GL530MG @Track Air Interface Protocol

EGPRS/LTE Cat-M1/LTE Cat-NB2/GNSS Tracker

TRACGL530MGAN0402

V4.02

Driving Smarter IoT

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Document Title	GL530MG @Track Air Interface Protocol
Version	4.02
Date	May 16, 2024
Status	Release
Document Control ID	TRACGL530MGAN0402

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Contents

History

Version	Date	Author	Description of Change
1.00	April 16, 2021	Eden Zhang	Initial.
1.01	June 24, 2022	Eden Zhang	Added parameters <*GNSS Timeout*> and <*GNSS Mode*> of **AT+GTCFG**.
1.02	September 7, 2022	Eden Zhang	1. Supported the messages of HEX format; 2. Supported rechargeable batteries and added a description of the parameter <*Battery Type*> in **AT+GTCFG**.
1.03	September 16,2022	Eden Zhang	Added the new type 14 to <*Power On Type*> in **+RESP:GTPNA**.
1.04	September 25, 2022	Eden Zhang	1. Added **AT+GTNTS**; 2. Fixed <*Modem Software Version*> to <*Modem Firmware Version*> in **+RESP:GTVER**; 3. Enabled Bit7 <*UID*> in <+*HBD Mask*>; 4. Fixed the rang of parameter <*Allowed Oper*> in **AT+GTNTS** from 10 to 6; Added 0x20 as it's <*Configuration Mask*> of **AT+GTRTO;** Added 0x14 as it's <*Message Type*> of **+ACK** message which is HEX format.
2.00	October 14, 2022	Eden Zhang	Rollback the logic of GTNMD and modified the description.
2.01	October 21, 2022	Eden Zhang	1. Modified the description of the parameter <*Sensor Enable*> within **AT+GTNMD** command; 2. Deleted the note information about **AT+GTNMD, AT+GTTEM** and **AT+GTLSA** from <*Mode Selection*> section of **AT+GTCFG** command.
3.00	January 4, 2023	Eden Zhang	Deleted the description of <*Battery Type*> (rechargeable battery).
3.01	February 17, 2023	Keira Zhao	Added the parameter <*TLS Enable*> to **AT+GTSRI** command.

3.02	February 23, 2023	Eden Zhang	1. Modified the description of the parameter <*Sensor Enable*> within **AT+GTNMD** command; 2. Added the new type 23 to <*Power On Type*> in **+RESP:GTPNA** message.
3.03	July 28, 2023	Eden Zhang	1. Added **+RESP:GTIND** message
4.00	September 11, 2023	Eden Zhang	1. Added mode 2 to <*Mode selection*> of **AT+GTCFG** command. 2. Added mode 3 to <*Start Mode*> of **AT+GTCFG** command. 3. Added <*ERI Mask*> of **AT+GTCFG** command to enable/disable **+RESP:GTERI** message.
4.01	April 24, 2024	Eden Zhang	1. Modified the <*GNSS Mode*> of **AT+GTCFG** command as supported setting by GNSS chip. 2. Added parameter <*Blocked Oper*> in **AT+GTNTS** command.
4.02	May 16, 2024	Eden Zhang	1. Add the power on type information to <*Report Type*> of the **+RESP:GTFRI.**

1. Overview

1.1. Scope of This Document

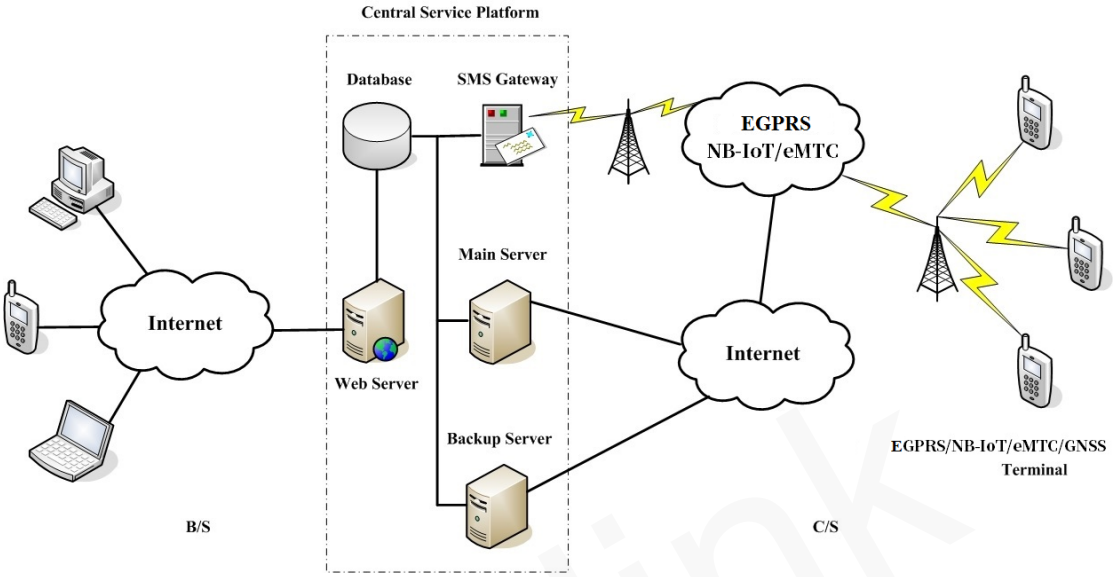
This @Track Air Interface Protocol (hereinafter referred to as @Track Protocol), defines all digital communication interfaces between the backend server and the terminal, based on printable ASCII characters over SMS, LTE or EGPRS. The backend server sends a command to the terminal and then the terminal confirms the receipt with an acknowledgment message. If configured, the terminal also sends report messages to the backend server.

The document describes how to build the backend server based on the @Track Air Interface Protocol.

1.2. Terms and Abbreviations

Abbreviation	Description
APN	Access Point Network
ASCII	American National Standard Code for Information Interchange
LTE	Long Term Evolution
EGPRS	Enhanced General Packet Radio Service
HDOP	Horizontal Dilution of Precision
ICCID	Integrated Circuit Card Identity
IP	Internet Protocol
SMS	Short Message Service
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
UTC	Coordinated Universal Time
GNSS	Global Navigation Satellite System

2. System Architecture



The backend server should be accessible to terminals and have the following abilities:

- ✧ The backend server should be able to access the internet and listen for the incoming connections from the terminal.
- ✧ The backend server should be able to support TCP or UDP connection with the terminal. It should be able to receive data from the terminal and send data back.
- ✧ The backend server should be able to receive and send SMS.

3. Message Description

3.1. Message Format

Messages in this document are composed of printable ASCII characters. The message format varies according to the message type as shown.

Message Format	Message Type
AT+GTXXX=<parameter1>,<parameter2>,…$	Command
+ACK:GTXXX,<parameter1>,<parameter2>,…$	Acknowledgement
+RESP:GTXXX,<parameter1>,<parameter2>,…$	Report

“XXX” is the function name and used to distinguish messages of the same type. The “<parameter1>,<parameter2>,…” carry the message’s parameters. The number of parameters varies according to messages. The ASCII character (,) is used to separate parameters. The parameter string may contain the following ASCII characters: ‘0’-‘9’, ‘a’-‘z’, and ‘A’-‘Z’. The message string ends with the character $.

To learn more, refer to Chapter 3.2 Command and Acknowledgement and Chapter 3.3 Report.

By sending commands to the terminal, the backend server can configure, query, and control the terminal when it performs specific actions. When the terminal receives commands over the air, it will reply with a corresponding acknowledgement message. According to the configuration, the terminal can send report messages to the backend server. Please see the following figure:

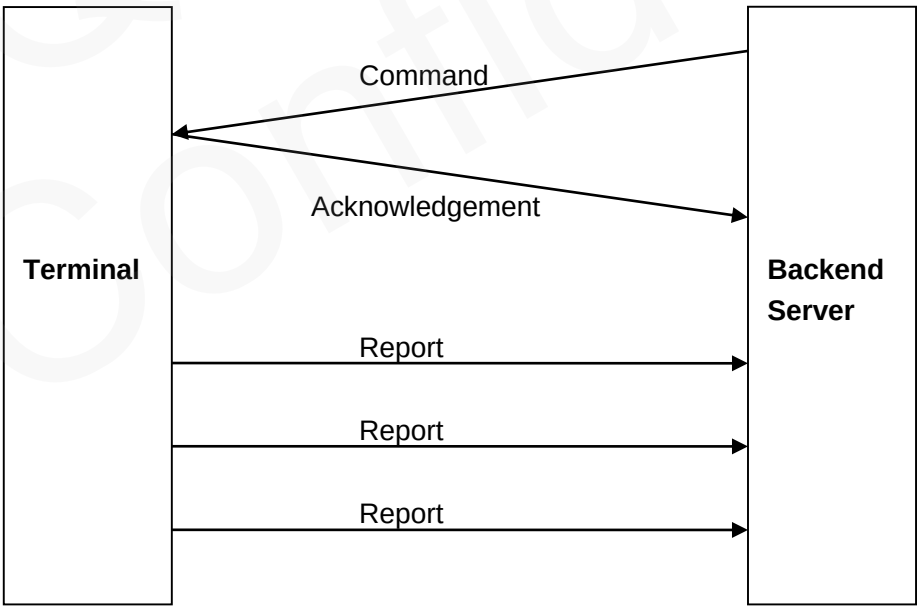


Figure 1: @Track Protocol Message Flow

3.2. Command and Acknowledgement

3.2.1. Server Connection

3.2.1.1. Bearer Setting Information

The command **AT+GTBSI** is used to configure the parameters for EGPRS/LTE parameters.

➢ **AT+GTBSI=**

Example: **AT+GTBSI=gl530,uniwap,ctnet@mynet.cn,vnet.mobi,,,,00,0,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	APN	<=64	(ASCII)	
3	APN User Name	<=30	(ASCII)	
4	APN Password	<=30	(ASCII)	
5	Backup APN	<=40	(ASCII)	
6	Backup APN User Name	<=30	(ASCII)	
7	Backup APN Password	<=30	(ASCII)	
8	APN Authentication Methods / Network Mode	2	00 - 33	00
9	LTE Mode	1	0 - 5	2
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Password*>: The valid characters for the password include ‘0’ - ‘9’, ‘a’ - ‘z’, and ‘A’ - ‘Z’. The default value is “gl530”.
✧ <*APN*>: Access point name (APN).
✧ <*APN User Name*>: The APN user name. If the parameter field is empty, the current value for this parameter will be cleared.
✧ <*APN Password*>: The APN Password. If the parameter field is empty, the current value for this parameter will be cleared.
✧ <*Backup APN*>: Backup access point name (APN). If <*APN*> does not work, <*Backup APN*> will be used.
✧ <*Backup APN User Name*>: The backup APN user name. If the parameter field is empty, the current value for this parameter will be cleared.
✧ <*Backup APN Password*>: The backup APN password. If the parameter field is empty, the current value for this parameter will be cleared.

✧ *<APN Authentication Methods / Network Mode>*: This field is in hex format. 4 high bits indicate APN authentication method and 4 low bits indicate network mode.

Mobile network mode of the device:

- 0: Auto (LTE First & EGPRS).
- 1: EGPRS only.
- 2: LTE only.
- 3: EGPRS First. (LTE & EGPRS).

Mobile APN Authentication method of the device:

- 0: No authentication
- 1: PAP authentication
- 2: CHAP authentication
- 3: PAP or CHAP authentication

✧ *<LTE Mode>*: The LTE network mode.

- 0: Cat-M1 & Cat-NB2 (Cat-M1 first).
- 1: Cat-NB2 & Cat-M1 (Cat-NB2 first).
- 2: Cat-M1.
- 3: Cat-NB2.
- 4: Cat-NB2 first (network search sequence: NB2, 2G, M1). It is valid when <Network Mode> is set to 0: Auto. (LTE &EGPRS).
- 5: Cat-NB2 only (network search sequence: NB2, 2G). It is valid when <Network Mode> is set to 0: Auto. (LTE &EGPRS).

Note: If *<Network Mode>* is 1, *<LTE Mode>* is invalid.

The network search sequence list is shown as below:

Network Mode		LTE Mode		Search Order		
Mode	Detail	Mode	Detail	1	2	3
0	Auto	0	Cat-M1&Cat-NB2(Cat-M1 First)	M1	2G	NB2
		1	Cat-M1&Cat-NB2(Cat-NB2 First)	2G	NB2	M1
		2	Cat-M1	M1	2G	N/A
		3	Cat-NB2	2G	NB2	N/A
		4	Cat-NB2 First	NB2	2G	M1
		5	Cat-NB2 Only	NB2	2G	N/A
1	EGPRS Only	N/A	N/A	2G	N/A	N/A
2	LTE Only	0	Cat-M1&Cat-NB2(Cat-M1 First)	M1	NB2	N/A
		1	Cat-M1&Cat-NB2(Cat-NB2 First)	NB2	M1	N/A
		2	Cat-M1	M1	N/A	N/A
		3	Cat-NB2	NB2	N/A	N/A
3	EGPRS First	0	Cat-M1&Cat-NB2(Cat-M1 First)	2G	M1	NB2
		1	Cat-M1&Cat-NB2(Cat-NB2 First)	2G	NB2	M1
		2	Cat-M1	2G	M1	N/A
		3	Cat-NB2	2G	NB2	N/A

- <*Serial Number*>: The serial number of the command. It will be included in the ACK message of the command.
- <*Tail Character*>: A character to indicate the end of the command. It must be '$'.

Note: If <*APN*>, <*APN User Name*>, <*APN Password*>, <*Backup APN*>, <*Backup APN User Name*>, or <*Backup APN Password*> is empty in **AT+GTBSI** or **AT+GTQSS** command, the device will clear the corresponding parameter. For other fields that are left empty, the device will keep using last stored value.

The acknowledgment message of the **AT+GTBSI** command:

- **+ACK:GTBSI,**

Example: **+ACK:GTBSI,710402,868487004352084,GL530MG,FFFF,20230815060303,09D8$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

- <*Protocol Version*>: The protocol version that the device conforms to. The first two characters indicate the device type. As shown in the example, "**71**" means GL530MG. The middle two characters indicate the major version number of the protocol and the last two characters indicate the minor version number of the protocol. Both version numbers are hex digits. For example, "**0A01**" means version 10.01.
- <*Unique ID*>: The IMEI of the device.
- <*Device Name*>: The specified name of the device.
- <*Serial Number*>: A serial number which is the same as the <*Serial Number*> in the corresponding command. It distinguishes which command the ACK message is for.
- <*Send Time*>: The local time when receiving the right **AT+GTXXX** command.
- <*Count Number*>: A self-increasing count number in each acknowledgment message and report message. It counts from 0000 and increases by 1 for each message. It rolls back after "FFFF".
- <*Tail Character*>: A character to indicate the end of the command. It must be '$'.

Note: Only after both the commands **AT+GTBSI** and **AT+GTSRI** are properly set can the ACK messages and other messages be sent to the backend server.

3.2.1.2. Backend Server Registration Information

The command **AT+GTSRI** is used to configure where and how to report all the messages, including the server information and the method of communication between the backend server and the device. When the device is configured correctly, it should be able to report data to the backend server.

➢ **AT+GTSRI=**

Example: **AT+GTSRI=gl530,3,0,1,180.169.235.202,7037,116.226.45.229,7012,+8613812341234,15,1,0,60,0,0,0001$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Report Mode	1	0 - 7	0
3	Manual Netreg	1	0 - 1	1
4	Buffer Mode	1	0 - 2	1
5	Main Server IP / Domain Name	<=60	(ASCII)	
6	Main Server Port	<=5	0 - 65535	0
7	Backup Server IP / Domain Name	<=60	(ASCII)	
8	Backup Server Port	<=5	0 - 65535	0
9	SMS Gateway	<=20	(Call Number)	
10	Heartbeat Interval	<=3	0 | 5 - 360(min)	0
11	SACK Enable	1	0 - 2	0
12	SMS ACK Enable	1	0 | 1	0
13	PSM Network Hold Time	<=5	0 - 86400 (sec)	0
14	Protocol Format	1	0 | 1	0
15	TLS Enable	1	0 | 1	0
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Report Mode*>: This parameter defines the method of communication between the backend server and the device. Supported report modes are as follows:

- 0: Stop mode.
- 1: TCP short-connection preferred mode. The connection is based on TCP protocol. The device connects to the backend server every time it needs to send data and will shut down the connection when it finishes sending data. If the device fails to establish TCP connection to the backend server (both Main Server and Backup Server), it will try to send data via SMS to the SMS gateway.
- 2: TCP short-connection forced mode. The connection is based on TCP protocol. The device connects to the backend server every time it needs to send data and will shut down the connection when the device finishes sending data. If the device fails to establish TCP connection to the backend server (both Main Server and Backup Server), it will store the data in the memory buffer if the buffer report function is enabled. Otherwise, the data is dropped.
- 3: TCP long-connection mode. The connection is based on TCP protocol. The device connects to the backend server and maintains the connection using the heartbeat data. The backend server should respond to the heartbeat data from the devices.
- 4: UDP mode. The device will send data to the backend server by UDP protocol. Receiving protocol commands via UDP is supported if the EGPRS/LTE network allows it.
- 5: Forced SMS mode. Only SMS is used for data transmission.
  Note: The message **+RESP:GTALM** is sent via TCP short connection when the report mode is forced SMS mode.
- 6: UDP with fixed local port mode. Like the UDP mode, the device will send data by using UDP protocol. The difference is the device will use a fixed local port rather than a random port to communicate with the server in this mode. Thus the backend server could use the identical port to communicate with all devices if the backend server and the devices are all in the same VPN network. The port number the device uses is the same as the port number of the main server.
- 7: Backup server supported TCP long-connection mode. The connection is based on TCP protocol. The device connects to the backend server and maintains the connection by using the heartbeat data. The backend server should respond to the heartbeat data from the devices. If the main server is lost, it will try to connect the backup server. And if the backup server is also lost, it will try to connect the main server again.

✧ <*Manual Netreg*>: Enable/disable manual network registration.

- 0: Disable manual network registration.
- 1: Enable manual network registration.

✧ <*Buffer Mode*>: The working mode of the buffer report function. If the buffer report function is enabled, the device will store all reports locally when in areas without

EGPRS/LTE network coverage. If the device goes back to areas with EGPRS/LTE network coverage, it will then send all the buffered reports through EGPRS/LTE. The device will delete all buffered reports after upgrading Modem/BB/MCU firmware locally or OTA.

- 0: Disable the buffer report function.
- 1: Low priority - Enable the buffer report function: In this mode, the device will send the buffered messages after sending real-time messages.
- 2: High priority - Enable the buffer report function: In this mode, the device will send all the buffered messages before sending real-time messages except **SOS**(ASCII)(HEX), **PFA**(ASCII)(HEX) and **UPD**(ASCII)(HEX).

✧ <*Main Server IP / Domain Name*>: The IP address or the domain name of the primary server.

✧ <*Main Server Port*>: The port of the primary server.

✧ <*Backup Server IP / Domain Name*>: The IP address or the domain name of the backup server.

✧ <*Backup Server Port*>: The port of the backup server.

✧ <*SMS Gateway*>: Maximum 20 characters (including the optional national code starting with "+"). Short code (for example, 10086) is also supported.

✧ <*Heartbeat Interval*>: The interval for sending heartbeat package message (**+ACK:GTHBD**) when report mode is TCP long-connection mode or UDP mode. If it is set to 0, no heartbeat message will be sent.

✧ <*SACK Enable*>: This parameter defines whether the backend server should respond to the device with SACK messages when receiving messages from the device.

- 0: The backend server does not reply with a SACK message after receiving a message from the device.
- 1: The backend server replies with a SACK message when receiving a message from the device.
- 2: The backend server replies with a SACK message when receiving a message from the device, but the device does not check the serial number of the SACK message.

Note: If the device receives **+SACK:GTHBD** from the backend server, the device must check the serial number of the SACK message **+SACK:GTHBD** regardless of the <*SACK Enable*> setting.

✧ <*SMS ACK Enable*>: It defines whether to reply with the ACK confirmation via SMS when the command is sent via SMS.

- 0: The device will send the ACK confirmation using the mode specified by <*Report Mode*>.
- 1: The device will send the ACK confirmation via SMS to the phone number which sends the command via SMS.

✧ <*PSM Network Hold Time*>: This parameter is used in power saving mode when the <*Report Mode*> is TCP long-connection mode, UDP mode or forced SMS mode. The network connection of the device will maintain <*PSM Network Hold Time*> after the message is sent and then the modem will be shut off.

- ✧ <*Protocol Format*>: This defines the format of the message sent from the device to the backend server. 0 means using the ASCII format, 1 means the HEX format.
- ✧ <*TLS Enable*>: Enable/disable TLS encrypted transmission on TLS 1.2 server. This parameter takes effect only when <*Report Mode*> is set to 1, 2, 3 and 7.
  - 0: Disable the TLS 1.2 server.
  - 1: Enable the TLS 1.2 server.
- ✧ <*Serial Number*>: The serial number of the command. It will be included in the ACK message of the command.
- ✧ <*Tail Character*>: A character to indicate the end of the command. And it must be '$'.

Note: If <*Report Mode*> is set to 4 (UDP mode), it is recommended to enable SACK or heartbeat mechanism (in this case, <*Heartbeat Interval*> should not be set to 0). Otherwise the backend server may not be able to send commands to the device.

The acknowledgment message of the **AT+GTSRI** command:

➢ **+ACK:GTSRI,**

Example: **+ACK:GTSRI,710402,868487004352084,GL530MG,0001,20230815060541,09DB$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

Note: Only after both the commands **AT+GTBSI** and **AT+GTSRI** are properly set can the ACK messages and other messages be sent to the backend server.

3.2.1.3. Quick Start Setting

The command **AT+GTQSS** is used to configure the parameters for EGPRS/LTE parameters and backend server information if the length of all the settings is less than 160 bytes. Otherwise, the two commands **AT+GTBSI** and **AT+GTSRI** are used to configure those settings.

➢ **AT+GTQSS=**

Example:

AT+GTQSS=gl530,test,,,3,0,1,116.226.44.17,7011,116.226.45.229,7012,+8613812341234,15,1,1,60,0002$				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	APN	<=64	(ASCII)	
3	APN User Name	<=30	(ASCII)	
4	APN Password	<=30	(ASCII)	
5	Report Mode	1	0 - 7	0
6	Protocol Format	1	0 | 1	0
7	Buffer Mode	1	0 - 2	1
8	Main Server IP / Domain Name	<=60	(ASCII)	
9	Main Server Port	<=5	0 - 65535	0
10	Backup Server IP/ Domain Name	<=60	(ASCII)	
11	Backup Server Port	<=5	0 - 65535	0
12	SMS Gateway	<=20	(Call Number)	
13	Heartbeat Interval	<=3	0 | 5 - 360(min)	0
14	SACK Enable	1	0 - 2	0
15	SMS ACK Enable	1	0 | 1	0
16	PSM Network Hold Time	<=5	0 - 86400(sec)	0
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

The acknowledgment message of the **AT+GTQSS** command:

- **+ACK:GTQSS,**

Example: +ACK:GTQSS,710402,868487004352084,GL530MG,FFFF,20230815062405,09E2$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	

Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.1.4. Network Operator Selection

The **AT+GTNTS** command is used to set network operator selection. The function will work only if the parameter <*Manual Netreg*> in **AT+GTSRI** command is set to 1.

➢ **AT+ GTNTS=**

Example: **AT+GTNTS=gl530,0,,,,,,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Enable	1	0 | 1	0
3	Reserved	0		
4	Reserved	0		
5	Allowed Oper1	5 | 6	00000 - 99999 | 000000 - 999999	
6	Allowed Oper2	5 | 6	00000 - 99999 | 000000 - 999999	
7	Allowed Oper3	5 | 6	00000 - 99999 | 000000 - 999999	
8	Reserved	0		
9	Blocked Oper1	5 | 6	00000 - 99999 | 000000 - 999999	
10	Blocked Oper2	5 | 6	00000 - 99999 | 000000 - 999999	
11	Blocked Oper3	5 | 6	00000 - 99999 | 000000 - 999999	
12	Reserved	0		
	Serial number	4	(HEX)	
	Tail character	1	$	$

✧ <*Enable*>: Enable or disable "NTS" based functionality.

- 0: Disable
- 1: Enable

✧ <*Allowed Oper1*>: Specify the PLMN(s) as telecom operators allowed list. The terminal supports setting up to 3 operators (i.e. PLMN). Each PLMN is represented by 5 or 6 digits, the first three digits represent MCC, and the remaining digits represent MNC. For example, "46000" means PLMN 46000.

In particular, the wildcard “FF” or “FFF” (Note that ‘F’ is a capital letter) can be used to match all MNCs in the country, that is, the format can be “MCCFF” or “MCCFFF” (where MCC is the specific mobile country code). For example, “460FF” covers the telecom operators all across China

✧ <*Blocked Oper1*>: Specify the PLMN(s) as telecom operators blocked list. The terminal supports setting up to 3 operators (i.e. PLMN). Each PLMN is represented by 5 or 6 digits, the first three digits represent MCC, and the remaining digits represent MNC. For example, “46000” means PLMN 46000.
In particular, the wildcard “FF” or “FFF” (Note that ‘F’ is a capital letter) can be used to match all MNCs in the country, that is, the format can be “MCCFF” or “MCCFFF” (where MCC is the specific mobile country code). For example, “460FF” covers the telecom operators all across China

Note: The function will be discounted when searching NBIot network, because it’ll take too long to search.

The acknowledgment message of **AT+ GTNTS** command:

➢ **+ACK:GTNTS**

Example: **+ACK:GTNTS,710402,868487004352084,GL530MG,004F,20230815071850,006E$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol version	6	(HEX)	
Unique ID	15	(IMEI)	
Device name	<=20	‘0’ - ‘9’, ‘a’ - ‘z’, ‘A’ - ‘Z’, ‘-’, ‘_’	
Serial number	4	(HEX)	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	(HEX)	
Tail character	1	$	$

3.2.2. Device Configuration

3.2.2.1. Global Configuration

The command **AT+GTCFG** is used to configure the global parameters.

➢ **AT+GTCFG=**

Example: **AT+GTCFG=gl530,,GL530MG,300,0823,006F,0,5,11111111111111,0,1200,0,1,24,1,1,5,0,0005,0,0,10,0,0,1,2,00000000,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530

2	New Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	
3	Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	GL530MG
4	GNSS Timeout	3	120 - 600(sec)	300
5	Event Mask	<=4	0000 - 0FFF	0823
6	Report Item Mask	<=4	0000 – 006F	002F
7	Mode Selection	1	0 - 2	0
8	Continuous Send Interval	<=4	0 | 1-1440(min)	5
9	Week Report Selection	14	'0' - '1'	10101010 101010
10	Start Mode	1	0 - 3	0
11	Specified Time of Day	4	HHMM	1200
12	Adjustment Enable	1	0 - 1	0
13	Initial Wakeup Interval	<=2	1 - 4|6|8|12|24	1
14	Final Wakeup Interval	<=2	1 - 4|6|8|12|24	24
15	Hold Days	<=2	1 - 99	1
16	Report Frequency	<=3	1 - 100	1
17	GNSS Fix Delay	2	5 - 60(sec)	5
18	AGPS Mode	1	0 | 1	0
19	GSM Report	4	0000 - FFFF	0000
20	Motor Vibration Time	1	0 - 9(*100ms)	0
21	Battery Type	1	0	0
22	Battery Low Percentage	<=2	0 - 30	10
23	Function Key Mode	1	0 - 2	0
24	GNSS Mode	<=2	0 | 1 | 4 | 5 | 10 | 11 | 12 | 14	0
25	SOS Report Mode	1	0 - 2	1
26	Location Request Mask	1	0 | 2	2
27	ERI Mask	<=8	(HEX)	0
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*New Password*>: It is used to change the current password.

- <*Device Name*>: The name of the device. It appears in each message.
- <*GNSS Timeout*>: The GNSS will use <GNSS *Timeout*> as the longest working time.
- <*Event Mask*>: A Hex value to configure which event report can be sent to the backend server. Each bit corresponds to a message. If the bit is set to 1, the corresponding message can be sent to the backend server. Otherwise, the corresponding message cannot be sent to the backend server. Here is the matching between each bit and message.

  Bit 0 (0001): **+RESP:GTPNA**
  Bit 1 (0002): **+RESP:GTPFA**
  Bit 2 (0004): Reserved
  Bit 3 (0008): Reserved
  Bit 4 (0010): Reserved
  Bit 5 (0020): **+RESP:GTBPL**
  Bit 6 (0040): Reserved
  Bit 7 (0080): Reserved
  Bit 8 (0100): Reserved
  Bit 9 (0200): Reserved
  Bit 10 (0400): Reserved
  Bit 11 (0800): **+RESP:GTPNL**
  Bit 12 (1000): Reserved
  Bit 13 (2000): Reserved
- <*Report Item Mask*>: The bitwise mask to configure the composition of the message, especially the composition of the GNSS information.

  Bit 0 (0001): <*Speed*>
  Bit 1 (0002): <*Azimuth*>
  Bit 2 (0004): <*Altitude*>
  Bit 3 (0008): Network data, including <*MCC*>, <*MNC*>, <*LAC*> and <*Cell ID*>
  Bit 4 (0010): Reserved
  Bit 5 (0020): <*Send Time*>, the time when the report message is generated.
  Bit 6 (0040): <*Device Name*>

  For each bit, set it to 1 to enable the corresponding component in the report and 0 to disable the corresponding component in the report. This mask is valid for all messages.
- <*Mode Selection*>: It configures the working mode of the device.
  - 0: Power saving mode (PSM). The device enters power saving status and reports the message **+RESP:GTFRI** periodically according to power saving mode parameters (such as <*Start Mode*>, <*Specified Time of Day*>, <*Adjustment Enable*>, <*Initial Wakeup Interval*>, <*Final Wakeup Interval*>, <*Hold Days*>, and <*Report Frequency*>). The connection between the device and the server will be maintained for a period of time according to the setting of <*PSM Network Hold Time*> in **AT+GTSRI**, and then the device will go into deep sleep.
  - 1: Continuous mode. The device is always active. This allows the control of

the device at any time and immediate receipt of ACK information from the device. The device performs GNSS fix and reports the message **+RESP:GTFRI** periodically according to <*Continuous Send Interval*>.

- 2: Automatic mode. In this mode, if <*Continuous Send interval*> is less than 10 minutes, the device works in continuous mode. Otherwise it will enter power saving mode, and wake up at an interval specified by <*Continuous Send Interval*>. In this case, <*Adjustment Enable*>, <*Initial Wakeup Interval*>, and <*Final Wakeup Interval*> will not work, and the device wakes up at a fixed interval.

✧ <*Continuous Send Interval*>: The send interval of the message **+RESP:GTFRI** when <*Mode Selection*> is set to 1 or 2. The value range is 1-1440 and the unit is minute. If the value is set to 0, the device will not report the message, and will not go to sleep.

✧ <*Week Report Selection*>: It configures the report mode for each day in one week. There are seven 2-character combinations in total. The seven combinations represent seven days of one week respectively. The first two characters represent Sunday, and last two characters represent Saturday. It only controls the report message **+RESP:GTFRI** with power saving mode.

The first character of each combination defines whether the device will report messages to the server on this day of week, and the second character defines whether the message should contain GNSS information when the first character is set to 1.

The 14-digit format can be configured as follows.

Example: 11000000101011. It means the messages on Sunday and Saturday will contain GNSS information, no message will be reported Monday, Tuesday and Wednesday, and messages for Thursday and Friday will not contain GNSS information.

✧ <*Start Mode*>*:* It configures how to determine the first wakeup time. The time of next wakeup will be calculated based on the <*Initial Wakeup Interval*>.

- 0: First wakeup at the time defined by <*Specified Time of Day*>.
- 1: To get the first wakeup time, add the current time and <*Initial Wakeup Interval*>.
- 2: The device will first wake up at the wake-up time point (calculated by <*Specified Time of Day*> and <*Initial Wakeup Interval*>) nearest to the current time. Wake-up time points are the time that the device should wake up at each day. For example, if <*Specified Time of Day*> is 0300 and <*Initial Wakeup Interval*> is 4 hours, then the wake-up time points are 03:00, 07:00, 11:00, 15:00, 19:00, 23:00. If the current time is 15:30, then the nearest wake-up time is 19:00.
- 3: Device will report at <*Specified Time of Day*> + random time between 0 – 60 minutes. *<Week Report Selection>, <Adjustment Enable>, <Initial Wakeup Interval>, <Final Wakeup Interval>, <Hold Days> and <Report Frequency>* would not work.

✧ <*Specified Time of Day*>: It configures the start time for the device to wake up (also referred to as first wakeup time herein). The value range of “HH” is “00”-”23”.The value range of “MM” is ‘00”-”59”.

- <*Adjustment Enable*>: Enable/disable the adjustment of the wakeup interval.
  - 0: Disable interval adjustment.
  - 1: Enable interval adjustment.
- <*Initial Wakeup Interval*>: A numeral to specify the initial hour interval for waking up the device. The value 24 means the device wakes up once per 24 hours. If <*Adjustment Enable*> is disabled, the device will always use this value as its waking up interval.
- <*Final Wakeup Interval*>: A numeral to specify the final hour interval for waking up the device. The value 24 means the device wakes up once per 24 hours. If the <*Adjustment Enable*> is enabled, after the specified time of <*Hold Days*>, the device's waking up interval switches from <*Initial Wakeup Interval*> to <*Final Wakeup Interval*>. And the device's report interval will remain at this value.
- <*Hold Days*>: The number of days to hold <*Initial Wakeup Interval*> before switching to <*Final Wakeup Interval*>.
- <*Report Frequency*>: This parameter value multiplied by <*Initial Wakeup Interval*> or <*Final Wakeup Interval*> equals the report frequency (Unit: hour) for the message **+RESP:GTFRI**.

  Note: If <*Report Frequency*> is set to 2 and <*Initial Wakeup Interval*> or <*Final Wakeup Interval*> is set to 2, the device will wake up every 2 hours and report the **+RESP:GTFRI** every 4 hours.
- <*GNSS Fix Delay*>: This value indicates the waiting time after GNSS fix succeeds. After GNSS fix succeeds, the device will wait for a period of time (specified by <*GNSS Fix Delay*>) and then get the result of GNSS fix because the position obtained immediately after the GNSS fix may not be accurate. (e.g. If <*GNSS Fix Delay*> is set to 7, the device will wait 7 seconds after GNSS fix and then get the fix result). The range of the parameter value is 5 - 60, and the default value is 5. Unit: second.
- <*AGPS Mode*>: A numeral to indicate whether to enable AGPS. AGPS helps to increase the chance of getting GNSS position successfully and reduce the time to get GNSS position.
  - 0: Disable the AGPS function.
  - 1: Enable the AGPS function.

  Note: The AGPS uses a URL to download the ephemeris data. Some SIM card operators do not support parsing URL to get the data. Contact with the SIM card provider to see whether URL parsing is supported or not. If not, disable this function. Otherwise, the power consumption of the device will increase. AGPS only increases the speed to get GNSS fix. It will not affect the function of GNSS.
- <*GSM Report*>: It controls how and when to report cell information.

  The high 2 bits, Bit 14-15, represent the report mode.
  - 0: Do not allow the cell information report.
  - 1: Allow the cell information report after failing to get the GNSS position if cell information is available.
  - 2: Report the message **+RESP:GTGSM** after each successful GNSS fix if cell information is available.
  - 3: Report the message **+RESP:GTGSM** regardless of whether getting the

GNSS position is successful or not if cell information is available.

The low 2 bits, bit0 and bit 2 are used to configure **+RESP:GTGSM** will be sent after which message.

- Bit 0 for **+RESP:GTRTL**
- Bit 2 for **+RESP:GTFRI**

✧ <*Motor Vibration Time*>: Enable/disable motor vibration function during device power on or power off. 0 means to disable the motor vibration. Units:100ms.

✧ <*Battery Type*>: A numeral to determine the battery type used in the device.

- 0: CR123A 9V 1400mAh battery

✧ <*Battery Low Percentage*>: If the battery percentage is lower than the value specified by this parameter, the device will report the message **+RESP:GTBPL**.

✧ <*Function Key Mode*>*:* Define the function of the key after the device is powered on.

- 0: The device will not perform any operation when the button is long pressed.
- 1: The device will power off when the button is long pressed.
- 2: When the function key is long pressed, SOS event will be triggered.

Note: <Function Key Mode> is to define the function of the key after the device is powered on. If not powered on, the key is used to power on the device first..

✧ <*GNSS Mode*>*:* The parameter that indicates the combinations of GNSS working mode.

- 0: GPS and GLONASS.
- 1: GPS only.
- 4: GPS and Beidou.
- 5: GPS and Galileo
- 10: GPS, GLONASS and Galileo.
- 11: GPS, GLONASS and Beidou.
- 12: GPS, Galileo and Beidou.
- 14: GPS, GLONASS, Galileo and Beidou.

Note: Only 5.1 version firmware of GNSS support 11 and 14.

✧ <*SOS Report Mode*>: A numeral to indicate the way of reporting GNSS location for SOS event.

- 0: Report only the last GNSS location immediately after SOS event is triggered.
- 1: Try to report the current GNSS location after SOS event is triggered.
- 2: Report the last GNSS location immediately after SOS event is triggered and then try to get the current GNSS location to report.

✧ <*Location Request Mask*>: Mask to control the location request

- Bit 0: Reserved.
- Bit 1: SMS location request.

Note: If the device is in power saving mode, the module is turned off also. So it cannot receive and process the “get position” message at this time. It will process the message after the device wakes up.

✧ <*ERI Mask*>: Bitwise mask to determine whether specified parameter fields are included in the **+RESP:GTERI** report message. For each bit, set it to 1 to enable the corresponding parameter field in the report. If this parameter value is not 0, **+RESP:GTERI** message will be sent instead of **+RESP:GTFRI**.

- Bit 0 – Bit 14: Reserved.
- Bit 15 for the <*RAT*> *and* <*Band*> field in the **+RESP:GTERI** report. RAT means Radio Access Technology.

The acknowledgment message of the **AT+GTCFG** command:

➢ **+ACK:GTCFG,**

Example: **+ACK:GTCFG,710402,868487004352084,GL530MG,008D,20230815100240,133A$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.2.2. Auto Unlock PIN

The command **AT+GTPIN** is used to unlock the USIM automatically.

➢ **AT+GTPIN=**

Example: **AT+GTPIN=gl530,0,,,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	‘0’ - ‘9’, ‘a’ - ‘z’, ‘A’ - ‘Z’	gl530
2	Auto Unlock PIN	1	0 | 1	0
3	PIN	4 - 8	‘0’ - ‘9’	
4	Reserved	0		
5	Reserved	0		
6	Reserved	0		
7	Reserved	0		
8	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Auto Unlock PIN*>: A numeral to indicate whether to unlock the USIM-PIN for the device.

- 0:Do not unlock USIM-PIN automatically.

- 1:Each time the device powers on, it will detect whether the USIM card is locked with a PIN. If it is locked, the device will auto-unlock the PIN.

✧ <*PIN*>: The PIN code which is used for unlocking PIN automatically. If it is empty, the PIN code saved in the device will be cleared.

The acknowledgment message of the **AT+GTPIN** command:

➢ **+ACK:GTPIN,**

Example: **+ACK:GTPIN,710402,868487004352084,GL530MG,FFFF,20230815000330,0A0E$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.2.3. Protocol Watchdog

The command **AT+GTDOG** is used to reboot the device in a time-based manner. This helps the device avoid working in abnormal status for a long time.

➢ **AT+GTDOG=**

Example: **AT+GTDOG=gl530,1,,1,0130,,1,,0,,,,0004$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Mode	1	0 - 1	1
3	Reserved	0		
4	Reboot Interval	<=2	1 - 30(day | hour)	7
5	Reboot Time	4	HHMM	0200
6	Reserved	0		
7	Report Before Reboot	1	0 | 1	1
8	Reserved	0		
9	Unit	1	0 | 1	0
10	Reserved	0		

11	Reserved	0		
12	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

- ✧ <*Mode*>: The working mode of this function.
  - 0: Disable this function.
  - 1: Reboot periodically according to the <*Reboot Interval*> and <*Reboot Time*> settings. It only works in continuous mode.
- ✧ <*Reboot Interval*>: The time interval (in days or hours) for rebooting the device.
- ✧ <*Reboot Time*>: At what time to perform the reboot operation when the <*Reboot Interval*> is reached. It only works when the unit is day.
- ✧ <*Report Before Reboot*>: Whether to report the **+RESP:GTDOG** message before reboot. 0 means "Do not report the **+RESP:GTDOG** message before reboot", and 1 means "Report the **+RESP:GTDOG** message before reboot". If this parameter is enabled, the device will obtain a real-time location and send it to the server.
- ✧ <*Unit*>: The unit of <*Reboot Interval*>.
  - 0: Day
  - 1: Hour

The acknowledgment message of the **AT+GTDOG** command:

➢ **+ACK:GTDOG,**

Example: **+ACK:GTDOG,710402,868487004352084,GL530MG,FFFF,20230815000319,0A2B$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.2.4. Time Adjustment

The command **AT+GTTMA** is used to adjust local time.

➢ **AT+GTTMA=**

Example: AT+GTTMA=gl530,+,7,0,1,20230815032345,,,,,FFFF$				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Sign	1	+/-	+
3	Hour Offset	<=2	0 - 12	0
4	Minute Offset	<=2	0 - 59	0
5	Daylight Saving	1	0 | 1	0
6	UTC Time	14	YYYYMMDDHHMMSS	
7	Reserved	0		
8	Reserved	0		
9	Reserved	0		
10	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

- ✧ <*Sign*>: It indicates the positive or negative offset of the local time from UTC time.
- ✧ <*Hour Offset*>: UTC offset in hours.
- ✧ <*Minute Offset*>: UTC offset in minutes.
- ✧ <*Daylight Saving*>: Enable/disable daylight saving time.
  - 0: Disable daylight saving time.
  - 1: Enable daylight saving time.
- ✧ <*UTC Time*>: UTC time used to adjust the local time.

The acknowledgment message of the **AT+GTTMA** command:

- ➢ **+ACK:GTTMA,**

Example: +ACK:GTTMA,710402,868487004352084,GL530MG,FFFF,20230815000049,0A35$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	

Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.2.5. Non-movement Detection

The command **AT+GTNMD** is used to configure the parameters for movement and non-movement detection.

➢ **AT+GTNMD=**

Example: **AT+GTNMD=gl530,0,0,3,3,2,1440,1,,,,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Sensor Enable	1	0 - 1	0
3	Mode	1	0 - F	0
4	Non-movement Duration	<=3	1 - 200(*15sec)	3
5	Movement Duration	<=2	3 - 50(*100ms)	3
6	Movement Threshold	1	2 - 9	2
7	Rest Send Interval	<=4	5 - 1440(min)	1440
8	Report Mode	1	1 - 3	2
9	Reserved	0		
10	Reserved	0		
11	Reserved	0		
12	Reserved	0		
13	Reserved	0		
14	Reserved	0		
15	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Sensor Enable*>*:* Enable/disable the sensor function where the device can detect movement or non-movement events.

✧ <*Mode*>: A hex numeral to determine how the function works. Each bit of the hex numeral indicates different actions the device can perform. If a bit is 1, the device will perform the corresponding action as described below.

Bit 0 (1): If movement is detected, the device will enter continuous mode. If non-movement is detected, the device will enter working mode as follows:

BIT0	**Mode Selection**	**Continuous Interval**	**Working Mode**
0	0	N/A	Power Saving Mode, Use <*Wakeup Interval*> to calculate next wakeup time
	1	N/A	Continuous Mode

	2	< 10	Continuous Mode
		>= 10	Power Saving Mode, Use <*Continuous Interval*> to calculate next wakeup time
1	0	N/A	Power Saving Mode, Use <*Wakeup Interval*> to calculate next wakeup time
	1		
	2	< 10	
		>= 10	Power Saving Mode, Use <*Continuous Interval*> to calculate next wakeup time

Bit 1 (2): Report the message **+RESP:GTNMR** to the backend server when non-movement is detected.

Bit 2 (4): Report the message **+RESP:GTNMR** to the backend server when movement is detected.

Bit 3 (8): Change the GNSS fix interval and the **+RESP:GTFRI** report interval to <*Rest Send Interval*> when non-movement is detected. If Bit 3 is enabled, Bit 0 will become invalid, and the device will stay in continuous mode.

- ✧ <*Non-movement Duration*>: A time parameter to determine whether the device enters non-movement status. If the motion sensor detects that the device stays in non-movement status for a period of time specified by <*Non-movement Duration*>, the device will be considered to be in non-movement status.
- ✧ <*Movement Duration*>: A time parameter to determine whether the device enters movement status. If the motion sensor detects that the device stays in movement for a period of time specified by <*Movement Duration*>, the device will be considered to be in movement status.
- ✧ <*Movement Threshold*>: The threshold for the motion sensor to determine whether the device is in movement state. The smaller the value is, the easier it will be for the device to be considered to enter the state of movement.
- ✧ <*Rest Send Interval*>: The send interval for the **+RESP:GTFRI** message when the device is in rest state and Bit 3 of <*Mode*> is set to 1.
- ✧ <*Report Mode*>*:* The parameter that configures how to report **+RESP:GTNMR** when motion sensor status changes.
  - 1: Report the last fixed position.
  - 2: Report the current position.
  - 3: Report the last fixed position immediately, and then turn on GNSS to get the current position and report position information again.

The acknowledgement message of the **AT+GTNMD** command:

➢ **+ACK:GTNMD,**

Example: **+ACK:GTNMD,710402,868487004352084,GL530MG,FFFF,20230815182210,0A3B$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	

Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.2.6. Settings for Preserving Device's Specified Logic States

The command **AT+GTPDS** is used to preserve specified logic state of the device. The function works according to the working mode, and saves the logic state according to the value of the <*Mask*>.

➢ **AT+GTPDS=**

Example: **AT+GTPDS=gl530,1,00000011,,,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Mode	1	0 - 2	1
3	Mask	<=8	(HEX)	00000019
4	Reserved	0		
5	Reserved	0		
6	Reserved	0		
7	Reserved	0		
8	Reserved	0		
9	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Mode*>: The working mode of the **AT+GTPDS** command.

- 0: Disable this function.
- 1: Preserve specified logic state of the device according to the value of the <*Mask*>.
- 2: Reset all the specified logical states listed in the <*Mask*> after receiving the command, and then preserve specified logic state of the device according to the value of the <*Mask*>.

✧ <*Mask*>: Bitwise mask to configure which device states will be preserved.
Each bit represents a state.

- Bit 0: States of GEO

- Bit 1: Reserved
- Bit 2: Reserved
- Bit 3: Information of last known position
- Bit 4: Current device state, including motion state
- Bit 15: Indication of the **+RESP:GTBPL** message having been reported

The acknowledgment message of the **AT+GTPDS** command:

➢ **+ACK:GTPDS,**

Example: **+ACK:GTPDS,710402,868487004352084,GL530MG,FFFF,20230815184619,0A51$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.3. Alarm Settings

3.2.3.1. Circular Geo-Fence Information

The command **AT+GTGEO** is used to configure the parameters of Circular Geo-Fence (Geo-Fence is a virtual perimeter on a geographic area using a location-based service. When the device enters or exits the area, a notification is generated. The notification contains information about the location of the device and can be sent to the backend server).

➢ **AT+GTGEO=**

Example: **AT+GTGEO=gl530,0,1,121.412248,31.187891,1000,000B$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	GEO ID	1|2	0 - 19	
3	Mode	1	0 - 3	0
4	Longitude	<=11	-180 - 180	

5	Latitude	<=10	-90 - 90	
6	Radius	<=7	50 - 6000000(m)	50
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

- ✧ <*GEO ID*>: A numeral to identify the Geo-fence.
- ✧ <*Mode*>: A numeral which indicates when to report the notification to the backend server:
  - 0: Disable the Geo-fence on the specified GEO ID.
  - 1: Reports when entering the Geo-fence.
  - 2: Reports when leaving the Geo-fence.
  - 3: Reports when entering or leaving the Geo-fence.
- ✧ <*Longitude*>: The longitude of a point which is defined as the centre of the circular Geo-fence region. The format is "(-)xxx.xxxxxx" and the value range is from "-180.000000" to "180.000000". The unit is degree. West longitude is represented as a negative value starting with the minus sign "-" and east longitude is represented as a positive value without "+".
- ✧ <*Latitude*>: The latitude of a point which is defined as the centre of the circular Geo-fence region. The format is "(-)xx.xxxxxx" and the value range is from "-90.000000" to "90.000000". The unit is degree. South latitude is represented as a negative value starting with the minus sign "-" and north latitude is represented as a positive value without "+".
- ✧ <*Radius*>: The radius of the circular Geo-fence region. The value range is (50-6000000) and the unit is meter.

The acknowledgment message of the **AT+GTGEO** command:

- ➢ **+ACK:GTGEO,**

Example: **+ACK:GTGEO,710402,868487004352084,GL530MG,0,000B,20230815000013,0A6A$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
GEO ID	<=2	0 - 19	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	

Tail Character	1	$	$

3.2.3.2. Temperature Alarm

The **AT+GTTEM** command is used to configure the temperature alarm function of the device. Based on the working mode, the device will report temperature alarm when its temperature is outside or inside a predefined range.

➢ **AT+GTTEM=**

Example: **AT+GTTEM=gl530,0,0,0,0,60,300,0,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Temperature Enable	1	0 | 1	0
3	Mode	1	0 - 4	0
4	Min. Temperature	<=3	-20 - +60(℃)	0
5	Max. Temperature	<=3	-20 - +60(℃)	0
6	Duration	<=4	10 - 3600(sec)	60
7	Send Interval	<=4	0 | 10 - 3600(sec)	300
8	Enable Continuous Mode	1	0 | 1	0
9	Reserved	0		
10	Reserved	0		
11	Reserved	0		
12	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Temperature Enable*>: Enable/Disable the temperature function. If disabled, the temperature value will be empty in the report.

✧ <*Mode*>: A numeral to indicate the working mode of the temperature alarm function.

- 0: Disable this function.
- 1: Report the alarm message **+RESP:GTTEM** when the current temperature is lower than the temperature specified by <*Min. Temperature*>.
- 2: Report the alarm message **+RESP:GTTEM** when the current temperature is higher than the temperature specified by <*Max. Temperature*>.
- 3: Report the alarm message **+RESP:GTTEM** when the current temperature is inside the temperature range.
- 4：Report the alarm message **+RESP:GTTEM** when the current temperature is outside the temperature range.

✧ <*Min. Temperature*>: The lower limit of the temperature range.

✧ <*Max. Temperature*>: The upper limit of the temperature range.

- <*Duration*>: If the temperature is in the specified temperature range and is maintained for a period of time specified by <*Duration*>, the temperature alarm will be triggered.
- <*Send Interval*>: If the temperature alarm is triggered, the temperature alarm message will be sent periodically according to <*Send Interval*>. If the <*Send Interval*> is set to 0, the temperature alarm message will be sent only once.
- <*Enable Continuous Mode*>: If it is enabled and the temperature alarm is triggered, the device enters continuous mode, otherwise enters power saving mode.
  Note: The device will report PNA-9 if it is enabled when triggering the alarm.

The acknowledgment message of the **AT+GTTEM** command:

➢ **+ACK:GTTEM,**

Example: **+ACK:GTTEM,710402,868487004352084,GL530MG,000E,20230815093254,000E$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.3.3. Light Sensor Alarm

The **AT+GTLSA** command is used to configure the light sensor alarm function. The two parameters <*Mode*> and <*Sensitivity Threshold*> are combined to determine whether the light sensor alarm event will be triggered.

➢ **AT+GTLSA=**

Example: **AT+GTLSA=gl530,0,5,3,0,0,2,0,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	‘0’ - ‘9’, ‘a’ - ‘z’, ‘A’ - ‘Z’	gl530
2	Mode	1	0 - 2	0
3	Sensitivity Threshold	1	1 - 9	5
4	Duration	<= 2	3 - 30(sec)	3
5	Send Interval	<= 3	0 | 10 - 300(sec)	0
6	End report	1	0 | 1	0
7	Report Mode	1	1 - 3	2
8	Enable Continuous Mode	0	0 | 1	0
9	Reserved	0		
10	Reserved	0		

11	Reserved	0		
12	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

- <*Mode*>: A numeral to indicate the working mode of light sensor alarm.
  - 0: Disable light sensor alarm.
  - 1: Enable light sensor alarm: The device will send the **+RESP:GTLSA** message when the detected light intensity is higher than <*Sensitivity Threshold*>.
  - 2: Enable light sensor alarm: The device will send the **+RESP:GTLSA** message when the light intensity detected is lower than <*Sensitivity Threshold*>.
- <*Sensitivity Threshold*>: The level of sensitivity to detect light intensity. The smaller the parameter is, the more sensitive the detection will be.
- <*Duration*>: If <*Mode*> is not 0 and the light intensity maintains a period of time specified by <*Duration*>, the light sensor alarm event will be triggered.
- <*Send interval*>: The send interval for the light sensor alarm report when the device enters into light sensor alarm status. 0 means “The light sensor alarm will only be reported once.
- <*End Report*>: The device reports the **+RESP:GTLSA** message when it exits the light sensor alarm status. 1 means “Enable this parameter”, and 0 means “Disable this parameter”.
- <*Report mode*>: A numeral to configure how to report **+RESP:GTLSA** when light sensor status changes.
  - 1: Report the last fixed position.
  - 2: Report the current position.
  - 3: Report the last fixed position immediately, and then turn on GNSS to get the current position and report position information again.
- <*Enable Continuous Mode*>: If it is enabled and the light alarm is triggered, the device enters continuous mode, otherwise enters power saving mode.
  Note: The device will report PNA-3 if it is enabled when triggering the alarm.

The acknowledgment message of the **AT+GTLSA** command:

- **+ACK:GTLSA,**

Example: **+ACK:GTLSA,710402,868487004352084,GL530MG,0010,20230815093254,11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	‘0’ - ‘9’, ‘a’ - ‘z’, ‘A’ - ‘Z’, ’-‘, ’_’	

Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.3.4. Light Tamper Alarm

The **AT+GTLTA** command is used to configure the light tamper alarm function.

➢ **AT+GTLTA=**

Example: **AT+GTLTA=gl530,0,,3,0,0,2,,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Mode	1	0 | 1	0
3	Reserved	0		
4	Duration	<= 2	3 - 30(sec)	3
5	Send Interval	<= 3	0 | 10 - 300 (sec)	0
6	End Report	1	0 | 1	0
7	Report Mode	1	1 - 3	2
8	Reserved	0		
9	Reserved	0		
10	Reserved	0		
11	Reserved	0		
12	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Mode*>: A numeral to indicate the working mode of light sensor tamper alarm
- 0: Disable light tamper alarm.
- 1: Enable light tamper alarm. The device will send the **+RESP:GTLTA** message when light sensor tamper detected.

✧ <*Duration*>: If <*Mode*> is not 0 and the light intensity maintains a period of time specified by <*Duration*>, the light sensor alarm event will be triggered.

✧ <*Send interval*>: The send interval for the light sensor alarm report when the device enters into light sensor alarm status. 0 means "The light sensor alarm will only be reported once.

✧ <*End Report*>: The device reports the **+RESP:GTLTA** message when it exits the light sensor alarm status. 1 means "Enable this parameter", and 0 means "Disable this parameter".

✧ <*Report mode*>: A numeral to configure how to report **+RESP:GTLTA** when light

sensor status changes.

- 1: Report the last fixed position.
- 2: Report the current position.
- 3: Report the last fixed position immediately, and then turn on GNSS to get the current position and report position information again.

The acknowledgment message of the **AT+GTLTA** command:

➢ **+ACK:GTLTA,**

Example: **+ACK:GTLTA,710402,868487004352084,GL530MG,0010,20230815093254,11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	

3.2.4. Other Settings

3.2.4.1. Real Time Operation

The command **AT+GTRTO** is used to retrieve information from the device or control the device when it executes certain actions.

➢ **AT+GTRTO=**

Example: **AT+GTRTO=gl530,8,,,,,,FFFF$** **AT+GTRTO=gl530,2,SRI,,,,,FFFF$** **AT+GTRTO=gl530,2,00000000000000000000804B,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Sub Command	<=2	1 - 1C	
3	AT Command | Configuration Mask | ATI Mask	3|16|8	"SRI" | (HEX) |(HEX)	
4	Reserved	0		

5	Reserved	0		
6	Reserved	0		
7	Sub Command Parameter	<=1	0 | 1	
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Sub Command*>: A hex value to indicate the sub command to be executed.

- 1: ***RTL***. Request the device to report its current position immediately via the message **+RESP:GTRTL**.
- 2: ***READ***. Get the current configuration of the device via the message **+RESP:GTALM**. The device will report the message in ASCII format if parameter <*Protocol Format*> in the **AT+GTSRI** command is set to 1.
- 3: ***REBOOT***. Reboot the device.
- 4: ***RESET***. Reset all parameters to factory settings and clear all buffered messages.
- 5: ***PWROFF***. Power off the device.
- 6: ***CID***. Get the ICCID of the SIM card being used by the device via the message **+RESP:GTCID**.
- 7: ***CSQ***. Get the current EGPRS signal level of the device via the message **+RESP:GTCSQ**.
- 8: ***VER***. Get the version information of the device via the message **+RESP:GTVER**.
- 9-A:(**Reserved**)
- B: ***TMZ***. Get the time zone settings via the message **+RESP:GTTMZ**.
- C: ***GIR*** Get cell information via message **+RESP:GTGSM**. It will report message with ASCII format if parameter <*Protocol Format*> in **AT+GTSRI** command is set to 1.
- D: ***AIF***. Get APN, ICCID, RSSI, cell ID, and IP via **+RESP:GTAIF**.
- E: ***GSV***. Request the device to report the GNSS fix level. The corresponding information will be reported via the message **+RESP:GTGSV**.
- F: ***INF***. Request the device information report. The corresponding information will be reported via the message **+RESP:GTINF**.
- 10: ***CLM***. Reset the coulometer. This command needs to be sent after the user replaces the battery with a new one.
- 11-13: (**Reserved**)
- 14: ***DELBUF.*** Delete all of buffered messages.
- 1C: ***ATI***. Get the basic device information via the message **+RESP:GTATI**.

✧ <*AT Command / Configuration Mask / ATI Mask*>:

- <*AT Command*>: To get a single AT command's configuration when <*Sub Command*> is set to 2, follow the format in the following example. For example, to get the configuration of **AT+GTBSI**, please set **AT+GTRTO=gl530,2,BSI,,,,,FFFF$**, and get it via **+RESP:GTALM**.

- <*Configuration Mask*>: If <*Sub Command*> is set to 2, the configuration information of the specified <*Configuration Mask*> can be obtained via the message **+RESP:GTALM**. The Configuration Mask must be 24 bytes. If it is less than 24 bytes, '0' will be added in the high bytes of the Configuration Mask.

Configuration Mask Table:

Mask Bit	Item
Bit 36 - Bit 63	Reserved
Bit 35	FVR
Bit 21 - Bit 34	Reserved
Bit 20	NTS
Bit 19	Reserved
Bit 18	HRM
Bit 17	UPC
Bit 16	GLM
Bit 15	WLT
Bit 13 - Bit 14	Reserved
Bit 12	LTA
Bit 11	LSA
Bit 10	TEM
Bit 9	GEO
Bit 8	PDS
Bit 7	NMD
Bit 6	TMA
Bit 5	DOG
Bit 4	PIN
Bit 3	CFG
Bit 2	Reserved
Bit 1	SRI
Bit 0	BSI

- <*ATI Mask*>: If <*Sub Command*> is set to 1C, the basic device information will be reported via the message **+RESP:GTATI** according to the <*ATI Mask*> setting.

ATI Mask Table:

Mask Bit	Item
Bit 0	Firmware Version
Bit 1	MCU Firmware Version
Bit 2 – Bit 6	Reserved
Bit 7	Modem Firmware Version
Bit 8 - Bit 11	Reserved for Firmware Version
Bit 12	Hardware Version
Bit 13	Modem Hardware Version
Bit 14 - Bit 15	Reserved for Hardware Version
Bit 16 - Bit 17	Reserved
Bit 18	Sensor ID
Bit 19 - Bit 31	Reserved

If <*Sub Command*> is set to 2, and this parameter field is left empty, the device will report all the configurations via **+RESP:GTALM**.

✧ <*Sub Command Parameter*>: This parameter is used together with some of the sub commands.

For the sub command RESET (4):

- 0: Light. Reset all configuration parameters, except parameters configured by **AT+GTBSI**, **AT+GTSRI**, **AT+GTCFG**, **AT+GTPIN**, **AT+GTNTS** and **AT+GTTMA**.
- 1: Heavy. Reset all configuration parameters, except parameters configured by **AT+GTPIN**.

Note: This field is only valid when the <*AT Command / Configuration Mask*> field is empty.

The acknowledgment message of the **AT+GTRTO** command:

➢ **+ACK:GTRTO,**

Example: +ACK:GTRTO,710402,868487004352084,GL530MG,RTL,FFFF,20230815000006,0A78$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Sub Command	<=6	Sub Command String	
Serial Number	4	(HEX)	

Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.4.2. Allowed Number List Configuration

The command **AT+GTWLT** is used to configure a list of authorized phone numbers which are allowed to perform the SMS function.

➢ **AT+GTWLT=**

Example:
AT+GTWLT=gl530,1,1,2,13813888888,13913999999,,,,,000C$

SN	Parameter	Length (Byte)	Range/Format	Default
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Number Filter	1	0 | 1	0
3	Phone Number Start	<=2	1 - 10	
4	Phone Number End	<=2	1 - 10	
5	Phone Number List	<=20*10		
6	Reserved	0		
7	Reserved	0		
8	Reserved	0		
9	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Number Filter*>: A numeral that indicates whether to filter the original number according to <*Phone Number List*> before executing SMS commands.
- 0: SMS commands will be executed no matter whether the original number is in the <*Phone Number List*>.
- 1: SMS commands will be executed only when the original number is in the <*Phone Number List*>.

✧ <*Phone Number Start*>: A numeral that indicates the first index of the allowed numbers to be input. For example, if it is 1, the device will update the allow list from the 1st number. If it is empty, there should be no <*Phone Number List*>.

✧ <*Phone Number End*>: A numeral that indicates the last index of the allowed numbers to be input. For example, if it is 2, the device will update the allow list until the 2nd one. If it is empty, there should be no <*Phone Number List*>.

✧ <*Phone Number List*>: A phone number allow list that could include several phone numbers. Two adjacent phone numbers are separated with ",". The number of the phone numbers in the list is determined by the parameters <*Phone Number Start*> and <*Phone Number End*>. For example, if <*Phone Number Start*> is 1 and <*Phone Number End*> is 2, the <*Phone Number List*> should include 2 phone numbers and

the two numbers are separated by ",".

Note: If more phone numbers are needed, please adjust <*Phone Number Start*> and <*Phone Number End*> for appropriate settings. If some phone numbers in <*Phone Number List*> are empty, then the corresponding phone numbers will be deleted. For example, to delete the 4th, 5th and 6th numbers of the <*Phone Number List*>, please set <*Start Index*> to 4 and <*End Index*> to 6 and keep those three phone numbers of <*Phone Number List*> empty.

The acknowledgment message of the **AT+GTWLT** command:

- **+ACK:GTWLT,**

Example: **+ACK:GTWLT,710402,868487004352084,GL530MG,000C,20230815085505,0025$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

Note: Make sure the length of the command is not greater than 160 bytes when sent via SMS.

3.2.4.3. Settings for SMS with Google Maps Link

The command **AT+GTGLM** is used to configure whether to send an SMS with a Google Maps link for an SOS event.

- **AT+GTGLM=**

Example: **AT+GTGLM=gl530,1,1,1,+13687665324,,,,,FFFF$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Google Mode	1	0|1|2	0
3	Phone Number Start	1	1 - 3	
4	Phone Number End	1	1 - 3	
5	Direct Number List	<=20*3		
6	Reserved	0		
7	Reserved	0		
8	Reserved	0		
9	Reserved	0		

	Serial Number	4	(HEX)	
	Tail Character	1	$	$

- <*Google Mode*>: A numeral to indicate whether to send an SMS with a Google Maps link to the number in <*Direct Number List*> for SOS.
  - 0: Do not send an SMS with a Google Maps link to the number in the <*Direct Number List*> for SOS.
  - 1: Send an SMS with a Google Maps link including the device name to the number in the <*Direct Number List*> for SOS.
  - 2: Send an SMS with a Google Maps link not including the device name to the number in the <*Direct Number List*> for SOS.
- <*Phone Number Start*>: The parameter that indicates the first index of the direct numbers to be input. For example, if it is 1, the device will update the direct number list from the 1st number. If it is empty, there should be no <*Direct Number List*>.
- <*Phone Number End*>: The parameter that indicates the last index of the direct numbers to be input. For example, if it is 2, the device will update the direct number list until the 2nd one. If it is empty, there should be no <*Direct Number List*>.
- <*Direct Number List*>: A phone number allow list that could include several phone numbers. And two neighboring phone numbers are separated with ",". The number of the phone number in the list depends on the parameters <*Phone Number Start*> and <*Phone Number End*>. For example, if <*Phone Number Start*> is 1 and <*Phone Number End*> is 2, the <*Direct Number List*> should include 2 phone numbers and the two numbers are separated with ",".

  Note: If more phone numbers are needed, please adjust <*Phone Number Start*> and <*Phone Number End*> for appropriate settings. If some phone numbers in <*Phone Number List*> are empty, then the corresponding phone numbers will be deleted. For example, to delete the 4th, 5th and 6th numbers of the <*Phone Number List*>, please set <*Start Index*> to 4 and <*End Index*> to 6 and keep those three phone numbers of <*Phone Number List*> empty.

The acknowledgment message of the **AT+GTGLM** command:

- **+ACK:GTGLM,**

Example: **+ACK:GTGLM,710402,868487004352084,GL530MG,0073,20230815073241,00AB$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.4.4. Over-the-Air Configuration Update

The **AT+GTUPC** command is used to download configuration file over the air for the update of the local configuration.

➢ **AT+GTUPC=**

Example: **AT+GTUPC=gl530,0,30,0,1,0,http://www.queclink.com/configure.ini,1,,1,1234578,,,0001$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Max Download Retry	1	0 - 3	0
3	Download Timeout	<=2	5 - 30(min)	10
4	Download Protocol	1	0	0
5	Report Enable	1	0 | 1	0
6	Update Interval	<=4	0 - 8760(hour)	0
7	Download URL	<=100	URL	
8	Mode	1	0 | 1	0
9	Reserved	0		
10	Extended Status Report	1	0 | 1	0
11	Identifier Number	<=8	(HEX)	0
12	Reserved	0		
13	Reserved	0		
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Max Download Retry*>: It specifies the maximum number of retries to download the configuration file upon download failure.

✧ <*Download Timeout*>: It specifies the expiration timeout of a single download. If the download expires, it is considered to be failure.

✧ <*Download Protocol*>: The protocol used to download the file. Only HTTP is supported now. It is set to 0.

✧ <*Report Enable*>: A numeral which indicates whether to report the message **+RESP:GTUPC** or **+RESP:GTEUC** when the configuration is updated over the air.

- 0: Do not report the message **+RESP:GTUPC** or **+RESP:GTEUC**.
- 1: Report the message **+RESP:GTUPC** or **+RESP:GTEUC**.

✧ <*Update Interval*>: The time measured in hours for updating the configuration over the air.

✧ <*Download URL*>: It specifies the URL to download the configuration file. If the <*Download URL*> ends with "/" which means the URL is just a path without file name. The device will add <imei>.ini as the file name to complete the URL. If it is greater than 100 bytes in length, error will be returned, The URL is a complete path and must contain an http header, such as http://.

✧ <*Mode*>: A numeral which indicates the working mode of updating configuration over the air.

- 0: Disable this function.
- 1: Enable this function.

✧ <*Extended Status Report*>: The parameter that indicates the message to be reported for the configuration update status when <*Report Enable*> is set to 1. In HEX format, this parameter is ignored and only the **+RESP:GTUPC** message will be sent to the backend server.

- 0: Report the message **+RESP:GTUPC**.
- 1: Report the message **+RESP:GTEUC** to include more information.

✧ <*Identifier Number*>: A numeral to identify the update configuration request. This number will be included in the message **+RESP:GTEUC** to indicate the request it is related to.

Note:

1. Make sure there is only one command per line in the configuration file and there is a "\r\n" between two commands. Only the first command will be executed when there is more than one command in a line.
2. There should be no space before each command.
3. The configuration file should be a plain text file.

The acknowledgment message of the **AT+GTUPC** command:

➢ **+ACK:GTUPC,**

Example: **+ACK:GTUPC,710402,868487004352084,GL530MG,0001,20230815070426,44C5$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	

Tail Character	1	$	$

3.2.4.5. Configuration File Version

The command **AT+GTFVR** is used to record configuration information from the configuration file (generated by Manage Tool) to be downloaded by the device during update via **AT+GTUPC**.

➢ **AT+GTFVR=**

Example: **AT+GTFVR=gl530,TEST,0001,,,,,,,,,,0010$**				
SN	**Parameter**	**Length (Byte)**	**Range/Format**	**Default**
1	Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
2	Configuration Name	<=40	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
3	Configuration Version	4	0000 - 9999	
4	Reserved	0		
5	Reserved	0		
6	Reserved	0		
7	Reserved	0		
8	Digital Signature	32	'0'-'9', 'a'-'z', 'A'-'Z'	
9	Reserved	0		
10	Reserved	0		
11	Reserved	0		
12	Reserved	0		
13	Generation Time	14	YYYYMMDDHHMMSS	
	Serial Number	4	(HEX)	
	Tail Character	1	$	$

✧ <*Configuration Name*>: The name of the configuration file.
✧ <*Configuration Version*>: The version number of the configuration file. The first two characters indicate the major version number, and the last two characters indicate the minor version number.
✧ <*Digital Signature*>: The parameter is used to confirm the validity of subsequent commands.
✧ <*Generation Time*>: The time when the configuration file is generated.

Note: The **AT+GTFVR** command must be the first command in the configuration file.

The acknowledgment message of the **AT+GTFVR** command:

- **+ACK:GTFVR,**

Example: **+ACK:GTFVR,710402,868487004352084,GL530MG,20230815140822,0010,20230815060848,479E$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Generation Time	14	YYYYMMDDHHMMSS	
Serial Number	4	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.2.4.6. SMS Position Request

This command can only be sent via SMS, and will enable the device to send SMS message with a Google Maps hyperlink of the current position immediately. Please refer to the Chapter 3.3.5 for details of the position report.

Command Format	**get position**
Example	get position

get position: It is a command string to request the current position and not case sensitive.

3.3. Report

This section defines the formats of the report messages. Due to the max length limit of an SMS message (160 bytes), it is recommended to carefully set the <*Report Item Mask*> in **AT+GTCFG** to limit the length of the report which contains GNSS position information in the case of SMS transmission. Otherwise the report will be truncated to fit the length of an SMS message.

3.3.1. Position Related Report

3.3.1.1. General Position Report

- **+RESP:GTGEO**: The message for **AT+GTGEO**

- **+RESP:GTRTL**: The message for the sub command 1 of **AT+GTRTO**.
- **+RESP:GTPNL**: The first location message after the device powers on
- **+RESP:GTNMR:** Non-movement / movement is detected by motion sensor according to the setting of **AT+GTNMD**
- **+RESP:GTDOG:** The watchdog reboot message
- **+RESP:GTFRI:** Fixed time message
- **+RESP:GTSOS**: The message reported after long pressing the function key if the function key is enabled and the mode is SOS mode

Example:

+RESP:GTGEO,710402,868487004352084,GL530MG,6,1,1,4,0.6,0,57.9,121.307979,31.126582,20230815053631,0460,0000,1815,B93B,27,0,8958,90,1,0,26.4,20230815133631,017E$

+RESP:GTRTL,710402,868487004352084,GL530MG,0,0,1,4,0.6,0,57.9,121.307979,31.126582,20230815053631,0460,0000,1815,B93B,27,0,8958,90,1,0,26.4,20230815133631,017F$

+RESP:GTPNL,710402,868487004352084,GL530MG,0,0,1,2,1.9,187,69.9,121.307967,31.126508,20230815054148,0460,0000,1842,8C5F,24,0,8947,90,1,0,27.9,20230815134149,0185$

+RESP:GTNMR,710402,868487004352084,GL530MG,0,1,1,0,0.3,0,70.8,121.307989,31.126608,20230815052624,0460,0000,1815,B93B,27,0,8964,90,1,1,26.4,20230815133143,0177$

$+RESP:GTDOG,710402,868487004352084,GL530MG,0,0,1,2,2.4,187,58.9,121.307834,31.126557,20230815054116,0460,0000,1842,8C3C,21,0,8958,90,1,0,27.2,20230815134116,0182$

+RESP:GTFRI,710402,867292060147944,GL530MG,0,2,1,0,1.2,327,47.3,135.226108,34.433184,20240911070419,0460,0000,5B4E,00C27B1A,14,0,8851,48,0,,,20240912080457,0604$

+RESP:GTSOS,710402,868487004352084,GL530MG,0,0,1,1,1.7,0,28.7,121.308010,31.126872,20230815053206,0460,0000,1815,B93B,27,0,8964,90,1,0,26.4,20230815133207,0179$

Parameter	Length (Byte)	Range/Format	Default
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' -'Z', '-', '_'	
Report ID	<=2	0 - 19	
Report Type	1	0 - 1|8|9|1 - 23|	
Number	1	1	

GNSS Accuracy	<=2	0 - 50	
Speed	<=5	0.0 - 999.9(km/h)	
Azimuth	<=3	0 - 359	
Altitude	<=8	(-)XXXXX.X (m)	
Longitude	<=11	(-)XXX.XXXXXX	
Latitude	<=10	(-)XX.XXXXXX	
GNSS UTC Time	14	YYYYMMDDHHMMSS	
MCC	4	0XXX	
MNC	4	0XXX	
LAC	4	(HEX)	
Cell ID	4|8	(HEX)	
CSQ RSSI	<=2	0 - 31|99	
CSQ BER	<=2	0 - 7|99	
Battery Voltage	<=5	0 - 10000(mV)	
Battery Percentage	<=3	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	<=5	(-)XX.X	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

- <*Report ID*>: The ID of Geo-fence in **+RESP:GTGEO**. For the ID of other reports, it is 0.
- <*Report Type*>: The type of the messages **+RESP:GTDOG** and **+RESP:GTNMR**. For other reports, it is 0.
  - For **+RESP:GTGEO**
    0: Exit the corresponding Geo-fence
    1: Enter the corresponding Geo-fence
  - For **+RESP:GTDOG**
    0: Reboot periodically according to the <*Interval*> and <*Time*> settings.
    8: Reboot message for modem failure watchdog.
    9: Reboot message for firmware failure watchdog in continuous mode
    (For firmware failure in power saving mode, the device goes to sleep)
  - For **+RESP:GTNMR**
    0: The state of the device changes from motion to rest.
    1: The state of the device changes from rest to motion.
  - For **+RESP:GTFRI**
    <*Power On Type*> in the **+RESP:GTPNA** message would be filled here.
- <*Number*>: The number of points in one message. This parameter value is always 1.
- <*GNSS Accuracy*>: A numeral to indicate the GNSS fix status and HDOP of the GNSS position. 0 indicates the current GNSS fix fails and the last known GNSS position is used. A non-zero value (1 - 50) indicates the current GNSS fix is successful and

represents the HDOP of the current GNSS position.

- <*Speed*>: The speed read from GNSS.
- <*Azimuth*>: The azimuth from GNSS.
- <*Altitude*>: The height above sea level from GNSS.
- <*Longitude*>: The longitude of the current position. The unit is degree, and accuracy is 6 decimal places. West longitude is represented as a negative value starting with the minus sign "-" and east longitude is represented as a positive value without "+".
- <*Latitude*>: The latitude of the current position. The unit is degree, and accuracy is 6 decimal places. South latitude is represented as a negative value starting with the minus sign "-" and north latitude is represented as a positive value without "+".
- <*GNSS UTC Time*>: UTC time from GNSS.
- <*MCC*>: Mobile country code. It is 3-digit in length and ranges from 000-999. If Bit 3 of the field <*Report Item Mask*> in **AT+GTCFG** is set to 0, the length of this field is 0 in ASCII format messages.
- <*MNC*>: Mobile network code. It is 3-digit in length and ranges from 000-999. If Bit 3 of the field <*Report Item Mask*> in **AT+GTCFG** is set to 0, the length of this field is 0 in ASCII format messages.
- <*LAC*>: Location area code in hex format.
- <*Cell ID*>: Cell ID in hex format.
- <*CSQ RSSI*>: The network signal strength level.
- <*CSQ BER*>: The quality of the network signal. The range is 0-7, and 99 is for unknown network signal strength.
- <*Battery Percentage*>: Current volume of the battery in percentage.
- <*Mode Selection*>: Current mode of the device.
  - 0: Power saving mode (PSM)
  - 1: Continuous mode
  - 2: Automatic mode
- <*Movement Status*>: The movement status of the device. **Note:** The <*Sensor Enable*> in the **AT+GTNMD** command must be enabled, otherwise this field is empty.
  - 0: Rest
  - 1: Motion
- <*Temperature*>: The real time temperature value of the device. It must be noted that the temperature function must be enabled in the in the **AT+GTTEM** command, otherwise this field is empty.

➢ **+RESP:GTERI,**

If the Bit 15 of <*ERI Mask*> is set to 1 in the **AT+GTCFG** command, the device will send the message **+RESP:GTERI** to the backend server instead of **+RESP:GTFRI**.

Example: **+RESP:GTERI,710402,868487004352084,GL530MG,0,0,1,1,16.6,0,9.4,121.307910,31.127837,20230915050629,0460,0000,1815,B93B,26,0,8964,90,1,0,26.6,1,900,20230915130830,0174$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	

Unique ID		15	(IMEI)	
Device Name		<=20	'0' - '9', 'a' - 'z', 'A' -'Z', '-', '_'	
ERI Mask		8	(HEX)	
Report ID		<=2	0 - 19	
Report Type		1	0 - 1|8|9|1 - 23|	
Number		1	1	
GNSS Accuracy		<=2	0 - 50	
Speed		<=5	0.0 - 999.9(km/h)	
Azimuth		<=3	0 - 359	
Altitude		<=8	(-)XXXXX.X (m)	
Longitude		<=11	(-)XXX.XXXXXX	
Latitude		<=10	(-)XX.XXXXXX	
GNSS UTC Time		14	(YYYYMMDDHHMMSS)	
MCC		4	0XXX	
MNC		4	0XXX	
LAC		4	(HEX)	
Cell ID		4|8	(HEX)	
CSQ RSSI		<=2	0 - 31|99	
CSQ BER		<=2	0 - 7|99	
Battery Voltage		<=5	0 - 10000(mV)	
Battery Percentage		<=3	0 - 100	
Mode Selection		1	0 - 2	
Movement Status		1	0 | 1	
Temperature		<=5	(-)XX.X	
RAT and Band Data (Optional)	RAT	1	0 – 3	
	Band	<=4	0 – 85|850|900|1800|1900	
Send Time		14	(YYYYMMDDHHMMSS)	
Count Number		4	(HEX)	
Tail Character		1	$	$

✧ <*RAT*>: Radio Access Technology.

- 0: NOSERVICE mode
- 1: EGPRS mode
- 2: LTE Cat M1 mode
- 3: LTE Cat NB 2 mode

✧ <*Band*>: 0 means invalid band, 1-85 means LTE band number and others mean GSM number.

Note: The item denoted with “optional” means the item is controlled by the parameter <*Report Item Mask*>.

3.3.1.2. Location Request Report

After the device receives the “get position” request via SMS, it will send the **+RESP:GTLBC** message to the backend server.

➢ **+RESP:GTLBC,**

Example: +RESP:GTLBC,710402,868487004352084,GL530MG,+8618771124121,1,1.1,187,47.2,121.308035,31.126858,20230815054349,0460,0000,1842,8C56,24,0,8947,89,1,0,27.9,20230815134350,0187$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Original Number	<=20	phone number	
GNSS Accuracy	<=2	0 - 50	
Speed	<=5	0.0 - 999.9(km/h)	
Azimuth	<=3	0 - 359	
Altitude	<=8	(-)XXXXX.X (m)	
Longitude	<=11	(-)XXX.XXXXXX	
Latitude	<=10	(-)XX.XXXXXX	
GNSS UTC Time	14	YYYYMMDDHHMMSS	
MCC	4	0XXX	
MNC	4	0XXX	
LAC	4	(HEX)	
Cell ID	4|8	(HEX)	
CSQ RSSI	<=2	0 - 31|99	
CSQ BER	<=2	0 - 7|99	
Battery Voltage	<=5	0 - 10000(mV)	
Battery Percentage	<=3	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	<=5	(-)XX.X	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Original Number*>: The phone number which initiates this report.

3.3.2. Device Information Report

The command **AT+GTRTO-F** is used to request device information.

➢ **+RESP:GTINF,**

Example: **+RESP:GTINF,710402,868487004352084,GL530MG,89860022092084000644,23,0,,1,,89,27.9,20230815054349,0,,,,,,,20230815134627,0189$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
ICCID	20	'0' - '9'	
CSQ RSSI	<=2	0 - 31 | 99	
CSQ BER	<=2	0 - 7 | 99	
Reserved	0		
Mode Selection	1	0 - 2	
Reserved	0		
Battery Percentage	3	0 - 100	
Temperature	<=5	(-)XX.X	
Last GNSS Fix UTC Time	14	YYYYMMDDHHMMSS	
Movement Status	1	0 | 1	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*ICCID*>: The ICCID of the installed SIM card.

✧ <*CSQ RSSI*>: The network signal strength level.

CSQ RSSI	**Signal Strength (dBm)**
0	<-133
1	-111

2 – 30	-109 – -53
31	>-51
99	Unknown

- ✧ <*CSQ BER*>: The quality of the network signal.
- ✧ <*Last GNSS Fix UTC Time*>: The UTC time of the latest successful GNSS fix.
- ✧ <*Temperature*>: The real time temperature value of the device. It must be noted that the temperature function must be enabled in the in the **AT+GTTEM** command, otherwise this field is empty.

3.3.3. Report for Querying

3.3.3.1. +RESP:GTALM

After the device receives the command **AT+GTRTO** to read all the configurations, it will send all configurations to the backend server via the message **+RESP:GTALM**. This message is only sent via EGPRS/LTE even if the report mode is forced SMS mode. If the message is too long, then it will be sub-packaged into several **+RESP:GTALM** messages. The **+RESP:GTALM** message does not support HEX report.

➢ **+RESP:GTALM,**

Example:
+RESP:GTALM,710402,868487004352084,GL530MG,1,1,BSI,cmnet,,,,,,01,2,SRI,2,1,1,180.169.235.202,7037,,0,,0,1,0,0,0,0,CFG,,GL530MG,300,0823,002F,1,5,10101010101010,0,1200,0,1,24,1,1,5,0,0000,0,0,10,0,0003,1,2,PIN,0,,,,,,,DOG,1,,7,0200,,1,,0,,,,TMA,+,0,0,0,,,,,,NMD,0,0,3,3,2,1440,2,,,,,,,,PDS,1,00000019,,,,,,,GEO,0,0,,,50,1,0,,,50,2,0,,,50,3,0,,,50,4,0,,,50,5,0,,,50,6,0,,,50,7,0,,,50,8,0,,,50,9,0,,,50,10,0,,,50,11,0,,,50,12,0,,,50,13,0,,,50,14,0,,,50,15,0,,,50,16,0,,,50,17,0,,,50,18,0,,,50,19,0,,,50,TEM,0,0,0,0,60,300,0,,,,,LSA,0,5,3,0,0,2,0,,,,,LTA,0,,3,0,0,2,,,,,,UPC,0,10,0,0,0,0,,0,,0,0,,,WLT,0,,,,,,,,,,,,,,,,HRM,,,7F,FF7F,FF7F,F77F,7F,,,,,NTS,0,,,,,,,,,,GLM,0,,,,,,,,FVR,,0000,,,,,,,,,,,20230815151436,01A4$

Parameter	Length (Byte)	Range/Format	Default
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Total Packets	<=2	1 - 15	
Current Packet	<=2	1 - 15	
Configurations	<=1500		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	

Tail Character	1	$	$

- ✧ <*Total Packets*>: The total number of **+RESP:GTALM** messages.
- ✧ <*Current Packet*>: The sequence number of the current **+RESP:GTALM** message.
- ✧ <*Configurations*>: The current configurations of the device.

Note: The length of every **+RESP:GTALM** message (including header and tail) should be no more than 1500 characters.

The configuration parameters of all commands are as follows:

Parameter	Length (Byte)	Range/Format	Default
BSI	3	BSI	
APN	<=64	(ASCII)	
APN User Name	<=30	(ASCII)	
APN Password	<=30	(ASCII)	
Backup APN	<=40	(ASCII)	
Backup APN User Name	<=30	(ASCII)	
Backup APN Password	<=30	(ASCII)	
APN Authentication Methods / Network Mode	2	00 - 33	00
LTE Mode	1	0 - 5	0
SRI	3	SRI	
Report Mode	1	0 - 7	
Manual Netreg	1	0 - 1	
Buffer Mode	1	0 - 2	
Main Server IP / Domain Name	<=60	(ASCII)	
Main Server Port	<=5	0 - 65535	
Backup Server IP / Domain Name	<=60	(ASCII)	
Backup Server Port	<=5	0 - 65535	
SMS Gateway	<=20	(Call Number)	
Heartbeat Interval	<=3	0 | 5 - 360(min)	
SACK Enable	1	0 - 2	

SMS ACK Enable	1	0 | 1	
PSM Network Hold Time	<=5	0 - 86400 (sec)	
Protocol Format	1	0 | 1	
TLS Enable	1	0 | 1	0
CFG	3	CFG	
Password	4 - 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
GNSS Timeout	3	120 - 600(sec)	300
Event Mask	4	(HEX)	
Report Item Mask	4	(HEX)	
Mode Selection	1	0 - 2	
Continuous Send Interval	<=4	0 | 1-1440(min)	
Week Report Selection	14		
Start Mode	1	0 - 3	
Specified time of day	4	HHMM	
Adjustment Enable	1	0 - 1	
Initial Wakeup Interval	<=2	1 - 4|6|8|12|24	
Final Wakeup Interval	<=2	1 - 4|6|8|12|24	
Hold Days	<=2	1 - 99	
Report frequency	<=3	1 - 100	
GNSS Fix Delay	2	5 - 60(sec)	5
AGPS Mode	1	0 | 1	0
GSM Report	4	(HEX)	0
Motor Vibration Time	1	0 - 9(*100ms)	0
Battery Type	1	0	0
Battery Low Percentage	<=2	0 - 30	
Function Key Mode	1	0 - 2	
GNSS Mode	<=2	0 | 1 | 4 | 5 | 10 | 11 | 12 | 14	0
SOS Report Mode	1	0 - 2	
Location Request Mask	1	0 | 2	

ERI Mask	4	(HEX)	
PIN	3	PIN	
Auto Unlock PIN	1	0 | 1	
PIN	4 - 8	'0' - '9'	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
DOG	3	DOG	
Mode	1	0 - 1	
Reserved	0		
Reboot Interval	<=2	1 - 30(day | hour)	
Reboot Time	4	HHMM	
Reserved	0		
Report Before Reboot	1	0 | 1	
Reserved	0		
Unit	1	0 | 1	
Reserved	0		
Reserved	0		
Reserved	0		
TMA	3	TMA	
Sign	1	+/-	+
Hour Offset	<=2	0 - 12	0
Minute Offset	<=2	0 - 59	0
Daylight Saving	1	0 | 1	0
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		

Reserved	0		
NMD	3	NMD	
Sensor Enable	1	0 - 1	
Mode	1	0 - F	
Non-movement Duration	<=3	1 - 200(*15sec)	
Movement Duration	<=2	3 - 50(*100ms)	
Movement Threshold	1	2 - 9	
Rest Send Interval	<=4	5 - 1440(min)	
Report Mode	1	1 - 3	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
PDS	3	PDS	
Mode	1	0 - 2	
Mask	8	00000000 - FFFFFFFF	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
GEO	3	GEO	
GEO ID0	1	0	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	

Radius	<=7	50 - 6000000(m)	
GEO ID1	1	1	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID2	1	2	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID3	1	3	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID4	1	4	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID5	1	5	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID6	1	6	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	

Radius	<=7	50 - 6000000(m)	
GEO ID7	1	7	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID8	1	8	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID9	1	9	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID10	2	10	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID11	2	11	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID12	2	12	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	

Radius	<=7	50 - 6000000(m)	
GEO ID13	2	13	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID14	2	14	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID15	2	15	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID16	2	16	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID17	2	17	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
GEO ID18	2	18	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	

Radius	<=7	50 - 6000000(m)	
GEO ID19	2	19	
Mode	1	0 - 3	
Longitude	<=11	-180 - 180	
Latitude	<=10	-90 - 90	
Radius	<=7	50 - 6000000(m)	
TEM	3	TEM	
Temperature Enable	1	0 | 1	0
Mode	1	0 - 4	0
Min. Temperature	<=3	-20 - +60	0
Max. Temperature	<=3	-20 - +60	0
Duration	<=4	10 - 3600(sec)	60
Send Interval	<=4	0 | 10 - 3600(sec)	300
Enable Continuous Mode	1	0 | 1	0
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
LSA	3	LSA	
Mode	1	0 - 2	0
Sensitivity Threshold	1	1 - 9	5
Duration	<= 2	3 - 30	3
Send Interval	<= 3	0 | 10 - 300(sec)	0
End report	1	0 | 1	0
Report Mode	1	1 - 3	2
Enable Continuous Mode	1	0 | 1	0
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		

LTA	3	LTA	
Mode	1	0 | 1	0
Reserved	0		
Duration	<= 2	3 - 30	3
Send Interval	<= 3	0 | 10 - 300 (sec)	0
End Report	1	0 | 1	0
Report Mode	1	1 - 3	2
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
UPC	3	UPC	
Max Download Retry	1	0 - 3	
Download Timeout	<=2	5 - 30(min)	
Download Protocol	1	0	
Report Enable	1	0 | 1	
Update Interval	<=4	0 - 8760(hour)	
Download URL	<=100	URL	
Mode	1	0 | 1	
Reserved	0		
Extended Status Report	1	0 | 1	
Identifier Number	<=8	(HEX)	
Reserved	0		
Reserved	0		
WLT	3	WLT	
Number Filter	1	0 | 1	
Phone Number List	<=20*10		
Reserved	0		
Reserved	0		

Reserved	0		
Reserved	0		
HRM	3	HRM	
Reserved	0		
Reserved	0		
+ACK Mask	4	(HEX)	7F
+RSP Mask	4	(HEX)	FF7F
+EVT Mask	4	(HEX)	FF7F
+INF Mask	4	(HEX)	F77F
+HBD Mask	4	(HEX)	7F
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
NTS	3	NTS	
Enable	1	0 | 1	0
Reserved	0		
Reserved	0		
Allowed Oper1	5 | 6	00000 - 99999 | 000000 - 999999	
Allowed Oper2	5 | 6	00000 - 99999 | 000000 - 999999	
Allowed Oper3	5 | 6	00000 - 99999 | 000000 - 999999	
Reserved	0		
Blocked Oper1	5 | 6	00000 - 99999 | 000000 - 999999	
Blocked Oper2	5 | 6	00000 - 99999 | 000000 - 999999	
Blocked Oper3	5 | 6	00000 - 99999 | 000000 - 999999	
Reserved	0		

GLM	3	GLM	
Google Mode	1	0|1|2	
Direct Number List	<=20*3		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
FVR	3	FVR	
Configuration Name	<=40	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Configuration Version	4	0000 - 9999	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Generation Time	14	YYYYMMDDHHMMSS	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.3.3.2. +RESP:GTCID

After the device receives the command **AT+GTRTO** to read the ICCID of the SIM card, it will send the ICCID to the backend server via the message **+RESP:GTCID**.

- **+RESP:GTCID,**

Example:
+RESP:GTCID,710402,868487004352084,GL530MG,898600200918F2006058,20230815165804,03CF$

Parameter	Length (Byte)	Range/Format	Default
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
ICCID	20	'0' - '9', 'a' - 'z', 'A' - 'Z'	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.3.3.3. +RESP:GTCSQ

After the device receives the command **AT+GTRTO** to read the LTE signal level, it will send the LTE signal level to the backend server via the message **+RESP:GTCSQ**.

➢ **+RESP:GTCSQ,**

Example: +RESP:GTCSQ,710402,868487004352084,GL530MG,11,0,20230815100009,03DA$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
CSQ RSSI	<=2	0 - 31 | 99	
CSQ BER	<=2	0 - 7 | 99	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*CSQ RSSI*>: The network signal strength level.

CSQ RSSI	Signal Strength (dBm)
0	<-113
1	-111
2 - 30	-109 - -53
31	>-51
99	Unknown

✧ <*CSQ BER*>: The quality of the LTE signal. The range is 0-7 and 99 is for unknown network signal strength.

3.3.3.4. +RESP:GTVER

After the device receives the command **AT+GTRTO** to get the versions (including firmware version and hardware version), it will send the version information to the backend server via the message **+RESP:GTVER**.

➢ **+RESP:GTVER,**

Example: **+RESP:GTVER,710402,868487004352084,GL530MG,71,070E,0103,,0103,0225,20230815135850,0194$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Device Type	2	(HEX)	
Firmware Version	4	(HEX)	
Hardware Version	4	(HEX)	
Reserved	0		
Modem Hardware Version	4	(HEX)	
Modem Firmware Version	4	0000 - 9999	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Firmware Version*>: The firmware version. The first two characters represent the major version and the last two characters represent the minor version. For example, **010A** means the version **1.10**.

✧ <*Hardware Version*>: The hardware version. The first two characters represent the major version and the last two characters represent the minor version. For example, **010A** means the version **1.10**.

✧ <*Modem Hardware Version*>: It gives the modem hardware information of this device.

✧ <*Modem Firmware Version*>: It gives the modem firmware version information of this device.

3.3.3.5. +RESP:GTTMZ

After the device receives the command **AT+GTRTO** to get the time zone settings, it will send the time zone information via the message **+RESP:GTTMZ** to the backend server.

➢ **+RESP:GTTMZ,**

Example: +RESP:GTTMZ,710402,868487004352084,GL530MG,-1100,0,20230815190547,0404$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Time Zone Offset	5	+/- HHMM	
Daylight Saving	1	0 | 1	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

3.3.3.6. +RESP:GTAIF

After the device receives the command **AT+GTRTO** to get the APN, ICCID, RSSI, cell ID, and IP, it will send the information via the message **+RESP:GTAIF** to the backend server.

➢ **+RESP:GTAIF,**

Example: +RESP:GTAIF,710402,8868487004352084,GL530MG,cmnet,,,,,,898600220920840006 44,29,0,8C5F,10.115.98.4,211.136.112.50,211.136.112.50,,,,1,20230815140137,01A0$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	IMEI	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
APN	<=64	(ASCII)	
APN User Name	<=30	(ASCII)	
APN Password	<=30	(ASCII)	

Backup APN	<=40	(ASCII)	
Backup APN User Name	<=30	(ASCII)	
Backup APN Password	<=30	(ASCII)	
ICCID	20	(HEX)	
CSQ RSSI	<=2	0 - 31 | 99	
CSQ BER	<=2	0 - 7 | 99	
Cell ID	4 | 8	XXXX | XXXXXXXX	
IP Address	<=15	(IP)	
Main DNS	<=15	(IP)	
Backup DNS	<=15	(IP)	
Reserved	0		
Reserved	0		
Reserved	0		
Network Type	1	0 - 2	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*CSQ RSSI*>: The network signal strength level.

CSQ RSSI	Signal Strength (dBm)
0	<-133
1	-111
2 - 30	-109 - -53
31	>-51
99	Unknow

✧ <*CSQ BER*>: The strength of the network signal. The range is 0-7 and 99 means unknown.

✧ <*Cell ID*>: Cell ID in hex format.

✧ <*IP Address*>: The IP address of the device.

✧ <*Main DNS*>: The main DNS server.

✧ <*Backup DNS*>: The backup DNS server.

✧ <*Network Type*>: Current network type.

- 0: Unregistered.
- 1: EGPRS
- 2: LTE

3.3.3.7. +RESP:GTGSV

After the device receives the command to get satellite information, it will send the satellite information via the message **+RESP:GTGSV** to the backend server.

➢ **+RESP:GTGSV,**

Example: **+RESP:GTGSV,710402,868487004352084,GL530MG,11,2,42,5,27,6,35,7,0,9,33,12,33,17,32,19,35,25,25,29,46,30,18,20230815110234,0008$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	IMEI	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
SV Count	<=2	0 - 24	
SV ID	<=3	>= 0	
SV Power	<=3	>= 0	
… … …			
SV ID	<=3		
SV Power	<=3		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*SV Count*>: The count of satellites the GNSS finds.
✧ <*SV ID*>: The satellite ID. In case of no satellite, the field is filled with zero.
✧ <*SV Power*>: Satellite power. In case of no satellite, the field is filled with zero.

3.3.3.8. +RESP:GTATI

After the device receives the command **AT+GTRTO** to get the basic device information (including modem firmware version and hardware version information), it will send the version information to the backend server via the message **+RESP:GTATI**.

➢ **+RESP:GTATI,**

Example: **+RESP:GTATI,710402,868487004352084,GL530MG,71,00043083,070E,0401,0225,0103,0103,44,20230815140538,01A2$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Device Type	2	(HEX)	
ATI Mask	8	(HEX)	
Firmware Version	4	(HEX)	
MCU Firmware Version	4	(HEX)	
Modem Firmware Version	4	0000 - 9999	
Hardware Version	4	(HEX)	
Modem Hardware Version	4	(HEX)	
Sensor ID	2	(HEX)	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

- <*Device Type*>: The type of the device.
- <*ATI Mask*>: Please refer to <*ATI Mask*> in the command **AT+GTRTO**.
- <*Firmware Version*>: The firmware version of the device. The first two characters indicate the major version and the last two characters indicate the minor version. For example, **010A** means the version **1.10**.
- <*MCU Firmware Version*>: The MCU firmware version of the device. The first two characters indicate the major version and the last two characters indicate the minor version. For example, **0102** means the version **1.02**.
- <*Modem Firmware Version*>: The Modem software version of the device. The first two characters indicate the major version and the last two characters indicate the minor version. For example, **0301** means the version **3.01**.
- <*Hardware Version*>: The hardware version of the device. The first two characters indicate the major version and the last two characters indicate the minor version. For example, **010A** means the version **1.10**.
- <*Sensor ID*>: It indicates the type of the sensor currently used by the device.

3.3.4. Event Report

The following event reports are triggered when certain events occur.
+RESP:GTPNA: Power on report
+RESP:GTPFA: Power off report
+RESP:GTBPL: Battery low
+RESP:GTTEM: Temperature alarm report
+RESP:GTLTA: Light sensor tamper alarm report.
+RESP:GTLSA: Light sensor alarm report.
+RESP:GTGSM: The report for the information of the serving cell and the neighbor cells. The device will report the message in ASCII format if parameter <*Protocol Format*> in the **AT+GTSRI** command is set to 1.
+RESP:GTUPC: The report for over-the-air configuration update
+RESP:GTEUC: The report for over-the-air configuration update if <*Extended Status Report*> is 1.
+RESP:GTIND: The indicate report for the device detects itself can not wakeup properly in previous wakeup, especially device is in a low battery environment.
In **+RESP:GTBPL** event report, the last known GNSS information and the current EGPRS/LTE network information are included.

➢ **+RESP:GTPNA,**

Example: **+RESP:GTPNA,710402,868487004352084,GL530MG,1,20230815094335,0390$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Power On Type	<=2	1 - 23	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Power On Type*>: A numeral to indicate how the device is activated.
- 1: Movement detected by the device
- 2: Specified time reached
- 3: Light sensor alarm event
- 4: Manual power on for the first time
- 5: RTO command or watchdog reboot
- 6: Abnormal power on
- 7: RTC error
- 8: FOTA process

- 9: Temperature sensor alarm event
- 10: Reset PIN
- 11-13: Reserved
- 14: Active wakeup. If the device goes into sleep mode, pressing the button three times within 2 seconds will wake it up, and the power on type will be 14.
- 15-22: Reserved
- 23: Non-Movement detected by the device

➢ **+RESP:GTPFA,**

Example: **+RESP:GTPFA,710402,868487004352084,GL530MG,20230815152625,0184$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

➢ **+RESP:GTBPL,**
➢ **+RESP:GTTEM,**
➢ **+RESP:GTLTA,**

Example: **+RESP:GTBPL,710402,868487004352084,GL530MG,0,0,1,0,0.4,187,45.8,121.307917,31.127042,20230815060907,0460,0000,1842,8C5F,29,0,,9,1,0,28.1,20230815141105,01A3$** **+RESP:GTTEM,710402,868487004352084,GL530MG,4,0,1,3,2.4,187,54.3,121.307881,31.127030,20230815061137,0460,0000,1842,8C5F,29,0,,9,1,0,27.6,20230815141137,01A9$** **+RESP:GTLTA,710402,868487004352084,GL530MG,1,0,1,0,0.4,187,45.8,121.307917,31.127042,20230815060907,0460,0000,1842,8C5F,29,0,,9,1,0,27.6,20230815141132,01A8$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	

Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Event State1	1	0 - 4	
Event State2	1	0	
Number	1	1	
GNSS Accuracy	<=2	0 - 50	
Speed	<=5	0.0 - 999.9(km/h)	
Azimuth	<=3	0 - 359	
Altitude	<=8	(-)XXXXX.X(m)	
Longitude	<=11	(-)XXX.XXXXXX	
Latitude	<=10	(-)XX.XXXXXX	
GNSS UTC Time	14	YYYYMMDDHHMMSS	
MCC	4	0XXX	
MNC	4	0XXX	
LAC	4	(HEX)	
Cell ID	4 | 8	(HEX)	
CSQ RSSI	<=2	0 - 31 | 99	
CSQ BER	<=2	0 - 7 | 99	
Reserved	0		
Battery Percentage	<=3	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	<=5	(-)XX.X	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

For **+RESP:GTBPL**

✧ <*Event state1*>: 0

✧ <*Event state2*>: 0

For **+RESP:GTTEM**

✧ <*Event state1*>: The temperature alarm state

- 1: The current temperature is lower than the low temperature threshold specified by <*Min. Temperature*>.
- 2: The current temperature is higher than the high temperature threshold specified

by <*Max. Temperature*>.

- 3: The current temperature is within the temperature threshold range.
- 4: The current temperature is outside the temperature threshold range.

✧ <Event state2>: 0

For **+RESP:GTLTA**

✧ <*Event state1*>: The light sensor tamper state.

- 0: Normal state
- 1: Tamper alarm state

✧ <*Event state2*>: 0

➢ **+RESP:GTLSA**

Example: **+RESP:GTLSA,710402,868487004352084,GL530MG,1,0,1,0,2.4,187,54.3,121.307881,31.127030,20230815061137,0460,0000,1842,8C5F,28,0,9,9,1,0,27.0,20230815141558,01AC$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Event State1	1	0 - 2	
Event State2	1	0	
Number	1	1	
GNSS Accuracy	<=2	0 - 50	
Speed	<=5	0.0 - 999.9(km/h)	
Azimuth	<=3	0 - 359	
Altitude	<=8	+/-XXXXX.X(m)	
Longitude	<=11	+/-XXX.XXXXXX	
Latitude	<=10	+/-XX.XXXXXX	
GNSS UTC Time	14	YYYYMMDDHHMMSS	
MCC	4	0XXX	
MNC	4	0XXX	
LAC	4	(HEX)	
Cell ID	4 | 8	(HEX)	
CSQ RSSI	<=2	0 - 31|99	
CSQ BER	<=2	0 - 7|99	
Light Level	1	1 - 9	
Battery Percentage	<=3	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	<=5	(-)XX.X	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

For **+RESP:GTLSA**

- ✧ <*Event state1*>: The light sensor alarm state.
  - 0: Normal state
  - 1: Above threshold alarm state
  - 2: Below threshold alarm state
- ✧ <*Event state2*>: 0
- ✧ <*Light Level*>: The level of light intensity detected by the device.

➢ **+RESP:GTGSM,**

Example: **+RESP:GTGSM,710402,868487004352084,GL530MG,FRI,0460,0001,1881,00B3B831,20,,0460,0000,5B64,0E77589C,17,,0460,0000,5B64,00D0525C,17,,,,,,,,,,,,,,,,,,0460,0000,5B64,0E77589A,18,,20230815100354,0018$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9' 'a' - 'z' 'A' - 'Z' '-' '_'	
Fix Type	3	FRI | RTL | GIR	
MCC1	4	0XXX	
MNC1	4	0XXX	
LAC1	4	(HEX)	
Cell ID1	4 | 8	(HEX)	
RX level1	<=2	0 - 63	
Reserved	0		
MCC2	4	0XXX	
MNC2	4	0XXX	
LAC2	4	(HEX)	
Cell ID2	4 | 8	(HEX)	
RX level2	<=2	0 - 63	
Reserved	0		
MCC3	4	0XXX	
MNC3	4	0XXX	
LAC3	4	(HEX)	
Cell ID3	4 | 8	(HEX)	

RX level3	<=2	0 - 63	
Reserved	0		
MCC4	4	0XXX	
MNC4	4	0XXX	
LAC4	4	(HEX)	
Cell ID4	4 | 8	(HEX)	
RX level4	<=2	0 - 63	
Reserved	0		
MCC5	4	0XXX	
MNC5	4	0XXX	
LAC5	4	(HEX)	
Cell ID5	4 | 8	(HEX)	
RX level5	<=2	0 - 63	
Reserved	0		
MCC6	4	0XXX	
MNC6	4	0XXX	
LAC6	4	(HEX)	
Cell ID6	4 | 8	(HEX)	
RX level6	<=2	0 - 63	
Reserved	0		
MCC	4	0XXX	
MNC	4	0XXX	
LAC	4	(HEX)	
Cell ID	<=8	(HEX)	
RX Level	<=2	0 - 63	
Reserved	0		
Send time	14	YYYYMMDDHHMMSS	
Count number	4	(HEX)	
Tail character	1	$	$

✧ *<Fix Type>*: A string which indicates the type of GNSS fix this cell information is for.

"FRI": This cell information is for FRI request.
"RTL": This cell information is for RTL request.
"GIR": This cell information is for GIR request.

- <*MCC (i)*>: MCC of the neighbor cell *i* (*i* is the index of the neighbor cell).
- <*MNC (i)*>: MNC of the neighbor cell *i*.
- <*LAC (i)*>: LAC in hex format of the neighbor cell *i*.
- <*Cell ID (i)*>: Cell ID in hex format of the neighbor cell *i*.
- <*RX level (i)*>: The network signal strength of the neighbor cell *i*. This parameter specifies a 6-bit value coded in 1. The dBm steps:
  0: -110 dBm
  1 to 62: -109 to -48 dBm
  63: -47 dBm
- <*MCC*>: MCC of the serving cell.
- <*MNC*>: MNC of the serving cell.
- <*LAC*>: LAC (in hex format) of the serving cell.
- <*Cell ID*>: Cell ID (in hex format) of the serving cell.
- <*RX level*>: The network signal strength of the serving cell.

Note:

1. It may include information of several neighbor cells. If no neighbor cell is found, all the fields of the neighbor cell will be empty.

➢ **+RESP:GTUPC,**

Example:
+RESP:GTUPC,710402,868487004352084,GL530MG,0,100,http://180.169.235.202:20194/UPC-GL530.ini,20230815095753,0818$

Parameter	Length (Byte)	Range/Format	Default
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Command ID	<=3	0 - 999	
Result	3	100 – 103 | 200 – 202 | 300 – 302 | 305 - 306	
Download URL	<=100	Complete URL	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

- <*Command ID*>: The command ID in the update configuration file. It is always 0 before the device starts to update the configuration. It indicates the total number of

the commands when the response code is 301. It indicates the ID of the command in wrong format when the response code is 302. It is empty when <*Result*> is greater than 302.

✧ <*Result*>: A numeral to indicate whether the configuration is updated successfully.

- 100: The update command is starting.
- 101: The update command is confirmed by the device.
- 102: The update command is refused by the device.
- 103: The update process is refused because the battery is low.
- 200: The device starts to download the package.
- 201: The device finishes downloading the package successfully.
- 202: The device fails to download the package.
- 300: The device starts to update the device configuration.
- 301: The device finishes updating the device configuration successfully.
- 302: The device fails to update the device configuration.
- 305: The update process is interrupted by reboot.
- 306: The update process is interrupted by MD5 verification error.

✧ <*Download URL*>: The complete URL to download the configuration. It includes the file name.

➢ **+RESP:GTEUC,**

Example: +RESP:GTEUC,710402,868487004352084,GL530MG,0,100,http://www.queclink.com/configure.ini,11111111,,,,,20230815141321,0629$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Command ID	<=3	0 - 999	
Result	3	100 – 103 | 200 – 202 |3 00 – 302 | 305 - 306	
Download URL	<=100	(URL)	
Identifier Number	8	(HEX)	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Command ID*>: The command ID in the update configuration file. It is always 0 before the device starts to update the configuration. It indicates the total number of the commands when the response code is 301. It indicates the ID of the command in

wrong format when the response code is 302. It is empty when the response code is 305 or 306.

✧ <*Result*>: A numeral to indicate whether the configuration is updated successfully.

- 100: The update command is starting.
- 101: The update command is confirmed by the device.
- 102: The update command is refused by the device.
- 103: The update process is refused because the battery is low.
- 200: The device starts to download the package.
- 201: The device finishes downloading the package successfully.
- 202: The device fails to download the package.
- 300: The device starts to update the device configuration.
- 301: The device finishes updating the device configuration successfully.
- 302: The device fails to update the device configuration.
- 303: Reserved
- 305: The update process is interrupted by abnormal reboot.
- 306: The update process is interrupted by MD5 verification error.

✧ <*Download URL*>: The complete URL to download the configuration. It includes the file name.

✧ <*Identifier Number*>: Please refer to the parameter <*Identifier Number*> in the command **AT+GTUPC**.

➢ **+RESP:GTIND,**

Example: +RESP:GTIND,710402,868487004352084,GL530MG,2,20230815141321,20230815141321,451E$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Attempted Times	<=2	0 - 255	
Last Attempted Time	14	YYYYMMDDHHMMSS	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

✧ <*Attempted Times*>: The number of times the device itself attempts to restore the normal wake up.

✧ <*Last Attempted Time*>: This time represents the last time the device detected that it could not wake up properly.

3.3.5. Buffer Report

If the buffer function is enabled, the device will save the messages into the buffer in the following circumstances.

- ✧ No network signal.
- ✧ Failed to activate network context for the TCP or UDP connection.
- ✧ Failed to establish TCP connection with the backend server.

The buffered messages will be sent to the backend server when connection to the server recovers. The buffer reports are saved to the built-in non-volatile memory in case the device is reset. The device can save 10000 messages at most.

- ✧ Only **+RESP** messages
- ✧ In the buffer report, the original header string "**+RESP**" is replaced by "**+BUFF**". Other contents such as the original sending time and count number remains unchanged.
- ✧ Buffered messages will be sent only via Network by TCP or UDP protocol. They cannot be sent via SMS. If report is forced SMS mode, the buffered messages will not be sent until the report mode is changed to TCP or UDP.
- ✧ The buffered messages will be sent after the real-time messages if <*Buffer Mode*> in **AT+GTSRI** is set to 1.
- ✧ The buffered messages will be sent before the real-time messages if <*Buffer Mode*> in **AT+GTSRI** is set to 2. The SOS has the highest and is sent before the buffered messages.

Example:

The following is an example of the buffered message:

+BUFF:GTFRI,710402,868487004352084,GL530MG,0,0,1,1,0.0,107,22.5,121.348337,31.163285,20230815015420,0001,0010,0001,01A2D001,18,0,8953,59,1,1,28.2,20230815095421,03C2$

3.3.6. Report with Google Maps Hyperlink

According to the settings of the command **AT+GTGLM** or upon receiving **SMS Position Request** message via SMS, the device can send an SMS with a Google Maps hyperlink to a mobile phone.

If the device receives an SMS Position Request message via SMS, it will send its current position to the original number via SMS with a Google Maps hyperlink if the original number is a direct number (please refer to <*Direct Number List*> in Chapter 3.2.4.3) or a number in the allowlist (please refer to <*Phone Number List*> in Chapter 3.2.4.2).

If the <*Google Mode*> in the command **AT+GTGLM** is set to 1 or 2, GL530MG Series will send an SMS with a Google Maps hyperlink to the direct phone numbers after the messages **+RESP:GTSOS**

- ➢ **Google Maps Hyperlink,**

Example: SOS: http://maps.google.com/maps?q=31.126202,121.307729+%28GL530MG%29 F0 D2023/08/15T03:53:39 B57%			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
SMS Header	<=30	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Google Maps Hyperlink	<=77		
GNSS Fix	2	F1 | F0	
GNSS UTC Time	20	DYYYY/MM/DDTHH:MM:SS	
Battery Level	<=5	B1 - 100(%)	

- ✧ <*SMS Header*>: A string that includes the device name and GNSS fix type ("**SOS**"/"**LBC**").
- ✧ <*Google Maps Hyperlink*>: A string to indicate the header of a Google Maps hyperlink.
- ✧ <*GNSS Fix*>: The accuracy of the location information. F0 means "No GNSS fix".

3.4. Heartbeat

Heartbeat is used to maintain the connection between the device and the backend server in the case of EGPRS/LTE communication. The heartbeat package is sent to the backend server at the interval defined by <*Heartbeat Interval*> in the **AT+GTQSS** or **AT+GTSRI** command.

- ➢ **+ACK:GTHBD,**

Example: +ACK:GTHBD,710402,868487004352084,GL530MG,20230815203001,451F$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	(HEX)	
Tail Character	1	$	$

Whenever the backend server receives a heartbeat package, it should reply with an acknowledgement to the device.

- ➢ **+SACK:GTHBD,**

Example: **+SACK:GTHBD,710402,11F0$** **+SACK:GTHBD,,11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Count Number	4	(HEX)	
Tail Character	1	$	$

- ✧ <*Protocol Version*>: The device type and the protocol version that the backend server supports. This field is optional. The backend server can just send an empty field to decrease the length of the heartbeat data acknowledgement.
- ✧ <*Count Number*>: The backend server uses the <*Count Number*> extracted from the heartbeat package from the device as the <*Count Number*> in the server acknowledgement of the heartbeat.

3.5. Server Acknowledgement

If server acknowledgement is enabled by the **AT+GTQSS** or **AT+GTSRI** command, the backend server should reply to the device whenever it receives a message from the device.

➢ **+SACK:**

Example: **+SACK:11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Count Number	4	(HEX)	
Tail Character	1	$	$

- ✧ <*Count Number*>: The backend server uses the <*Count Number*> extracted from the received message as the <*Count Number*> in the server acknowledgement.

4. HEX Format Message

From this version, the @Tracker protocol supports messages in HEX format. For all the commands, they still use the ASCII format as described above. By default the device uses ASCII format messages. Use **AT+GTQSS** or **AT+GTSRI** (set the <*Protocol Format*> to 1) to enable the HEX format messages.

All the messages are sorted into 5 categories (acknowledgement to command (**+ACK**), location report (**+RSP**), event report (**+EVT**), information report (**+INF**) and the heartbeat data (**+HBD**)). Messages of the same category have the same header string.

The composition of the HEX message could be customized by **AT+GTHRM** command. The actual length of each HEX report depends on the setting of the masks in **AT+GTHRM**.

The device uses CRC-CCITT (0xFFFF) method to calculate the checksum of the report data and appends the checksum to the end of the data. The backend server could use this checksum to verify the integrity of the received data.

At the end of each HEX message, the device uses 0x0D and 0x0A as the end.

The HEX messages are transmitted in network byte order (big-endian).

4.1. Hex Report Mask

AT+GTHRM command uses <+*ACK Mask*>, <+*RSP Mask*>, <+*EVT Mask*>, <+*INF Mask*> and <+*HBD Mask*> to control the composition of the corresponding HEX message. In each HEX message, the corresponding mask for the report is included to indicate which part is reported.

- **AT+GTHRM,**

Example: **AT+GTHRM=gl530,,,7F,FF7F,FF7F,FF7F,7F,,,,,0018$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Password	4 – 20	'0' - '9', 'a' - 'z', 'A' - 'Z'	gl530
Reserved	0		
Reserved	0		
+ACK Mask	<=4	(HEX)	007F
+RSP Mask	<=4	(HEX)	FF7F
+EVT Mask	<=4	(HEX)	FF7F

+INF Mask	<=4	(HEX)	F77F
+HBD Mask	<=4	(HEX)	007F
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial Number	4	(HEX)	
Tail Character	1	$	$

✧ <+*ACK Mask*>: Component mask of the acknowledgement received.

Bit	Item to Mask
Bit 7	Reserved
Bit 6	<*Count Number*>
Bit 5	<*Send Time*>
Bit 4	<*Device Name*>
Bit 3	<*Firmware Version*>
Bit 2	<*Protocol Version*>
Bit 1	<*Device Type*>
Bit 0	<*Length*>

✧ <+*RSP Mask*>: Component mask of the location message.

Bit	Item to Mask
Bit 15	<*Temperature*>
Bit 14	<*Motion Status*>
Bit 13	<*Mode Selection*>
Bit 12	<*Battery Percentage*>
Bit 11	<*Network Data*>
Bit 10	<*Altitude*>
Bit 9	<*Azimuth*>
Bit 8	<*Speed*>
Bit 7	<*Battery Voltage*>

Bit 6	*<Count Number>*
Bit 5	*<Send Time>*
Bit 4	*<Device Name>*
Bit 3	*<Firmware Version>*
Bit 2	*<Protocol Version>*
Bit 1	*<Device Type>*
Bit 0	*<Length>*

✧ *<+EVT Mask>*: Component mask of the event message.

Bit	**Item to Mask**
Bit 15	*<Temperature>*
Bit 14	*<Motion Status>*
Bit 13	*<Mode Selection>*
Bit 12	*<Battery Percentage>*
Bit 11	*<Network Data>*
Bit 10	*<Altitude>*
Bit 9	*<Azimuth>*
Bit 8	*<Speed>*
Bit 7	Reserved
Bit 6	*<Count Number>*
Bit 5	*<Send Time>*
Bit 4	*<Device Name>*
Bit 3	*<Firmware Version>*
Bit 2	*<Protocol Version>*
Bit 1	*<Device Type>*
Bit 0	*<Length>*

✧ *<+INF Mask>*: Component mask of the information message. Bit 8 to Bit 15 indicate which groups of items are included when the device reports the message INF(ASCII)(HEX). Bit 16 to Bit 31 are valid only when Bit 7 is 1.

Bit	**Item to Mask**

Bit 15	Reserved
Bit 14	*<Temperature>*
Bit 13	*<Motion Status>*
Bit 12	*<Mode Selection>*
Bit 11	*<Battery Percentage>*
Bit 10	*<Hardware Version>*
Bit 9	*<CSQ RSSI> & <CSQ BER>*
Bit 8	*<ICCID>*
Bit 7	Reserved
Bit 6	*<Count Number>*
Bit 5	*<Send Time>*
Bit 4	*<Device Name>*
Bit 3	*<Firmware Version>*
Bit 2	*<Protocol Version>*
Bit 1	*<Device Type>*
Bit 0	*<Length>*

✧ *<+HBD Mask>*: Component mask of the heartbeat data.

Bit	Item to Mask
Bit 7	*<UID>*
Bit 6	*<Count Number>*
Bit 5	*<Send Time>*
Bit 4	*<Device Name>*
Bit 3	*<Firmware Version>*
Bit 2	*<Protocol Version>*
Bit 1	*<Device Type>*
Bit 0	*<Length>*

The acknowledgment message of **AT+GTHRM** command:

➢ **+ACK:GTHRM,**

Example: +ACK:GTHRM,710402,868487004352084,GL530MG,0019,20230815093254,11F0$			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	(HEX)	
Unique ID	15	(IMEI)	
Device Name	<=20	'0' - '9', 'a' - 'z', 'A' - 'Z', '-', '_'	
Serial Number	4	(HEX)	
Send Time	14	(YYYYMMDDHHMMSS)	
Count Number	4	(HEX)	
Tail Character	1	$	$

4.2. Acknowledgement +ACK

- **+ACK,**

Example: 2B 41 43 4B 01 00 7F 25 71 03 03 06 0B 47 4C 35 33 30 4D 47 00 00 FF FF 07 E6 0B 12 10 07 07 00 06 0C 76 0D 0A			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+ACK	+ACK
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
ID	1	0 - 31	
Serial Number	2	(HEX)	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(HEX)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

✧ <*Message Type*>: The ID of the command that the device received.

Command	ID
AT+GTBSI	0
AT+GTSRI	1
AT+GTQSS	2
Reserved	3
AT+GTCFG	4
AT+GTPIN	5
AT+GTDOG	6
AT+GTTMA	7
AT+GTNMD	8
AT+GTPDS	9
AT+GTGEO	10
AT+GTTEM	11
AT+GTLSA	12
AT+GTLTA	13
Reserved	14
AT+GTRTO	15
AT+GTUPC	16
AT+GTWLT	17
AT+GTUPD	18
AT+GTHRM	19
AT+GTNTS	20
Reserved	21
AT+GTGLM	22
…	
AT+GTFVR	80

✧ <*Report Mask*>: It refer to the <*+ACK Mask*> in **AT+GTHRM.**

✧ <*Length*>: The length of the acknowledgement message (total characters from header to the tail).

✧ <*Unique ID*>: If Bit 4 of <*+ACK Mask*> is 0, IMEI of the device will be used as the

unique ID of the device. IMEI is a 15-digit string. In the HEX format message, every 2 digits are encoded into one byte as an integer.

IMEI	13	57	90	24	68	11	22	0
HEX	0D	39	5A	18	44	0B	16	00

If the Bit 4 of <*+ACK Mask*> is 1, the device name is used as the unique ID of the device. Refer to the <*Device Name*> in **AT+GTCFG** for the device name. Device name is an 8-bytes string. If the length of the <*Device Name*> is more than 8 bytes, only the first 8 bytes will be acquired. In the Hex format message, each byte is encoded into one byte as an integer. If the device name is less than 8 bytes, the empty bytes will be set to 0.

Device Name	g	l	5	3	0	m	g	
HEX	67	6c	35	33	30	6d	67	00

- <*ID*>: Sub-command ID of **AT+GTRTO** or **AT+GTGEO**. Set it to 0 for other reports.
- <*Send Time*>: The local time to send the acknowledgement message. Total 7 bytes. The first 2 bytes are for year, the rest 5 bytes for month, day, hour, minute and second respectively.

Send Time	2023		03	31	06	29	11
HEX	07	E7	03	1F	06	1D	0B

- <*Checksum*>: The CRC16 checksum for data from <*Message Type*> to <*Count Number*>.

4.3. Location Report +RSP

Location messages (including **+RESP:GTGEO**, **+RESP:GTFRI**, **+RESP:GTRTL**, **+RESP:GTNMR, +RESP:GTDOG,+RESP:GTSOS**) use the following format.

- **+RSP,**

Example:
2B 52 53 50 01 FF 7F 4D 71 04 02 09 11 47 4C 35 33 30 4D 47 00 00 06 01 00 00 00 00 00 00 35 07 3B A0 82 01 DB 83 EF 07 E8 09 0C 08 29 05 04 60 00 01 5D 5A 0B 25 79 81 16 00 3A 00 00 00 00 00 07 E8 09 0C 08 29 05 00 A2 67 B1 0D 0A

Parameter	Length (Byte)	Range/Format	Default
Message Header	4	+RSP	+RSP
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71

Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Report Id	1	0 - 19	
Report Type	1	(HEX)	
GNSS Accuracy	<=2	0 - 50	
Speed	3	0.0 - 999.9(km/h)	
Azimuth	2	0 - 359	
Altitude	2	((-)XXXXX(m))	
Longitude	4	(-180 - 180)	
Latitude	4	(-90 - 90)	
GNSS UTC Time	7	(YYYYMMDDHHMMSS)	
MCC	2	(HEX)	
MNC	2	(HEX)	
LAC	2	(HEX)	
Cell ID	4	(HEX)	
CSQ RSSI	1	0 - 31|99	
CSQ BER	1	0 - 7|99	
Battery Voltage	2	0 - 10000(mV)	
Battery Percentage	1	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	3	(-)XX.X	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

✧ <*Message Type*>: The ID of location message.

Command	**ID**
+RESP:GTGEO	0

+RESP:GTFRI	1
+RESP:GTPNL	2
+RESP:GTNMR	3
+RESP:GTRTL	4
+RESP:GTDOG	5
Reserved	6
+RESP:GTLBC	7
+RESP:GTSOS	8
…	
+RESP:GTERI	18

- <*Report Mask*>: It refer to the <*+RSP Mask*> in **AT+GTHRM.**
- <*Unique ID*>: If the Bit 4 of <*+RSP Mask*> is 0, IMEI of the device is used as the unique ID of the device. IMEI is a 15-digit string. In the HEX format message, every 2 digits are encoded into one byte as an integer.

IMEI	**13**	**57**	**90**	**24**	**68**	**11**	**22**	**0**
HEX	**0D**	**39**	**5A**	**18**	**44**	**0B**	**16**	**00**

If the Bit 6 of <*+RSP Mask*> is 1, the device name is used as the unique ID of the device. Refer to the <*Device Name*> in **AT+GTCFG** for the device name. Device name is an 8-byte string. If the length of the <*Device Name*> is more than 8 bytes, only the first 8 bytes will be acquired. In the Hex format message, each byte is encoded into one byte as an integer. If the device name is less than 8 bytes, the empty bytes will be set to 0.

Device Name	**g**	**l**	**5**	**3**	**0**	**m**	**g**	
HEX	**67**	**6c**	**35**	**33**	**30**	**6d**	**67**	**00**

- <*Report ID*>: The ID of Geo-fence in **+RESP:GTGEO**. For the ID of other reports, it is 0.
- <*Report Type*>: The type of the messages **+RESP:GTGEO, +RESP:GTDOG** and **+RESP:GTNMR**. For other reports, it is 0.
  - For **+RESP:GTGEO**
    0: Exit the corresponding Geo-fence
    1: Enter the corresponding Geo-fence
  - For **+RESP:GTNMR**
    0: The state of the device changed from motion to rest
    1: The state of the device changed from rest to motion
  - For **+RESP:GTDOG**
    0: Reboot periodically according to the <*Interval*> and <*Time*> settings
  - For **+RESP:GTFRI**
    <*Power On Type*> in the **+RESP:GTPNA** message would be filled here.

- <*Speed*>: Total 3 bytes. The first two bytes are for the integer part of the speed and the last byte is for the fraction part. The fraction part has only 1 digit.
- <*Longitude*>: The longitude of the current position. Total 4 bytes. The longitude is converted to an integer with 6 implicit decimals and this integer is reported in HEX format. If the value of the longitude is negative, it is represented in 2's complement format.

Longitude 121.390847	**121390847**			
HEX	**07**	**3C**	**46**	**FF**

- <*Latitude*>: The latitude of the current position. Total 4 bytes. The latitude is converted to an integer with 6 implicit decimals and this integer is reported in HEX format. If the value of the latitude is negative, it is represented in 2's complement format.

Latitude 31.164503	**31164503**			
HEX	**01**	**DB**	**88**	**57**

- <*Altitude*>: The altitude from GNSS. If the altitude is negative, it is represented in 2's complement format. Unit: meter.
- <*GNSS UTC Time*>: The UTC time from the GNSS chip. Total 7 bytes. The first 2 bytes are for year, the rest 5 bytes for month, day, hour, minute and second respectively.

GNSS UTC Time	**2023**		**03**	**14**	**08**	**24**	**13**
HEX	**07**	**E7**	**03**	**0E**	**08**	**18**	**0D**

- <*Mode Selection*>: Current mode of the device. Total 1 byte.
  - 0: Power saving mode (PSM)
  - 1: Continuous mode
  - 2: Automatic mode
- <*Movement Status*>: The movement status of the device. Total 1 byte. It must be noted that the sensor function must be enabled in the **AT+GTNMD** command, otherwise it's always 0.
  - 0: Stillness
  - 1: Motion
- <*Temperature*>: Total 3 bytes. The first two bytes are for the integer part of the temperature and the last byte is for the fraction part. The fraction part has only 1 digit. It must be noted that the temperature function must be enabled in the in the **AT+GTTEM** command, otherwise it's always 0.

Location message for **+RESP:GTLBC** uses below format.

Example:
2B 52 53 50 07 FF EF 55 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 70 10 64 89 90 90 53 3F 01 00 00 00 00 00 00 28 07 3B A1 3C 01 DB 83 8B 07 E6 0B 12 08 0D 3A 04 60 00

00 5B 64 0E 77 58 9A 13 00 23 6B 63 01 00 00 1C 01 07 E6 0B 12 10 0D 3A 00 1F 0D DF 0D 0A			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+RSP	+RSP
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Number Length/Number Type	1	(HEX)	
Phone Number	<=10	(Call Number)	
GNSS Accuracy	<=2	0 - 50	
Speed	3	0.0 - 999.9(km/h)	
Azimuth	2	0 - 359	
Altitude	2	((-)XXXXX(m))	
Longitude	4	(-180 - 180)	
Latitude	4	(-90 - 90)	
GNSS UTC Time	7	(YYYYMMDDHHMMSS)	
MCC	2	(HEX)	
MNC	2	(HEX)	
LAC	2	(HEX)	
Cell ID	4	(HEX)	
CSQ RSSI	1	0 - 31|99	
CSQ BER	1	0 - 7|99	
Battery Voltage	2	0 - 10000(mV)	
Battery Percentage	1	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	3	(-)XX.X	

Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

✧ <*Number Length/Number Type*>: The high nibble is for <*Number Length*> and the low nibble is for <*Number Type*>. <*Number Length*> is the number of bytes used to represent the phone number. <*Number Type*> indicates if there is a '+' sign before the phone number. 1 means there is the sign and 0 means no such a sign.

	Number Length	**Number Type**
HEX	**7**	**0**

✧ <*Phone Number*>: No more than 10 bytes. Each byte uses the high nibble and low nibble to represent one digit of the phone number respectively. If the last low nibble has no digit to represent, fill in 0xF.

Phone Number 02154450293	**02**	**15**	**44**	**50**	**29**	**3**
HEX	**02**	**15**	**44**	**50**	**29**	**3F**

The location report message **+RESP:GTERI** uses the format below.

➢ **+RSP,**

Example:
2B 52 53 50 01 FF 7F 4D 71 04 00 06 0B 47 4C 35 33 30 4D 47 00 00 00 01 00 00 00 00 00 00 22 07 3B A1 15 01 DB 83 BC 07 E6 0B 12 08 09 14 04 60 00 00 5B 64 0E 77 58 9A 12 00 63 01 00 00 1C 01 07 E6 0B 12 10 09 14 00 0E 95 E3 0D 0A

Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+RSP	+RSP
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
ERI Mask	4	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Report Id	1	0 - 19	
Report Type	1	(HEX)	

GNSS Accuracy		<=2	0 - 50	
Speed		3	0.0 - 999.9(km/h)	
Azimuth		2	0 - 359	
Altitude		2	((-)XXXXX(m))	
Longitude		4	(-180 - 180)	
Latitude		4	(-90 - 90)	
GNSS UTC Time		7	(YYYYMMDDHHMMSS)	
MCC		2	(HEX)	
MNC		2	(HEX)	
LAC		2	(HEX)	
Cell ID		4	(HEX)	
CSQ RSSI		1	0 - 31|99	
CSQ BER		1	0 - 7|99	
Battery Voltage		2	0 - 10000(mV)	
Battery Percentage		1	0 - 100	
Mode Selection		1	0 - 2	
Movement Status		1	0 | 1	
Temperature		3	(-)XX.X	
RAT and Band Data (Optional)	RAT	1	0 – 3	
	Band	2	0 – 85|850|900|1800|1900	
Send Time		7	(YYYYMMDDHHMMSS)	
Count Number		2	(HEX)	
Checksum		2	(Checksum)	
Tail Characters		2	0x0D 0x0A	0x0D 0x0A

✧ <*RAT*>: Radio Access Technology.
- 0: NOSERVICE mode
- 1: EGPRS mode
- 2: LTE Cat M1 mode
- 3: LTE Cat NB 2 mode

✧ <*Band*>: 0 means invalid band, 1-85 means LTE band number and others mean GSM number.

Note: The item denoted with “optional” means the item is controlled by the parameter <*Report Item Mask*>.

4.4. Information Report +INF

Information message (including **+RESP:GTINF** and **+RESP:GTINF**) uses the following format.

➢ **+INF,**

Example:
2B 49 4E 46 00 7F 6F 38 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 01 03 89 86 04 67 09 21 C0 32 90 51 12 00 00 00 64 01 00 00 1B 06 07 E6 0B 12 10 16 18 00 49 87 31 0D 0A

Parameter	Length (Byte)	Range/Format	Default
Message Header	4	+INF	+INF
Reserved	1	0	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Hardware Version	2	(HEX)	
ICCID	10	ICCID	
CSQ RSSI	1	0 - 31 | 99	
CSQ BER	1	0 - 7 | 99	
Reserved	2	0000	
Battery Percentage	1	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	3	(-)XX.X	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

- <*Report Mask*>: It refers to the <*+INF Mask*> in **AT+GTHRM.**
- <*Unique ID*>: If the Bit 4 of <*+INF Mask*> is 0, IMEI of the device is used as the unique ID. IMEI has 14 bytes in hexadecimal format. In the Hex format message, every two bytes are encoded into one byte as an integer. The 8th byte is reserved and its value is 0x00.

IMEI	13	57	90	24	68	11	22	0
HEX	0D	39	5A	18	44	0B	16	00

If the Bit 1 of <*+INF Mask*> is 1, the device name is used as the unique ID of the device. Refer to the <*Device Name*> in **AT+GTCFG** for the device name. Device name is an 8-byte string. If the length of the <*Device Name*> is more than 8 bytes, only the first 8 bytes will be acquired. In the Hex format report, each byte is encoded into one byte as an integer. If the device name is less than 8 bytes, the empty bytes will be set to 0.

Device Name	g	l	5	3	0	m	g	
HEX	67	6c	35	33	30	6d	67	00

- <*ICCID*>: ICCID is a 20-digit string. In the HEX format message, every 4 bits are used to represent one digit of the ICCID.

ICCID	89	86	00	00	09	09	17	21	49	53
HEX	89	86	00	00	09	09	17	21	49	53

- <*Cell Number*>: It represents the number of the IMSI**.** The IMSI consists of MCC, MNC, LAC, and Cell ID.

4.5. Event Report +EVT

Event message (including **+RESP:GTPNA**) uses the following format.

- **+EVT,**

Example:
2B 45 56 54 00 FF 6F 23 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 05 07 E6 0B 12 10 10 2B 00 27 CE D0 0D 0A

Parameter	Length (Byte)	Range/Format	Default
Message Header	4	+EVT	+EVT
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	

Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Power On Type	1	1 - 23	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

✧ <*Message Type*>: The ID of event message.

Command	ID
+RESP:GTPNA	0
+RESP:GTPFA	1
+RESP:GTBPL	2
+RESP:GTTEM	3
Reserved	4
+RESP:GTUPC	5
+RESP:GTLSA	6
+RESP:GTLTA	7
+RESP:GTUPD	8
Reserved	9
Reserved	10

✧ <*Report Mask*>: It refers to the <*+EVT Mask*> in **AT+GTHRM.**

✧ <*Unique ID*>: If the Bit 4 of <*+EVT Mask*> is 0, IMEI of the device is used as the unique ID of the device. IMEI is a 15-digit string. In the HEX format message, every 2 digits are encoded into one byte as an integer.

IMEI	**13**	**57**	**90**	**24**	**68**	**11**	**22**	**0**
HEX	**0D**	**39**	**5A**	**18**	**44**	**0B**	**16**	**00**

If the Bit 6 of <*+EVT Mask*> is 1, the device name is used as the unique ID of the device. Refer to the <*Device Name*> in **AT+GTCFG** for the device name. Device name is an 8-byte string. If the length of the <*Device Name*> is more than 8 bytes, only the first 8 bytes will be acquired. In the Hex format report, each byte is encoded into one byte as an integer. If the device name is less than 8 bytes, the empty bytes will be set to 0.

Device Name	g	l	5	3	0	m	g	
HEX	67	6c	35	33	30	6d	67	00

✧ <*Power On Type*>: A numeral to indicate how the device is activated.

- 1: Movement detected by the device.
- 2: Specified time reached.
- 3: Light sensor alarm event.
- 4: Manual powering on for the first time.
- 5: RTO command or dog reboot.
- 6: Abnormal power on.
- 7: RTC error.
- 8: FOTA process.
- 9: Temperature sensor alarm event.
- 10: Reset PIN
- 11-13:Reserved
- 14: Active wakeup. If the device goes into sleep mode, pressing the button three times within 2 seconds will wake it up, and the power-on type will be 14.
- 15-22: Reserved
- 23: Non-Movement detected by the device

Event message **+RESP:GTPFA** uses the following format.

➢ **+EVT,**

Example: **2B 45 56 54 01 FF 6F 22 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 07 E6 0B 12 10 10 20 00 26 7D 22 0D 0A**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+EVT	+EVT
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	

Tail Characters	2	0x0D 0x0A	0x0D 0x0A

Event messages (including **+RESP:GTBPL**, **+RESP:GTTEM**, **+RESP:GTLTA**) use the following format.

- **+EVT,**

Example: **2B 45 56 54 02 FF 6F 4E 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 00 00 00 00 00 00 00 00 00 28 07 3B A1 85 01 DB 83 26 07 E6 0B 12 08 15 1C 04 60 00 00 5B 64 0E 77 58 9A 11 00 00 01 01 00 00 1B 08 07 E6 0B 12 10 15 28 00 43 21 0A 0D 0A**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+EVT	+EVT
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Event State1	1	0 - 4	
Event State2	1	0	
GNSS Accuracy	<=2	0 - 50	0
Speed	3	0.0 - 999.9(km/h)	
Azimuth	2	0 - 359	
Altitude	2	((-)XXXXX(m))	
Longitude	4	(-180 - 180)	
Latitude	4	(-90 - 90)	
GNSS UTC Time	7	(YYYYMMDDHHMMSS)	
MCC	2	(HEX)	
MNC	2	(HEX)	
LAC	2	(HEX)	
Cell ID	4	(HEX)	
CSQ RSSI	1	0 - 31|99	

CSQ BER	1	0 - 7|99	
Reserved	1		
Battery Percentage	1	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	3	(-)XX.X	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

For **+RESP:GTBPL**

- <*Event state1*>: 0
- <*Event state2*>: 0

For **+RESP:GTTEM**

- <*Event state1*>: The temperature alarm state
  - 1: The current temperature is lower than the low temperature threshold specified by <*Min. Temperature*>.
  - 2: The current temperature is higher than the high temperature threshold specified by <*Max. Temperature*>.
  - 3: The current temperature is within the temperature threshold range.
  - 4: The current temperature is outside the temperature threshold range.
- <*Event state2*>: 0

For **+RESP:GTLTA**

- <*Event state1*>: The light sensor tamper state.
  - 0: Normal state
  - 1: Tamper alarm state
- <*Event state2*>: 0

Event message **+RESP:GTLSA** uses the following format.

➢ **+EVT,**

Example:
2B 45 56 54 06 FF 6F 4E 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 01 00 01 00 00 00 00 00 00 24 07 3B A1 37 01 DB 83 B6 07 E6 0B 12 08 10 32 04 60 00 00 5B 64 0E 77 58 9A 14 00 09 63 01 00 00 1B 06 07 E6 0B 12 10 10 33 00 2C 28 67 0D 0A

Parameter	Length (Byte)	Range/Format	Default
Message Header	4	+EVT	+EVT
Message Type	1	(HEX)	

Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Event State1	1	0 - 2	
Event State2	1	0	
GNSS Accuracy	<=2	0 - 50	0
Speed	3	0.0 - 999.9(km/h)	
Azimuth	2	0 - 359	
Altitude	2	((-)XXXXX(m))	
Longitude	4	(-180 - 180)	
Latitude	4	(-90 - 90)	
GNSS UTC Time	7	(YYYYMMDDHHMMSS)	
MCC	2	(HEX)	
MNC	2	(HEX)	
LAC	2	(HEX)	
Cell ID	4	(HEX)	
CSQ RSSI	1	0 - 31|99	
CSQ BER	1	0 - 7|99	
Light level	1	0 - 9	
Battery Percentage	1	0 - 100	
Mode Selection	1	0 - 2	
Movement Status	1	0 | 1	
Temperature	3	(-)XX.X	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

For **+RESP:GTLSA**

- ✧ <*Event state1*>: The light sensor alarm state.
  - 0: Normal state
  - 1: Above threshold alarm state
  - 2: Below threshold alarm state
- ✧ <*Event state2*>: 0
- ✧ <*Light Level*>: The level of light intensity detected by the device.

Event message **+RESP:GTUPC** uses the following format.

Example: **2B 45 56 54 05 FF 6F 51 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 00 00 64 2A 68 74 74 70 3A 2F 2F 31 30 31 2E 32 33 30 2E 37 31 2E 31 31 34 3A 32 30 31 39 34 2F 46 56 52 2D 56 45 52 5F 61 74 2E 69 6E 69 00 07 E6 0B 12 10 17 25 00 4F AB F9 0D 0A**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+EVT	+EVT
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Command ID	1	0 - 999	
Result	2	100 - 103 | 200 - 202 | 300 - 302 | 305 - 306	
URL Length	1	(HEX)	
Download URL	<=60	Complete URL	1
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

- ✧ <*Command ID*>: The command ID in the update configuration file. It is always 0 before the device starts to update the configuration. It indicates the total number of the successfully executed commands when the result code is 301. And it is the number of the commands which have failed to execute when the result code is 302.

- <*Result*>: A numeral to indicate whether the configuration is updated successfully.
  - 100: The update command is starting.
  - 101: The update command is confirmed by the device.
  - 102: The update command is refused by the device.
  - 103: The update process is refused because the battery is low.
  - 200: The device starts to download the package.
  - 201: The device finishes downloading the package successfully.
  - 202: The device fails to download the package.
  - 300: The device starts to update the device configuration.
  - 301: The device finishes updating the device configuration successfully.
  - 302: The device fails to update the device configuration.
  - 305: The update process is interrupted by abnormal reboot.
  - 306: The update process is interrupted by MD5 verification error.
- <*URL Length*>*:* The length of complete URL.
- <*Download URL*>: The complete URL to download the configuration. It includes the file name and ends with 0x00.

Event message **+RESP:GTUPD** uses the following format.

- **+EVT,**

Example: **2B 45 56 54 08 FF 7F 25 71 03 03 06 0B 47 4C 35 33 30 4D 47 00 00 64 01 07 E6 0B 12 10 07 11 00 08 A3 D9 0D 0A**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+EVT	+EVT
Message Type	1	(HEX)	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Code	2	(HEX)	
Retry	1	(HEX)	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

4.6. Heartbeat Data +HBD

➢ **+HBD,**

Example: **2B 48 42 44 00 00 EF 22 71 03 03 06 0B 56 54 57 00 2B 3D 11 06 07 E6 0B 12 10 0B 2B 00 18 89 FE 0D 0A**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Message Header	4	+HBD	+HBD
Reserved	1	0	
Report Mask	2	(HEX)	
Length	1	(Length)	
Device Type	1	71	71
Protocol Version	2	(HEX)	
Firmware Version	2	(HEX)	
Unique ID	8	(IMEI)	
Send Time	7	(YYYYMMDDHHMMSS)	
Count Number	2	(HEX)	
Checksum	2	(Checksum)	
Tail Characters	2	0x0D 0x0A	0x0D 0x0A

✧ <*Report Mask*>: It refers to the <*+HBD Mask*> in **AT+GTHRM.**

✧ <*Unique ID*>: If Bit 4 of <*+HBD Mask*> is 0, IMEI of the device is used as the unique ID of the device. IMEI is a 15-digit string. In the HEX format message, every 2 digits are encoded into one byte as an integer.

IMEI	**13**	**57**	**90**	**24**	**68**	**11**	**22**	**0**
HEX	**0D**	**39**	**5A**	**18**	**44**	**0B**	**16**	**00**

If the Bit 4 of <*+HBD Mask*> is 1, the device name is used as the unique ID of the device. Refer to the <*Device Name*> in **AT+GTCFG** for the device name. Device name is an 8-byte string. If the length of the <*Device Name*> is more than 8 bytes, only the first 8 bytes will be acquired. In the Hex format report, each byte is encoded into one byte as an integer. If the device name is less than 8 bytes, the empty bytes will be set to 0.

Device Name	**g**	**l**	**5**	**3**	**0**	**m**	**g**	
HEX	**67**	**6c**	**35**	**33**	**30**	**6d**	**67**	**00**

If the mask of <*UID*> is set to 0 in the <*+HBD Mask*> of **AT+GTHRM**, the heartbeat message will not include device name or IMEI information. If the mask of <*UID*> is set to 1, the heartbeat message will report device name or IMEI according to the mask of <*Device Name*>.

4.7. Buffer Report in HEX Format

When HEX format messages go into the local buffer, the device will replace the second byte of the report messages with 'B'. Thus, **+BSP** is the buffered report for **+RSP**, **+BNF** is the buffered report for **+INF** and **+BVT** is the buffered report for **+EVT**. The rest part of the messages remains the same.

5. Appendix A: Two's Complement

For a positive value, the two's complement is itself. Take 17 as an example. Its HEX format is 0x11 and the two's complement for it is 0x11. For a negative value, the following gives detailed calculations.

-X is a negative value.
Firstly, get to know the number of bits for the negative value N, then the two's complement for it is:

2^N - X

For example, to use 16 bits to represent -100, the two's complements for it should be:

2^16 – 100 = 65436 = 0xFF9C

Above is two's complement for -100 in hex format.

On the contrary, the two's complement can also be converted to the hex value that it represents similarly.

1. Get to know the number of bits for the two's complement.
2. Get the sign of the value, positive or negative. If the highest bit is 1, it is a negative value. If the highest bit is 0, it is a positive value.
3. If it is a positive value, there is no need for conversion. It is the value.
4. If it is a negative value, get the real value through the following calculation:

   -(2^N – X)

   Where:

   N is the number of bits for the two's complement.

   X is the value that is converted from the two's complement directly.

For example, if the number of bits for the two's complement is 16 and the two's complement is 0xFF9C, then it is a negative value as the highest bit is 1, and the detailed calculation for it is:

-(2^16 – 0XFF9C) = -100

6. Appendix: Message Index

✧ **Command and ACK**

AT+GTBSI
+ACK:GTBSI
AT+GTSRI
+ACK:GTSRI
AT+GTQSS
+ACK:GTQSS
AT+GTNTS
+ACK:GTNTS
AT+GTCFG
+ACK:GTCFG
AT+GTPIN
+ACK:GTPIN
AT+GTDOG
+ACK:GTDOG
AT+GTTMA
+ACK:GTTMA
AT+GTNMD
+ACK:GTNMD
AT+GTPDS
+ACK:GTPDS
AT+GTGEO
+ACK:GTGEO
AT+GTTEM
+ACK:GTTEM
AT+GTLSA
+ACK:GTLSA
AT+GTLTA
+ACK:GTLTA
AT+GTRTO
+ACK:GTRTO
AT+GTWLT
+ACK:GTWLT
AT+GTGLM
+ACK:GTGLM
AT+GTUPC
+ACK:GTUPC
AT+GTFVR
+ACK:GTFVR

✧ **Position Related Report**

+RESP:GTGEO

+RESP:GTRTL
+RESP:GTPNL
+RESP:GTNMR
+RESP:GTDOG
+RESP:GTFRI
+RESP:GTERI
+RESP:GTSOS
+RESP:GTLBC

✧ **Device Information Report**

+RESP:GTINF

✧ **Report for Querying**

+RESP:GTALM
+RESP:GTCID
+RESP:GTCSQ
+RESP:GTVER
+RESP:GTTMZ
+RESP:GTAIF
+RESP:GTGSV
+RESP:GTATI

✧ **Event Report**

+RESP:GTPNA
+RESP:GTPFA
+RESP:GTBPL
+RESP:GTTEM
+RESP:GTLTA
+RESP:GTLSA
+RESP:GTGSM
+RESP:GTUPC
+RESP:GTEUC

✧ **Heartbeat**

+ACK:GTHBD
+SACK:GTHBD

✧ **Server Acknowledgement**

+SACK

✧ **HEX Format Message**

AT+GTHRM
+ACK:GTHRM
+ACK

+RSP
+INF
+EVT
+HBD