



AT command Reference
TT8850AT001

TT8850

AT Command Reference

Revision 1.04

5/06/2011

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Document Title	TT8850 AT Command Reference
Version	1.04
Date	2011-05-06
Status	Release
Document Control ID	TT8850AT001

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0. Revision history

Revision	Date	Author	Description of change
1.00	2011-04-19	Ramiro Sanchez	SkyPatrol release
1.01	2011-04-21	Ramiro Sanchez	<ol style="list-style-type: none"> 1. Add the parameters of the command AT+GTWLT in the message GTALL. 2. Correct the length of the parameter <Count number> to 2 in HEX format of event report. 3. Add the description of the command for FOTA 4. Add the report message about FOTA 5. Add the description about FOTA process
1.03	2011-04-21	Ramiro Sanchez	<ol style="list-style-type: none"> 1. Modify the definition of the parameter <Report ID/Status> for other messages except GEO related messages in HEX format of event report. 2. Correct the definition of the situation when <GPS on need> is 2. It keeps GPS opened always in movement state as well as in ignition on state. 3. Correct <Begin time> and <End time> in the command AT+GTFRI to use local time. 4. Correct the range of <GPS on need> to 0 1 2 in the report message GTGPS. 5. Correct the range of <LED on> to 0 1 2 in the report message GTBAT. 6. The sub command 4(RESET) do not reset the parameters set by the command AT+GTTMA. 7. Delete the header "+RESP:". 8. Correct the description of <SMS header> in the Report Google Maps hyperlink. 9. Modify the minimum value of the parameter <Mileage> and <Distance> to 50

1.04	2011-05-06	Ramiro Sanchez	<ol style="list-style-type: none">1. Remove the two reserved fields between Device name and GPS on need in GTALL message2. Add new fields <i><Report items mask></i> and <i><SACK enable></i> in the report messages, for both ASCII format and HEX format.3. In both ASCII format and HEX format of the message GTANT, use the parameter <i><Report ID></i> to indicate which GPS antenna is being used, internal antenna or external antenna.4. Modify the default value of the parameter <i><Report items mask></i> as 0x5F to allow protocol version appear by default.5. Add the specification for the coding conversion of report message for sending report via SMS.
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1. Overview

1.1. Scope

The Air Interface Protocol is a digital communication interface over SMS or GPRS which is used for all communication between the backend server and the terminal. The backend server sends a command to the terminal and then the terminal confirms with an acknowledgement message. If necessary, the terminal also sends report messages to the backend server.

The purpose of this document is to describe how to build up the backend server based on the Air Interface Protocol.

1.2. Terms and Abbreviations

Table 1: Terms and abbreviations

Abbreviation	Description
APN	Access Point Network
ASCII	American National Standard Code for Information Interchange
FOTA	Update the Firmware Over The Air
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
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

2. System Architecture

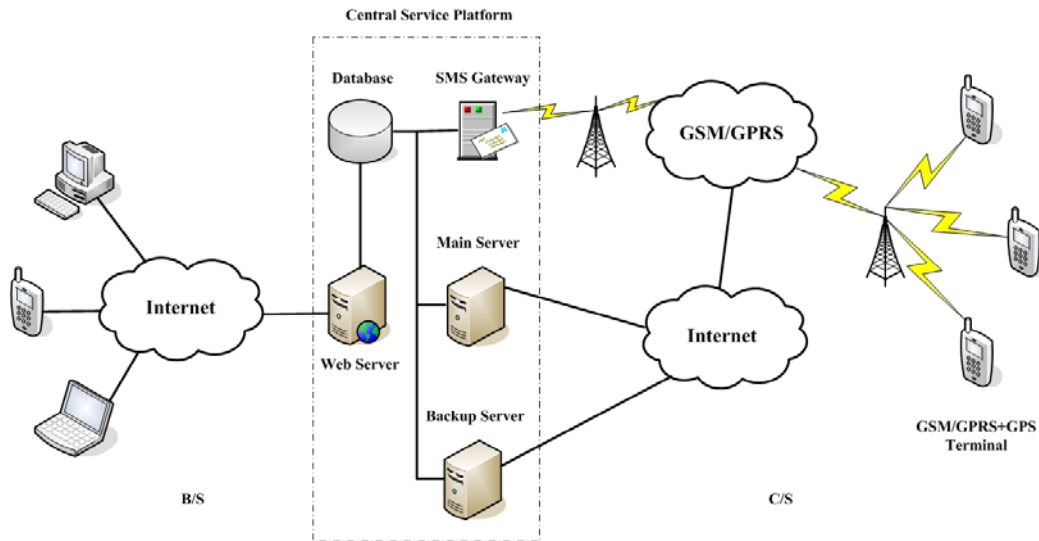


Figure 1: System architecture

The backend server can be accessed by many terminals and should have the following abilities:

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

3. Message Description

3.1. Message Format

The protocol command and acknowledgement are composed of printable ASCII characters as the following format:

Message format	Message type
AT+GTXXX=<parameter1>,<parameter2>,...\$	Command
+ACK:GTXXX,<parameter1>,<parameter2>,...\$	Acknowledgement

The entire message string ends with character '\$'.

The characters 'XXX' identify the deferent message.

The "<parameter1>,<parameter2>,..." carry the message's parameters. The number of parameters is different in different messages. The ASCII character ',' is used to separate the neighbouring parameter characters. The parameter string may contain the ASCII characters: '0'-'9', 'a'-'z', 'A'-'Z'.

And the report from the terminal to the backend server could be ASCII format or HEX format.

Detailed descriptions of each message format are located in the specific message sections.

By sending Commands to the terminal, the backend server can either configure and query the parameters of the terminal or control the terminal to perform specific actions. When the terminal receives Commands over the air, it will reply with a corresponding Acknowledgement message.

According to the configuration of the parameters, the terminal can send Report messages to the backend server. Please see the following figure:

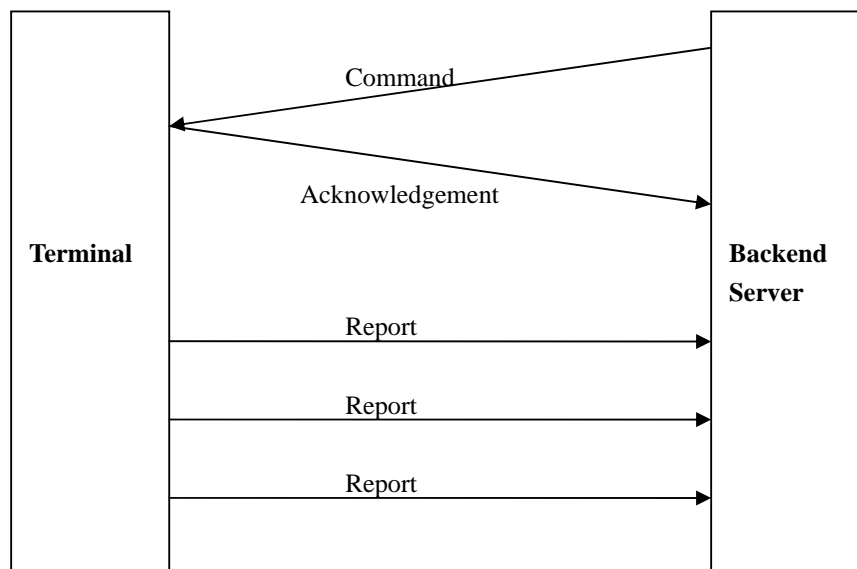


Figure 2: @Tracker protocol messages flow

When the device receives commands over the air, it supports several commands in one SMS or GPRS packet without separate symbol between two close commands. But it is necessary to make sure the total size of the several commands is not longer than 160 if the commands are sent via SMS. Here is an example to send three commands in one SMS.

```
AT+GTFRI=TT8850,1,1,,,0000,2359,60,60,,,1F,0,,,,,,,,,0007$AT+GTGEO=TT8850,0,3,101.412248,21.187891,1000,600,,,,,,,,,0008$AT+GTSPD=TT8850,1,5,40,30,60,,,,,,,,,0009$
```

It includes three commands (**AT+GTFRI**, **AT+GTGEO** and **AT+GTSPD**) in the above message. And the terminal will handle the three commands one by one after it received the message via SMS and it will report the following three acknowledgement message to the backend server one by one.

```
+ACK:GTFRI,020100,135790246811220,,0,,0007,20100310172830,11F0$
```

```
+ACK:GTGEO,020100,135790246811220,,0,0,0008,20100310172900,11F1$
```

```
+ACK:GTSPD,020100,135790246811220,,0,,0009,20100310172930,11F2$
```

3.2. Command and Acknowledgement

3.2.1. Quick Start Setting

The command **AT+GTQSS** is used to set the GPRS parameter and backend server information in one command if all these settings are within 160 bytes, otherwise use **AT+GTBSI** and **AT+GTSRI** in two steps.

➤ **AT+GTQSS=**

Example:

AT+GTQSS=TT8850,cmnet,,,4,,116.226.44.17,9001,116.226.44.16,9002,+8613812341234,0,1,,0001\$

Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
APN	<=40		
APN user name	<=30		
APN password	<=30		
Report mode	1	0 – 5	0
Buffer enable	1	0 1	1
Main server IP/domain name	<=60		
Main server port	<=5	0 – 65535	0
Backup server IP	<=15		0.0.0.0
Backup server port	<=5	0 – 65535	0
SMS gateway	<=20		
Heartbeat interval	<=5	0 30 – 21600sec	0
SACK enable	1	0 1	0
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ <Password>: The valid character of password is '0'-'9', 'a'-'z', 'A'-'Z'. The default value is "TT8850".
- ✧ <APN>: Access point name (APN).
- ✧ <APN user name>: the GPRS APN user name. If the parameter field is empty, the parameter will be cleared.
- ✧ <APN password>: the GPRS APN password. If the parameter field is empty, the parameter will be cleared.
- ✧ <Report mode>: Supports report modes as following:
 - 0: Stop reporting.
 - 1: TCP short-connect preferred mode. The connection is based on TCP protocol. The

terminal connects to the backend server every time it needs to send data and will shut down the connection when the terminal finishes sending data. And if it is failed to establish a TCP connection with the backend server (including Main Server and Backup Server), it will try to send data via SMS.

2: TCP short-connect forced mode. The connection is based on TCP protocol. The terminal connects to the backend server every time it needs to send data and will shut down the connection when the terminal finishes sending data. And if it is failed to establish a TCP connection with the backend server (including Main Server and Backup Server), it will be stored in the BUFFER (if BUFFER function is enabled, please refer to *<Buffer enable>*) or discarded (if the BUFFER function is disabled).

3: TCP long-connect mode. The connection is based on TCP protocol. The terminal connects to the backend server and maintains the connection using the heart beat data. Please note that in this mode the backend server should respond to the heart beat data from the terminals.

4. UDP mode. The terminal will send data to the backend server by UDP protocol. It supports to receive protocol command via UDP. But it is recommended to make sure the IP address and UDP port of the device can be visited in the internet, and this is generally realized by heart beat package and the message **GTPDP**.

5: Force on SMS. Only use the SMS for transmitting.

- ✧ *<Reserved>*: Not used at present. Please keep empty.
- ✧ *<Buffer enable>*: Enable or disable BUFFER function. Please refer to 3.3.4 for the details about BUFFER function.
 - 0 Disable the BUFFER function.
 - 1 Enable the BUFFER function.
- ✧ *<Main server IP/domain name>*: The IP address or the domain name of the main server.
- ✧ *<Main server port>*: The port of the main server.
- ✧ *<Backup server IP>*: The IP address of the backup backend server.
- ✧ *<Backup server port>*: The port of the backup server.
- ✧ *<SMS gateway>*: Maximum 20 characters including the optional national code starting with "+" for SMS messages. Short code (for example: 10086) is also supported.
- ✧ *<Heartbeat interval>*: the interval for the terminal to send heartbeat package message to the backend server. If set to 0, no heartbeat package is sent.
- ✧ *<SACK enable>*: A numeric to indicate whether the backend server should reply SACK message to the device.
 - 0: the backend server does not reply SACK message after receiving a message from the device, including response for the heartbeat message.
 - 1: the backend server should reply SACK message after receiving a message from the device, including response for the heartbeat message.
- ✧ *<Serial number>*: the serial number for the command. It will be invoked in the ACK message of the command.
- ✧ *<Tail character>*: a character to indicate the end of the command. And it should be "\$".

Note:

Before sending an ASCII format message to the SMS gateway via SMS, the terminal will convert

<Message header> to ASCII format ("0004").

Before sending a HEX format message to the SMS gateway via SMS, the terminal will convert almost the whole message to ASCII format except the fields of <Unique ID> and <Device name>. For example, the message header 0x0005 which takes up two bytes will be converted to "0005" and the send time which are composed by the hex values 0x0B, 0x05, 0x05, 0x12, 0x20, 0x1E will be converted to "0B050512200E".

The acknowledgement message of **AT+GTQSS** command:

➤ **+ACK:GTQSS,**

Example: +ACK:GTQSS,020100,135790246811220,,0,,0001,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ <Protocol version>: The combination of the device type and the version number of the applied protocol. The first two characters 'XX' indicate the device type. '02' represents TT8850. The middle two characters are the main version number and the last two characters are the minimum version number. Both the main version and the minimum version are hex digital. For example, '020A' means version 2.10.
- ✧ <Unique ID>: ID of the device, use the IMEI of the current SIM card inside the terminal.
- ✧ <Device name>: Please refer to the parameter <Device name> in the command **AT+GTCFG**.
- ✧ <Command response>: A numeric to indicate whether the command is executed
 - 0: Command executed successfully
 - 1: Error in command
- ✧ <Serial number>: The same serial number which is sent to the device with the corresponding command. The backend server could use it to distinguish which command the ACK message is for.
- ✧ <Send time>: The local time to send the ACK message.
- ✧ <Count number>: The self-increasing count number will be put into every acknowledgment message and report message. The count is beginning from 0000 and increases by 1 every time. It will roll back after "FFFF".

3.2.2. Bearer Setting Information

The command **AT+GTBSI** is used to set the GPRS parameter.

➤ **AT+GTBSI=**

Example: AT+GTBSI=TT8850,cmnet,,,,,,,,0002\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
APN	<=40		
APN user name	<=30		
APN password	<=30		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

The acknowledgement message of **AT+GTBSI** command:

➤ **+ACK:GTBSI,**

Example: +ACK:GTBSI,020100,135790246811220,,0,,0002,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.3. Backend Server Register Information

The command **AT+GTSRI** is used to configure the backend server information that the terminal reports to and the report mode that defines the communication method between the backend server and the terminal.

➤ **AT+GTSRI=**

Example: AT+GTSRI=TT8850,4,,116.226.44.17,9001,116.226.44.16,9002,+8613812341234,0,1,,,,,0003\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Report mode	1	0 – 5	0
Buffer enable	1	0 1	1
Main server IP/domain name	<=60		
Main server port	<=5	0 – 65535	0
Backup server IP	<=15		0.0.0.0
Backup server port	<=5	0 – 65535	0
SMS gateway	<=20		
Heartbeat interval	<=5	0 30 – 21600sec	0
SACK enable	1	0 1	0
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

The acknowledgement message of **AT+GTSRI** command:

➤ **+ACK:GTSRI,**

Example: +ACK:GTSRI,020100,135790246811220,,0,,0003,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.4. Global Configuration

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

➤ **AT+GTCFG=**

Example:

AT+GTCFG=quectl,123456,,,,,,,,,,,,,0004\$

AT+GTCFG=TT8850,,TT8850,0,7,0,0,,,,,1,1,300,1,,,,,0004\$

Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
New password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	
Device name	10	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
GPS on need	1	0 1 2	1
GPS fix delay	2	5 – 60sec	5
Report format	1	0 1	1
Report items mask	<=4	0000 – FFFF	005F
Reserved	0		
Event mask	4	0000-FFFF	0FFF
EPB mode	1	0 1	0
LED on	1	0 1 2	1
Info report enable	1	0 1	1
Info report interval	<=5	30 – 86400sec	300
Location by call	1	0 1	1
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ **<New password>**: Set to change the current password.
- ✧ **<Device name>**: the name of the device, which appears in each uplink message.
- ✧ **<GPS on need>**: Whether to close GPS chip after retrieving GPS position information.
 - 0: Never close GPS chip
 - 1: Close GPS chip after retrieving GPS information every time.
 - 2: Never close GPS chip only in ignition on state.
- ✧ **<GPS fix delay>**: This is the time to wait after GPS fixing succeed. After GPS fixing succeed, the device will wait for a period of time (defined by **<GPS fix delay>**) and then get the result of GPS fixing because maybe it is not accurate to get the position immediately after GPS fixing succeed. (e.g. if **<GPS fix delay>** is set as 7, we will wait for 7 seconds after GPS fixing succeed and then get the position as the result). The range of the parameter is 5 – 60, and the default value is 5. Unit: second.
- ✧ **<Report format>**: A numeric to control which format to use for position and event report

message.

0: ASCII format

1: HEX format

- ✧ **<Report items mask>**: Bitwise report mask to configure the composition of all the uplink message. Each bit represents a field in the uplink message. If some bit is set as 1, the corresponding field will be filled if it is included in the uplink message. Otherwise, the field will be empty.

Bit0(0001): **<speed>**

Bit1(0002): **<azimuth>**

Bit2(0004): **<altitude>**

Bit3(0008): GSM LAI and CI, including **<mcc>**, **<mnc>**, **<lac>**, **<cellid>** and the **<reserved1>** parameter "00"

Bit4(0010): **<send time>**

Bit5(0020): **<Device name>**

Bit6(0040): **<Protocol version>**

- ✧ **<Event mask>**: A Hex value to configure which event reports can be sent to the backend server: Each bit corresponds to a report message. And if the bit is set as 1, the corresponding report message can be sent to the backend server. Otherwise, it can not be sent to the backend server. Here is the mapping between each bit and each report message.

bit0(0001): **GTPNA**

bit1(0002): **GTPFA**

bit2(0004): **GTEPN**

bit3(0008): **GTEPF**

bit4(0010): Reserved

bit5(0020): **GTBPL**

Bit6(0040): **GTBTC**

Bit7(0080): **GTSTC**

bit8(0100): **GTSTT**

bit9(0200): **GTANT**

bit10(0400): **GTPDP**

bit11(0800): **GTPNL**

- ✧ **<EPB mode>**: The mode of External Power Control Unit With Built-in Motion Sensor.

0: disable External Power Control Unit With Built-in Motion Sensor.

1: enable External Power Control Unit With Built-in Motion Sensor.

- ✧ **<LED on>**: Configure the working mode of GPS LED.

0: Each time the device powers on, GPS LED's will work for 150 seconds and then are turned off deadily. GSM LED and Power LED works normally.

1: All LEDs work normally, please refer to chapter 4 for the details.

2: All LEDs are off always.

- ✧ **<Info report enable>**: Enable/disable the device information report (**GTINF**) function. The device information include state of the device, ICCID, GSM signal strength, adapter connection status, battery voltage, charging status, Power and GPS LED working mode, GPS on need setting, GPS antenna type, GPS antenna status, the last known time of GPS fix.

0: Disable the device information report function.

1: Enable the device information report function.

✧ <Info report interval>: The interval of reporting the device information.

✧ <Location by call>: Configure how to handle the incoming call.

0: Just hang up the call.

1: Hang up the call and report the current position.

The acknowledgement message of **AT+GTCFG** command:

➤ **+ACK:GTCFG,**

Example:			
+ACK:GTCFG,020100,135790246811220,,0,,0004,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.5. Non movement detection

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

➤ **AT+GTNMD=**

Example:			
AT+GTNMD=TT8850,,3,2,3,180,180,,,,,0005\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
mode	1	0-F	0
Non-movement duration	<=3	1 – 255(×15sec)	2
Movement duration	<=2	1 – 10(×128ms)	3
Movement threshold	1	2 – 4	2
rest fix interval	5	5 – 86400sec	300
rest send interval	5	5 – 86400sec	300
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ **<mode>**: A hex numeric to determine how the function works. Each bit of the hex numeric indicate different behavior that device could do. If the corresponding bit is 1, the device will behave as the description. Otherwise, it won't behave as the description.
 - Bit0(1): Suspend the report of FRI and Geo-Fence when it detects non-movement.
 - Bit1(2): Report the message **GTNMR** to the backend server when it detects non-movement.
 - Bit2(4): Report the message **GTNMR** to the backend server when it detects movement.
 - Bit3(8): Change the fix interval and send interval of FRI to *<rest fix interval>* and *<rest send interval>* when it detects non-movement. In the case, It just modify the fix interval and send interval of FRI but not suspend the report of FRI even if Bit0 is 1.
- ✧ **<Non-movement duration>**: A time parameter to determine whether the device enters non-movement status, i.e. if the motion sensor detects that the device keeps in non-movement for a period of time defined by *<Non-movement duration>*, the device will be considered as 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 keeps in movement for a period of time defined by *<Movement duration>*, the device will be considered as in movement status.
- ✧ **<Movement threshold>**: The threshold for the motion sensor to determine whether the device is in movement. The less, the more likely to be treated as movement.
- ✧ **<rest fix interval>**: the fix interval for the report of FRI when the device is in rest state if Bit3

of *<mode>* is 1.

- ✧ *<rest send interval>*: the send interval for the report of FRI when the device is in rest state if Bit3 of *<mode>* is 1.

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

➤ **+ACK:GTNMD,**

Example:			
+ACK:GTNMD,020100,135790246811220,,0,,0005,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.6. Time Adjustment

The command **AT+GTTMA** is used to adjust local time. If the GPS fixing is successful, the local time will be automatically adjusted according to the GPS UTC time.

➤ **AT+GTTMA=**

Example: AT+GTTMA=TT8850,-,3,30,0,20090917203500,,,,,0006\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Sign	1	+ -	+
Hour Offset	<=2	0 - 23	00
Minute Offset	<=2	0 - 59	00
Daylight Saving	1	0 1	0
UTC Time	14	YYYYMMDDHHMMSS	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ <Sign>: Indicate the positive or negative of the local time offset to UTC
- ✧ <Hour Offset>: UTC offset in hours
- ✧ <Minute Offset>: UTC offset in minutes
- ✧ <Daylight Saving>: Enable/disable daylight saving time.
0: Disable daylight saving
1: Enable daylight saving
- ✧ <UTC time>: The configuration UTC time.

The acknowledgement message of **AT+GTTMA** command:

➤ **+ACK:GTTMA,**

Example: +ACK:GTTMA,020100,135790246811220,,0..0007,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		

Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.7. Fixed Report Information

The command **AT+GTFRI** is used to configure the parameters of scheduled report.

➤ **AT+GTFRI=**

Example:

AT+GTFRI=TT8850,0,,,,,,,,,,,,,0007\$

AT+GTFRI=TT8850,1,1,0000,2359,60,60,,,1F,,,,,,0007\$

Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Mode	1	0 1 2 3	0
Discard no fix	1	0 1	1
Begin time	4	HHMM	0000
End time	4	HHMM	0000
Check interval1	<=5	5 – 86400sec	180
Send interval1	<=5	5 – 86400sec	180
Check interval2	<=5	5 – 86400sec	180
Send interval2	<=5	5 – 86400sec	180
Report mask	<=4	0000 – FFFF	001F
Distance	<=5	50 – 65535m	1000
Mileage	<=5	50 – 65535m	1000
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

✧ **<Mode>**:

0: Disable fixed report function.

1: Enable the scheduled timing report.

2: Enable the scheduled distance report. Report each time the straight length that the device moved has exceeded the specified distance. It ignores the detail path the device has passed along. This function is invalid unless the GPS chip opens always. Unit: Meter.

3: Enable the scheduled mileage report. Report each time the path length that the device moved has exceeded the specified length. It calculates the length of the detail path the device has passed along. This function is invalid unless the GPS chip opens always. Unit: Meter.

- ✧ **<Discard no fix>**: 0 to report last known GPS position if there is no GPS fix, 1 to send nothing if there is no GPS fix.
- ✧ **<Begin time>**: The start time of scheduled fixed report. The valid format is "HHMM". The value range of "HH" is "00"-"23". The value range of "MM" is "00"-"59". It is noticed to use local time here.
- ✧ **<End time>**: The end time of scheduled fixed report. The valid format and range are same as **<Begin time>**.
- ✧ **<Check interval1>**: The interval time to fix GPS when the device attached vehicle is ignition off, its value range is 5-86400 and the unit is second.
- ✧ **<Send interval1>**: The period to send the position information when the device attached vehicle is ignition off. The value range is 5-86400 and the unit is second.
- ✧ **<Check interval2>**: The interval time to fix GPS when the device attached vehicle is ignition on, its value range is 5-86400 and the unit is second.
- ✧ **<Send interval2>**: The period to send the position information when the device attached vehicle is ignition on. The value range is 5-86400 and the unit is second.
- ✧ **<Report mask>**: Bitwise report mask to configure the composition of GPS position information for fixed report. If some bit is set as 1, the corresponding field will be filled in the position related message. Otherwise, the field will be empty.
 - Bit0(0001): **<speed>**
 - Bit1(0002): **<azimuth>**
 - Bit2(0004): **<altitude>**
 - Bit3(0008): GSM LAI and CI, including **<mcc>**, **<mnc>**, **<lac>**, **<cellid>** and the **<reserved1>** parameter "00"
 - Bit4(0010): **<send time>**
- ✧ **<Distance>**: the specified distance to send the position information when **<Mode>** is 2 and this is valid only in the case that GPS chip keep opened always. Unit: meter.
- ✧ **<Mileage>**: the specified path length to send the position information when **<Mode>** is 3 and this is valid only in the case that GPS chip keep opened always.. Unit: meter.

Note:

- ✧ Check and send interval

If **<GPS On Need>** was set as 1 or **<GPS On Need>** was set as 2 without ignition on,

The terminal has two modes to operate the GPS module according to the value of **<Check interval>**:

- Normal mode: If the **<Check interval>** is more than 60 seconds, the terminal will close the GPS part every time after GPS fixing finishes in order to save power.
- Emergency mode: If the **<Check interval>** is less than 60 seconds, the terminal will never close the GPS part. In this mode, the **<Send interval>** will be ignored, the terminal reports every **<Check interval>** time, and the minimum value of **<Check interval>** is forced to 5 seconds.

<Check interval> and **<Send interval>** should be always the same, because GTFRI message includes only one position. If **<Send interval>** / **<Check interval>** > 1, GTFRI will includes only the last position.

✧ Action time range

- *<Begin time>* < *<End time>*: reports in the time period (begin time, end time) every day.
- *<Begin time>* > *<End time>*: reports starting from *<Begin time>* and stopping at *<End time>* on the following day.
- *<Begin time>* = *<End time>*: reports on the whole day.

The acknowledgement message of **AT+GTFRI** command:

➤ **+ACK:GTFRI,**

Example:			
+ACK:GTFRI,020100,135790246811220,,0,,0007,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.8. Geo-Fence Information

The command **AT+GTGEO** is used to configure the parameters of Geo-Fence. Geo-Fence is a virtual perimeter on a geographic area using a location-based service, so that when the geofencing terminal enters or exits the area a notification is generated. The notification can contain information about the location of the terminal and may be sent to the backend server.

➤ **AT+GTGEO=**

Example: AT+GTGEO=TT8850,0,3,101.412248,21.187891,1000,600,,,,,0008\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
GEO ID	1	0 – 4	
Mode	1	0 – 3	0
Longitude	<=11	(-)xxx.xxxxxx	
Latitude	<=10	(-)xx.xxxxxx	
Radius	<=7	50 – 6000000m	50
Check interval	<=5	0 30 – 86400sec	0
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

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

Note:

If the parameter *<Check interval>* is set as 0, *<Mode>* will be set as 0 automatically (To Geo-Fence 0, *<Mode>* will be restored at first and it could be used later when switch on Geo-Fence 0 via Function Key), because the terminal doesn't know when to check Geo-Fence if the parameter *<Check interval>* is 0.

The acknowledgement message of **AT+GTGEO** command:

➤ **+ACK:GTGEO,**

Example:			
+ACK:GTGEO,020100,135790246811220,,0,0,0008,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
GEO ID	1	0 – 4	
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.9. Speed Alarm

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

➤ **AT+GTSPD=**

Example: AT+GTSPD=TT8850,1,5,40,30,60,,,,,0009\$ AT+GTSPD=TT8850,2,0,80,30,60,,,,,0009\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Mode	1	0 1 2	0
Min speed	<=3	0 – 400km/h	0
Max speed	<=3	0 – 400km/h	0
Duration	<=4	15 – 3600sec	60
Send interval	<=4	30 – 3600sec	300
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ **<Mode>**: A numeric to indicate the working mode of speed alarm.
 - 0: Disable speed alarm.
 - 1: Enable speed alarm. If the current speed is within the speed range defined by min speed and max speed, a speed alarm is sent.
 - 2: Enable speed alarm. If the current speed is outside the speed range defined by min speed and max speed, a speed alarm is sent.
- ✧ **<Min speed>**: The lower limit of the speed range.
- ✧ **<Max speed>**: The upper limit of the speed range.
- ✧ **<Duration>**: According to the working mode, if the speed satisfies the specified speed range and maintains a period of time defined by <Duration>, the speed alarm will be triggered.
- ✧ **<Send interval>**: After the speed alarm is triggered, the speed alarm message is sent every interval time.

The acknowledgement message of **AT+GTSPD** command:

➤ **+ACK:GTSPD,**

Example: +ACK:GTSPD,020100,135790246811220,,0,,0009,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF,	

		$X \in \{'A'-'Z', '0'-'9'\}$	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.10. Function Key Setting

The **AT+GTFKS** command is used to configure the function of the power key and the function key.

➤ **AT+GTFKS=**

Example: AT+GTFKS=TT8850,1,,1,,,,,000A\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Power key enable	1	0 1	1
Reserved	0		0
Function key mode	1	0 1 2 3	3
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ **<Power key enable>**: A numeric to indicate the working mode of the power key.
 - 0: Press power key will not power down the device.
 - 1: Press power key will power down the device.
- ✧ **<Function key mode>**: The working mode for the function key operation..
 - 0: Ignore the function key operation.
 - 1: Geo-Fence mode. Switch on/off the Geo-Fence ID 0 when the function key is long pressed. And after long press the function key, the terminal will report the message **GTSWGW** to inform to switch on or off Geo-Fence ID 0 via this operation.
 - 2: Geo-Fence in current position. Switch on/off the Geo-Fence 0 when the function key is long pressed and use the current position as the centre of Geo-Fence 0 when switch on the Geo Fence 0 via the function key. After long press the function key, the terminal will report the message **GTSWGW** immediately. And if this operation is expected to switch on Geo-Fence ID 0, the terminal will start GPS fixing to get the current position as the centre of Geo-Fence ID 0. After GPS fixing finishes, it will report the message **GTGCR** to inform the result of GPS fixing and whether Geo-Fence ID 0 was switched on successfully.
 - 3: SOS mode. After long press for 3 seconds, the device will report the current position according to the result of the latest GPS fixing and then start GPS fixing. After the GPS fixing finishes or timeout, the device will report the SOS message according the result of the GPS fixing.

The acknowledgement message of **AT+GTFKS** command:

➤ **+ACK:GTFKS,**

Example: +ACK:GTFKS,020100,135790246811220,,0,,000A,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF, $X \in \{'A'-'Z', '0'-'9'\}$	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.11. Real Time Operation

The **AT+GTRTO** command is used to configure the function of the power key and the function key.

➤ **AT+GTRTO=**

Example: AT+GTRTO=TT8850,0,,,,,000B\$			
Parameter	Length (byte)	Range/Format	Default
Password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Sub command	1	0 – C	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	\$

✧ **<Sub command>**: A numeric to indicate the sub command to execute.

0 (**GPS**): Request GPS related information, including setting of *<GPS on need>*, *<Report items mask>*, *<Report mask>* of fixed report, GPS antenna type, GPS antenna status and the last known time of successful GPS fixing.

1 (**RTL**): Request the device to report its current position.

2 (**READ**): Request the device to report its entire configuration.

3 (**REBOOT**): Reboot the device remotely.

4 (**RESET**): Reset all parameters to factory default except parameter of **AT+GTBSI**, **AT+GTSRI**.

5 (**PWROFF**): Power off the device remotely.

6 (**CID**): Request the device to report the ICCID of the installed SIM card.

7 (**CSQ**): Request the device to report the current GSM signal level.

8 (**VER**): Request the device to report version information including the device type, the firmware version and the hardware version.

9 (**BAT**): Request the device to report power supply related information including the external power supply status, current voltage of the battery, the battery charging status and the working mode of LED.

A (**TMZ**): Request the device to report the time zone setting.

B: (**INF**): Read the device information report function. The corresponding information will be reported via the message GTINF.

C: (**GGL**): Get a message with google map hyperlink of the current position. And the message with google map hyperlink will be sent to the original place where the command is from.

The acknowledgement message of **AT+GTRTO** command:

➤ **+ACK:GTRTO,**

Example:			
+ACK:GTRTO,020100,135790246811220,,0,GPS,000B,20100310172830,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Sub command	<=6	Sub command string	
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.12. White Call List Configuration

The **AT+GTWLT** command is used to set white call list table.

➤ AT+GTWLT=

Example: AT+GTWLT=TT8850,1,1,2,13813888888,13913999999,,,,,000C\$			
Parameter	Length (byte)	Range/Format	Default
password	4~8	'0'-'9','a'-'z','A'-'Z'	TT8850
call filter	1	0 1 2	1
mobile start	1	1-10	
mobile end	1	1-10	
white number list	<=20*10		
reserved	0		
reserved	0		
reserved	0		
reserved	0		
Serial number	4	0000 – FFFF	
Tail character	1	\$	

- ✧ **<call filter>**: A numeric to indicate whether to filter the incoming call according to **<white number list>** before it try to send google link SMS to the incoming number.
 - 0: Do not return a google link SMS to incoming number no matter what the parameter **<location by call>** was set and no matter whether the incoming number is in the **<white number list>**.
 - 1: Do not filter the incoming call. It will return a google link SMS to the incoming number as long as the parameter **<location by call>** was set as 1.
 - 2: Filter the incoming call. If the incoming number isn't in **<white number list>** or **<direct number list>**, it won't return a google link SMS to the incoming number even if the parameter **<location by call>** was set as 1.
- ✧ **<mobile start>**: A numeric to indicate the first index of the white call number to input. For example, if it is **1**, it will update the white call list from the **1st** one. If it is empty, it should not include **<white number list>** later.
- ✧ **<mobile end>**: A numeric to indicate the last index of the white call number to input. For example, if it is **2**, it will update the white call list until the **2nd** one. If it is empty, it should not include **<white number list>** later.
- ✧ **<white number list>**: A phone number list. It could include several phone numbers. And two close phone numbers are separated with ",". The number of the phone number in the list is up to the parameter **<mobile start>** and **<mobile end>**. For example, if **<mobile start>** is **1** and is **<mobile end>** **2**, the **<white number list>** should include **2** phone numbers and the two numbers are separated by with ",".

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

➤ **+ACK:GTWLT,**

Example:			
+ACK:GTWLT,020100, 135790246811220,,0,,000C,20101029085505,0025\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

Note:

It is necessary to make sure the total size of the command is not greater than 160 if it is sent via SMS.

3.2.13. Start FOTA

To start the firmware update, the backend server sends **AT+GTUPD (sub-command:0)** command to the device to apply firmware update. Upon this command, the device is informed of where to download the update package and how to download the package.

➤ **Start: AT+GTUPD=**

Example:			
AT+GTUPD=TT8850, 0,0,10,0,,,http://fota.queclink.com/gl200_0301_0305.bin,,,,,000D\$			
Parameter	Length(byte)	Range/Format	Default value
password	4~6	'0'-'9','a'-'z','A'-'Z'	TT8850
sub-command	1	0	
max download retry	1	0 – 3	0
download timeout	2	10 – 30 min	10
download protocol	1	0	0
download user name	<=6	'0'-'9','a'-'z','A'-'Z'	
download password	<=6	'0'-'9','a'-'z','A'-'Z'	
download URL	100	legal URL	
reserved	0		
reserved	0		
reserved	0		
reserved	0		
serial number	4	0000-FFFF	
tail character	1	\$	\$

- ✧ <password>: the valid character of password is '0'-'9', 'a'-'z', 'A'-'Z'. The default value is "TT8850".
- ✧ <sub-command>: sub-command of AT+GTUPD, 0 means to start the firmware update.
- ✧ <max download retry>: specifies the maximum time of retrying to download the update package upon downloading failure.
- ✧ <download timeout>: specifies the expiration timeout of one single downloading. If the downloading expires, it is considered to be failure.
- ✧ <download protocol>: the protocol used to download the package. Only HTTP is supported now. Set to 0.
- ✧ <download user name>: if the file server uses authentication, specifies the user name here.
- ✧ <download password>: if the file server uses authentication, specifies the password here.
- ✧ <download URL>: specifies the URL to download the package.
- ✧ <reserved>: reserved for future extension.
- ✧ <serial number>: As the command reference, the exact serial number will be sent back to the platform in ACK. It is in hexadecimal format. It should begin from 0000 and increases by 1 every time. It should roll back after "FFFF".
- ✧ <tail character>: A character to indicate the end of the command. Must be "\$".

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

➤ **+ACK:GTUPD**

Example: +ACK:GTUPD,020100,135790246811220,,0,,000D,20101029085505,0025\$			
Parameter	Length (byte)	Range/Format	Default
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Command response	1	0 1	
Reserved	0		
Serial number	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.2.14. Stop FOTA

Before the device is downloading the update package, the backend server could use the **AT+GTUPD (sub-command:1)** command to cancel the current firmware updating. If the package is downloaded successful, this command is ignored by device.

➤ **Stop: AT+GTUPD=**

Example: AT+GTUPD=TT8850,1,,,,,000E\$			
Parameter	Length(byte)	Range/Format	Default value
password	4~6	'0'-'9','a'-'z','A'-'Z'	TT8850
sub-command	1	1	
reserved	0		
reserved	0		
reserved	0		
reserved	0		
serial number	4	0000-FFFF	
tail character	1	\$	\$

✧ **<sub-command>**: sub-command of AT+GTUPD, 1 means to cancel the current firmware update process.

✧

3.3. Report

3.3.1. Position and Event Report

Position report and event report are encapsulated with the same format. And there are two types of format for the position report and event report, ASCII format and HEX format. And the parameter *<Report format>* in the command AT+GTCFG decides which format will be used to encapsulate the position report and event report.

3.3.1.1. ASCII format Report

The following table gives the structure of the ASCII format. And two adjacent parameters are separated by the symbol “,” except *<Count number>* and *<Tail character>*.

Example:

```
\0\4,005F,0,GTFR1,020100,135790246811220,,0,0,1,1,4.3,92,70.0,121.354335,31.222073,20090214013254,0460,0000,18d8,6141,90,20090214093254,11F0$
```

```
\0\4,005F,0,GTGEO,020100,135790246811220,,0,0,1,1,4.3,92,70.0,121.354335,31.222073,20090214013254,0460,0000,18d8,6141,90,20090214093254,11F0$
```

```
\0\4,005F,0,GTSPD,020100,135790246811220,,0,0,1,1,4.3,92,70.0,121.354335,31.222073,20090214013254,0460,0000,18d8,6141,90,20090214093254,11F0$
```

```
\0\4,005F,0,GTSSOS,020100,135790246811220,,0,0,1,1,4.3,92,70.0,121.354335,31.222073,20090214013254,0460,0000,18d8,6141,90,20090214093254,11F0$
```

```
\0\4,005F,0,GTRTL,020100,135790246811220,,0,0,1,1,4.3,92,70.0,121.354335,31.222073,20090214013254,0460,0000,18d8,6141,90,20090214093254,11F0$
```

```
\0\4,005F,0,GTPNL,020100,135790246811220,,0,0,1,1,4.3,92,70.0,121.354335,31.222073,20090214013254,0460,0000,18d8,6141,90,20090214093254,11F0$
```

```
\0\4,005F,0,GTNMR,020100,135790246811220,,0,0,1,1,4.3,92,70.0,121.354335,31.222073,20090214013254,0460,0000,18d8,6141,90,20090214093254,11F0$
```

Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTXXX	
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	

Device name	10		
Report ID	1	0 – 4	
Report type	2	0 1 2 3 21 22 41 42	
Number	1	1	
GPS accuracy	<=2	0 1 – 50	
Speed	<=5	0.0 – 999.9km/h	
Azimuth	<=3	0 – 359	
Altitude	<=8	(-)xxxxx.x m	
Longitude	<=11	(-)xxx.xxxxxx	
Latitude	<=10	(-)xx.xxxxxx	
GPS UTC time	14	YYYYMMDDHHMMSS	
MCC	4	0XXX	
MNC	4	0XXX	
LAC	4	XXXX	
Cell ID	4	XXXX	
battery percentage	3	0-100	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ **<Message header>**: A numeric to indicate this message is a message in ASCII format. It is always 0x0004 for ASCII format.
- ✧ **<Report items mask>**: It is same as the parameter **<Report items mask>** in the command AT+GTCFG to indicate which fields are empty in the following structure of the message. If some bit is 0, the corresponding field will be empty. About the meaning of each bit, please refer to the chapter 3.2.4.
- ✧ **<SACK enable>**: It is same as the parameter **<SACK enable>** in the command AT+GTQSS and AT+GTSRI to indicate whether it is necessary to respond an acknowledgement message to the unit for the message.
- ✧ **<Message type>**: A string with five characters to indicate the type of the message. And it always starts with "GT". And the later 3 character tell us the type of the message as following.

FRI: Report by scheduled time or scheduled distance or scheduled mileage. Please refer to the command AT+GTFRI.

GEO: Geo-Fence report. Please refer to the command AT+GTGEO.

SPD: Speed alarm report. Please refer to the command AT+GTSPD.

SOS: SOS alarm report which is generated by long press the function key. Please refer to the parameter **<Function key mode>** in the command AT+GTFKS.

RTL: Real time location. Please refer to the sub command 1 in the command AT+GTRTO.

PNL: The first location after power on.

NMR: Location report when movement state changes.

LBC: Location by call request

GCR: Location as the centre of the Geo-Fence 0.

PNA: Power on report.

PFA: Power off report.

EPN: Report for connecting external power supply.

EPF: Report for the removing external power supply.

BPL: Battery low report.

BTC: Report for charging started.

STC: Report for charging stopped.

STT: Report for the device state changed, including motion state and ignition state.

ANT: GPS antenna indication.

PDP: PDP connection reset report.

SWG: Report for switching on or off Geo-Fence 0.

✧ **<Report ID>:** ID of Geo-Fence in **GTGEO**, 0 for other reports.

- For **GTGEO**, it is ID of Geo-Fence,
- For the message **GTANT**, it indicates which GPS antenna is being used.
0: the device is using the internal GPS antenna.
1: the device is using the external GPS antenna.
- For other messages, it is always 0.

✧ **<Report type>:** It has different meaning in different report.

- For **GTGEO**
0: exit the corresponding Geo-Fence.
1: enter the corresponding Geo-Fence.
- For **GTSPD**
0: Outside the speed range.
1: Inside the speed range.
- For **GTNMR**
0: The state of the device changed from motion to rest.
1: The state of the device changed from rest to motion.
- For **GTGCR**, it is the new mode of Geo-Fence 0,
0: Disable the Geo-Fence 0.
1: Reports when enters the Geo-Fence 0.
2: Reports when leaves the Geo-Fence 0.
3: Reports when enters or leaves the Geo-Fence 0.
- For **GTSTT**, it means the current state of the device,
21: The device attached vehicle is ignition on and motionless.
22: The device attached vehicle is ignition on and moving.
41: The device is motionless without ignition on.
42: The device is moving without ignition on.
- For **GTSWG**, it means the new state of Geo-Fence 0,
0: deactivate the Geo-Fence report of the Geo-Fence 0.
1: Activate the Geo-Fence report of the Geo-Fence 0.
- For other messages, it is always 0,

✧ **<Number>:** Number of points in one report message. It is always 1.

✧ **<GPS accuracy>:** The HDOP defined in NMEA0183. The range of value is 1 – 50. The smaller

the value, the higher the precision. Different from NMEA0183, 0 here means no fix, while GPS accuracy between 0 and 1 is set to 1.

- ✧ <Speed>: The speed from GPS.
- ✧ <Azimuth> The azimuth from GPS.
- ✧ <Altitude>: The height above sea level from GPS.
- ✧ <Longitude>: The longitude of the current position. The format is “(-)xxx.xxxxxx” and the value range is from “-180.000000” to “180.000000”. The unit is degree. West longitude is defined as negative starting with minus “-” and east longitude is defined as positive without “+”.
- ✧ <Latitude>: The latitude of the current position. The format is “(-)xx.xxxxxx” and the value range is from “-90.000000” to “90.000000”. The unit is degree. South Latitude is defined as negative starting with minus “-” and north Latitude is defined as positive without “+”.
- ✧ <GPS UTC time>: UTC time from GPS.
- ✧ <MCC>: Mobile country code. It is 3 digits in length and ranges from 000-999.
- ✧ <MNC>: Mobile network code. It is 3 digits in length and ranges from 000-999.
- ✧ <LAC>: Location area code in hex format.
- ✧ <Cell ID>: Cell ID in hex format.
- ✧ <battery percentage>: The current volume of the battery in percentage.

3.3.1.2. Hex format report

The following table gives the structure of the HEX format. Different from ASCII format, there is no separate character between two adjacent parameters.

Example:			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0005
Report item Mask	2	0x0000-0x007F	
SACK enable	1	0 1	
Message type	1	1 - 22	
Protocol version	3	XX0000 – XXFFFF	
Unique ID	15	IMEI	
Device name	10		
Report ID/Status	1	0 – 4 0x21 0x22 0x41 0x42	
Number	1	1	
GPS accuracy	1	0 1 – 50	
Speed	2	0.0 – 999.9km/h	
Azimuth	2	0 – 359	
Altitude	3	±XXXXX.X m	
Longitude	4	±XXX.XXXXXX	
Latitude	4	±XX.XXXXXX	
GPS UTC time	6	YYMMDDHHMMSS	

MCC	2	0XXX	
MNC	2	0XXX	
LAC	2	XXXX	
Cell ID	2	XXXX	
Battery percentage	1	0-100	
Send time	6	YYMMDDHHMMSS	
Count number	2	0000 – FFFF	

- ✧ **<Message header>**: A numeric to indicate this message is a message in HEX format. It is always 0x0005 for ASCII format.
- ✧ **<Report items mask>**: It is same as the parameter **<Report items mask>** in the command AT+GTCFG to indicate which fields are discarded in the following structure of the message. If some bit is 0, the corresponding field will be discarded. About the meaning of each bit, please refer to the chapter 3.2.4.
- ✧ **<SACK enable>**: It is same as the parameter **<SACK enable>** in the command AT+GTQSS and AT+GTSRI to indicate whether it is necessary to respond an acknowledgement message to the unit for the message.
- ✧ **<Message type>**: A numeric to indicate the type of the message.
 - 0x01**: Report by scheduled time or scheduled distance or scheduled mileage. Please refer to the command AT+GTFRI.
 - 0x02**: Report for into Geo-Fence. Please refer to the command AT+GTGEO.
 - 0x03**: Speed alarm report. Please refer to the command AT+GTSPD.
 - 0x04**: SOS alarm report which is generated by long press the function key. Please refer to the parameter **<Function key mode>** in the command AT+GTFKS.
 - 0x05**: Real time location. Please refer to the sub command 1 in the command AT+GTRTO.
 - 0x06**: The first location after power on.
 - 0x07**: Location report when movement state changes.
 - 0x08**: Location by call request
 - 0x09**: Location as the centre of the Geo-Fence 0.
 - 0x0A**: Power on report.
 - 0x0B**: Power off report.
 - 0x0C**: Report for connecting external power supply.
 - 0x0D**: Report for the removing external power supply.
 - 0x0E**: Battery low report.
 - 0x0F**: Report for charging started.
 - 0x10**: Report for charging stopped.
 - 0x11**: Report for the device state changed, including motion state and ignition state.
 - 0x12**: GPS antenna indication.
 - 0x13**: PDP connection reset report.
 - 0x14**: Report for out from Geo-Fence. Please refer to the command AT+GTGEO.
 - 0x15**: Report for switching on Geo-Fence 0.

0x16: Report for switching off Geo-Fence 0.

- ✧ <Report ID/Status>: It has different meaning in different report.
 - For 0x02 and **0x14** and **0x15** and **0x16**, it is the ID of the Geo-Fence.
 - For **0x12**, it indicates which GPS antenna is being used.
 - 0: the device is using the internal GPS antenna.
 - 1: the device is using the external GPS antenna.
 - For **other messages**, it means the current state of the device,
 - 0x21: The device attached vehicle is ignition on and motionless.
 - 0x22: The device attached vehicle is ignition on and moving.
 - 0x41: The device is motionless without ignition on.
 - 0x42: The device is moving without ignition on.
- ✧ <Number>: Number of points in one report message. It is always 1.
- ✧ <GPS accuracy>: The HDOP defined in NMEA0183. The range of value is 1 – 50. The smaller the value, the higher the precision. Different from NMEA0183, 0 here means no fix, while GPS accuracy between 0 and 1 is set to 1.
- ✧ <Speed>: The speed from GPS.
- ✧ <Azimuth> The azimuth from GPS.
- ✧ <Altitude>: The height above sea level from GPS.
- ✧ <Longitude>: The longitude of the current position. The format is “(-)xxx.xxxxxx” and the value range is from “-180.000000” to “180.000000”. The unit is degree. West longitude is defined as negative starting with minus “-” and east longitude is defined as positive without “+”.
- ✧ <Latitude>: The latitude of the current position. The format is “(-)xx.xxxxxx” and the value range is from “-90.000000” to “90.000000”. The unit is degree. South Latitude is defined as negative starting with minus “-” and north Latitude is defined as positive without “+”.
- ✧ <GPS UTC time>: UTC time from GPS.
- ✧ <MCC>: Mobile country code. It is 3 digits in length and ranges from 000-999.
- ✧ <MNC>: Mobile network code. It is 3 digits in length and ranges from 000-999.
- ✧ <LAC>: Location area code in hex format.
- ✧ <Cell ID>: Cell ID in hex format.
- ✧ <battery percentage>: The current volume of the battery in percentage.

3.3.2. Device Information Report

There are two types of format for the device information report, ASCII format and HEX format. And the parameter *<Report format>* in the command AT+GTCFG decides which format will be used to encapsulate the device information report.

Note: If a device information report is the result of the GTRTO command with the sub command B, it will be always encapsulated in ASCII format, no matter what is *<Report format>*.

3.3.2.1. ASCII format Report

The following table gives the structure of the ASCII format. And two adjacent parameters are separated by the symbol “,” except *<Count number>* and *<Tail character>*.

Example: \0\4,GTINF,020100,135790246811220,,41,898600810906F8048812,16,0,0,4.10,0,0,0,0,20100 214013254,90,20100214093254,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTINF	
Protocol version	6	XX0000 – XXXFFF, X∈{'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
State	2	21 22 41 42	
ICCID	20		
CSQ RSSI	<=2	0 – 31 99	
CSQ BER	<=2	0 – 7 99	
External power supply	1	0 1	
Battery voltage	<=4	0.0 – 4.50V	
Charging	1	0 1	
LED on	1	0 1 2	
GPS on need	1	0 1	
GPS antenna type	1	0 1	
GPS accuracy	<=2	0 1-50	
GPS antenna state	1	0	
Last GPS fix UTC time	14	YYYYMMDDHHMMSS	
battery percentage	3	0-100	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ *<Message header>*: A numeric to indicate this message is a message in ASCII format. It is always 0x0004 for ASCII format.
- ✧ *<Report items mask>*: It is same as the parameter *<Report items mask>* in the command AT+GTCFG to indicate which fields are empty in the following structure of the message. If some bit is 0, the corresponding field will be empty. About the meaning of each bit, please refer to the chapter 3.2.4.
- ✧ *<SACK enable>*: It is same as the parameter *<SACK enable>* in the command AT+GTQSS and AT+GTSRI to indicate whether it is necessary to respond an acknowledgement message to the unit for the message.
- ✧ *<Message type>*: A string with five characters to indicate the type of the message. It is always GTINF for the device information report.
- ✧ *<State>*: The current motion state of the device.
 - 21: The device attached vehicle is ignition on and motionless.
 - 22: The device attached vehicle is ignition on and moving.
 - 41: The device is motionless without ignition on.
 - 42: The device is moving without ignition on.
- ✧ *<ICCID>*: The ICCID of the installed SIM card.
- ✧ *<CSQ RSSI>*: The GSM signal strength level.
- ✧ *<CSQ BER>*: The quality of the GSM signal.
- ✧ *<External power supply>*: Whether the external power supply is connected.
 - 0: Not connected
 - 1: Connected
- ✧ *<Battery voltage>*: The voltage of the battery.
- ✧ *<Charging>*: Whether the battery is charging when the external power supply is connected.
 - 0: Not charging
 - 1: Charging
- ✧ *<LED on>*: The setting of *<LED on>* in **AT+GTCFG**.
- ✧ *<GPS on need>*: The setting of *<GPS on need>* in **AT+GTCFG**.
- ✧ *<GPS antenna type>*: A numeric to indicate which GPS antenna is working now.
 - 0: inside GPS antenna
 - 1: outside GPS antenna
- ✧ *<GPS accuracy>*: The accuracy of the latest successful GPS fixing.
- ✧ *<GPS antenna state>*: the status of the working GPS antenna.
 - 0: The antenna is working
- ✧ *<Last GPS fix UTC time>*: The UTC time of the latest successful GPS fixing.
- ✧ *<battery percentage>*: The current volume of the battery in percentage.

3.3.2.2. HEX format Report

The following table gives the structure of the HEX format. Different from ASCII format, there is no separate character between two adjacent parameters.

Example:

Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0005
Report item Mask	2	0x0000-0x007F	
SACK enable	1	0 1	
Message type	1	0x21	0x21
Protocol version	3	XX0000 – XXFFFF	
Unique ID	15	IMEI	
Device name	10		
State	1	0x21 0x22 0x41 0x42	
ICCID	20		
CSQ RSSI	1	0 – 31 99	
CSQ BER	1	0 – 7 99	
Power status	1		
Battery voltage	2	0.0 – 4.50V	
GPS status	1		
GPS accuracy	1	0 1-50	
Last GPS fix UTC time	6	YYMMDDHHMMSS	
battery percentage	1	0-100	
Send time	6	YYMMDDHHMMSS	
Count number	2	0000 – FFFF	

- ✧ *<Message header>*: A numeric to indicate this message is a message in HEX format. It is always 0x0005 for HEX format.
- ✧ *<Report items mask>*: It is same as the parameter *<Report items mask>* in the command AT+GTCFG to indicate which fields are discarded in the following structure of the message. If some bit is 0, the corresponding field will be discarded. About the meaning of each bit, please refer to the chapter 3.2.4.
- ✧ *<SACK enable>*: It is same as the parameter *<SACK enable>* in the command AT+GTQSS and AT+GTSRI to indicate whether it is necessary to respond an acknowledgement message to the unit for the message.
- ✧ *<Message type>*: A numeric to indicate this is a device information report. It is always 23.
- ✧ *<State>*: The current motion state of the device.
 - 0x21: The device attached vehicle is ignition on and motionless.
 - 0x22: The device attached vehicle is ignition on and moving.
 - 0x41: The device is motionless without ignition on.
 - 0x42: The device is moving without ignition on.
- ✧ *<ICCID>*: The ICCID of the installed SIM card.
- ✧ *<CSQ RSSI>*: The GSM signal strength level.
- ✧ *<CSQ BER>*: The quality of the GSM signal.
- ✧ *<Power status>*:.
 - Bit0 represents whether external power supply is connected.
 - 0: Not connected

-
- 1: Connected
 - Bit1 represents whether the unit is in charging state
 - 0: Not charging
 - 1: Charging
 - Bit3 and Bit2 represent the LED working mode.
 - 0: Each time the device powers on, GPS LED's will work for 150 seconds and then are turned off deadly. GSM LED and Power LED works normally.
 - 1: All LEDs work normally, please refer to chapter 4 for the details.
 - 2: All LEDs are off always.
 - ✧ <Battery voltage>: The voltage of the battery. It has 2 implicit decimal,
 - ✧ <GPS status>:
 - Bit1 and Bit0 give the value of <GPS on need>.
 - Bit2 represents <GPS antenna type>.
 - Bit3 represents <GPS antenna state>.
 - ✧ <GPS accuracy>: The accuracy of the latest successful GPS fixing.
 - ✧ <Last GPS fix UTC time>: The UTC time of the latest successful GPS fixing.
 - ✧ <battery percentage>: The current volume of the battery in percentage.

3.3.3. Report for Querying

These are the report of real time querying by command **AT+GTRTO**.

➤ **GTGPS**: The report for real time operation GPS

Example: \0\4,005F,0,GTGPS,020100,135790246811220,,0,1F,1F,0,0,20100214013254,20100214093254,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTGPS	
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
GPS on need	1	0 1	
GPS fix delay	3	5 – 900sec	
GPS antenna type	1	0 1	
Report items mask	<=4	0000 – FFFF	
FRI report mask	<=4	0000 – FFFF	
GPS antenna state	1	0	
Last GPS fix UTC time	14	YYYYMMDDHHMMSS	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

✧ <FRI report mask>: The setting of <Report mask> in **AT+GTFRI**.

➤ **GTALL**: The report for real time operation READ

Example: \0\4,005F,0,GTALL,020102,359464036027139,TT8850,BSI,cmnet,,,,,,,,SRI,3,0,quectel.3322.org,7069,0.0.0.0,0,,300,0,,,,CFG,TT8850,TT8850,,,0,5,0,003F,,0813,0,0,0,300,1,,,,NMD,0,2,3,2,300,300,,,,TMZ,+0000,0,FRI,1,0,0000,0000,60,60,60,60,003F,100,1000,,,,GEO,0,0,,,50,0,,,,1,0,,,50,0,,,,2,0,,,50,0,,,,3,0,,,50,0,,,,4,0,,,50,0,,,,SPD,0,0,0,60,300,,,,FKS,1,,3,,,,WLT,1,,,,,,20110401081722,0218\$			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTALL	
Protocol version	6	XX0000 – XXXFFF,	

		$X \in \{'A'-'Z', '0'-'9'\}$	
Unique ID	15	IMEI	
Device name	10		
BSI	3	BSI	BSI
APN	≤ 40		
APN user name	≤ 30		
APN password	≤ 30		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
SRI	3	SRI	SRI
Report mode	1	0 – 5	
Buffer enable	1	0 1	
Main server IP/domain name	≤ 60		
Main server port	≤ 5	0 – 65535	
Backup server IP	≤ 15		
Backup server port	≤ 5	0 – 65535	
SMS gateway	≤ 20		
Heartbeat interval	≤ 5	0 30 – 21600sec	
SACK enable	1	0 1	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
CFG	3	CFG	CFG
New password	4 – 6	'0' – '9', 'a' – 'z', 'A' – 'Z'	
Device name	10		
Reserved	0		
Reserved	0		
GPS on need	1	0 1 2	
GPS fix delay	3	5 – 60sec	
Report format	1	0 1	
Report items mask	≤ 4	0000 – FFFF	
Reserved	0		
Event mask	4	0000-FFFF	
EPB mode	1	0 1	
LED on	1	0 1 2	
Info report enable	1	0 1	
Info report interval	≤ 5	30 – 86400sec	
Location by call	1	0 1	

Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
NMD	3	NMD	NMD
mode	1	0-F	
Non-movement duration	<=3	0 – 255(×15sec)	
Movement duration	<=2	0 – 10(×100ms)	
Movement threshold	1	2 – 4	
rest fix interval	5	5 – 86400sec	
rest send interval	5	5 – 86400sec	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
TMZ	3	TMZ	TMZ
Time Zone	5	- +HHMM	
Daylight Saving	1	0 1	
FRI	3	FRI	FRI
Mode	1	0 1	
Discard no fix	1	0 1	
Begin time	4	HHMM	
End time	4	HHMM	
Check interval1	<=5	5 – 86400sec	
Send interval1	<=5	5 – 86400sec	
Check interval2	<=5	5 – 86400sec	
Send interval2	<=5	5 – 86400sec	
Report mask	<=4	0000 – FFFF	
Distance	<=5	50 – 65535m	
Mileage	<=5	50 – 65535m	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
GEO	3	GEO	GEO
GEO ID0	1	0	0
Mode	1	0 – 3	
Longitude	<=11	±xxx.xxxxxx	
Latitude	<=10	±xx.xxxxxx	
Radius	<=7	50 – 6000000m	
Check interval	<=5	0 30 – 86400sec	

Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
GEO ID1	1	1	1
Mode	1	0 – 3	
Longitude	<=11	±xxx.xxxxxx	
Latitude	<=10	±xx.xxxxxx	
Radius	<=7	50 – 6000000m	
Check interval	<=5	0 30 – 86400sec	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
GEO ID2	1	2	2
Mode	1	0 – 3	
Longitude	<=11	±xxx.xxxxxx	
Latitude	<=10	±xx.xxxxxx	
Radius	<=7	50 – 6000000m	
Check interval	<=5	0 30 – 86400sec	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
GEO ID3	1	3	3
Mode	1	0 – 3	
Longitude	<=11	±xxx.xxxxxx	
Latitude	<=10	±xx.xxxxxx	
Radius	<=7	50 – 6000000m	
Check interval	<=5	0 30 – 86400sec	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
GEO ID4	1	4	4
Mode	1	0 – 3	
Longitude	<=11	±xxx.xxxxxx	
Latitude	<=10	±xx.xxxxxx	
Radius	<=7	50 – 6000000m	
Check interval	<=5	0 30 – 86400sec	
Reserved	0		
Reserved	0		

Reserved	0		
Reserved	0		
SPD	3	SPD	SPD
Mode	1	0 1 2	
Min speed	<=3	0 – 400km/h	
Max speed	<=3	0 – 400km/h	
Duration	<=4	15 – 3600sec	
Send interval	<=4	30 – 3600sec	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
FKS	3	FKS	FKS
Power key enable	1	0 1	
Reserved	1		
Function key mode	1	0 1 2 3	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Send time	14	YYYYMMDDHHMMSS	
WLT	3	WLT	WLT
call filter	1	0 1 2	
white number	20		
white number	20		
white number	20		
white number	20		
white number	20		
white number	20		
white number	20		
white number	20		
white number	20		
white number	20		
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		

- ✧ No matter what report mode is set, **GTALL** is only reported through GPRS. If the current report mode is forcing on SMS, **GTALL** will be reported via TCP short connection.

➤ **GTCID:** The report for real time operation CID

Example:

\0\4,005F,0,GTCID,020100,135790246811220,,898600810906F8048812,20100214093254,11F0\$

Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTCID	
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
ICCID	20		
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

➤ **GTCSQ:** The report for real time operation CSQ

Example:

\0\4,005F,0,GTCSQ,020100,135790246811220,,16,0,20100214093254,11F0\$

Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTCSQ	
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
CSQ RSSI	<=2	0 – 31 99	
CSQ BER	<=2	0 – 7 99	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

➤ **GTVER:** The report for real time operation VER

Example:

\0\4,005F,0,GTVER,020100,135790246811220,,TT8850,0100,0101,20100214093254,11F0\$

Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004

Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTVER	
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Device type	10	'0' – '9', 'a' – 'z', 'A' – 'Z'	TT8850
Firmware version	4	0000 – FFFF	
Hardware version	4	0000 – FFFF	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

- ✧ <Device type>: A string represents the type of the device.
- ✧ <Firmware version>: The firmware version. The first two characters point out the main version and the last two characters point out the subsidiary version. For example: 010A means the version 1.10
- ✧ <Hardware version>: The hardware version. The first two characters point out the main version and the last two characters point out the subsidiary version. For example: 010A means the version 1.10

➤ **GTBAT**: The report for real time operation BAT

Example:			
\0\4,005F,0,GTBAT,020100,135790246811220,,0,,,4.10,0,1,20100214093254,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTALL	
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
External power supply	1	0 1	
Reserved	0		
battery percentage	3	0-100	
Battery voltage	<=4	0.0 – 4.50V	
Charging	1	0 1	
LED on	1	0 1	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	

Tail character	1	\$	\$
----------------	---	----	----

✧ <Device type>: A string represents the type of the device.

➤ **GTTMZ**: The report for real time operation TMZ

Example:			
\0\4,005F,0,GTTMZ,020100,135790246811220,-0330,0,20100214093254,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTALL	
Protocol version	6	XX0000 – XXXFFF, X ∈ {'A'-'Z', '0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Time zone offset	5	±HHMM	
Daylight saving	1	0 1	
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.3.4. Buffer Report

If BUFFER function is enabled, the terminal will save the message into the BUFFER in the following circumstances.

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

These messages will be sent to the backend server after the message can be sent to the backend server. The device can save up to 3000 messages if the length of each buffered message is not greater than 160.

- ✧ Acknowledgement message and GTALL can not be saved into BUFFER.
- ✧ Buffered messages will be sent only via GPRS by TCP or UDP protocol. They cannot be sent via SMS. If the current report mode is forcing on SMS, the buffered messages won't be sent until the report mode is changed to TCP or UDP connection.

3.3.5. Report Google Maps hyperlink

The device can send a SMS with Google Maps hyperlink to a mobile phone after receive GTRTO command with sub command C.

➤ Google Maps hyperlink

Example: TT8850 RTO: http://maps.google.com/maps?q=31.222073,121.354335+%28GL100%29F1D2009/01/01T00:00:00B74%0			
Parameter	Length(byte)	Range/Format	Default
Sms header	<=30		
Google Maps hyperlink	<=77		
GPS fix	2	F1 F0	
GPS UTC time	20	DYYYY/MM/DDTHH:M M:SS	
battery level	<=5	B1-100%	
heading	<=3	0 - 359	

- ✧ <Sms header>: A string that includes the terminal name set in the command **AT+GTGLM** and GPS fix type ("**SOS**", "**IN GEO-i**", "**OUT GEO-i**", "**LBC**").
- ✧ <Google Maps hyperlink>: A string of a google map hyperlink.
- ✧ <battery level>: The current volume of the battery in percentage.
- ✧ <heading>: the heading of the current position.

3.3.6. FOTA report

After the command AT+GTUPD has been executed for downloading firmware over the air or stopping updating firmware over the air, the unit will send the message GTUPD to indicate the

different phase for downloading firmware over the air. Here is the detailed information about the message GTUPD.

3.3.6.1. ASCII format report

The following table gives the structure of the ASCII format. And two adjacent parameters are separated by the symbol “,” except *<Count number>* and *<Tail character>*.

Example: \\0\4,005F,0,GTUPD,020100,135790246811220,,100,,20090201000000,11F0\$			
Parameter	Length(byte)	Range/Format	Default
Message header	2	0x0004	0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTUPD	GTUPD
protocol version	6	XX0000 – XXXFFF, X ∈ {'A' – 'Z', '0' – '9'}	
unique ID	15	IMEI	
device name	<=10	'0'-'9','a'-'z','A'-'Z'	
code	3	100 101 102 103 200 201 202 300 301 302 303	
download times	1	1 2 3 4	
send time	14	YYYYMMDDHHMMSS	
count number	4	0000-FFFF	
tail character	1	\$	\$

- ✧ *<code>*: A numeric to indicate the result of the different phases for FOTA.
 - 100: the update command is confirmed by the device.
 - 101: the update command is refused by the device.
 - 102: the update process is canceled by the backend server.
 - 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 firmware
 - 301: the device finishes updating the firmware successfully
 - 302: the device fails to update the firmware
 - 303: the update process does not start because the battery is low
- ✧ *<download times>*: For the code 100, 101, 102, 103, 300, 301, 302 and 303, it is empty. For the code 200, 201 and 202, it is the times that the unit has downloaded update package for.

3.3.6.2. HEX format report

The following table gives the structure of the HEX format. Different from ASCII format, there is no separate character between two adjacent parameters.

Example:			
Parameter	Length(byte)	Range/Format	Default
Message header	2	0x0005	0x0005
Report item Mask	2	0X0000-0X007F	
SACK enable	1	0 1	
Message type	1	0x23	0x23
protocol version	3	XX0000 – XXXFFF	
unique ID	15	IMEI	
device name	<=10	'0'-'9','a'-'z','A'-'Z'	
code	2	0x0064 0x0065 0x0066 0x0067 0x00C8 0x00C9 0x00CA 0x012C 0x012D 0x012E 0x012F	
download times	1	0 1 2 3 4	
send time	6	YYMMDDHHMMSS	
count number	2	0000-FFFF	

- ✧ *<code>*: A numeric to indicate the result of the different phases for FOTA.
 - 0x0064: the update command is confirmed by the device.
 - 0x0065: the update command is refused by the device.
 - 0x0066: the update process is canceled by the backend server.
 - 0x0067: the update process is refused because the battery is low.
 - 0x00C8: the device starts to download the package
 - 0x00C9: the device finishes downloading the package successfully
 - 0x00CA: the device fails to download the package
 - 0x012C: the device starts to update the firmware
 - 0x012D: the device finishes updating the firmware successfully
 - 0x012E: the device fails to update the firmware
 - 0x012F: the update process does not start because the battery is low
- ✧ *<download times>*: For the code 0x0064, 0x0065, 0x0066, 0x0067, 0x012C, 0x012D, 0x012E and 0x012F, it is always 0. For the code 0x00C8, 0x00C9 and 0x00CA, it is the times that the unit has downloaded update package for.

3.4. Heartbeat

Heartbeat is used to maintain the contact between the device and the backend server if communicating via GPRS. The heartbeat package is sent to the backend server at the interval defined by *<Heartbeat interval>* in **AT+GTQSS** or **AT+GTSRI** command.

There are two types of format for the heartbeat, ASCII format and HEX format. And the parameter *<Report format>* in the command **AT+GTCFG** decides which format will be used to encapsulate the heartbeat.

The heartbeat acknowledgement should be always in ASCII format as a common server acknowledgement in the chapter 3.5.

After the unit sends the heartbeat to the backend server, it has two different behaviors as following.

1. If *<SACK enable>* is set as 1, it will wait for the response of the heartbeat from the backend server. If it doesn't receive the response in at most 2 minutes, it will reset the whole connection.
2. If *<SACK enable>* is set as 0, it won't wait for the response of the heartbeat from the backend server.

3.4.1.1. ASCII format Report

Here is the heartbeat from the unit to the backend server.

Example: \\0\\4,005F,0,GTHBD,020100,135790246811220,,20100214093254,11F0\$			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0004
Report item Mask	4	0000-007F	
SACK enable	1	0 1	
Message type	5	GTHBD	
Protocol version	6	XX0000 – XXFFFF, X ∈ {'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Send time	14	YYYYMMDDHHMMSS	
Count number	4	0000 – FFFF	
Tail character	1	\$	\$

3.4.1.2. HEX format Report

Here is the heartbeat from the unit to the backend server.

Example:			
Parameter	Length (byte)	Range/Format	Default
Message header	2		0x0005
Report item Mask	2	0x0000-0x007F	
SACK enable	1	0 1	
Message type	1	0x22	0x22
Protocol version	3	XX0000 – XXXFFF, X ∈ {'A'-'Z','0'-'9'}	
Unique ID	15	IMEI	
Device name	10		
Send time	6	YYMMDDHHMMSS	
Count number	2	0000 – FFFF	

3.5. Sever Acknowledgement

If server acknowledgement is enabled by 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
Messaeg header	6	+SACK:	+SACK:
Count number	4	0000 – FFFF	
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. FOTA Process

4.1. Fota Process Introduction

The process of FOTA includes the following four steps.

4.1.1. Initiation of the FOTA process

The backend server sends the **AT+GTUPD (sub-command:0)** command to the device to initiate the update process. Along with this command, the backend server sends necessary information for the device to start the update process.

It's the backend server's duty to decide when and how to initiate the firmware update process to all the devices which backend server controls. As the response messages collector and the controller, the backend server has all the information it needs to start an update process including the current firmware versions of the devices (current firmware can retrieve with the **AT+GTRTO** command), the version of the latest available firmware and the location of the proper update packages.

4.1.2. Confirmation of FOTA process

Upon the **AT+GTUPD (sub-command:0)** command, the device will first check the current battery capacity. If the battery capacity can not support the update process, it will report **+RESP:GTUPD (code: 103)** to notify the backend server that the update process is to be aborted because of low battery. If the battery capacity is ample, the device will send **GTUPD** with confirmation information to the backend server. Then the update process proceeds to the next step.

If the update command is confirmed, the device will turn into a non-interactive mode. That is, the end user can no longer make phone call, all incoming call are rejected automatically until the update process finishes. At the meantime, the device will ignore all the command received from the backend server if it is not related to the update process. Also the device will stop all the reports that are not related to the update process.

4.1.3. Downloading of the update package

If the update command is confirmed, the device will use the information sent by the backend server to download the update package. If the downloading fails, it will retry the specified times. If all attempts fail, the updating process is aborted and the device will automatically reboot to go back to the normal working mode. If the downloading successes, the update process proceeds to the next step. Either way, the device will send **GTUPD** with downloading information to the backend server.

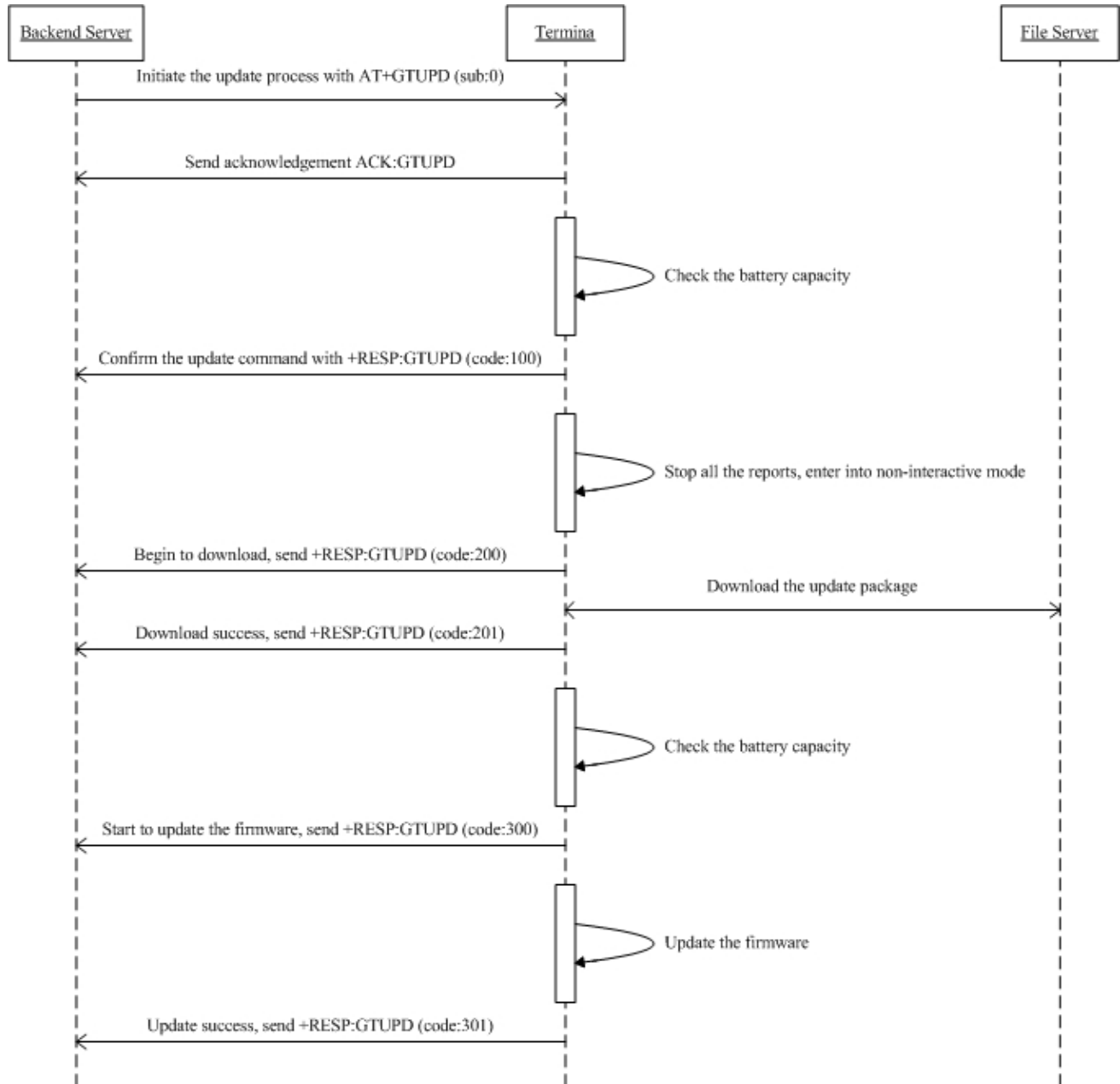
Before the package is downloaded, the backend server could send **AT+GTUPD (sub-command:1)**

command to cancel the current update process. This is the only chance to abort during the update process.

4.1.4. Updating of the firmware

After downloading the package successfully, the device will check the battery capacity again. If the battery can not support the update process, the device will report **GTUPD (code: 303)** to notify the backend server that the update process is to be aborted because of low battery. If the battery capacity is ample, the device will send **GTUPD (code:300)** to the backend server to inform of the start of the updating. Then it uses the update package to update the firmware. After the updating, success or failure, the device will reboot automatically. After the device boots up, it sends **GTUPD** with updating information to the backend server and works as usual.

4.2. An example of successful FOTA



5. LED Indication

Light	Event	State
GSM light	Searching network	Fast flash
	Network has been registered	Slow flash
	Power off	Dark
GPS light	GPS has fixed	Solid
	GPS is in fixing	Fast flash
	GPS is on and GPS data wrong	Slow flash
	GPS is off	Dark
Power light	Power on and normal	Dark
	Charger inserted and charging completed	Solid
	Charger inserted and charging	Fast flash
	Power key was pressed and prepare to power off	Fast flash
	Abnormal	Fast flash
	Power low alert	Slow flash
	Power off or turn off the power light by command	Dark

Appendix: Message Index

✧ Command and ACK

AT+GTQSS

+ACK:GTQSS

AT+GTBSI

+ACK:GTBSI

AT+GTSRI

+ACK:GTSRI

AT+GTCFG

+ACK:GTCFG

AT+GTTMA

+ACK:GTTMA

AT+GTFRI

+ACK:GTFRI

AT+GTGEO

+ACK:GTGEO

AT+GTSPD

+ACK:GTSPD

AT+GTFKS

+ACK:GTFKS

AT+GTRTO

+ACK:GTRTO

AT+GTWLT

+ACK:GTWLT

Start: AT+GTUPD

Stop: AT+GTUPD

+ACK:GTUPD

✧ Position Related Report

GTFRI

GTGEO

GTSPD

GTSOS

GTRTL

GTLBC

GTPNL

GTNMR

GTGCR

✧ Device Information Report

GTINF

✧ **Report for Querying**

GTGPS

GTALL

GTCID

GTCSQ

GTVR

GTBAT

GTTMZ

✧ **Event Report**

GTPNA

GTPFA

GTEPN

GTEPF

GTBTC

GTSTC

GTBPL

GTSTT

GTANT

GTPDP

GTSWG

✧ **FOTA report**

GTUPD

✧ **Heartbeat**

GTHBD

✧ **Server Acknowledgement**

+SACK