath5.izatcloud.net/xtra3grc.bin>

<http://xtrapath6.izatcloud.net/xtra3grc.bin>

1.3.3. Procedure of Using gpsOneXTRA Assistance Feature

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

The procedure of using gpsOneXTRA Assistance feature is illustrated below:

Step 1: If gpsOneXTRA Assistance is disabled, enable it first through **AT+QGPSXTRA** and then reboot the module to activate the feature.

Step 2: Query and confirm the validity of gpsOneXTRA data file through **AT+QGPSXTRADATA?**. If the

data is invalid, perform **Steps 3 to 6**; if the data is valid, turn on GNSS engine according to the procedure described in **Chapter 1.1** directly.

Step 3: Download file *xtra2.bin* or *xtra3grc.bin* to the module over URLs listed above.

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

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

Step 6: Turn on GNSS engine according to the procedure described in **Chapter 1.1**.

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

2.3. AT Commands Description

2.3.1. AT+QGPSCFG Configure GNSS

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

AT+QGPSCFG Configure GNSS	
Test Command AT+QGPSCFG=?	Response +QGPSCFG: "outport",(list of supported <outport>s),(list of supported <baud_rate>s) +QGPSCFG: "nmeasrc",(list of supported <NMEA_src>s) +QGPSCFG: "gpsnmeatype",(range of supported <GPS_NMEA_type>s) +QGPSCFG: "glonassnmeatype",(range of supported <GLONASS_NMEA_type>s) +QGPSCFG: "galileonmeatype",(list of supported <Galileo_NMEA_type>s) +QGPSCFG: "beidoumeatype",(range of supported <BeiDou_NMEA_type>s) +QGPSCFG: "gsvextnmeatype",(list of supported <GSVEXT_NMEA_type>s) +QGPSCFG: "gnssconfig",(range of supported <GNSS_config>s) +QGPSCFG: "autogps",(list of supported <autoGPS>s) +QGPSCFG: "sate_mode",(list of supported <mode>s) +QGPSCFG: "speed_threshold",(range of supported <speed_threshold>s) +QGPSCFG: "estimation_error",(range of supported <hori_unc>s),(range of supported <vert_unc>s),(range of supported <speed_unc>s),(range of supported

	<p><head_unc>s) +QGPSCFG: "nmea_epe",(list of supported <NMEA_EPE>s) +QGPSCFG: "nav_mode",(list of supported <mode>s)</p> <p>OK</p>
Maximum Response Time	300 ms
Characteristics	-

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

This command configures the output port of NMEA sentences and the port baud rate.

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

<p>Write Command AT+QGPSCFG="outport"[,<outport>[,<baud_rate>]]</p>	<p>Response</p> <p>If the optional parameters are omitted, query the current setting: +QGPSCFG: "outport",<outport>[,<baud_rate>]</p> <p>OK</p> <p>If any of the optional parameters is specified, set the output port of NMEA sentences and the port baud rate when <outport> is "uartnmea" or "auxnmea": OK</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 configurations are saved automatically.

Parameter

<outport>	String type. Output port of NMEA sentences.
"none"	Close NMEA sentence output
<u>"usbnmea"</u>	Output over USB NMEA port
"uartnmea"	Output over GNSS UART port
"auxnmea"	Output over debug UART port
"cmux1"	Output over CMUX1 UART port
"cmux2"	Output over CMUX2 UART port

"cmux3"	Output over CMUX3 UART port
"cmux4"	Output over CMUX4 UART port
<baud_rate>	Integer type. Baud rate of GNSS UART port and debug UART port. <baud_rate> is available only when <outport> is "uartnmea" or "auxnmea". Unit: bps.
	4800
	9600
	19200
	38400
	57600
	<u>115200</u>
	230400
	460800
	921600
<errcode>	Error code of an operation. See Chapter 4 for details.

NOTE

When <baud_rate> is 4800 or 9600, data loss may occur if a large amount of NMEA sentences are output.

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

This command enables or disables the acquisition of NMEA sentences through **AT+QGPGNMEA**.

AT+QGPSCFG="nmeasrc" Enable/Disable Acquisition of NMEA Sentences Through AT+QGPGNMEA	
Write Command AT+QGPSCFG="nmeasrc"[,<NMEA_src>]	Response If the optional parameter is omitted, query the current setting: +QGPSCFG: "nmeasrc",<NMEA_src> OK If the optional parameter is specified, set whether to enable the acquisition of NMEA sentences through AT+QGPGNMEA : OK 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 automatically.

Parameter

<NMEA_src>	Integer type. Set whether to acquire the original NMEA sentences through AT+QGPSCFG="gpsnmeatype" . If enabled, original NMEA sentences can be acquired through AT+QGPSCFG="gpsnmeatype" , and the sentences are output over the same NMEA port as before. 0 Disable <u>1</u> Enable
<errcode>	Error code of an operation. See Chapter 4 for details.

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

This command configures the output type of GPS NMEA sentences.

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

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

Parameter

<GPS_NMEA_type>	Integer type. Output type of GPS NMEA sentences by XOR. 0 Disable 1 GGA 2 RMC 4 GSV 8 GSA
------------------------------	--

	16 VTG
	31 All above types
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.1.4. AT+QGPSCFG="glonassnmeatype" Configure Output Type of GLONASS NMEA Sentences

This command configures the output type of GLONASS NMEA sentences.

AT+QGPSCFG="glonassnmeatype" Configure Output Type of GLONASS NMEA Sentences

Write Command AT+QGPSCFG="glonassnmeatype", <GLONASS_NMEA_type>]	Response If the optional parameter is omitted, query the current setting: +QGPSCFG: "glonassnmeatype",<GLONASS_NMEA_type> OK If the optional parameter is specified, set the output type of GLONASS NMEA sentences: OK 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 automatically.

Parameter

<GLONASS_NMEA_type>	Integer type. Output type of GLONASS NMEA sentences by XOR. 0 Disable 1 GSV 2 GSA 4 GNS
<errcode>	Error code of an 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 setting: +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>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
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Maximum Response Time	300 ms
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Characteristics	The command takes effect immediately. The configuration is saved automatically.
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Parameter

<Galileo_NMEA_type>	Integer type. Output type of Galileo NMEA sentences by XOR. 0 Disable 1 GSV
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.1.6. AT+QGPSCFG="beidoumeatype" Configure Output Type of BeiDou NMEA Sentences

This command configures the output type of BeiDou NMEA sentences.

AT+QGPSCFG="beidoumeatype" Configure Output Type of BeiDou NMEA Sentences

Write Command AT+QGPSCFG="beidoumeatype" [<BeiDou_NMEA_type>]	<p>Response</p> <p>If the optional parameter is omitted, query the current setting: +QGPSCFG: "beidoumeatype", <BeiDou_NMEA_type></p> <p>OK</p> <p>If the optional parameter is specified, configure the output type of BeiDou NMEA sentences:</p>
---	--

	<p>OK</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 automatically.</p>

Parameter

<BeiDou_NMEA_type>	<p>Integer type. Configure output type of BeiDou NMEA sentences by XOR.</p> <p>0 Disable</p> <p>1 GSA</p> <p>2 GSV</p>
<errcode>	Error code of an operation. See Chapter 4 for details.

NOTE

When configuring output type of BeiDou NMEA sentences to GSA NMEA sentences, QZSS NMEA sentences are output at the same time.

2.3.1.7. AT+QGPSCFG="gsvextnmeatype" Enable/Disable Output of GSVEXT NMEA Sentences

This command enables or disables the output of GSVEXT NMEA sentences.

AT+QGPSCFG="gsvextnmeatype" Enable/Disable Output of GSVEXT NMEA Sentences

<p>Write Command</p> <p>AT+QGPSCFG="gsvextnmeatype" [<GSVEXT_NMEA_type>]</p>	<p>Response</p> <p>If the optional parameter is omitted, query the current setting: +QGPSCFG: "gsvextnmeatype", <GSVEXT_NMEA_type></p> <p>OK</p> <p>If the optional parameter is specified, set whether to enable the output of GSVEXT NMEA sentences: OK</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 automatically.

Parameter

<GSVEXT_NMEA_type>	Integer type. Enable/disable output of extended GSV information. Elevation/Azimuth/SNR (C/No) are displayed as decimals when extended information is enabled; otherwise, Elevation/Azimuth/SNR (C/No) are displayed as integers. <u>0</u> Disable 1 Enable
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.1.8. AT+QGPSCFG="gnssconfig" Configure Supported GNSS Constellation

This command configures the supported GNSS constellations of the module.

AT+QGPSCFG="gnssconfig" Configure Supported GNSS Constellation

Write Command AT+QGPSCFG="gnssconfig"[,<GNSS_config>]	Response If the optional parameter is omitted, query the current setting: +QGPSCFG: "gnssconfig",<GNSS_config> OK If the optional parameter is specified, configure the supported GNSS constellations: OK 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 automatically.

Parameter

<GNSS_config>	Integer type. Supported GNSS constellation. GPS is always on. <u>0</u> GLONASS OFF/BeiDou and QZSS OFF/Galileo OFF <u>1</u> 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
<errcode>		Error code of an operation. See Chapter 4 for details.

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

This command configures whether to enable automatic running of GNSS after the module is powered on.

AT+QGPSCFG="autogps" Enable/Disable GNSS to Run Automatically	
Write Command AT+QGPSCFG="autogps" [<autoGPS >]	Response If the optional parameter is omitted, query the current setting: +QGPSCFG: "autogps", <autoGPS> OK If the optional parameter is specified, set whether to enable automatic running of GNSS: OK 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 automatically.

Parameter

<autoGPS>	Integer type. Enables/disables GNSS to run automatically after the module is powered on. <u>0</u> Disable 1 Enable
<errcode>	Error code of an operation. See Chapter 4 for details.

NOTE

This command is valid only when the GNSS works in **stand-alone** mode.

2.3.1.10. AT+QGPSCFG="sate_mode" Configure to Show Only GPS Satellites Information or All GNSS Satellites in Use

This command configures whether to show only GPS satellites information or all GNSS satellites information in use in the positioning information returned after the execution of **AT+QGPSLOC**.

AT+QGPSCFG="sate_mode" Configure to Show Only GPS Satellites Information or All GNSS Satellites in Use	
Write Command AT+QGPSCFG="sate_mode" [<mode >]	Response If the optional parameter is omitted, query the current setting: +QGPSCFG: "sate_mode", <mode> OK If the optional parameter is specified, configure to show only GPS statement information or all GNSS satellites information in use: OK 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 automatically.

Parameter

<mode>	Integer type. Configure whether to show only GPS satellites information or all GNSS satellites information in use <u>0</u> Number of GPS SVs used in location. 1 Number of GPS + GLONASS + Galileo + BeiDou + QZSS SVs used in location.
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.1.11. AT+QGPSCFG="speed_threshold" Configure Speed and Distance Thresholds

This command configures the speed and distance thresholds.

AT+QGPSCFG="speed_threshold" Configure Speed and Distance Thresholds	
Write Command AT+QGPSCFG="speed_threshold" [<speed_threshold> [<distance_threshold>]]	Response If <speed_threshold> and <distance_threshold> are both omitted, query the current setting: +QGPSCFG: "speed_threshold", <speed_threshold>, <di

	<p>stance_threshold></p> <p>OK</p> <p>If <distance_threshold> is omitted, only set the speed threshold and the distance threshold is 0 by default:</p> <p>OK</p> <p>If <speed_threshold> and <distance_threshold> are specified, set both the speed and distance thresholds:</p> <p>OK</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 configurations are saved automatically.

Parameter

<speed_threshold>	Float type. Speed threshold. Range: 0.00–2.00. Default value: 0.15. Unit: m/s. If the speed is less than the threshold, the speed in the NMEA sentence is 0.
<distance_threshold>	Integer type. Distance threshold. Range: 0–10000. Default value: 0 (0 means the position is always updated). Unit: m. If the moved distance is less than the threshold, the position in the NMEA sentence will not be updated and the last position will be used.
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.1.12. AT+QGPSCFG="estimation_error" Get Estimated Position Error

This command acquires the estimated position error.

AT+QGPSCFG="estimation_error" Get Estimated Position Error	
Write Command AT+QGPSCFG="estimation_error"	<p>Response</p> <p>+QGPSCFG: "estimation_error",<hori_unc>,<vert_unc>,<speed_unc>,<head_unc></p> <p>OK</p> <p>If there is any error related to ME functionality:</p> <p>+CME ERROR: <errcode></p>

Maximum Response Time	300 ms
Characteristics	/

Parameter

<hor_unc>	Float type. Horizontal estimated position error. Unit: meter.
<vert_unc>	Float type. Vertical estimated position error. Unit: meter.
<speed_unc>	Float type. Horizontal estimated velocity error. Unit: m/s.
<head_unc>	Float type. Estimated heading error. Unit: degree.
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.1.13. AT+QGPSCFG="nmea_epe" Enable/Disable Output of EPE NMEA Sentences

The command enables/disables the output of EPE NMEA sentences.

AT+QGPSCFG="nmea_epe" Enable/Disable Output of EPE NMEA Sentences

Write Command AT+QGPSCFG="nmea_epe" [<NMEA_EPE>]	Response If the optional parameter is omitted, query the current setting: +QGPSCFG: "nmea_epe", <NMEA_EPE> OK If the optional parameter is specified, set whether to enable the output of EPE NMEA sentences: OK 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 automatically.

Parameter

<NMEA_EPE>	Integer type. Enable/disable the output of EPE NMEA sentences. <u>0</u> Disable 1 Enable. The sentence is in the format of: \$PQEPE,<timestamp>,<status>,<HDOP>,<hor_unc>,<vert_unc>,<speed_unc>,<head_unc>*<checksum>
<timestamp>	String type. UTC time. Format: hhmmss.ss.

<status>	String type. Indicate whether the data is valid. A Valid data V Invalid data
<HDOP>	Float type. Horizontal dilution of precision.
<hori_unc>	Float type. Horizontal estimated position error. Unit: meter.
<vert_unc>	Float type. Vertical estimation position error. Unit: meter.
<speed_unc>	Float type. Horizontal estimated velocity error. Unit: m/s.
<head_unc>	Float type. Estimated heading error. Unit: degree.
<checksum>	Hexadecimal type. The checksum is the XOR of all the bytes between the "\$" and the "*" (not including the delimiters themselves).
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.1.14. AT+QGPSCFG="nav_mode" Configure Navigation Mode

This command configures GNSS navigation mode.

AT+QGPSCFG="nav_mode" Configure Navigation Mode

Write Command AT+QGPSCFG="nav_mode"[,<mode>]	Response If the optional parameter is omitted, query the current setting: +QGPSCFG: "nav_mode",<mode> OK If the optional parameter is specified, configure the navigation mode: OK 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 automatically.

Parameter

<mode>	Integer type. Navigation mode. 0 Low speed mode. Low speed movement will have better position accuracy. It is recommended to use this mode when speed is less than 0.1 m/s. 1 Normal mode. For general purpose.
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.2. AT+QGPSDEL Delete Assistance Data

This command deletes assistance data so as 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, cold start of GNSS can be enforced through **AT+QGPS**. Hot/warm start can also be performed if the corresponding condition is 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 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

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

2.3.3. AT+QGPS Turn On GNSS

This command turns on GNSS feature. When **<fix_count>** is 0, GNSS continuously gets a position fix, and it can be turned off through **AT+QGPSEND**. When **<fix_count>** is not 0, the GNSS is turned off automatically when **<fix_count>** reaches the specified value.

AT+QGPS Turn on GNSS

Test Command AT+QGPS=?	Response +QGPS: (range of supported <GNSS_mode> s),(range of
----------------------------------	---

	supported <fix_max_time>s),(range of supported <fix_max_dist>s),(range of supported <fix_count>s),(list 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_max_time>[,<fix_max_dist>[,<fix_count>[,<fix_rate>]]]]	Response OK 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

<GNSS_state>	Integer type. GNSS state. 0 GNSS OFF 1 GNSS ON
<GNSS_mode>	Integer type. GNSS working mode. 1 Stand-alone 2 MS-based 3 MS-assisted 4 Low Accuracy MSA (cell ID)
<fix_max_time>	Integer type. The maximum positioning time, which indicates 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. The default value will be used if the parameter is omitted. Range: 1–255. Default value: 30. Unit: second.
<fix_max_dist>	Integer type. Accuracy threshold of positioning. Range: 1–1000. Default value: 50. Unit: meter.
<fix_count>	Integer type. Number of attempts for positioning. Range: 0–1000. Default value: 0. 0 indicates continuous positioning. Non-zero values indicate the actual number of attempts for positioning.
<fix_rate>	Float or integer type. The interval time between the first and second time positioning. Unit: second. If <fix_rate> < 1, it is a float type. Available options: 0.1 0.2

0.5

If **<fix_rate>** ≥ 1 , it is an integer type.

Range: 1–65535. Default value: 1.

<errcode> Error code of an operation. See **Chapter 4** for details.

2.3.4. AT+QGPSEND Turn Off GNSS

This command turns off GNSS feature. When GNSS is turned on and **<fix_count>** is 0, GNSS fixes position continuously. In such a case, GNSS can be turned off compulsorily through **AT+QGPSEND**. When **<fix_count>** is not 0, GNSS will be turned off automatically when **<fix_count>** reaches the value specified, and thus the command can be ignored in such a case.

AT+QGPSEND Turn off GNSS

Test Command AT+QGPSEND=?	Response OK
Execution Command AT+QGPSEND	Response OK If there is any error related to ME functionality: +CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	/

Parameter

<errcode> Error code of an operation. See **Chapter 4** for details.

2.3.5. AT+QGPSLOC Acquire Positioning Information

This command acquires positioning information. Before the command is executed, GNSS must be turned on through **AT+QGPS**. If it fails in position fix, **+CME ERROR: <errcode>** will be returned to indicate the corresponding situation.

AT+QGPSLOC Acquire Positioning Information

Test Command AT+QGPSLOC=?	Response +QGPSLOC: (list of supported <mode>s)[,(range of supported <time>s)] OK
Read Command AT+QGPSLOC?	Response Return the positioning information in <latitude> , <longitude> format of ddmm.mmmmN/S,dddmm.mmmmE/W:

	<p>+QGPSLOC: <UTC>,<latitude>,<longitude>,<HDOP>,<altitude>,<fix>,<COG>,<spkm>,<spkn>,<date>,<nsat></p> <p>OK</p>
<p>Write Command AT+QGPSLOC=<mode>[,<time>]</p>	<p>Response</p> <p>+QGPSLOC: <UTC>,<latitude>,<longitude>,<HDOP>,<altitude>,<fix>,<COG>,<spkm>,<spkn>,<date>,<nsat></p> <p>OK</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 configurations are not saved.

Parameter

<mode>	<p>Integer type. Latitude and longitude display format.</p> <p>0 <latitude>,<longitude> format: ddmm.mmmmmN/S,dddmm.mmmmmE/W</p> <p>1 <latitude>,<longitude> format: ddmm.mmmmmm,N/S,dddmm.mmmmmm,E/W</p> <p>2 <latitude>,<longitude> format: (-)dd.ddddd,(-)ddd.ddddd</p>
<time>	<p>Integer type. The time to report the queried results periodically. Range: 0–3600. Default value: 0 (0 indicates that this feature is disabled). Unit: second.</p>
<UTC>	<p>String type. UTC time.</p> <p>Format: hhmmss.s (Quoted from GPGLGA sentence).</p>
<latitude>	<p>Float type. Latitude.</p> <p>If <mode> is 0:</p> <p>Format: ddmm.mmmmmN/S (Quoted from GPGLGA sentence)</p> <p>dd 00–89 (Unit: degree)</p> <p>mm.mmmmm 00.0000–59.9999 (Unit: minute)</p> <p>N/S North latitude/South latitude</p> <p>If <mode> is 1:</p> <p>Format: ddmm.mmmmmm,N/S (Quoted from GPGLGA sentence)</p> <p>dd 00–89 (Unit: degree)</p> <p>mm.mmmmmm 00.000000–59.999999 (Unit: minute)</p> <p>N/S North latitude/South latitude</p> <p>If <mode> is 2:</p> <p>Format: (-)dd.ddddd (Quoted from GPGLGA sentence)</p> <p>dd.ddddd -89.99999 to 89.99999 (Unit: degree)</p> <p>- South latitude</p>

<longitude>	<p>Float type. Longitude.</p> <p>If <mode> is 0:</p> <p>Format: dddmm.mmmmE/W (Quoted from GPGGA sentence)</p> <p>ddd 000–179 (Unit: degree)</p> <p>mm.mmmm 00.0000–59.9999 (Unit: minute)</p> <p>E/W East longitude/West longitude</p> <p>If <mode> is 1:</p> <p>Format: dddmm.mmmmmm,E/W (Quoted from GPGGA sentence)</p> <p>ddd 000–179 (Unit: degree)</p> <p>mm.mmmmmm 00.000000–59.999999 (Unit: minute)</p> <p>E/W East longitude/West longitude</p> <p>If <mode> is 2:</p> <p>Format: (-)ddd.ddddd (Quoted from GPGGA sentence)</p> <p>ddd.ddddd -179.99999 to 179.99999 (Unit: degree)</p> <p>- West longitude</p>
<HDOP>	Float type. Horizontal precision. Range: 0.5–99.9. (Quoted from GPGGA sentence)
<altitude>	Float type. The altitude of the antenna away from the sea level, accurate to one decimal place. Unit: meter. (Quoted from GPGGA sentence)
<fix>	Integer type. GNSS positioning mode (Quoted from GNGSA/GPGSA sentence).
	2 2D positioning
	3 3D positioning
<COG>	String type. Course Over Ground based on true north.
	Format: ddd.mm. (Quoted from GPVTG sentence)
	ddd 000–359 (Unit: degree)
	mm 00–59 (Unit: minute)
<spkm>	Float type. Speed over ground.
	Format: xxxx.x. unit: Km/h. Accurate to one decimal place. (Quoted from GPVTG sentence)
<spkn>	Float type. Speed over ground.
	Format: xxxx.x. Unit: knots. Accurate to one decimal place. (Quoted from GPVTG sentence)
<date>	String type. UTC time when fixing position.
	Format: ddmmyy. (Quoted from GPRMC sentence)
<nsat>	Number of satellites, from 00 (the first 0 should be retained) to 12 (Quoted from GPGGA sentence). Use AT+QGPSCFG="sate_mode" to display the number of GPS satellites in use or the number of all GNSS satellites in use. Default value: the number of GPS satellites in use.
<errcode>	Error code of an operation. See Chapter 4 for details.

NOTE

The response of **AT+QGPSLOC?** is the same as that of **AT+QGPSLOC=0**.

2.3.6. AT+QGPSGNMEA Acquire NMEA Sentences

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

The sentence output can be disabled through **AT+QGPPCFG="gpsnmeatype",0**, **AT+QGPPCFG="glonassnmeatype",0**, **AT+QGPPCFG="galileonmeatype",0** and **AT+QGPPCFG="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. And the sentences acquired through the command will be the last ones that have ever been acquired.

AT+QGPSGNMEA Acquire NMEA Sentences

Test Command
AT+QGPSGNMEA=?

Response
+QGPSGNMEA: (list of supported **<NMEA_sentence>**s)

OK

Write Command
Acquire GGA sentences
AT+QGPSGNMEA="GGA"

Response
+QGPSGNMEA: **<GGA_sentence>**

OK

If there is any error related to ME functionality:
+CME ERROR: **<errcode>**

Write Command
Acquire RMC sentences
AT+QGPSGNMEA="RMC"

Response
+QGPSGNMEA: **<RMC_sentence>**

OK

If there is any error related to ME functionality:
+CME ERROR: **<errcode>**

Write Command
Acquire GSV sentences
AT+QGPSGNMEA="GSV"

Response
+QGPSGNMEA: **<GSV_sentence>**

OK

If there is any error related to ME functionality:
+CME ERROR: **<errcode>**

Write Command
Acquire GSA sentences
AT+QGPSGNMEA="GSA"

Response
+QGPSGNMEA: **<GSA_sentence>**

OK

	<p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
<p>Write Command Acquire VTG sentences AT+QGPSGNMEA="VTG"</p>	<p>Response +QGPSGNMEA: <VTG_sentence></p> <p>OK</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
<p>Write Command Acquire GNS sentences AT+QGPSGNMEA="GNS"</p>	<p>Response +QGPSGNMEA: <GNS_sentence></p> <p>OK</p> <p>If there is any error related to ME functionality: +CME ERROR: <errcode></p>
Maximum Response Time	300 ms
Characteristics	/

Parameter

<GGA_sentence>	String type. GGA sentences.
<RMC_sentence>	String type. RMC sentences.
<GSV_sentence>	String type. GSV sentences.
<GSA_sentence>	String type. GSA sentences.
<VTG_sentence>	String type. VTG sentences.
<GNS_sentence>	String type. GNS sentences.
<NMEA_sentence>	String type. The supported NMEA standard sentences. "GGA" "RMC" "GSV" "GSA" "VTG" "GNS"
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.7. AT+QGPSXTRA Enable/Disable gpsOneXTRA Assistance Feature

This command enables/disables gpsOneXTRA Assistance feature, and the feature can be activated after the module is rebooted.

AT+QGPSXTRA Enable/Disable gpsOneXTRA Assistance Feature	
Test Command AT+QGPSXTRA=?	Response +QGPSXTRA: (list of supported <XTRA_enable>s) OK
Read Command AT+QGPSXTRA?	Response +QGPSXTRA: <XTRA_enable> OK
Write Command AT+QGPSXTRA=<XTRA_enable>	Response OK If there is any error 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 automatically.

Parameter

<XTRA_enable>	Integer type. Enable/disable gpsOneXTRA Assistance feature. 0 Disable 1 Enable
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.8. AT+QGPSXTRATIME Inject gpsOneXTRA Time

This command injects gpsOneXTRA time to GNSS engine. Before using it, you must enable gpsOneXTRA Assistance feature through **AT+QGPSXTRA=1**. After gpsOneXTRA Assistance feature is enabled, the GNSS engine will ask for gpsOneXTRA time and data file. Before gpsOneXTRA data file is injected, use this command to inject gpsOneXTRA time first.

AT+QGPSXTRATIME Inject gpsOneXTRA Time	
Test Command AT+QGPSXTRATIME=?	Response +QGPSXTRATIME: (list of supported <op>s),<XTRA_time>,(list of supported <UTC>s),(list of supported <force>s),<uncrtn>

	OK
Write Command Inject gpsOneXTRA time AT+QGPSXTRATIME=<op>,<XTRA_time>[,<UTC>[,<force>,<uncrtn>]]	Response OK 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

<op>	Integer type. Operation type. 0 Inject gpsOneXTRA time
<XTRA_time>	String type. Current UTC/GPS time. Format: YYYY/MM/DD,hh:mm:ss. For example: "2016/01/03,15:34:50".
<UTC>	Integer type. The type of time. 0 GPS time 1 UTC time
<force>	Integer type. Allow or force the GPS subsystem to accept the time injected. 0 Allow acceptance 1 Force acceptance
<uncrtn>	Integer type. Uncertainty of time. Default value: 3500. Unit: millisecond. It indicates the time difference between sending a request to the SNTP server and receiving a response from the SNTP server. If the set time is less than 3.5 s, it will be counted as 3.5 s.
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.9. AT+QGPSXTRADATA Inject gpsOneXTRA Data File

This command injects gpsOneXTRA assistance data file to GNSS engine. Before using it, you must enable gpsOneXTRA Assistance feature, store valid gpsOneXTRA data file into the UFS file of the module and inject gpsOneXTRA time to GNSS engine. After this command is executed successfully, gpsOneXTRA data file can be deleted from the UFS file, and you can query whether gpsOneXTRA data file is injected successfully through **AT+QGPSXTRADATA?**.

AT+QGPSXTRADATA Inject gpsOneXTRA Data File

Test Command AT+QGPSXTRADATA=?	Response +QGPSXTRADATA: <XTRA_data_filename> OK
--	---

<p>Read Command</p> <p>Query the status of gpsOneXTRA data file</p> <p>AT+QGPSXTRADATA?</p>	<p>Response</p> <p>+QGPSXTRADATA: <XTRA_data_durtime>,<injected_datatime></p> <p>OK</p> <p>If there is any error related to ME functionality:</p> <p>+CME ERROR: <errcode></p>
<p>Write Command</p> <p>Inject gpsOneXTRA data file</p> <p>AT+QGPSXTRADATA=<XTRA_data_filename></p>	<p>Response</p> <p>OK</p> <p>If there is any error related to ME functionality:</p> <p>+CME ERROR: <errcode></p>
<p>Maximum Response Time</p>	<p>300 ms</p>
<p>Characteristics</p>	<p>The command takes effect immediately.</p> <p>The configuration is not saved.</p>

Parameter

<XTRA_data_filename>	String type. Filename of gpsOneXTRA data file. For example, "UFS:xtra2.bin" or "USF:xtra3grc.bin".
<XTRA_data_durtime>	Integer type. Valid time of injected gpsOneXTRA data file. Unit: min. 0 No gpsOneXTRA data file or the file is overdue 1–10080 Valid time of injected gpsOneXTRA data file
<injected_datatime>	Starting time of valid time of gpsOneXTRA data file. Format: YYYY/MM/DD,hh:mm:ss. For example, 2016/01/03,15:34:50.
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.10. AT+QCFGEXT Extended Configuration Settings

This command queries and configures various extended settings of the module.

AT+QCFGEXT Extended Configuration Settings

<p>Test Command</p> <p>AT+QCFGEXT=?</p>	<p>Response</p> <p>+QCFGEXT: "addgeo",<geoid>,<mode>,<shape>,<lat1>,<lon1>,<lat2>[,<lon2>[,<lat3>,<lon3>[,<lat4>,<lon4>]]]</p> <p>+QCFGEXT: "deletegeo",<geoid></p> <p>+QCFGEXT: "querygeo",<geoid></p> <p>OK</p>
<p>Maximum Response Time</p>	<p>300 ms</p>

2.3.10.1. AT+QCFGEXT="addgeo" Add a Geo-fence

This command adds a geo-fence.

AT+QCFGEXT="addgeo" Add a Geo-fence

Write Command

AT+QCFGEXT="addgeo",[<geoid>,<mode>,<shape>,<lat1>,<lon1>,<lat2>,<lon2>,<lat3>,<lon3>,<lat4>,<lon4>]]]]

Response

If all parameters after "addgeo" are omitted, query the current setting of all geo-fences that have been added:

+QCFGEXT: "addgeo",<geoid>,<mode>,<shape>,<lat1>,<lon1>,<lat2>,<lon2>,<lat3>,<lon3>,<lat4>,<lon4>]]]]

...

+QCFGEXT: "addgeo",<geoid>,<mode>,<shape>,<lat1>,<lon1>,<lat2>,<lon2>,<lat3>,<lon3>,<lat4>,<lon4>]]]]

OK

If the optional parameters after <geoid> are omitted, query the current setting of the specified geo-fence:

+QCFGEXT: "addgeo",<geoid>,<mode>,<shape>,<lat1>,<lon1>,<lat2>,<lon2>,<lat3>,<lon3>,<lat4>,<lon4>]]]]

OK

If <shape>=0, add a circular geo-fence and the parameters after <lat2> must be omitted:

OK

If <shape>=1, add a circular geo-fence and the parameters after <lon2> must be omitted:

OK

If <shape>=2, add a triangle geo-fence and the parameters after <lon3> must be omitted:

OK

If <shape>=3, add a quadrangle geo-fence and all parameters must be specified:

OK

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

<geoid>	Integer type. Geo-fence ID. Range: 0–9.
<mode>	Integer type. URC report mode. 0 Disable URC to be reported when entering or leaving the geo-fence 1 Enable URC to be reported when entering the geo-fence 2 Enable URC to be reported when leaving the geo-fence 3 Enable URC to be reported when entering or leaving the geo-fence The URC is shown as below: +QIND: "GEOFENCE",<ID>,<action>,<time>,<latitude>,<longitude>,<altitude>,<course>,<speed>,<PDOP>,<HDOP>,<VDOP> The parameters of the URC are described as below: <ID> The ID of geo-fence which is to be entered or left. <action> The current action of the module. 1 Entering the geo-fence 2 Leaving the geo-fence <time> The UTC time when entering or leaving the geo-fence. Format: YYYY/MM/DD hh:mm:ss <latitude> The latitude of the module when entering or leaving the geo-fence. Unit: degree. Format: ±dd.ddddd. Range: -90.000000 to 90.000000. <longitude> The longitude of the module when entering or leaving the geo-fence. Unit: degree. Format: ±ddd.ddddd. Range: -180.000000 to 180.000000. <altitude> Mean sea level altitude. Unit: meter. <course> Course over ground, relative to true north. Unit: degree. <speed> Speed over ground. Unit: m/s. <PDOP> Position dilution of precision. <HDOP> Horizontal dilution of precision. <VDOP> Vertical dilution of precision.
<shape>	Integer type. Geo-fence shape. 0 Circularity with center and radius 1 Circularity with center and one point on the circle 2 Triangle 3 Quadrangle
<lat1>	The latitude of a point which is defined as the center of the geo-fence circular region or the first point. Unit: degree. Format: ±dd.ddddd. Range: -90.000000 to 90.000000.
<lon1>	The longitude of a point which is defined as the center of the geo-fence circular region

	or the first point. Unit: degree. Format: ±ddd.ddddddd. Range: -180.000000 to 180.000000.
<lat2>	When <shape> is 0, this parameter is a radius. Unit: meter. Range: 0-6000000. When <shape> is other values, this parameter is a latitude. Unit: degree. Format: ±dd.ddddddd. Range: -90.000000 to 90.000000. If <shape> is 0, the parameters after <lat2> must be omitted.
<lon2>	The longitude of the second point. Unit: degree. Format: ±ddd.ddddddd. Range: -180.000000 to 180.000000. If <shape> is 1, the parameters after <lon2> must be omitted.
<lat3>	The latitude of the third point. Unit: degree. Format: ±dd.ddddddd. Range: -90.000000 to 90.000000.
<lon3>	The longitude of the third point. Unit: degree. Format: ±ddd.ddddddd. Range: -180.000000 to 180.000000. If <shape> is 2, the parameters after <lon3> must be omitted.
<lat4>	The latitude of the fourth point. Unit: degree. Format: ±dd.ddddddd. Range: -90.000000 to 90.000000.
<lon4>	The longitude of the fourth point. Unit: degree. Format: ±ddd.ddddddd. Range: -180.000000 to 180.000000.
<errcode>	Error code of operation. See Chapter 4 for details.

2.3.10.2. AT+QCFGEXT="deletegeo" Delete a Geo-fence

This command deletes a geo-fence.

AT+QCFGEXT="deletegeo" Delete a Geo-fence

Write Command	Response
AT+QCFGEXT="deletegeo",<geoID>	OK 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

<geoID>	Integer type. Geo-fence ID. Range: 0–10. 10 means deleting all geo-fences.
<errcode>	Error code of an operation. See Chapter 4 for details.

2.3.10.3. AT+QCFGEXT="querygeo" Query Position with Respect to Geo-fence

This command queries the position with respect to the geo-fence.

AT+QCFGEXT="querygeo" Query Position with Respect to Geo-fence

Write Command AT+QCFGEXT="querygeo",<geoID>	Response +QCFGEXT: "querygeo",<geoID>,<posWrtGeofence> OK If there is any error related to ME functionality: +CME ERROR: <errcode>
Maximum Response Time	300 ms
Characteristics	/

Parameter

<geoID>	Integer type. Geo-fence ID. Range: 0–9.
<posWrtGeofence>	Integer type. Position with respect to the geo-fence. 0 Position unknown 1 Position is inside the geo-fence 2 Position is outside the geo-fence
<errcode>	Error code of an operation. See Chapter 4 for details.

3 Examples

3.1. Turn On and Off GNSS

Default arguments are used in this example to turn on the GNSS. After the GNSS is turned on, NMEA sentences are output from "usbntmea" port by default, and GNSS can be turned off through **AT+QGSEND**.

```

AT+QGPS=1 //Turn on GNSS.
OK
//After the GNSS is turned on, NMEA sentences will be output from "usbntmea" port by default.
AT+QGPSLOC? //Obtain positioning information.
+QGPSLOC: 061951.0,3150.7223N,11711.9293E,0.7,62.2,2,0.00,0.0,0.0,110513,09

OK
AT+QGSEND //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" //Acquire GGA sentences.
+QGPSGNMEA: $GPGGA,103647.00,3150.721154,N,11711.925873,E,1,02,4.7,59.8,M,-2.0,M,,*77

OK
AT+QGPSCFG="nmeasrc",0 //Set <NMEA_src> to 0 to disable acquisition of NMEA
                           sentences through AT+QGPSGNMEA.
OK
AT+QGPSGNMEA="GGA" //Acquisition of NMEA sentences through
AT+QGPSGNMEA is disabled, therefore GGA sentences
    
```

cannot be acquired.

+CME ERROR: 507

3.3. Procedure of Using gpsOneXTRA Assistance Feature

The examples show the procedure of using gpsOneXTRA Assistance feature.

3.3.1. Download gpsOneXTRA Data File through AT+QHTTPGET

//If gpsOneXTRA Assistance is disabled, enable it through **AT+QGPSXTRA=1** and restart the module, then perform the following procedure.

AT+QGPSXTRA=1 //Enable gpsOneXTRA Assistance.

OK

//The gpsOneXTRA Assistance feature is activated after restarting the module.

//If gpsOneXTRA data file is valid (query through **AT+QGPSXTRADATA?**), turn on GNSS engine directly.

//If gpsOneXTRA data file is invalid (query through **AT+QGPSXTRADATA?**), perform the following procedure.

//You can download the gpsOneXTRA data file through **AT+QHTTPGET** from URL <http://xtrapath1.izatcloud.net/xtra3grc.bin> or other URLs listed in **Chapter 1.3.1**. For more details about this command, see *document [4]*.

AT+QHTTPURL=43

CONNECT

<input_data> //After **CONNECT** is reported, input the URLs listed in **Chapter 1.3.1**.

OK

AT+QHTTPURL?

+QHTTPURL: <http://xtrapath1.izatcloud.net/xtra3grc.bin>

OK

AT+QHTTPGET=60

OK

+QHTTPGET: 0,200,33298 //Requested successfully

AT+QHTTPREADFILE="UFS:xtra3grc.bin",80

OK

+QHTTPREADFILE: 0 //Downloaded successfully

AT+QGPSXTRATIME=0,"2017/11/08,15:30:30",1,1,5 //Inject gpsOneXTRA time to GNSS engine.

OK

AT+QGPSXTRADATA="UFS:xtra3grc.bin" //Injected gpsOneXTRA data file to GNSS engine successfully.

```

OK
AT+QFDEL="UFS:xtra3grc.bin" //Delete gpsOneXTRA data file from UFS file.
OK
AT+QGPS=1 //Turn on GNSS engine.
OK
    
```

3.3.2. Download gpsOneXTRA Data File through MCU or Browser

//If gpsOneXTRA Assistance is disabled, enable it through **AT+QGPSXTRA=1** and restart the module, then perform the following procedure.

```

AT+QGPSXTRA=1 //Enable gpsOneXTRA Assistance.
    
```

OK

//The gpsOneXTRA Assistance feature is activated after restarting the module.

//If gpsOneXTRA data file is valid (query through **AT+QGPSXTRADATA?**), turn on GNSS engine directly.

//If gpsOneXTRA data file is invalid (query through **AT+QGPSXTRADATA?**), perform the following procedure.

//You can download the gpsOneXTRA data file to PC (or MCU) from URL <http://xtrapath4.izatcloud.net/xtra3grc.bin> or other URLs listed in **Chapter 1.3.2**.

```

AT+QFUPL="UFS:xtra2.bin",60831,60 //Select the gpsOneXTRA data file and upload it to the module over QCOM. For more details about this command, see document [2]. For more details about QCOM tool usage and configuration, see document [3].
    
```

OK

```

AT+QGPSXTRATIME=0,"2017/11/08,15:30:30",1,1,5 //Inject gpsOneXTRA time to GNSS engine.
    
```

OK

```

AT+QGPSXTRADATA="UFS:xtra2.bin" //Injected gpsOneXTRA data file to GNSS engine.
    
```

OK

```

AT+QFDEL="UFS:xtra2.bin" //Delete gpsOneXTRA data file from UFS file.
    
```

OK

```

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

OK

NOTE

After XTRA data is injected, the relevant almanac is stored in the EFS partition of the module, and it cannot be lost after shutdown. Also, it can continue to be used within the subsequent validity period. Even if the XTRA file is deleted, it only needs to inject the reference time and turn on GNSS for normal use. Therefore, the download and injection of XTRA data only need to be performed for the first time until the validity period of the XTRA file expires. To prevent traffic consumption and additional operation steps, there is no need to download or inject XTRA data in each process.

3.4. Application of Geo-fence Feature

```

AT+QCFGEXT="addgeo",0,3,0,31.826,117.2168,100 //Add a circular geo-fence 0.
OK
AT+QCFGEXT="addgeo",0 //Query the setting of geo-fence 0.
+QCFGEXT: "addgeo",0,3,0,31.826000,117.216800,100.0

OK
AT+QCFGEXT="addgeo",7,1,3,31.833348,117.212909,31.826453,117.213248,31.828730,117.222093
,31.833502,117.22086232 //Add a quadrangle geo-fence 7.
OK
AT+QCFGEXT="addgeo",7 //Query the setting of geo-fence 7.
+QCFGEXT: "addgeo",7,1,3,31.833348,117.212909,31.826453,117.213248,31.828730,117.222093,3
1.833502,117.220862

OK
AT+QCFGEXT="deletegeo",7 //Delete geo-fence 7.
OK

AT+QGPS=1 //Turn on GNSS engine.
OK
AT+QCFGEXT="querygeo",0 //Query the position with respect to geo-fence 0.
+QCFGEXT: "querygeo",0,1 //The current position is inside the geo-fence 0.

OK

//When entering the geo-fence 0, this URC will be reported.
+QIND: "GEOFENCE",0,1,2017/08/25 08:35:53,31.825179,117.217127,34.0,0.2,13.8,1.1,0.7,0.8
//When leaving the geo-fence 0, this URC will be reported.
+QIND: "GEOFENCE",0,2,2017/08/25 08:36:07,31.826951,117.217071,38.0,359.0,13.4,0.9,0.6,0.6

```

3.5. Application of EPE NMEA Sentences Feature

```

AT+QGPSCFG="nmea_epe",1 //Enable output of EPE NMEA sentences
OK
AT+QGPS=1 //Turn on GNSS
OK

//Output NMEA sentence through USB NMEA port
$PQEPE,,V,,,,,*2B //Invalid data

```

//Waiting for successful GNSS positioning
\$PQEPE,032707.00,A,0.7,3.00,3.58,0.1,*18

//Valid data

AT+QGSEND
OK

//Turn off GNSS

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

<errcode>	Description
501	Invalid parameter
502	Operation not supported
503	GNSS subsystem busy
504	Session is ongoing
505	Session not active
506	Operation timeout
507	Feature not enabled
508	Time information error
509	gpsOneXTRA not enabled
510	gpsOneXTRA file open failed
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	Geo-fence ID does not exist
549	Unknown error

5 Appendix References

Table 3: Related Documents

Document Name
[1] Quectel_BG96_AT_Commands_Manual
[2] Quectel_BG96_FILE_AT_Commands_Manual
[3] Quectel_QCOM_User_Guide
[4] Quectel_BG96_HTTP(S)_AT_Commands_Manual

Table 4: Terms and Abbreviations

Abbreviation	Description
BeiDou	BeiDou Navigation Satellite System
DOP	Dilution of Precision
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
gpsOneXTRA	An Auxiliary Positioning Technology Provided by Qualcomm
GSA	GNSS DOP and Active Satellites
GSV	GNSS Satellites in View
HDOP	Horizontal Dilution of Precision

LPWA	Low-Power Wide-Area
MCU	Micro Control Unit
ME	Mobile Equipment
MS	Mobile Station
MSA	Mobile Station Assisted
NMEA	National Marine Electronics Association
NVRAM	Non-Volatile Random Access Memory
PC	Private Computer
PDOP	Position Dilution of Precision
RMC	Recommended Minimum Specific GNSS Data
SNR	Signal Noise Ratio
SNTP	Simple Network Time Protocol
SV	Satellite
TTF	Time to First Fix
UART	Universal Asynchronous Receiver & Transmitter
UFS	User File Storage
URC	Unsolicited Result Code
URL	Uniform Resource Locator
USB	Universal Serial Bus
UTC	Universal Time Code
VDOP	Vertical Dilution of Precision
VTG	Course over Ground and Ground Speed
