ASR6601

OTA upgrade manual

Version: 1.2.0

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About this document

This document describes the OTA upgrade Demo program in the SDK for ASR6601 IoT LPWAN SoC.

Target Audience

This document is intended for the following engineers:

- hardware development engineer
- software engineer
- technical support engineer

Product numbering

Product models corresponding to this document:

Model	Flash	SRAM	Core	Package	Frequency
ASR6601SE	256 KB	64 KB	32-bit 48 MHz ARM STAR	QFN68, 8*8 mm	150 ~ 960 MHz
ASR6601CB	128 KB	16 KB	32-bit 48 MHz ARM STAR	QFN48, 6*6 mm	150 ~ 960 MHz

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Document Revision History

Date	Version	Release Notes
2020.06	V0.1.0	Initial Release.
2020.10	V0.2.0	Updated the hardware connection example diagram in Section 1.1.
2021.01	V1.1.0	Removed the Overview in Chapter 1 and merged its contents into the "About This Document" section of the Preface.
2021.06	V1.2.0	Added verified Android phone models in section 1.1.

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1. Prepare

1.1 Hardware Preparation

The required hardware list:

(1) ASR6601 demo board 2 pcs

(2) Antenna 2 pcs

(3) USB cable 2 pcs

(4) USB adapter 1 pc

(5) Android phone 1 pc

Verified Android phone models:

- Huawei Mate 20 Pro, Android version 10, EMUI version 11.0.0
- Huawei nova, Android version 10, EMUI version 11.0.0
- Huawei Maimang 6, Android version 8, EMUI version 8.0.0
- Xiaomi MIX 2S, Android version 9, MIUI version 11.0.3

(6) PC 1 pc

Figure 1-1 Mobile phone connection diagram

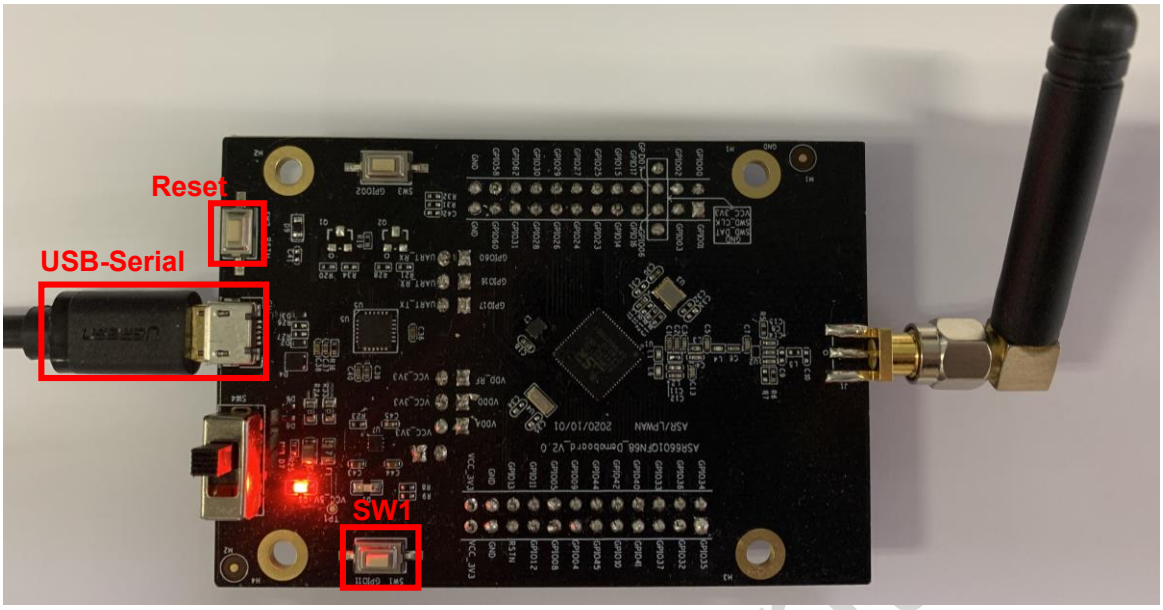

Figure 1-2 Target board connection diagram

1.2 Software Preparation

1.2.1 OTA Dongle Software Preparation

The OTA dongle code is in the projects\${DEMO_BOARD}\examples\ota\dongle directory, where ${DEMO_BOARD} is the board name of the OTA dongle, such as ASR6601SE-EVAL for the ASR6601SE development board and ASR6601CB-EVAL for the ASR6601CB development board.

Compile and download the corresponding code to the OTA dongle board.

1.2.2 Target board software preparation

The target board software is divided into two parts: OTA bootloader and app code.

(1) **OTA bootloader**

The OTA bootloader code is in the directory projects\${DEMO_BOARD}\examples\ota \bootloader, where ${DEMO_BOARD} is the name of the target board, such as ASR6601SE-EVAL for the ASR6601SE development board, and ASR6601CB-EVAL for the ASR6601CB development board. Compile and download the corresponding code to the 0x08000000 address of the target board.

(2) **APP**

The App code is the code to be upgraded in the end. You can use any code. In this document, the uart_printf project is used as an example.

Modify the gcc.ld file of the uart_printf project, change the FLASH start address to 0x0800D000, and compile the modified project. After the compilation is complete, copy the generated project file to the mobile phone.

```
/* Generate a link error if heap and stack don't fit into RAM */
_HEAP_SIZE = 0x1000;      /* required amount of heap  */
_STACK_SIZE = 0x1000; /* required amount of stack */

/* Specify the memory areas */
MEMORY
{
    FLASH (rx)      :  ORIGIN = 0x0800D000, LENGTH = 204K
    RAM (xrw)       :  ORIGIN = 0x20000000, LENGTH = 64k
}

/* Define output sections */
SECTIONS
{
```

Figure 1-3 Linker Script File

1.2.3 Mobile phone preparation

The corresponding code of LoRa OTA APP is in the directory of projects\ASR6601SE-EVAL \examples\ota\android_app (the APP has no board distinction, and the codes in the directories of ASR6601SE-EVAL and ASR6601CB-EVAL are the same).

Copy the apk package to your phone and install it.

2. Upgrade Process

2.1 Entering OTA bootloader

Press and hold the SW1 button on the target board and then reboot to put the target board into the OTA bootloader.

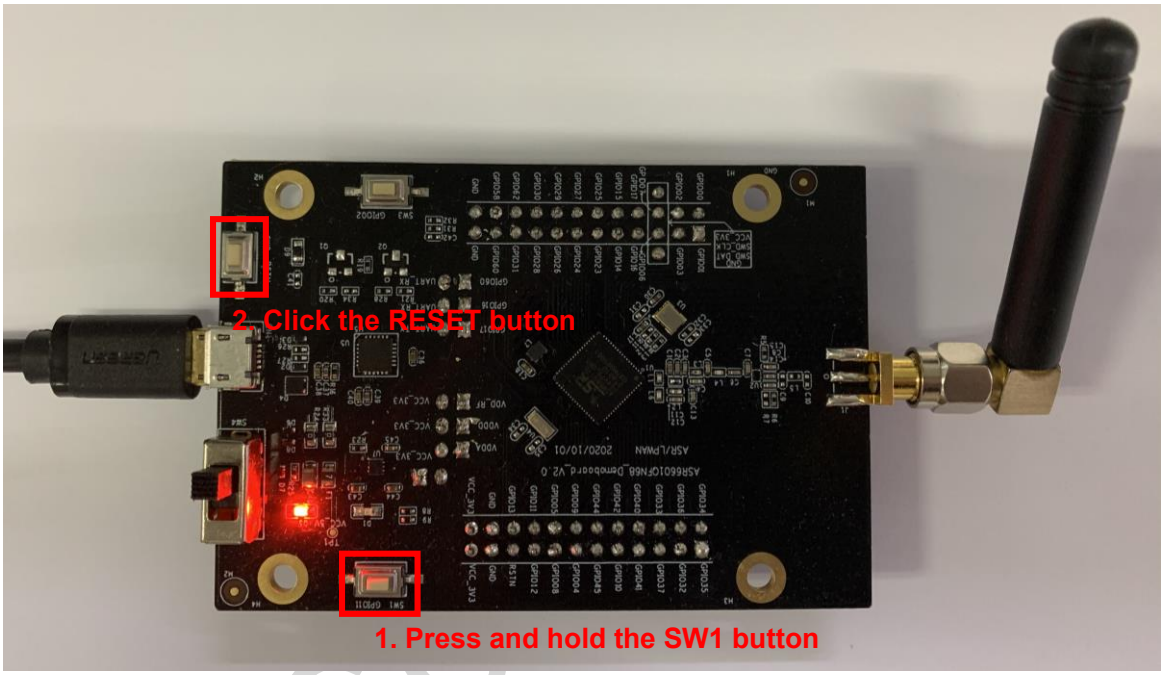

Figure 2-1 Entering OTA bootloader mode

2.2 Open the app

After connecting the mobile phone and OTA dongle with a USB adapter, open the APP and the interface will be as shown in Figure 2-2:

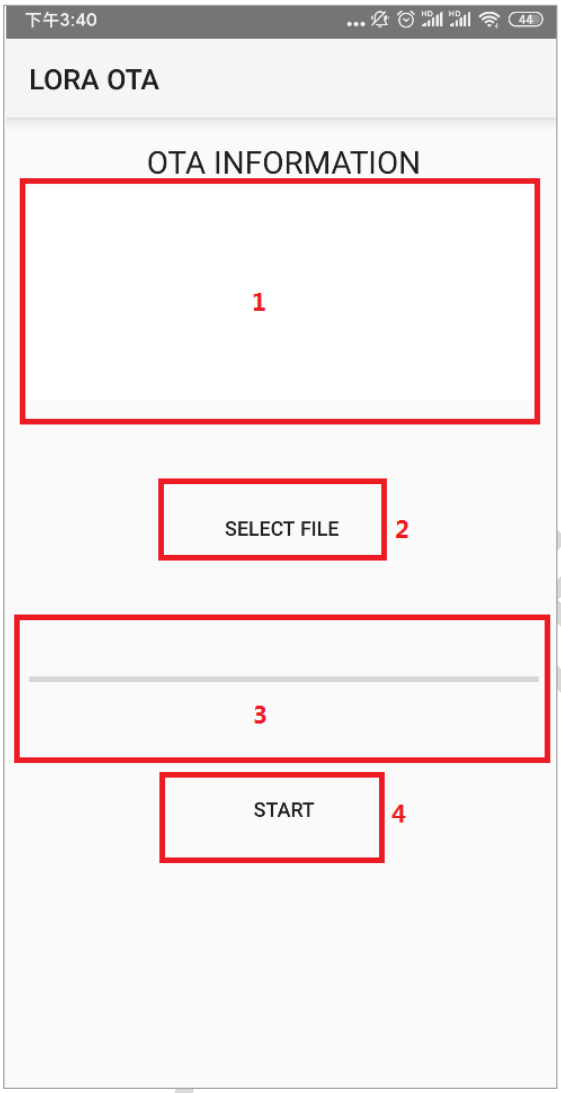

Figure 2-2 Main interface

Note: When connecting the OTA dongle, if the prompt box in Figure 2-3 appears, please click "Confirm".

Figure 2-3 USB access prompt

The annotations in Figure 2-2 are explained as follows:

- Annotation 1: This area will display information during the OTA upgrade process.
- Annotation 2: Button for selecting the upgrade file.
- Annotation 3: Progress bar, indicating the progress of the OTA.
- Annotation 4: Button for starting the OTA upgrade.

2.3 Upgrade file selection

(1) Click the "SELECT FILE" button in Figure 2-2, and the following interface will appear:

Figure 2-4 File browsing

(2) Go to the bin directory and select the bin file ss shown in Figure 2-5:

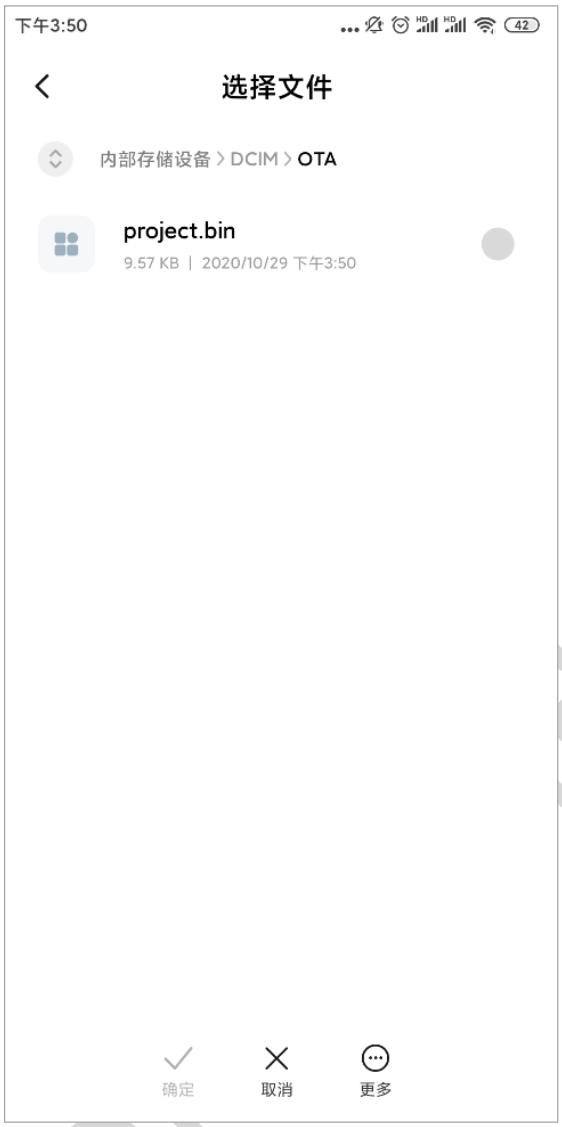

Figure 2-5 Select bin file

(3) After selecting the bin file, return to the main interface, and the interface will show a prompt that the upgrade file has been selected:

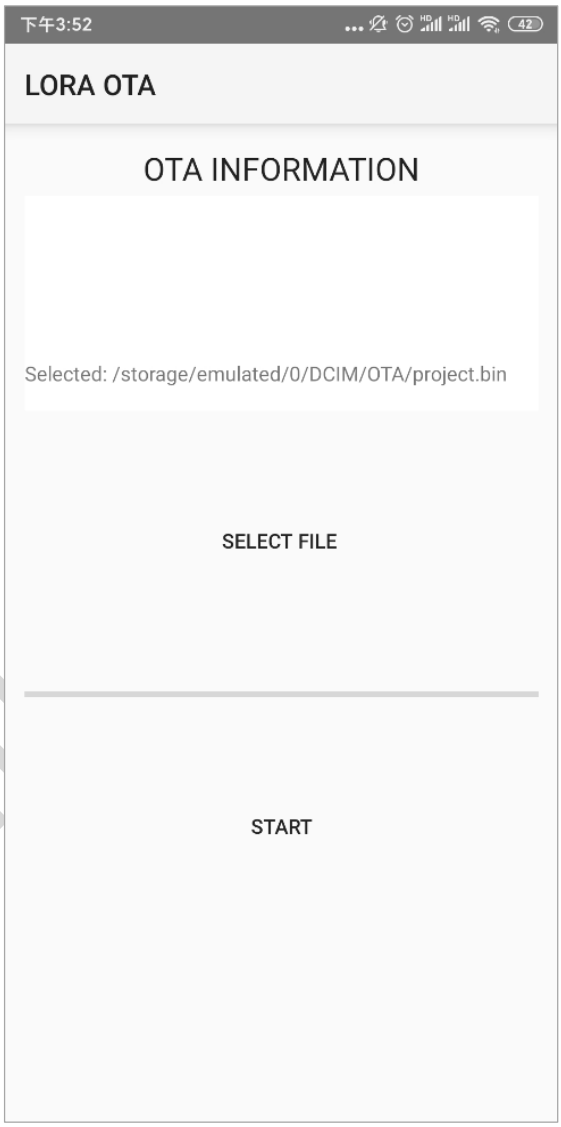

Figure 2-6 Prompt of the selected upgrade file

2.4 Start upgrading

(1) Click the "START" button to start the upgrade:

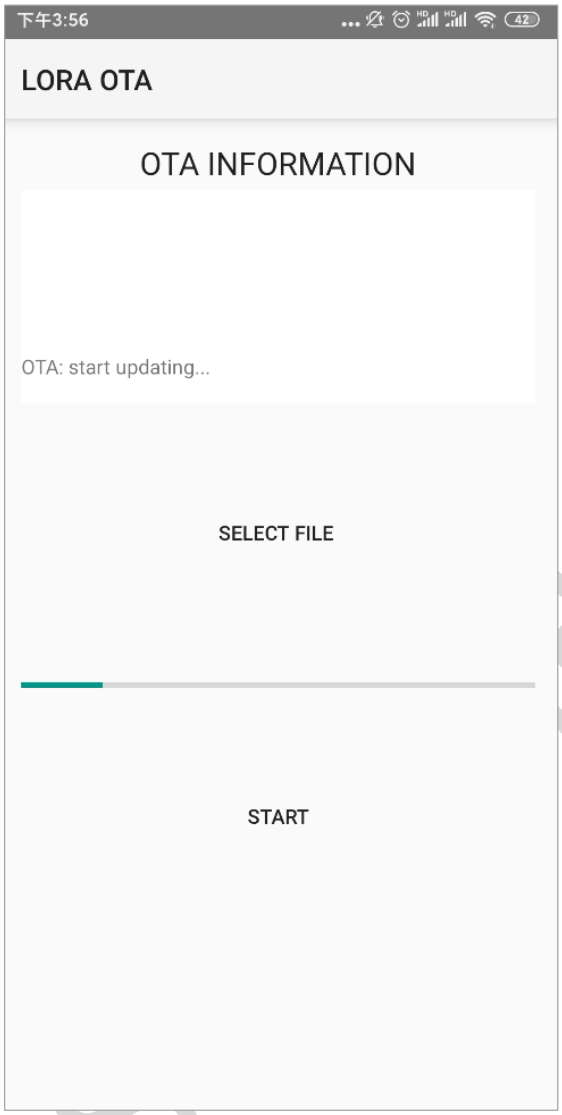

Figure 2-7 Start Upgrading

(2) After the upgrade is successful, the APP prompts "OTA: done":

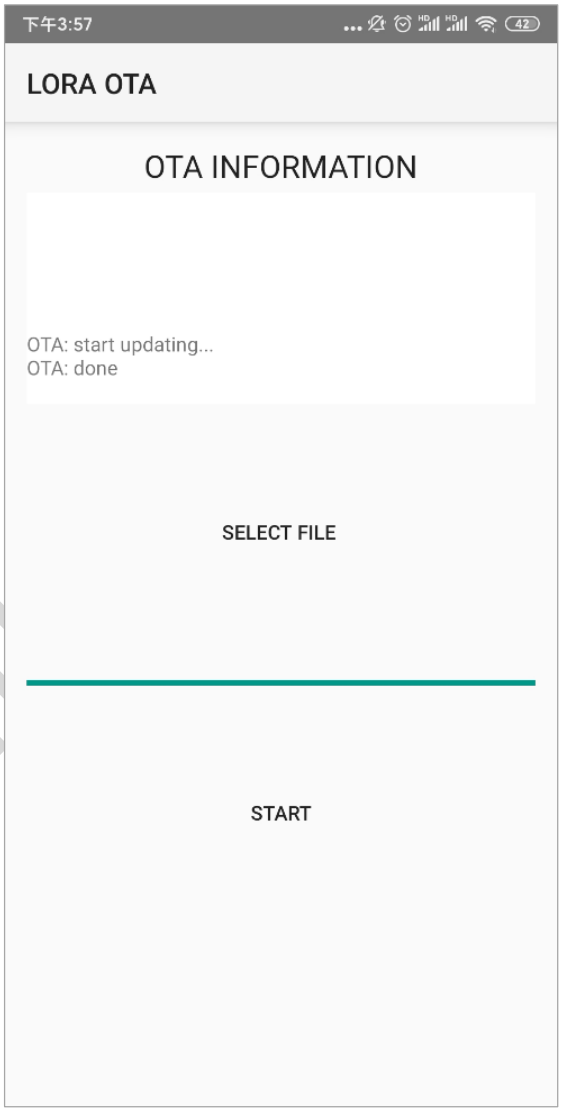

Figure 2-8 Upgrade successful

At the same time, the target board prints: hello world

3. OTA dongle AT command description

3.1 AT command list

Main AT commands:

Table 3-1 OTA dongle main AT commands

Command	Description
AT+FREQ	Frequency setting
AT+CFG	Configuration parameters
AT+TX	Send data
AT+RX	Enter receive mode
AT+DATA	Report after data receiving

3.2 AT command description

3.2.1 AT+FREQ

Command and Response	AT RQ=<freq>	OK or +CME ERROR:<err>
Parameters	Set frequency **freq**: 150000000-960000000	
Example	AT+FREQ=470000000	

3.2.2 AT+CFG

Command and Response	AT+CFG=<modem>,<p1>,<p2>,<p3>,<p4>,<p5>,<txp>	OK or +CME ERROR:<err>
Parameters	This command is used to configure parameters. **modem**：Modulation type（0：FSK；1：LORA） ↙ If modem is 0: **P1**：fsk bandwith **P2**：fsk datarate **P3**：fsk dev **P4**：fsk preamble length **P5**：fsk afc bandwith ↙ If modem is 1: **P1**：lora bandwith, – 0：125K – 1：250K – 2：500K **P2**：lora sf（5-12） **P3**：lora cr – 1：4/5 – 2：4/6 – 3：4/7 – 4：4/8 **P4**：lora preamble length **P5**：lora iqi（0：false；1：true）	
	txp：tx power（0-22）	

Example AT+CFG=1,0,7,1,8,0,22

3.2.3 AT+TX

Command andResponse	AT+TX=<len>,<data>	OK+SEND or ERR+SEND:1
Parameters	This command is used to send data. **len**：Data length **data**：Send binary data in hex format	
Example	AT+TX=3,123456	

3.2.4 AT+RX

Command and response	AT+RX=<timeout>	OK or +CME ERROR:<err>
Parameters	This command is used to receive data. **timeout**：timeout（ms），0 - no timeout	
Example	AT+RX=0	

3.2.5 AT+DATA

Command and response	AT+DATA=<status>,<snr>,<rssi>,<len>,<data> N/A
Parameters	This command is for data reporting. The dongle will send this command after receiving the data. **status**：Data reporting status ↙ 0：normal ↙ 1：rx_timeout ↙ 2：rx_error **snr**：Packet signal-to-noise ratio **rssi**：Signal level

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4. OTA bootloader command description

4.1 Command list

Table 4-1 OTA bootloader related commands

Command	Command Code	Description
SYNC	1	SYNC command to determine connection status
JUMP	2	Jump command
FLASH	3	Download command
ERASE	4	Erase command
VERIFY	5	Verify Command
REBOOT	12	Restart Command
SN	13	Read Serial Number Command

4.2 Format

4.2.1 Request

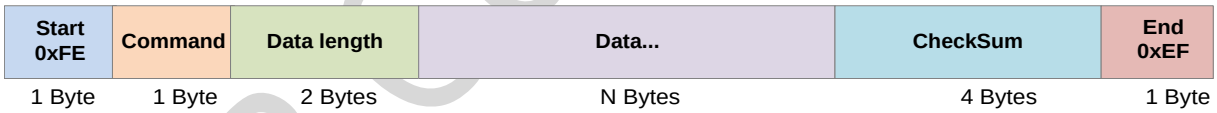

Figure 4-1 OTA bootloader request command format

Among them, Command is the command number and Checksum algorithm is CRC32.

4.2.2 Response

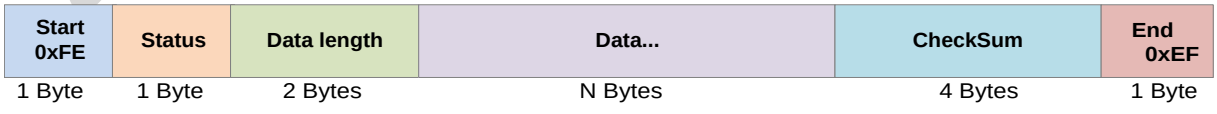

Figure 4-2 OTA bootloader response command format

4.3 Command payload format

Table 4-2 Payload formats of various types of commands

Command Type	Payload Format
SYNC command	none
JUMP command	**Addr:** 4 Bytes, jump address
FLASH command	**Addr**：4 Bytes, download address **Size**：4 Bytes, burning data length **Data**：N Bytes, data to download
ERASE command	**Addr**：Erase region start address **Size**：Erase region size
VERIFY Command	**Addr**：Verify the starting address **Size**：Verify region size **Checksum**：Verify checksum value
REBOOT command	**Mode**：reboot mode, 0: reboot into app; 1: reboot into OTA bootloader
SN Command	none