



ASR6601

OTA Upgrade Guide

Version 1.2.0

Issue Date 2021-06-23

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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 China STAR- MC1 Processor	QFN68, 8*8 mm	150 ~ 960 MHz
ASR6601CB	128 KB	16 KB	32-bit 48 MHz Arm China STAR- MC1 Processor	QFN48, 6*6 mm	150 ~ 960 MHz
ASR6601SER	256 KB	64 KB	32-bit 48 MHz Arm China STAR- MC1 Processor	QFN68, 8*8 mm	150 ~ 960 MHz
ASR6601CBR	128 KB	16 KB	32-bit 48 MHz Arm China STAR- MC1 Processor	QFN48, 6*6 mm	150 ~ 960 MHz

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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

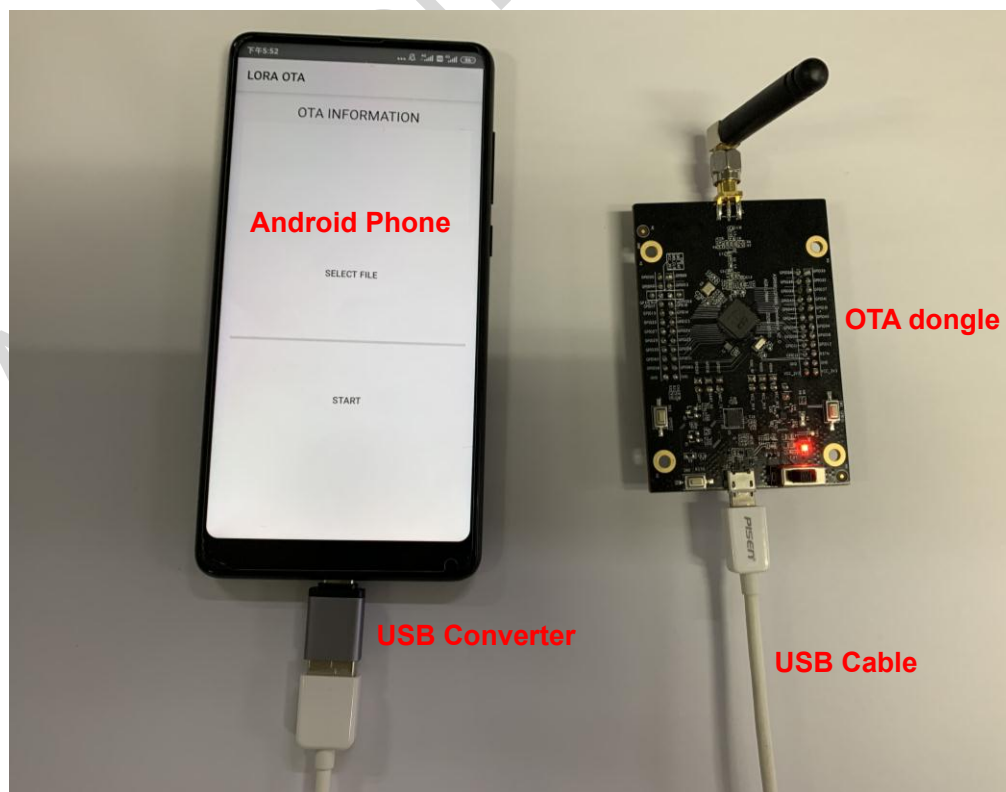


Figure 1-1 Connect the Cellphone to the OTA Dongle Board

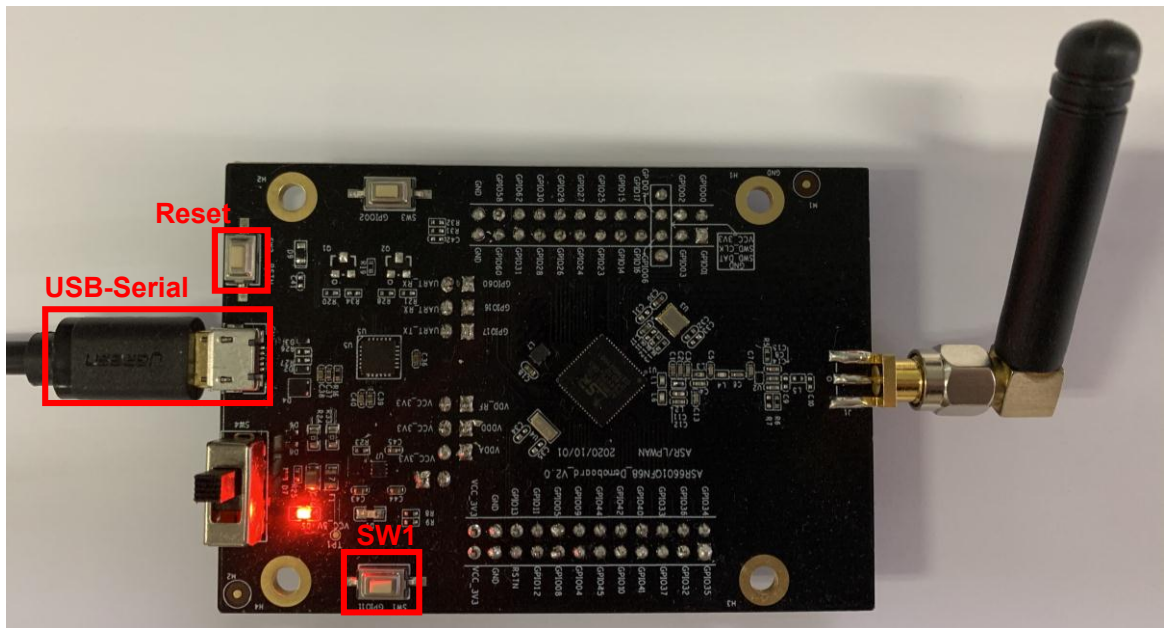


Figure 1-2 Connect the Target Board to the PC

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.

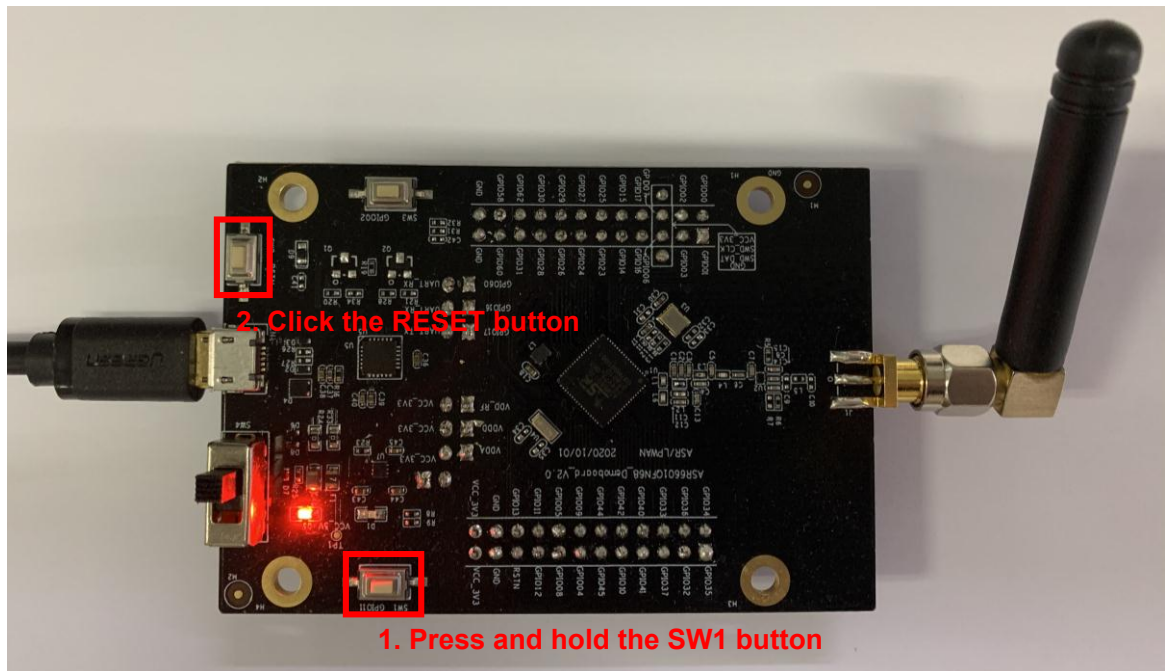


Figure 2-1 Enter OTA Bootloader Mode

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.

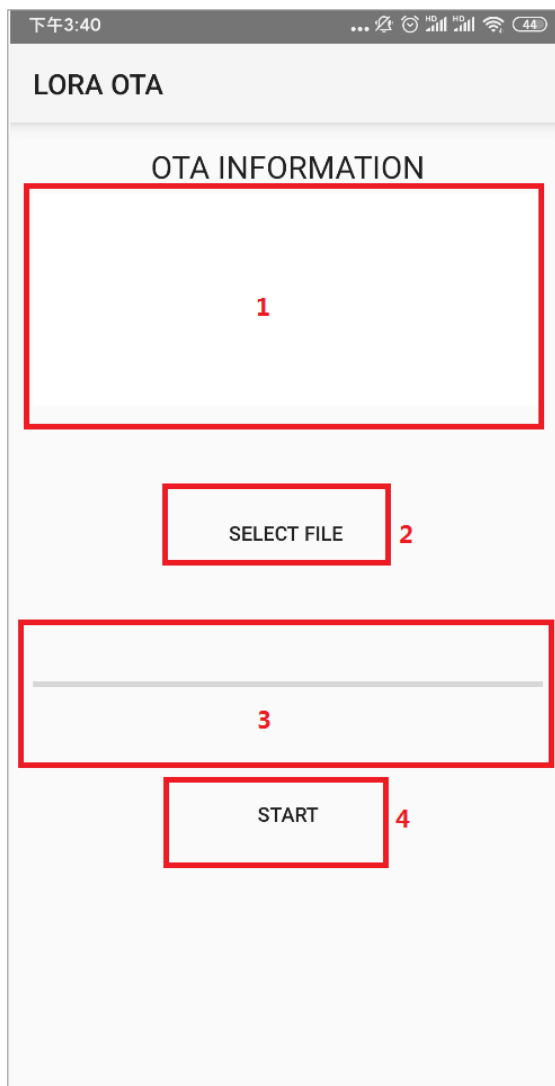


Figure 2-2 LoRa OTA APP Main Interface

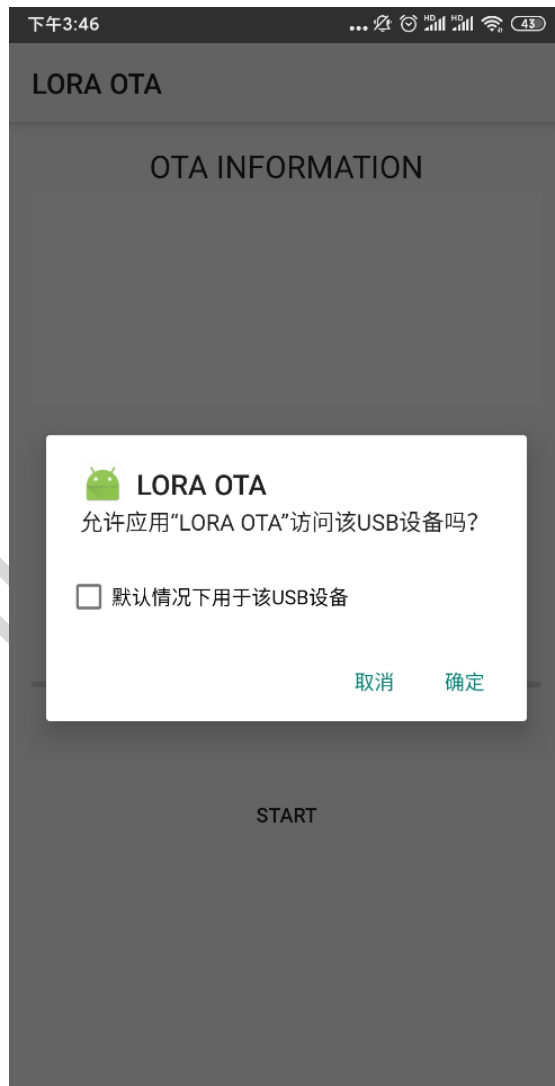


Figure 2-3 Access Prompt

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.

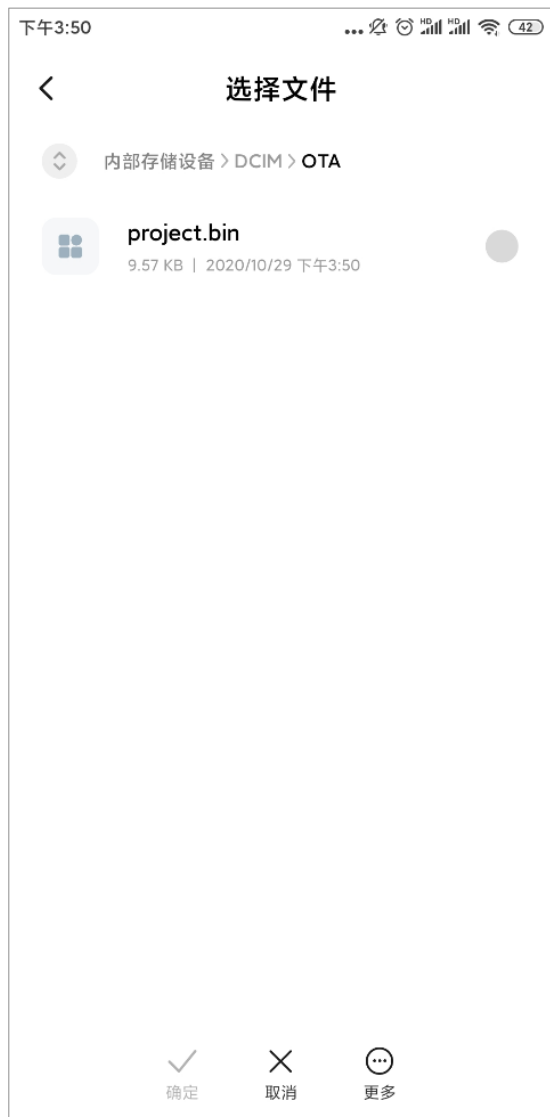


Figure 2-5 Select the Bin File

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

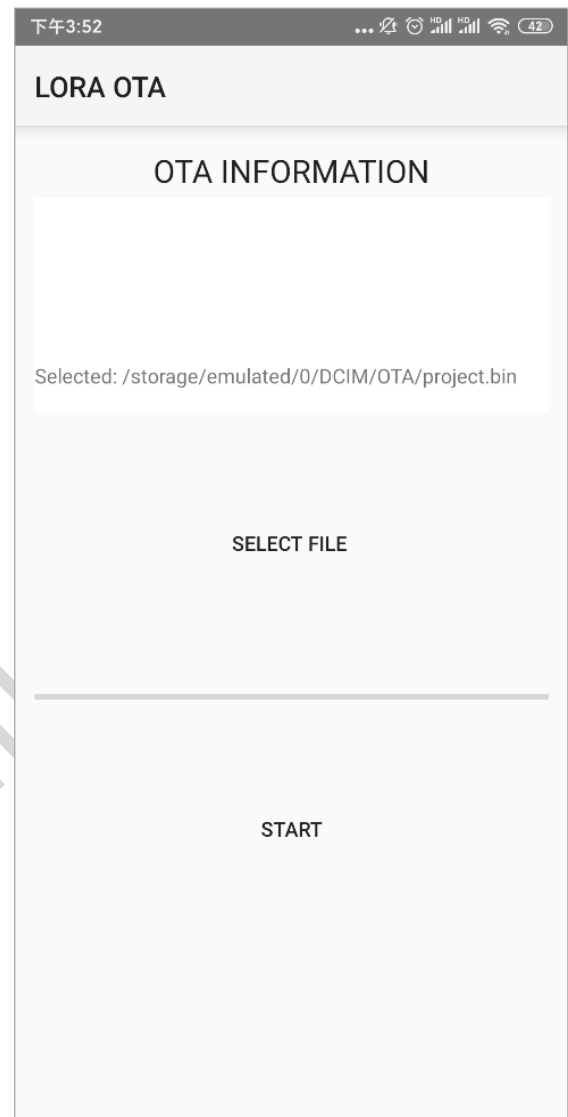


Figure 2-6 Information Area Shows the Selected Bin File

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.

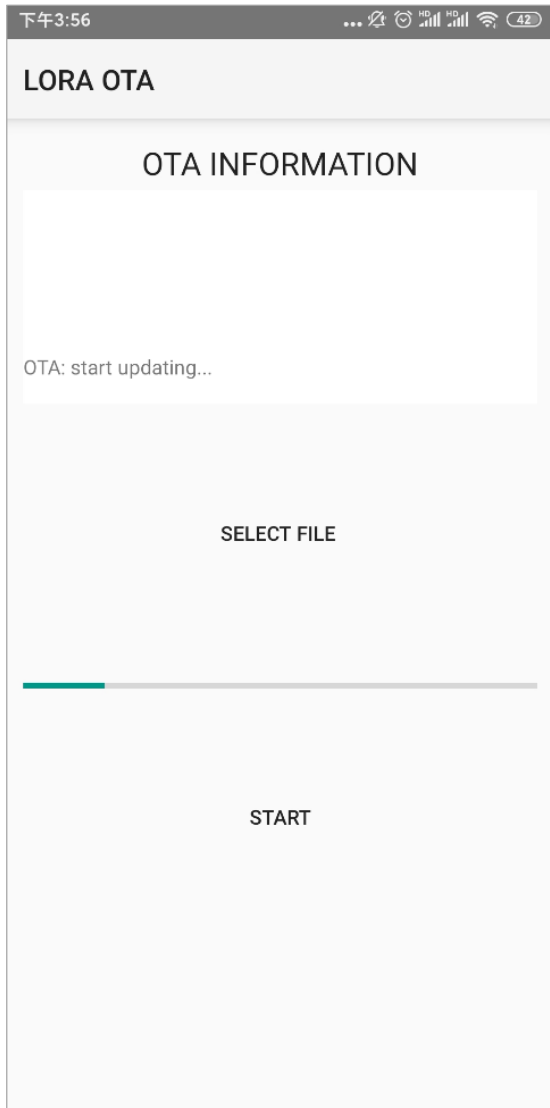


Figure 2-7 Start Upgrade

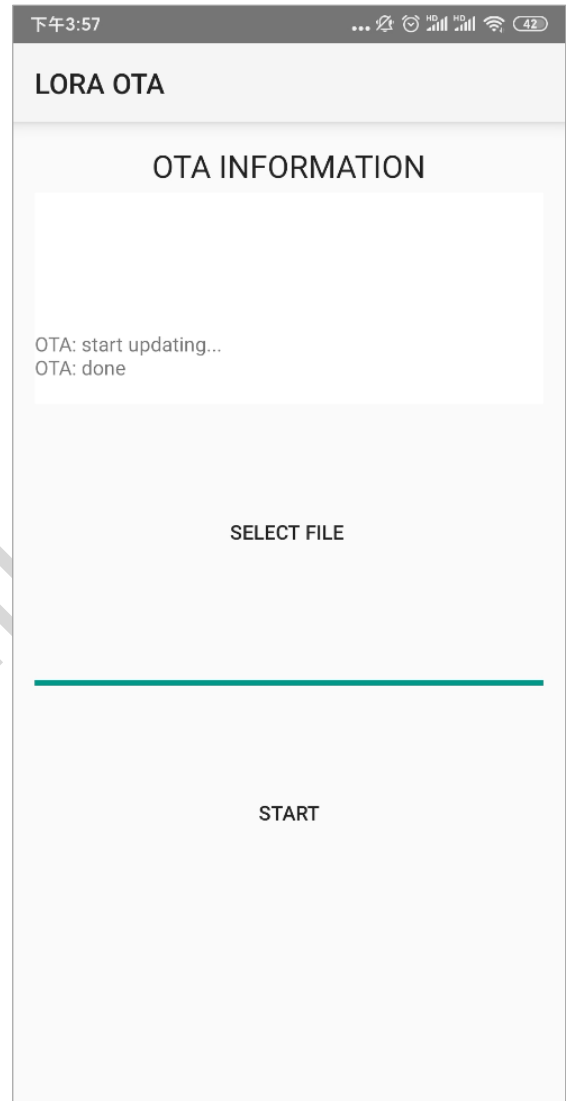


Figure 2-8 Finish Upgrading

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. freq: 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>modem: Modulation type (0: FSK; 1: LORA)</p> <ul style="list-style-type: none"> If modem is set to 0: <p>P1: fsk bandwidth</p> <p>P2: fsk datarate</p> <p>P3: fsk dev</p> <p>P4: fsk preamble length</p> <p>P5: fsk afc bandwidth</p> If modem is set to 1: <p>P1: lora bandwidth,</p> <ul style="list-style-type: none"> 0: 125K 1: 250K 2: 500K <p>P2: lora sf (5-12)</p> <p>P3: lora cr</p> <ul style="list-style-type: none"> 1: 4/5 2: 4/6 3: 4/7 4: 4/8 <p>P4: lora preamble length</p> <p>P5: lora iq (0: false; 1: true)</p> <p>txp: 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. len : data length data : 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. timeout : 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. status : the status of reporting data <ul style="list-style-type: none"> ● 0: normal ● 1: rx_timeout ● 2: rx_error snr : data package signal-noise ratio rsi : signal intensity len : data length data : 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

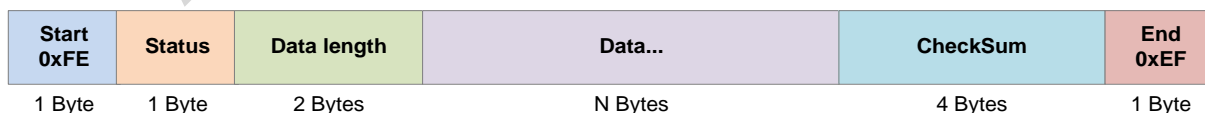


Figure 4-2 OTA Bootloader Response Command Format

4.3 Command Payload Format

Table 4-2 Command Payload Format

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