



**ASR6601**

# **OTA Upgrade Guide**

**Version 1.2.0**

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## About This Document

This document mainly introduces the OTA upgrade Demo project in LPWAN SoC ASR6601 SDK.

## Intended Readers

This document is mainly for engineers who use this chip to develop their own platform and products, for instance:

- PCB Hardware Development Engineer
- Software Engineer
- Technical Support Engineer

## Included Chip Models

The product models corresponding to this document are as follows.

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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## ASR Microelectronics Co., Ltd.

**Address:** 9F, Building 10, No. 399 Keyuan Road, Zhangjiang High-tech Park, Pudong New Area, Shanghai, 201203, China

**Homepage:** <http://www.asrmicro.com/asrweb/>

## Revision History

Date	Version	Release Notes
2020.06	V0.1.0	First Release.
2020.10	V0.2.0	Updated Figure 1-1 and Figure 1-2.
2021.05	V1.1.0	Deleted Chapter 1, and move the contents to "About This Document".
2021.06	V1.2.0	Added verified Android phone models in Section 1.1.

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# 1. Preparation

## 1.1 Hardware

Hardware requirements are as follows:

- (1) 2 ASR6601 development boards
- (2) 2 antennas
- (3) 2 USB cable
- (4) 1 USB converter
- (5) 1 Android cellphone

The Android phone models verified by ASR are as follows:

- HUAWEI Mate 20 Pro, Android 10, EMUI 11.0.0
  - HUAWEI nova, Android 10, EMUI 11.0.0
  - HUAWEI Maimang 6, Android 8, EMUI 8.0.0
  - Xiaomi MIX 2S, Android 9, MIUI 11.0.3
- (6) 1 PC

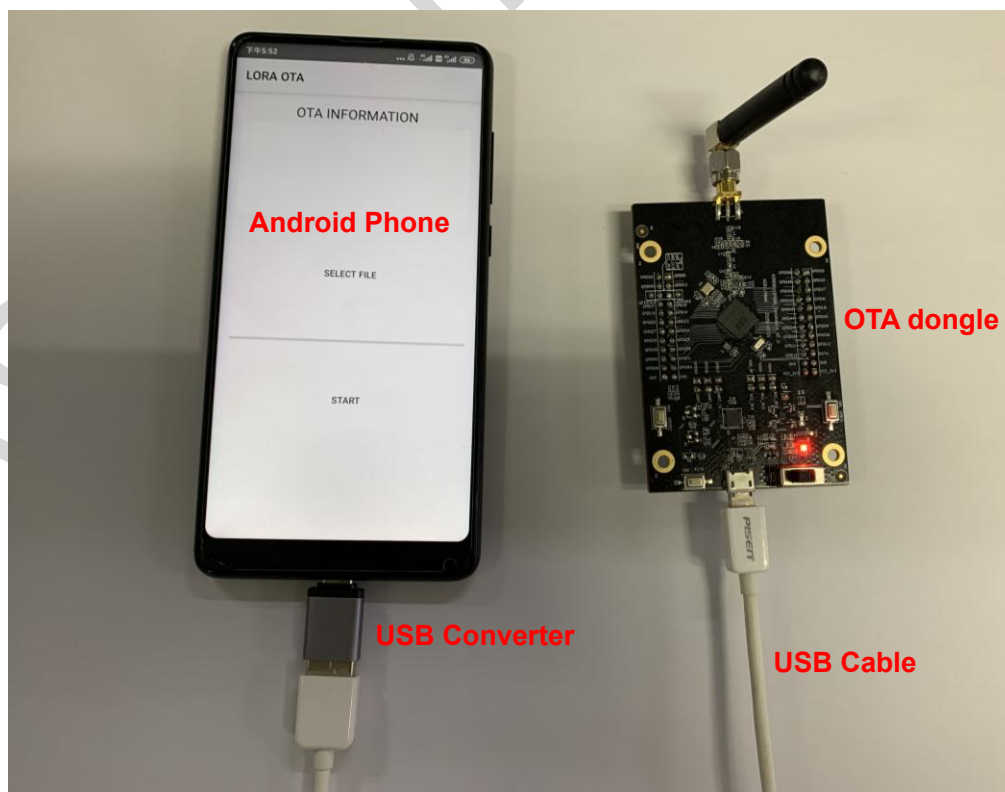


Figure 1-1 Connect the Cellphone to the OTA Dongle Board

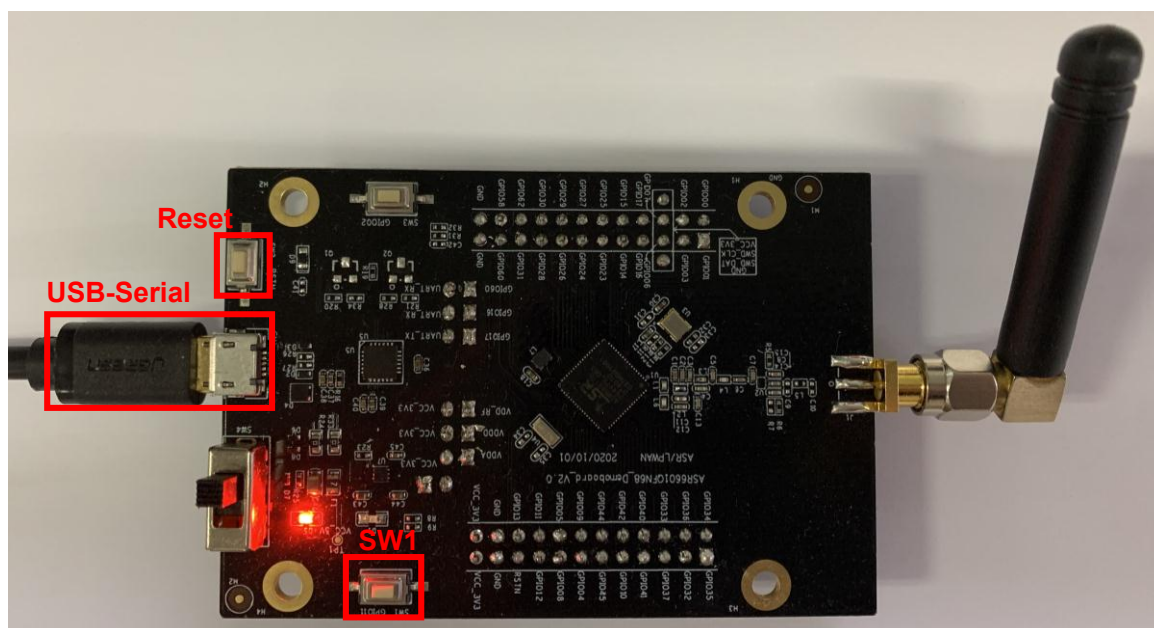


Figure 1-2 Connect the Target Board to the PC

## 1.2 Software

### 1.2.1 OTA Dongle Board Software

OTA dongle code is located in `projects\${DEMO_BOARD}\examples\ota\dongle` directory. `\${DEMO_BOARD}` is the name of the OTA dongle board, for example, ASR6601SE-EVAL stands for ASR6601SE development board, and ASR6601CB-EVAL stands for ASR6601CB development board.

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

### 1.2.2 Target Board Software

There are two parts regarding the target board software: OTA bootloader and APP code.

#### (1) OTA bootloader

OTA bootloader code is located in `projects\${DEMO_BOARD}\examples\ota\bootloader` directory. `\${DEMO_BOARD}` is the name of the target board, for example, ASR6601SE-EVAL stands for ASR6601SE development board, and ASR6601CB-EVAL stands for ASR6601CB development board.

Compile and download the corresponding code to `0x08000000` address.

#### (2) APP

APP code is the code needs updates. In this document, we take `uart_printf` project as an example.



Edit the *gcc.ld* file in the *uart\_printf* project. Edit the start address of *FLASH* to *0x0800D000*. Then compile the modified project. After the compilation is complete, copy the generated project file (*project.bin*) to the cellphone.

```
/* 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

### 1.2.3 Cellphone

LoRa OTA APP code is located in *projects\ASR6601SE-EVAL\examples\ota\android\_app*.

Copy **apk** to the cellphone, then install.

## 2. Upgrade Process

### 2.1 Enter OTA Bootloader Mode

Press and hold the SW1 button of the target board, then RESET the board to make it enter OTA bootloader mode.

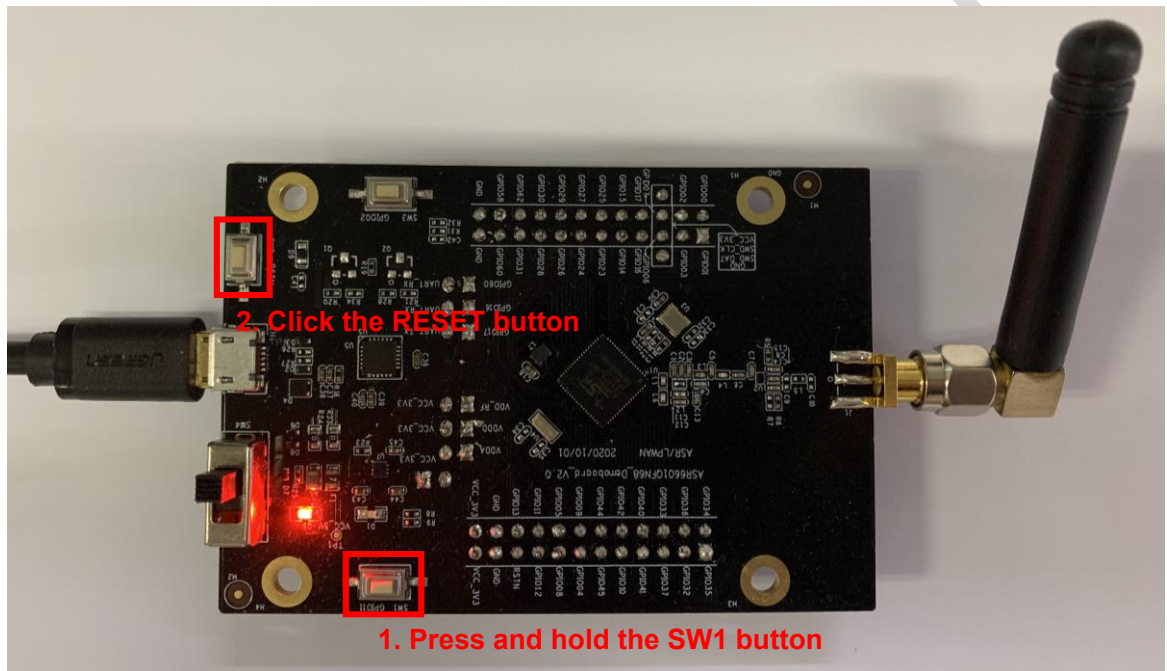


Figure 2-1 Enter OTA Bootloader Mode

## 2.2 Open APP

Connect the cellphone and the OTA dongle board via a USB converter. Then open the APP. The main interface is shown as follows:

**Note:** Click “Confirm” if an access prompt appears during the connection.

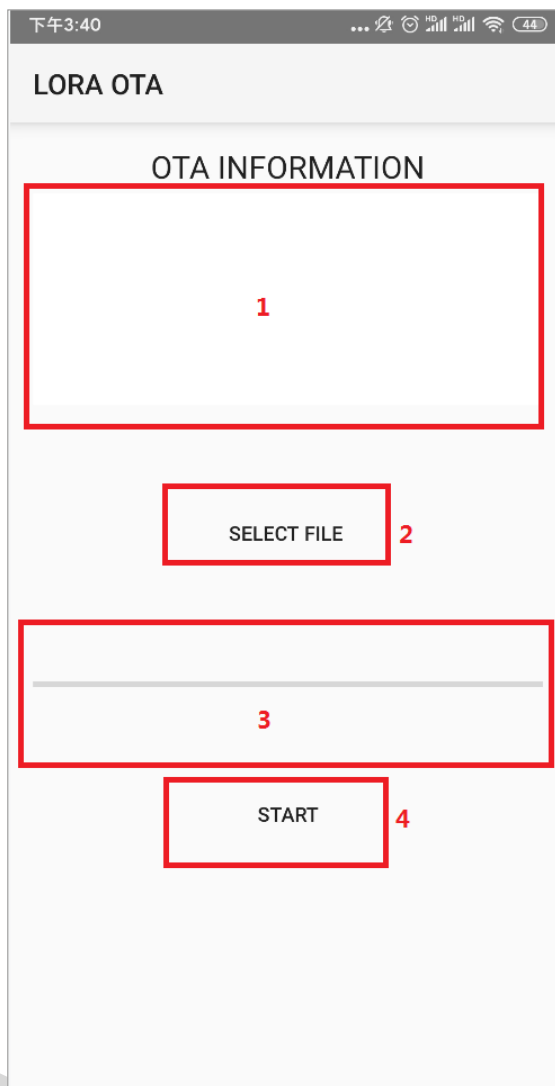


Figure 2-2 LoRa OTA APP Main Interface

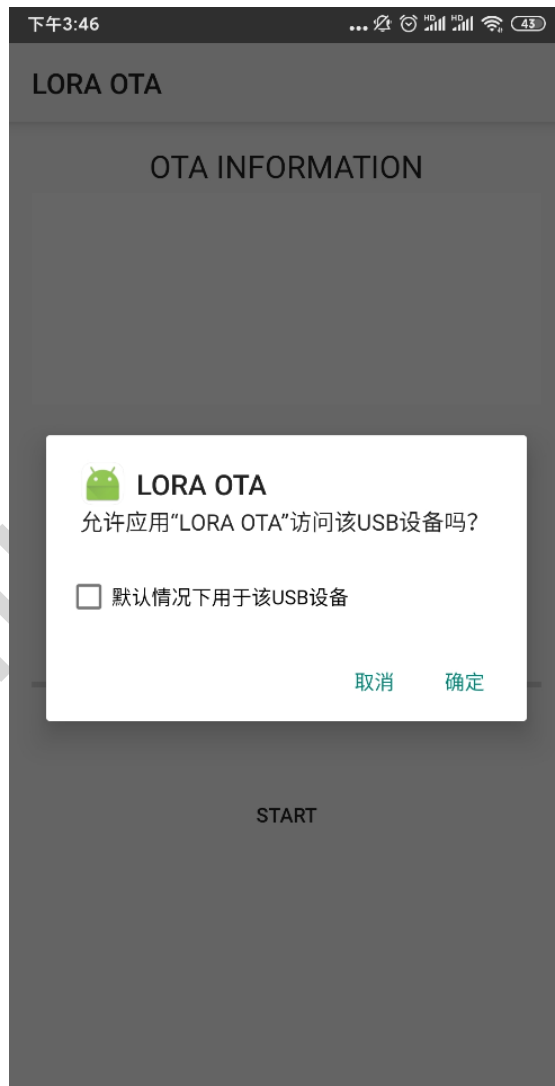


Figure 2-3 Access Prompt

Explanations about the red marks in Figure 2-2:

- Red 1: this area provides relevant information during OTA upgrade.
- Red 2: this button is used to select the corresponding upgrade file.
- Red 3: this progress bar shows the progress of OTA.
- Red 4: this button is used to start OTA upgrade.

## 2.3 Select the Upgrade File

(1) Click the “SELECT FILE” button in Figure 2-2 and you can see below interface:



Figure 2-4 File Management Interface

(2) Enter the directory where the project.bin file is located, and select the bin file.

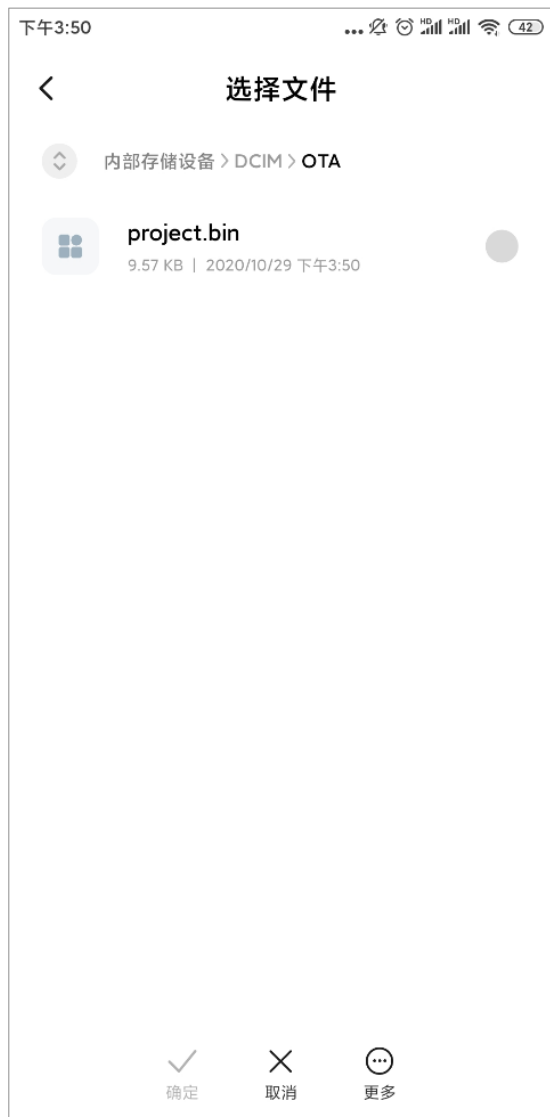


Figure 2-5 Select the Bin File

(3) Go back to the main interface. The OTA information area will display the selected bin file:

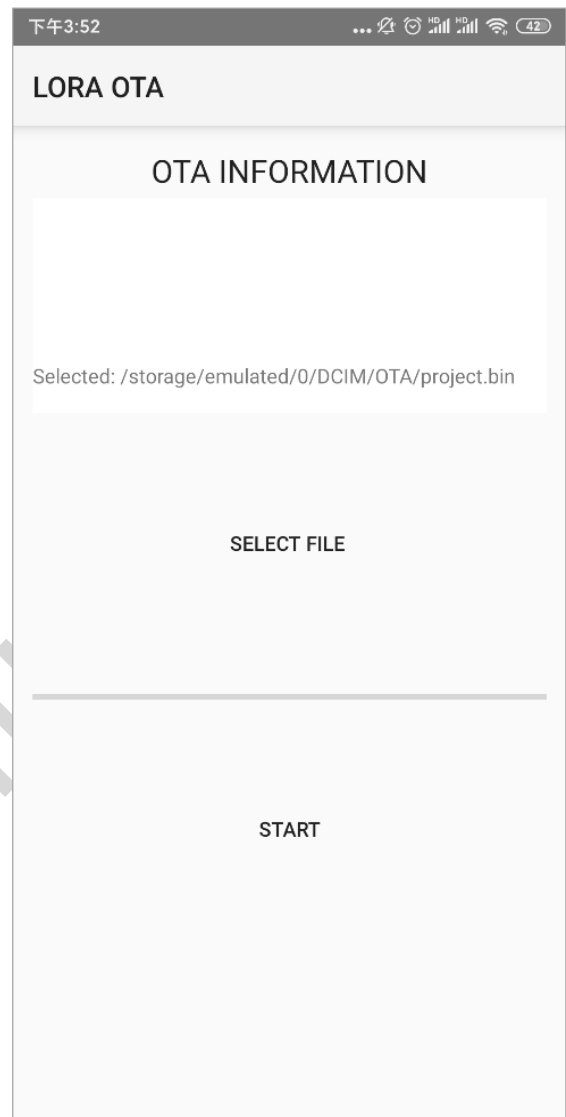


Figure 2-6 Information Area Shows the Selected Bin File

## 2.4 Start Upgrade

- (1) Click "START" to start upgrade and it will be shown in the OTA information area.
- (2) The information area will display "OTA: done" when the OTA upgrade is finished successfully.

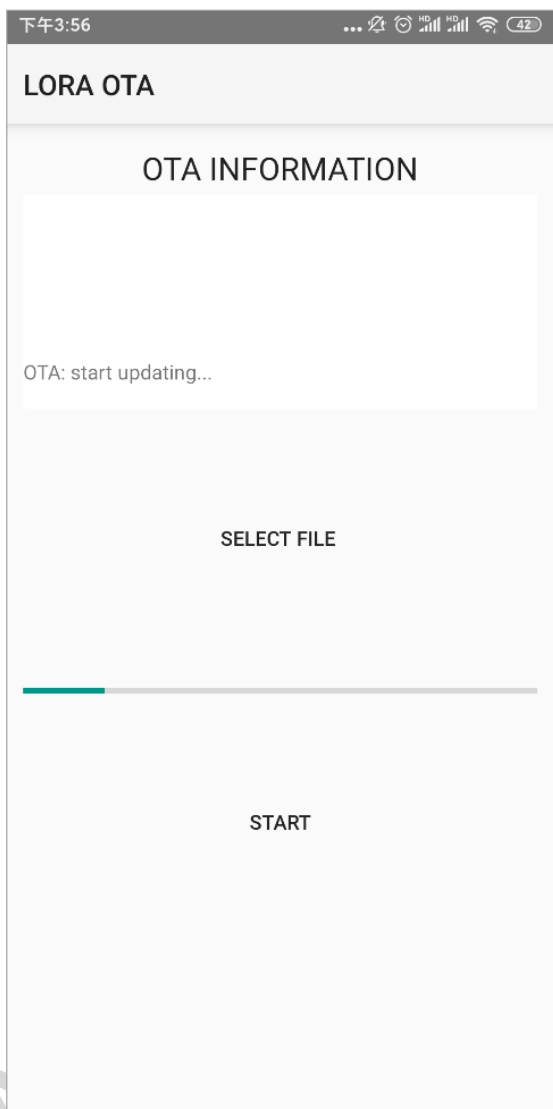


Figure 2-7 Start Upgrade

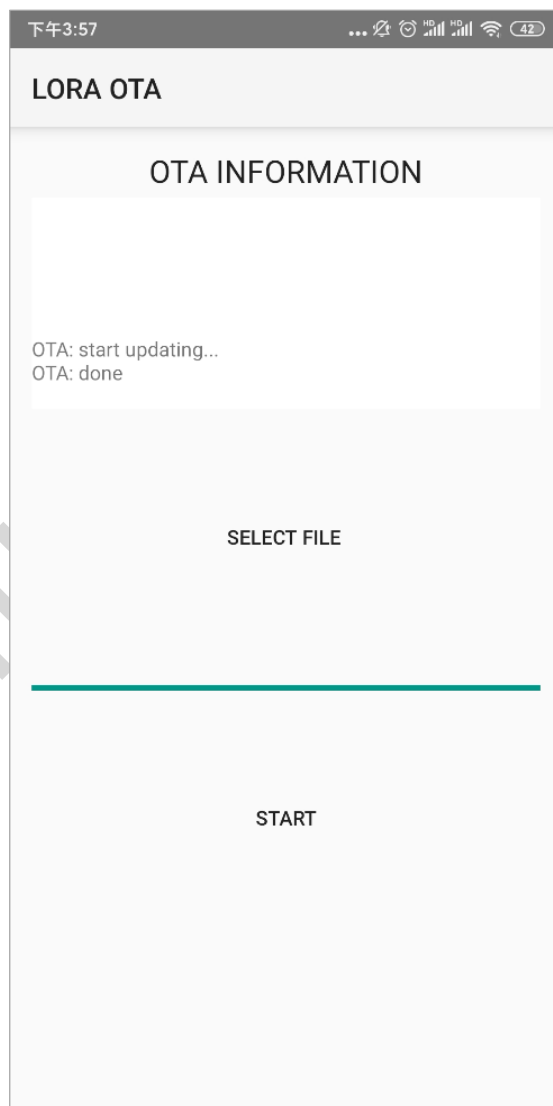


Figure 2-8 Finish Upgrading

Meanwhile, the target board will print: `hello world`

## 3. OTA Dongle AT Commands

### 3.1 Overview

The relevant AT Commands are as follows:

Table 3-1 OTA Dongle AT commands

Command	Description
AT+FREQ	Set frequency rate
AT+CFG	Configure parameters
AT+TX	Send data
AT+RX	Enter receiving mode
AT+DATA	Report data after receipt

### 3.2 AT Commands Descriptions

#### 3.2.1 AT+FREQ

Commands and Response	AT+FERQ=<freq>	OK or +CME ERROR:<err>
Parameters and Returned Values	This command is used to set frequency rate. <b>freq:</b> 150000000-960000000	
Example	AT+FREQ=470000000	

## 3.2.2 AT+CFG

Commands and Response	AT+CFG=<modem>,<p1>,<p2>,<p3>,<p4>,<p5>,<txp>	OK or +CME ERROR:<err>
Parameters and Returned Values	<p>This command is used to configure parameters.</p> <p><b>modem:</b> Modulation type (0: FSK; 1: LORA)</p> <ul style="list-style-type: none"> <li>If modem is set to 0:           <p><b>P1:</b> fsk bandwidth</p> <p><b>P2:</b> fsk datarate</p> <p><b>P3:</b> fsk dev</p> <p><b>P4:</b> fsk preamble length</p> <p><b>P5:</b> fsk afc bandwidth</p> </li> <li>If modem is set to 1:           <p><b>P1:</b> lora bandwidth,</p> <ul style="list-style-type: none"> <li>0: 125K</li> <li>1: 250K</li> <li>2: 500K</li> </ul> <p><b>P2:</b> lora sf (5-12)</p> <p><b>P3:</b> lora cr</p> <ul style="list-style-type: none"> <li>1: 4/5</li> <li>2: 4/6</li> <li>3: 4/7</li> <li>4: 4/8</li> </ul> <p><b>P4:</b> lora preamble length</p> <p><b>P5:</b> lora iq (0: false; 1: true)</p> </li> </ul> <p><b>txp:</b> tx power (0-22)</p>	
Example	AT+CFG=1,0,7,1,8,0,22	



### 3.2.3 AT+TX

Commands and Response	AT+TX=<len>,<data>	OK+SEND or ERR+SEND:1
Parameters and Returned Values	This command is used to send data. <b>len</b> : data length <b>data</b> : hex format data	
Example	AT+TX=3,123456	

### 3.2.4 AT+RX

Commands and Response	AT+RX=<timeout>	OK or +CME ERROR:<err>
Parameters and Returned Values	This command is used to receive data. <b>timeout</b> : timeout (ms), if set to 0, it means continuous receiving	
Example	AT+RX=0	

### 3.2.5 AT+DATA

Commands and Response	AT+DATA=<status>,<snr>,<rsi>,<len>,<data>	N/A
Parameters and Returned Values	This command is used to report data. The dongle board sends this command when it receives data. <b>status</b> : the status of reporting data <ul style="list-style-type: none"> <li>● 0: normal</li> <li>● 1: rx_timeout</li> <li>● 2: rx_error</li> </ul> <b>snr</b> : data package signal-noise ratio <b>rsi</b> : signal intensity <b>len</b> : data length <b>data</b> : hex format data	
Example	AT+DATA=0,9,-45,3,123456	

# 4. OTA Bootloader Commands

## 4.1 Overview

Table 4-1 OTA Bootloader Commands

Command	Command Number	Description
SYNC	1	SYNC command tells if the connection is normal
JUMP	2	Jump command
FLASH	3	Flash command
ERASE	4	Erase command
VERIFY	5	Verify command
REBOOT	12	Reboot command
SN	13	Read the serial number command

## 4.2 Command Format

### 4.2.1 Request

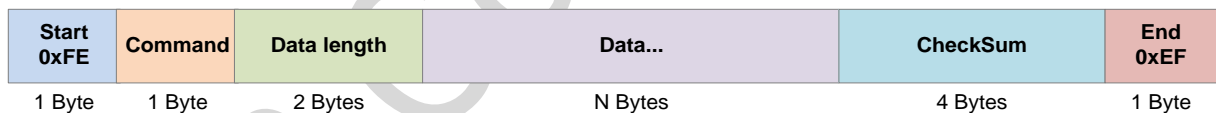


Figure 4-1 OTA Bootloader Request Command Format

Fill in the command number in the "Command" column. The algorithm of Checksum is CRC32.

### 4.2.2 Response

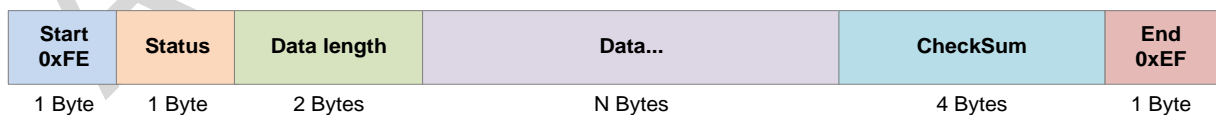


Figure 4-2 OTA Bootloader Response Command Format

### 4.3 Command Payload Format

Table 4-2 Command Payload Format

Command Type	Payload Format
SYNC	N/A
JUMP	<b>Addr:</b> 4 Bytes, the address to jump to
FLASH	<b>Addr:</b> 4 Bytes, the address to flash data <b>Size:</b> 4 Bytes, the size of the flashed data <b>Data:</b> N Bytes, the data to be flashed
ERASE	<b>Addr:</b> the address of the erased area <b>Size:</b> the size of the erased area
VERIFY	<b>Addr:</b> the start address of the Flash to be verified <b>Size:</b> the size of the verified area <b>Checksum:</b> check sum value
REBOOT	<b>Mode:</b> reboot mode <ul style="list-style-type: none"><li>● 0: reboot to enter APP</li><li>● 1: reboot to enter OTA bootloader</li></ul>
SN	N/A