

EG060V-EA FOTA

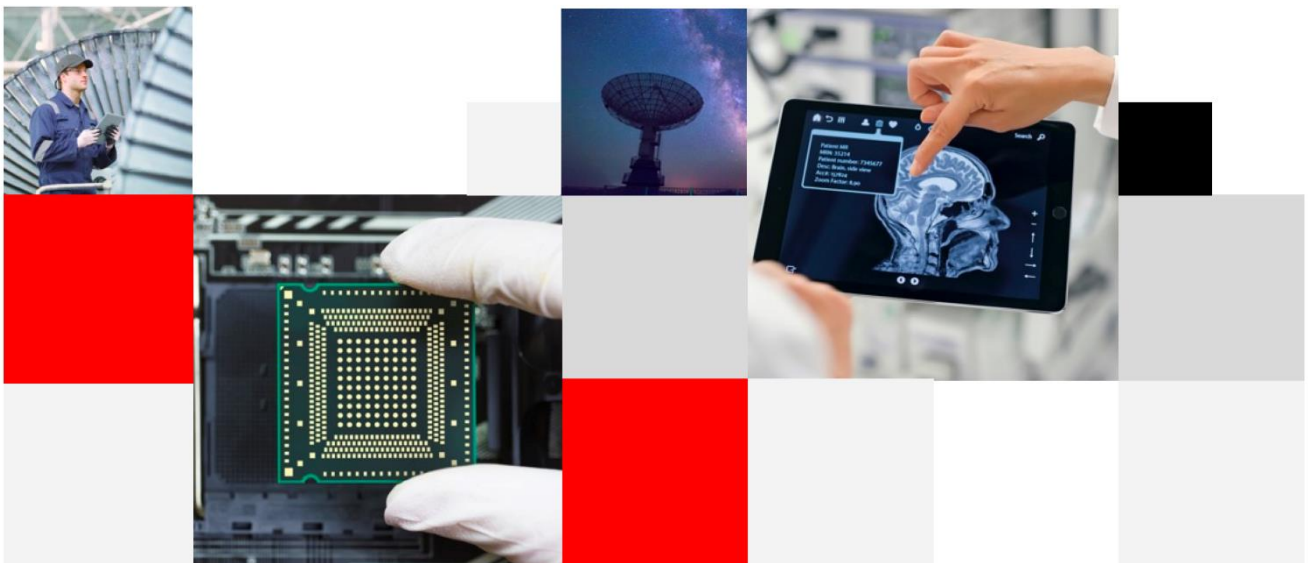
Application Note

LTE-A Module Series

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About the Document

Revision History

Version	Date	Author	Description
-	2021-01-14	Gale GAO/ Paddy LI/ Ethan BI	Creation of the document
1.0	2021-04-09	Gale GAO/ Paddy LI/ Ethan BI	First official release

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1 Introduction

FOTA (Firmware Upgrade Over the Air) refers to the practice of remotely upgrading firmware to a new version or reverting firmware back to an old version.

This document describes how to implement FOTA on the Quectel EG060V-EA module using AT commands and introduces the system partitions involved in the upgrade.

NOTE

To obtain the firmware package, please contact Quectel Technical Support (support@quectel.com).

2 Description of FOTA AT Commands

2.1. AT Command Syntax

2.1.1. Definitions

- **<CR>** Carriage return character.
- **<LF>** Line feed character.
- **<...>** Parameter name. Angle brackets do not appear on the command line.
- **[...]** Optional parameter of a command or an optional part of TA information response. Square brackets do not appear on the command line. When an optional parameter is not given in a command, the new value equals to its previous value or the default settings, unless otherwise specified.
- **Underline** Default setting of a parameter.

2.1.2. AT Command Syntax

All command lines must start with **AT** or **at** and end with **<CR>**. Information responses and result codes always start and end with a carriage return character and a line feed character: **<CR><LF><response><CR><LF>**. Throughout this document, only the commands and responses are presented, while carriage return and line feed characters are deliberately omitted.

Table 1: Type of AT Commands

Command Type	Syntax	Description
Test Command	AT+<cmd>=?	Test the existence of corresponding Write Command and return information about the type, value, or range of its parameter(s).
Read Command	AT+<cmd>?	Check the current parameter value of a corresponding Write Command.
Write Command	AT+<cmd>=<p1>[,<p2>[,<p3>[...]]]	Set user-definable parameter value.
Execution Command	AT+<cmd>	Return a specific information parameter or perform a specific action.

2.2. Declaration of AT Command Examples

The AT command examples in this document are provided to help you familiarize with AT commands and learn how to use them. The examples, however, should not be taken as Quectel's recommendation or suggestions about how you should design a program flow or what status you should set the module into. Sometimes multiple examples may be provided for one AT command. However, this does not mean that there exists a correlation among these examples and that they should be executed in a given sequence.

2.3. FOTA Related AT Commands

2.3.1. AT+QFOTADL=<HTTP_URL> FOTA via HTTP(S) Server

If the target firmware package is stored on an HTTP(S) server, after a (U)SIM card is inserted and the module is registered to the network, you can execute **AT+QFOTADL=<HTTP_URL>** to trigger firmware upgrade over the air. After the upgrade completes, the module automatically reboots by default.

AT+QFOTADL=<HTTP_URL> FOTA via HTTP(S) Server	
Write Command AT+QFOTADL=<HTTP_URL>	Response OK +QIND: "FOTA","START" +QIND: "FOTA","UPDATING",<percent> +QIND: "FOTA","UPDATING",<percent> ... +QIND: "FOTA","END",<err> If there is any error: ERROR
Maximum Response Time	300 ms
Characteristics	/

Parameter

<HTTP_URL>	String format. It should be started with "http://" or "http(s)://". For example: "http://<http_server_URL>:<http_port>/<http_file_path>"
<http_server_URL>	String type. The IP address or domain name of the HTTP(S) server.

<http_port>	Integer type. The port of the HTTP(S) server. Default: 80. Range: 1–65535.
<http_file_path>	String type. The file name in the HTTP(S) server.
<percent>	Integer type. The upgrade progress in percentage.
<result>	Integer type. CURL status code which indicates the upgrade result.
	0 Upgraded successfully
	-1 Upgrade failed

Example

```
//Upgrade firmware via an HTTP(S) server whose address is "http://220.180.239.212:8051/quectel_
skylark_pm801_AB_OTA_IMG."
AT+QFOTADL="http://220.180.239.212:8051/quectel_skylark_pm801_AB_OTA_IMG"
OK

QIND: "FOTA", "START" //Start to upgrade the firmware.

+QIND: "FOTA", "UPDATING", 11
+QIND: "FOTA", "UPDATING", 23
+QIND: "FOTA", "UPDATING", 35
+QIND: "FOTA", "UPDATING", 47
+QIND: "FOTA", "UPDATING", 59
+QIND: "FOTA", "UPDATING", 71
+QIND: "FOTA", "UPDATING", 83
+QIND: "FOTA", "UPDATING", 95
+QIND: "FOTA", "UPDATING", 100
+QIND: "FOTA", "END", 0 //Firmware upgraded successfully.
```

2.3.2. AT+QFOTADL=<file_name> Firmware Upgrade via Local File System

If the firmware package is stored in the module's file system, execute **AT+QFOTADL=<file_name>** to trigger firmware upgrade. After the upgrade completes, the module automatically reboots by default.

AT+QFOTADL=<file_name> Firmware Upgrade via Local File System

Write Command

Response

AT+QFOTADL=<file_name>	<p>OK</p> <p>+QIND: "FOTA","START"</p> <p>+QIND: "FOTA","UPDATING",<percent></p> <p>+QIND: "FOTA","UPDATING",<percent></p> <p>...</p> <p>+QIND: "FOTA","END",<err></p> <p>If there is any error: ERROR</p>
Maximum Response Time	300 ms
Characteristics	/

Parameter

<file_name>	String type. The path of the firmware package stored in the local file system. The maximum length is 90 bytes.
<percent>	Integer type. The upgrade progress in percentage.
<result>	Integer type. CURL status code which indicates the upgrade result.
	0 Updated successfully
	Others Error code (See Chapter 4 for the description of error codes.)

NOTE

This method is currently not recommended as it is limited by the available flash space of the module.

Example

```
//Upgrade firmware whose firmware package is stored in the local file system.
AT+QFOTADL="/quectel_skylark_pm801_AB_OTA_IMG"
OK

+QIND: "FOTA","START" //Start to upgrade the firmware.

+QIND: "FOTA","UPDATING",11

+QIND: "FOTA","UPDATING",23
```

```
+QIND: "FOTA","UPDATING",35
+QIND: "FOTA","UPDATING",47
+QIND: "FOTA","UPDATING",59
+QIND: "FOTA","UPDATING",71
+QIND: "FOTA","UPDATING",83
+QIND: "FOTA","UPDATING",95
+QIND: "FOTA","UPDATING",100
+QIND: "FOTA","END",0 //Upgraded successfully.
```

2.3.3. AT+QFOTASTA Query FOTA Upgrade Progress

This command queries FOTA upgrade progress in percentage. It can be used after the FOTA URC report is disabled using **AT+QCFG="FOTA",<reset>,0**.

AT+QFOTASTA Query FOTA Upgrade Progress

Execution Command AT+QFOTASTA?	Response +QFOTASTA: <percentage> OK If there is any error: ERROR
Maximum Response Time	300 ms
Characteristics	/

Parameter

<percent> Integer type. The upgrade progress in percentage.

2.3.4. AT+QCFG="FOTA" FOTA Related Common Settings

This command controls module reboot and URC report.

AT+QCFG="FOTA" FOTA Related Common Settings	
Execution Command AT+QCFG="FOTA"	Response +QCFG: "fota",<reboot>,<URC> OK
Write Command AT+CFG="FOTA",<reset>,<URC>	Response OK Or ERROR
Maximum Response Time	300 ms
Characteristics	The command takes effect immediately. The configurations will be saved automatically.

Parameter

<reboot>	Integer type. Configures whether to reboot the module after a successful upgrade. 0 Do not reboot <u>1</u> Reboot
<URC>	Integer type. Whether to enable URC report of the upgrade progress in percentage. 0 Disable <u>1</u> Enable

Example

```

AT+QCFG="FOTA" //Query FOTA related settings.
+QCFG: "FOTA",1,1

OK
AT+QCFG="FOTA",0,0 //Disable URC report and automatic module reboot.
OK
AT+QFOTADL="/quectel_skylark_pm801_AB_OTA_IMG"
OK

+QIND: "FOTA","START"

+QIND: "FOTA","END",0 //Upgraded successfully. The module does not reboot.
    
```

3 System Partition

3.1. Partition

EG060V-EA is a dual-system module. Compared with FOTA on a single-system module, which is implemented in the recovery mode, FOTA on the dual-system module has the following advantages:

- A. FOTA on EG060V-EA is much safer as the module has a copy of its key partitions;
- B. The upgrade process does not affect other business;
- C. EG060V-EA directly writes to flash the firmware while downloading it from the HTTP(S) server without consuming the flash memory space.

Table 2: Key Partition List

Partition Name	Usage	Read&Write	Size	Image
bootloader	OBM image	raw	256 KB	tim_nezha3.bin TLoader_NAND.bin
cp_reliabledata	Stores data required by CP: band, IMEI, MEP, protocol configuration parameters, RF calibration parameters, etc.	raw	128 KB	CP_ReliableData.bin
ap_reliabledata	Stores data required by AP: SN, audio calibration parameters, etc.	raw	128 KB	AP_ReliableData.bin
cp_reliabledata_backup	Backup partition to store the data required by CP: band, IMEI, MEP, protocol configuration parameters, RF calibration parameters etc.	raw	128 KB	CP_ReliableData.bin
ap_reliabledata_backup	Backup partition to store the data required by AP: SN, audio calibration parameters etc.	raw	128 KB	AP_ReliableData.bin
cpimage-a	cp/msa/rf	raw	15 MB	ARBEL_SKYLARK.bin

				MSA_SKYLARK.bin RFPLUGIN_CA_LWG.bin
cpimage-b	cp/msa/rf	raw	15 MB	ARBEL_SKYLARK.bin MSA_SKYLARK.bin RFPLUGIN_CA_LWG.bin
u-boot-a	U-BOOT	raw	768 KB	u-boot.bin
u-boot-b	U-BOOT	raw	768 KB	u-boot.bin
kernel-a	kernel image	raw	5 MB	zImage
kernel-b	kernel image	raw	5 MB	zImage
rootfs-a	root file system	ro(squashfs)	20 MB	root.squashfs
rootfs-b	root file system	ro(squashfs)	20 MB	root.squashfs
oem_data	ubifs	rw(ubifs)	12 MB	oem_data.ubi
rootfs_data	ubifs	rw(ubifs)	24.75 MB	-
dtim-a	dynamic trust image	raw	256 KB	DTim.Primary DTim.Ppsetting
dtim-b	dynamic trust image	raw	256 KB	Dtim.Recovery

3.2. Dual System

During FOTA, only the dtim, CP image, uboot, kernel, and rootfs are upgraded. There is a copy of these partitions on each system of the module, as shown in the figure below. If either system turns abnormal, the module switches to the other system to ensure normal operation.

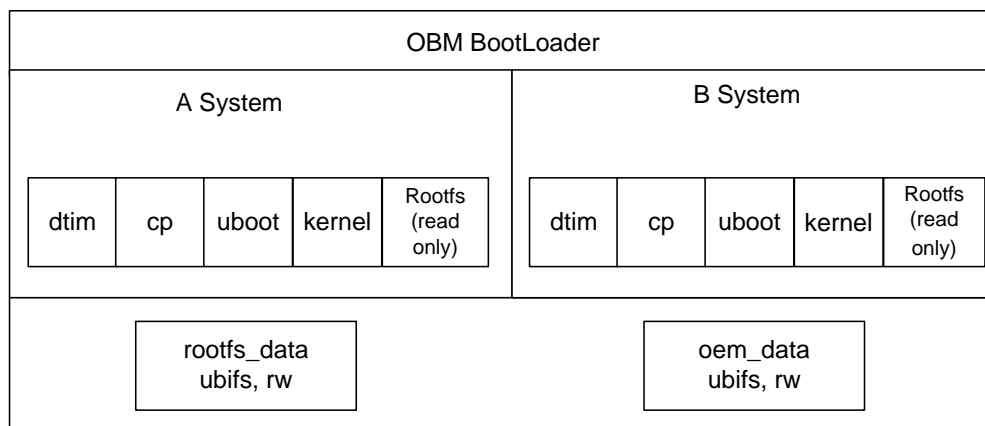


Figure 1: Dual System

4 Appendix A References

Table 3: Error Codes

Abbreviation	Description
0	FOTA successful
1	Upgrade file does not exist
2	Fail to open upgrade file
3	Obtaining upgrade file times out
4	URL name error (when upgrading via HTTP(S) server)
5	Upgrade file size error

Table 4: Terms and Abbreviations

Abbreviation	Description
AP	Application Processor
CP	Communication Processor
CURL	Command Line Uniform Resource Locator
FOTA	Firmware Upgrade Over-the-Air
HTTP(S)	Hyper Text Transport Protocol (Secure)
IMEI	International Mobile Equipment Identity
MEP	Mobile Equipment Personalization
OBM	OEM Boot Module
OEM	Original Equipment Manufacturer
RF	Radio Frequency

SN	Serial Number
TA	Terminal Adapter
URL	Uniform Resource Locator
