GL502MG @Track Air Interface

Firmware Update Protocol

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

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0. Revision History

Version	Date	Author	Description of Change
1.00	2020-03-31	Sean Guo	Initial

1. Scope

This document describes the over-the-air firmware update for GL502MG. It enables the end users to update the firmware of GL502MG remotely without bringing their devices to the service centre. Thus, the service provider of GL502MG can conveniently promote new features or carry out debugging for the end users to improve the customer experience.

During the firmware update, three kinds of equipment are involved:

- The terminal: GL502MG whose firmware is to be updated.
- The backend server: the server which remotely controls the terminal and receives report from the terminal.
- The file server: the server which stores the packages of the update.

Note:

The file server and the backend server could be hosted on the same machine.

This document describes the process of the firmware update and the necessary message exchanged during the update but does not cover the information below:

- The time and the method that the backend server initiates the update.
- The deployment method of the update package.
- How to set up a file server.
- The communication between the backend server and the file server.

2. Message

2.1. Command and Acknowledgement

The command **AT+GTUPD** is used to start and stop the firmware update remotely.

2.1.1. Start the Firmware Update

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

➢ **Start: AT+GTUPD=**

Example: **AT+GTUPD=gl502m,0,1,10,0,,,http://218.17.46.11:926/gl502m/deltabin/GL502M_1713_R00A02V04.enc,,0,,,0001$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default value**
Password	4–20	'0'-'9', 'a'-'z', 'A'-'Z'	gl502m
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		
Update Type	1	0	0
Reserved	0		
Reserved	0		
Serial Number	4	0000-FFFF	
Tail Character	1	$	$

✧ <*Password*>: The valid characters for the password include '0'-'9', 'a'-'z', and 'A'-'Z'. The default value is "gl502m".

✧ <*Sub-Command*>: The sub-command of **AT+GTUPD**. 0 means "Start the firmware update".

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

✧ <*Download Timeout*>: If downloading is not finished within this time, it will be regarded that the downloading failed.

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

✧ <*Download User Name*>: If the file server uses authentication, the user name is specified here.

✧ <*Download Password*>: If the file server uses authentication, the password is specified here.

✧ <*Download URL*>: It specifies the URL to download the package.

✧ <*Update Type*>: It specifies the type of the firmware to be updated.

- 0: MCU firmware.
- 2: Bluetooth firmware.

✧ <*Reserved*>: Reserved for future expansion.

✧ <*Serial Number*>: The serial number will be sent back to the backend server in ACK as a reference of the command. It is in hexadecimal format. It counts from 0000 and increases by one every time. The serial number rolls back after "FFFF".

✧ <*Tail Character*>: A character to indicate the end of the command. It must be '$'.

2.1.2. Stop the Firmware Update

Before the update package has been downloaded to the device, the user can use **AT+GTUPD (sub-command:1)** command to cancel current firmware updating. If update package downloading finishes, this command will be ignored by the device.

➢ **Stop: AT+GTUPD=**

Example: **AT+GTUPD=gl502m,1,,,,,0001$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default Value**
Password	4–20	'0'-'9', 'a'-'z', 'A'-'Z'	gl502m
Sub-Command	1	1	
Reserved	0		
Reserved	0		
Reserved	0		
Reserved	0		
Serial Number	4	0000-FFFF	
Tail Character	1	$	$

✧ <*Sub-Command*>: The sub-command of **AT+GTUPD**. 1 means "Cancel the current firmware update process".

2.1.3. Acknowledgement

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

➢ **+ACK:GTUPD,**

Example: **+ACK:GTUPD,EE0100,352948070074301,,0001,20161105074622,11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	XX0000 – XXFFFF, X∈{'A' – 'Z', '0' – '9'}	
Unique ID	15	IMEI	
Device Name	<=20	'0'-'9', 'a'-'z', 'A'-'Z'	
Serial Number	4	0000-FFFF	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	0000-FFFF	
Tail Character	1	$	$

✧ <*Protocol Version*>: The protocol version that the terminal conforms to. The first two characters XX indicate the device type. **D5** means GL502M. The middle two characters represent the major version number and the last two characters represent the minor version number. And both of the major version and the minor version numbers are hex digits. For example, **0101** means version 1.01.

✧ <*Unique ID*>: The terminal's IMEI.

✧ <*Device Name*>: An ASCII string which represents the name of the device.

✧ <*Serial Number*>: The <*Serial Number*> in the **AT+GTUPD** command.

✧ <*Send Time*>: The local time (shown on the terminal) to send the message.

✧ <*Count Number*>: The self-increasing count number will be included in every acknowledgment message. The count begins from 0000 and increases by 1 every time. It will roll back after "FFFF".

2.2. Report

During the firmware update process, the device reports its status (including update confirmation information, package downloading information and firmware update information) to the backend server via the message **+RESP:GTUPD** at different phases.

2.2.1. Update Confirmation

The device sends update confirmation information to the backend server if:

- ✧ The update command is confirmed by the device.
- ✧ The update command is refused by the device.
- ✧ The update process is canceled by the backend server.
- ✧ The update command is refused because the battery is low.

➢ **Confirmation: +RESP:GTUPD,**

Example: **+RESP:GTUPD,EE0100,352948070074301,,100,,20161105074725,11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	XX0000 – XXFFFF, X∈{'A' – 'Z', '0' – '9'}	
Unique ID	15	IMEI	
Device Name	<=20	'0'-'9', 'a'-'z', 'A'-'Z'	
Code	3	100|101|102|103	
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	0000-FFFF	
Tail Character	1	$	$

✧ <*Code*>: The code for the confirmation information.

- 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.

2.2.2. Package Downloading

The device sends package downloading information to the backend server if:

- ✧ The device starts to download the package.
- ✧ The device finishes downloading the package successfully.
- ✧ The device fails to download the package.

➢ **Downloading: +RESP:GTUPD,**

Example: **+RESP:GTUPD,EE0100,352948070074301,,200,1,20161105074732,11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	XX0000 – XXFFFF, X∈{'A' – 'Z', '0' – '9'}	
Unique ID	15	IMEI	
Device Name	<=20	'0'-'9', 'a'-'z', 'A'-'Z'	
Code	3	200|201|202	
Download Times	1	1|2|3|4	
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	0000-FFFF	
Tail Character	1	$	$

- ✧ <*Code*>: The code for the download information.
  - 200: The device starts to download the package.
  - 201: The device finishes downloading the package successfully.
  - 202: The device fails to download the package.
- ✧ <*Download Times*>: The count of the package downloads.

2.2.3. Firmware Update

The device sends the firmware update information to the backend server if:

- ✧ The device starts to update the firmware.
- ✧ The device finishes updating the firmware successfully.
- ✧ The device fails to update the firmware.
- ✧ The update process does not start because the battery is low.

➢ **Updating: +RESP:GTUPD,**

Example: **+RESP:GTUPD,EE0100,352948070074301,gl502m,300,,20161105074742,11F0$**			
Parameter	**Length (Byte)**	**Range/Format**	**Default**
Protocol Version	6	XX0000 – XXFFFF, X∈{'A' – 'Z', '0' – '9'}	
Unique ID	15	IMEI	
Device Name	<=20	'0'-'9', 'a'-'z', 'A'-'Z'	
Code	3	300|301|302|303	
Reserved	0		
Send Time	14	YYYYMMDDHHMMSS	
Count Number	4	0000-FFFF	
Tail Character	1	$	$

- ✧ <*Code*>: The code for the update information.
  - 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.

3. Firmware Update Process

The firmware update process includes four steps: initiation of the update process, confirmation of the update process, downloading of the update package and updating of the firmware.

3.1. Initiation of the Update Process

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

The backend server decides when and how to initiate the firmware update process of the devices it controls. As the response message receiver and the controller, the backend server has all the information (including the current firmware version (to know via **AT+GTRTO** command) of the devices, the version of the latest available firmware and the location of the proper update packages) it needs to start an update process.

3.2. Confirmation of the Update Process

Upon receiving the **AT+GTUPD** (**sub-command:0**) command, the device will first check the current battery capacity. If the battery capacity cannot support the update process, it will report **+RESP:GTUPD** (**code: 103**) to inform 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 **+RESP: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 go in a non-interactive mode. In which, the end user can no longer make phone calls and all incoming calls are rejected automatically until the update process finishes. In the meantime, the device will ignore all the commands and stop all the reports not related to the update process.

3.3. Downloading of the Update Package

When 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 as the specified times in <Max Download Retry>. If all downloading attempts fail, the update process will be aborted and the device will automatically reboot to go back to normal working mode. If the downloading succeeds, the update process will proceed to the next step. Either way, the device will send **+RESP:GTUPD** with download information to the backend server.

Before the package is downloaded, the user can send **AT+GTUPD (sub-command:1)** command to cancel current update process. This is the only chance to abort the updating during the update process.

3.4. Update of the Firmware

After downloading the package successfully, the device will check the battery capacity again. If the battery cannot support the update process, the device will report **+RESP:GTUPD (code: 303)** to inform 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 **+RESP:GTUPD (code: 300)** to the backend server to indicate the starting of the update. After the update, whether successful or not, the device will reboot automatically. After that, it will send **+RESP:GTUPD** with update information to the backend server and works as usual.

3.5. An Example of Successful Update