MP Tool User Guide

Realtek

V1.3

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1 Overview

1.1 Hardware Interface

RTL8762X supports UART interfaces for flash downloading:

P3_1&P3_0 is required for using UART downloading interface.

Precautions:

1. Try not to multiplex the pins already used by downloading interface.
2. If pins used by downloading interface are multiplexed on the hardware, it is necessary to check the electrical characteristics. Otherwise, external loading on pins may alter the waveforms of downloading interface and cause problems.

1.2 Image for Downloading

MP Tool supports downloading packet image to mass-produced production and independent images to debugging devices. The packet image can be generated by RTK MP Pack Tool provided by Realtek.

1.3 Software

MP Tool is the software tool for mass production and RD developing.

MP Tool supports two modes: MP mode and RD mode, MP mode is for MP downloading on mass-produced products, while RD mode is for RD downloading. RD mode is closed by default. User needs to use RegistrySet Tool provided by Realtek to enable RD downloading function. If users want to use the RD mode on computer, they just need to run the RegistrySet Tool at first time. The RegistrySet Tool can be found in Realtek MP Kits.

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2 Realtek MP Kits Introduction

Realtek MP Kits includes tools (download tool, pack tool and RegistrySet.exe tool) and documents for mass production and RD developing.

2.1 RTL8762X MP Tool

2.1.1 Starting Interface

Realtek MP Tool's starting interface supports IC and language selection. Currently only English and Chinese (simplified) are supported. Starting interface is shown in Figure 2-1.

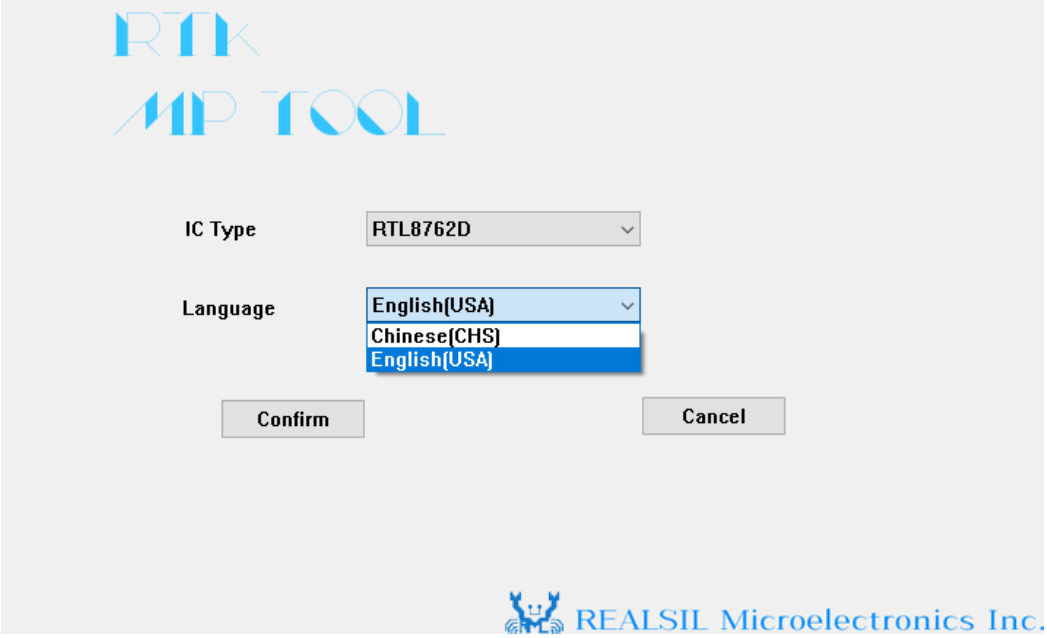

Figure 2-1 Starting interface

2.1.2 MP Mode

Supported functions in MP Mode are listed as follows:

- UART interface
- Up to 24 ports download at a time
- Packet files download
- File type check
- One-Click download
- Lock and unlock settings
- Support setting unique mode
- Support SPI to set extra flash

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- 3 ways to set BT address

1. **Communication interface and Download port amount**

   MP Tool supports up to twenty-four ports to download file at a time through UART interface in MP mode.

2. **File type check**

   Before downloading, Tool will check file types. Error files cannot be downloaded to flash.

3. **One-click Download**

   To decrease risk of misoperation in factory, MP Tool applies “one-click download” mode to do mass production in MP mode. It means that operator only needs to click mouse to complete entire downloading procedure. It is shown in Figure 2-2.

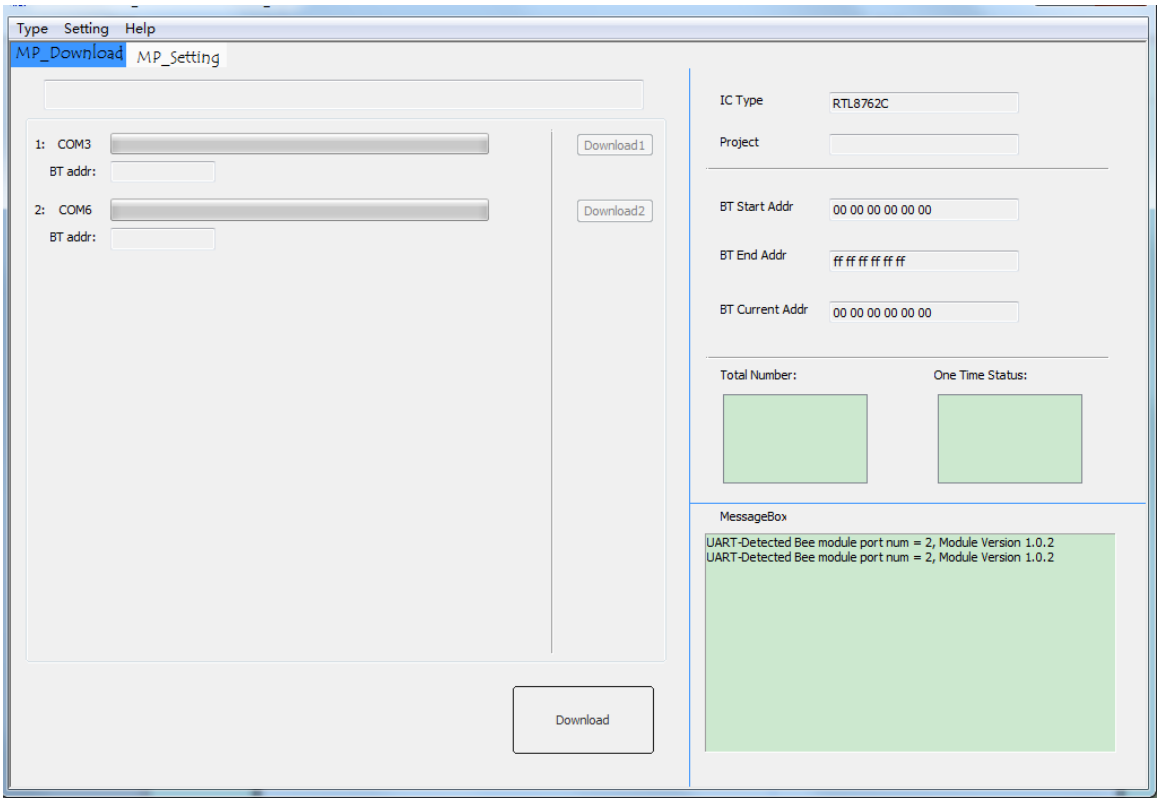

Figure 2-2 One-click Download

4. **Lock and Unlock**

   To avoid error operations, MP Tool provides “LOCK” and “UNLOCK” functions for developers. After setting the parameters on MP Setting page, developers can click “LOCK” button to lock settings. It can click “UNLOCK” button to input password & login in to change MP Setting interface, if users want to modify parameters. It is shown in Figure 2-3.

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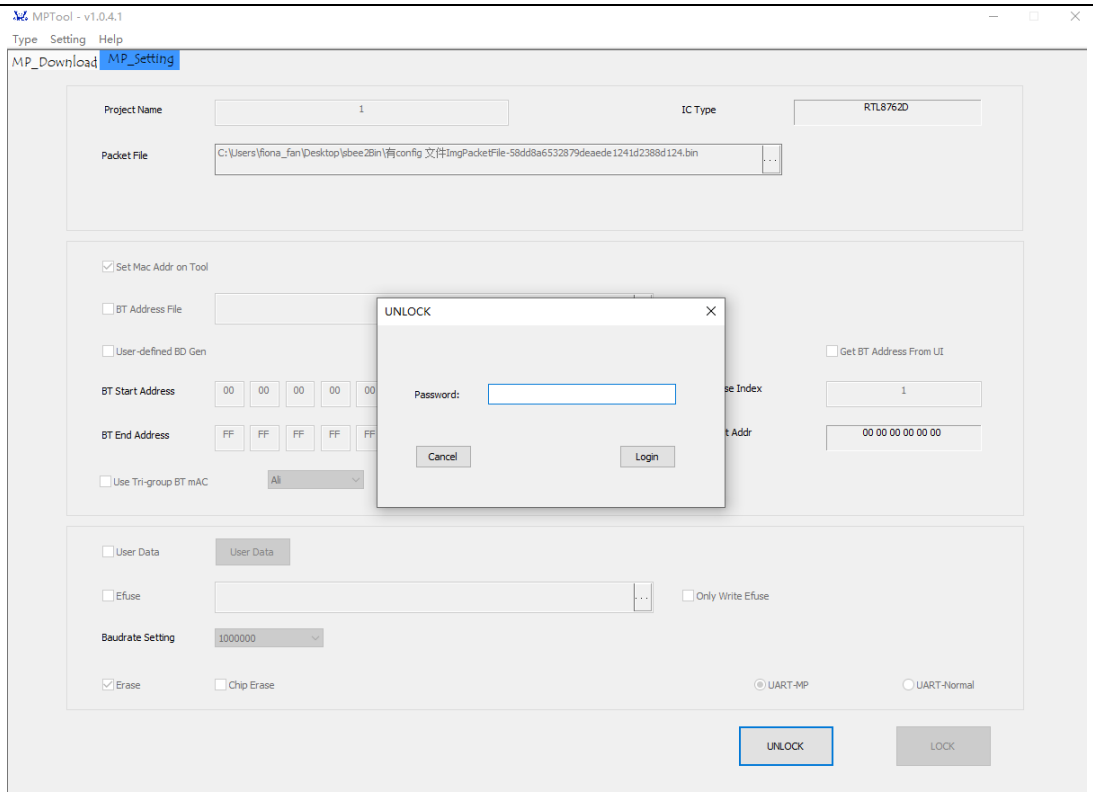

Figure 2-3 Unlock MP Setting interface

The password can be modified through “Password Modify” item in “Setting” menu. It is shown in Figure 2-4.

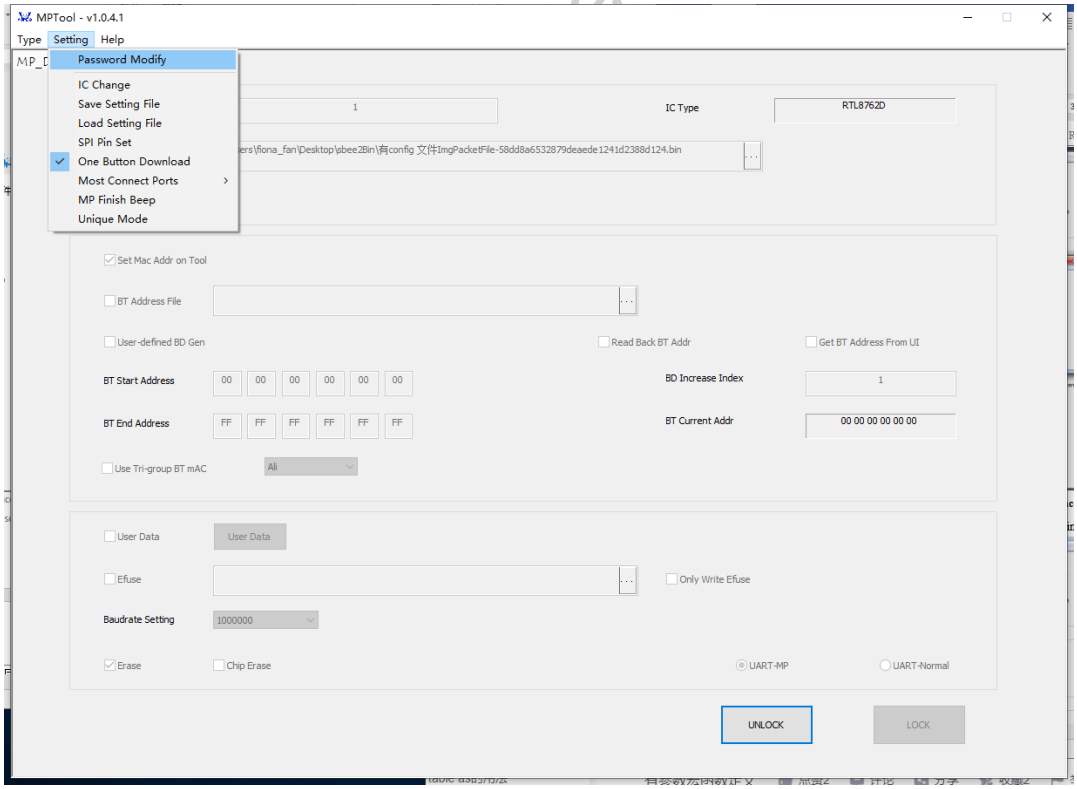

Figure 2-4 MP Setting interface’s Password modify

5. MP Setting

MP Setting is used to configure parameters in mass production, which includes packet Image import, project

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name configuration, BT start and end address configuration, BT address increase index configuration and BT address file import. It is shown in Figure 2-5.

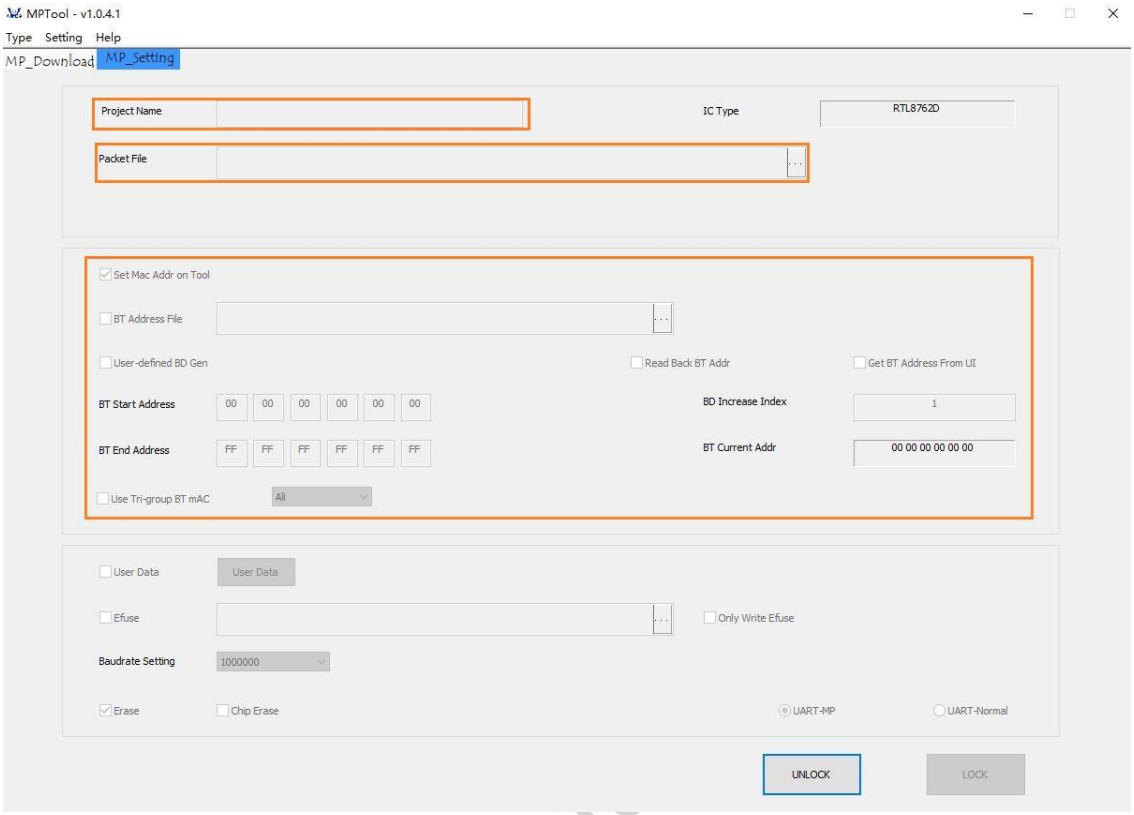

Figure 2-5 MP Setting interface

2.1.3 RD Mode

When entering debug mode for the first time, other function keys can only be enabled when the flash map.ini file is generated or loaded. You can call the flash map tool through the button of the flash map tool to generate the flash map.ini file, or load the existing flash map.ini file in the layout file. Supported functions in RD Mode are listed as follows.

- 2 types of communication interfaces
- Support to load Flash Map Tool
- Support to load Pack Tool
- Both multi-ports & single-port download
- Download separated files
- Config file set
- Flash layout check
- Patch conversion
- Image address configuration
- Erase flash

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- Read flash back
- Backup files
- Flash check
- Password to unlock flash
- Set Efuse

1. **Download interface**

   In RD mode, MP Tool supports UART interfaces to download files.

2. **Support to load Flash Map Tool**

   In the debug mode, you can call the Flash Map Tool by clicking the button of the Flash Map Tool. The generated flashmap.ini file will be saved in the FlashMap folder, and will be directly loaded at the layout file of the RD side. According to the image planned in the flashmap.ini file, the file type is displayed in the file type column on the RD side, and the user can load the corresponding image. At the same time, after clicking Confirm of Flash Map Tool, OTAHeader will be generated and saved in the OTAHeader folder. For the specific use of flash map tool, please refer to the user guide of flash map tool.

3. **Support to load Pack Tool**

   In debug mode, you can call the Pack Tool by clicking the button of the Pack Tool to pack the files. The generated package file is saved in the PacketFiles folder. For the specific use of Pack Tool, please refer to the user guide of Pack Tool.

4. **Download port number**

   In RD mode, MP Tool supports up to eight ports to download files at the same time through UART interface.

5. **Download**

   In RD mode, MP Tool supports downloading separated files, including APP Image, ROM Patch Image, OTA Header file, and System Config File. Users can download them separately or together.

6. **Config file set**

   MP Tool supports user to set RTL8762X's configuration and generates Config file which would be downloaded to flash or used for packet file on mass production.

7. **Flash layout check**

   The imported image file will perform memory check through flash layout check function, in order to avoid memory address conflicts

8. **Patch conversion**

   MP Tool can update the start address and signature key for patch image.

9. **Image address configuration**

   In debug mode, MPTool supports importing the flash map.ini file from the outside to set the starting address of the image, which is generated by clicking the button of the Flash Map Tool.

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10. Erase flash

In RD mode, MP Tool supports erasing flash, including full chip erasing and selective erasing of fixed addresses and sizes. Entire chip erasing takes a long time, but it will completely erase the flash data. The selective erasing takes a short time and only erases the flash data in a fixed area.

11. Read flash back

MP Tool supports user to read flash back and save it as a bin file. The reading flash size can't exceed 32Mbytes one time. At the same time, it supports to read back the entire package file and display it in the read all folder according to the file type name.

12. Backup files

Support to backup all files set in RD setting page to a backup folder.

13. Flash check

In RD mode, MP tool support to read back all datas from flash and judge whether boot normally or not.

14. Password to unlock flash

Though filling in password key to unlock flash for debugging .

15. Set Efuse

Suppot to generate Efuse.json file for downloading.

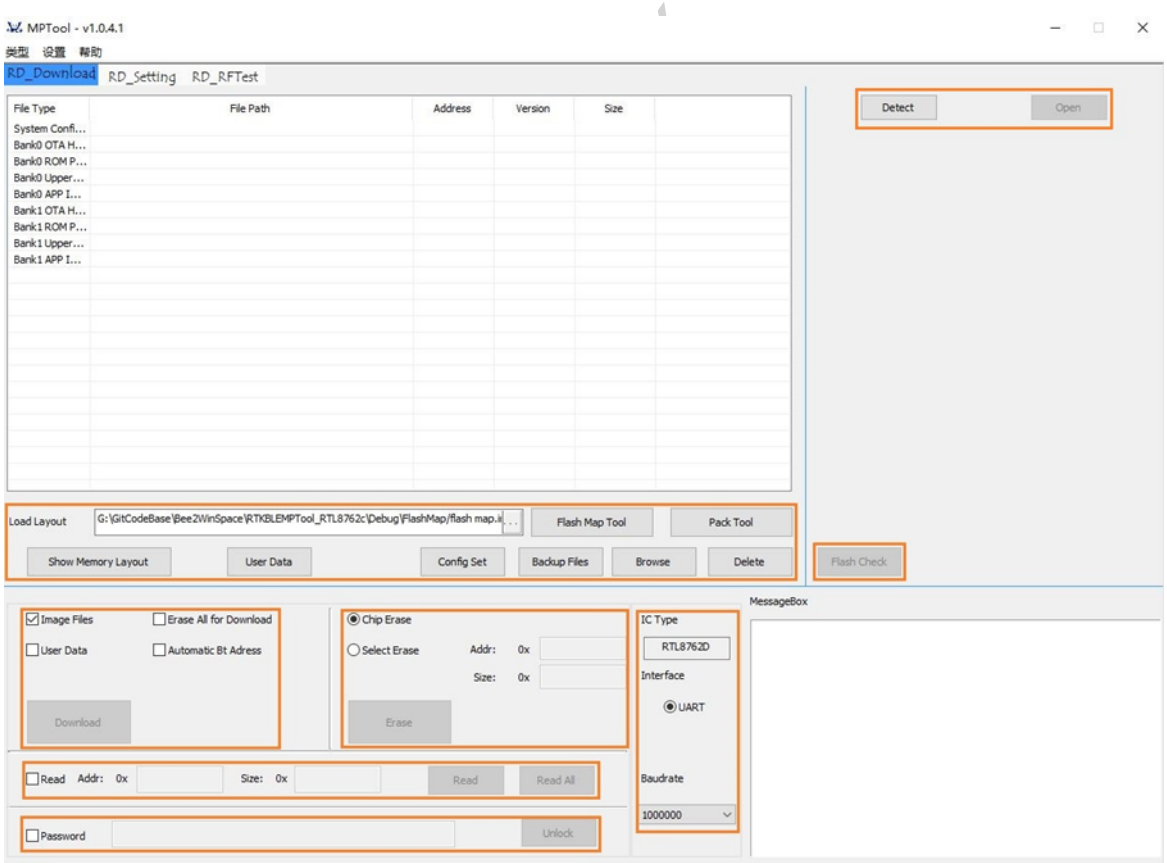

Figure 2-6 MP RD interface

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2.2 MP Pack Tool introduction

MP Pack Tool is used to generate packet file for mass production.

2.2.1 MP Pack Tool UI

Multiple image files are combined into one packet by MP Pack Tool. The Pack Tool UI is shown in Figure 2-7

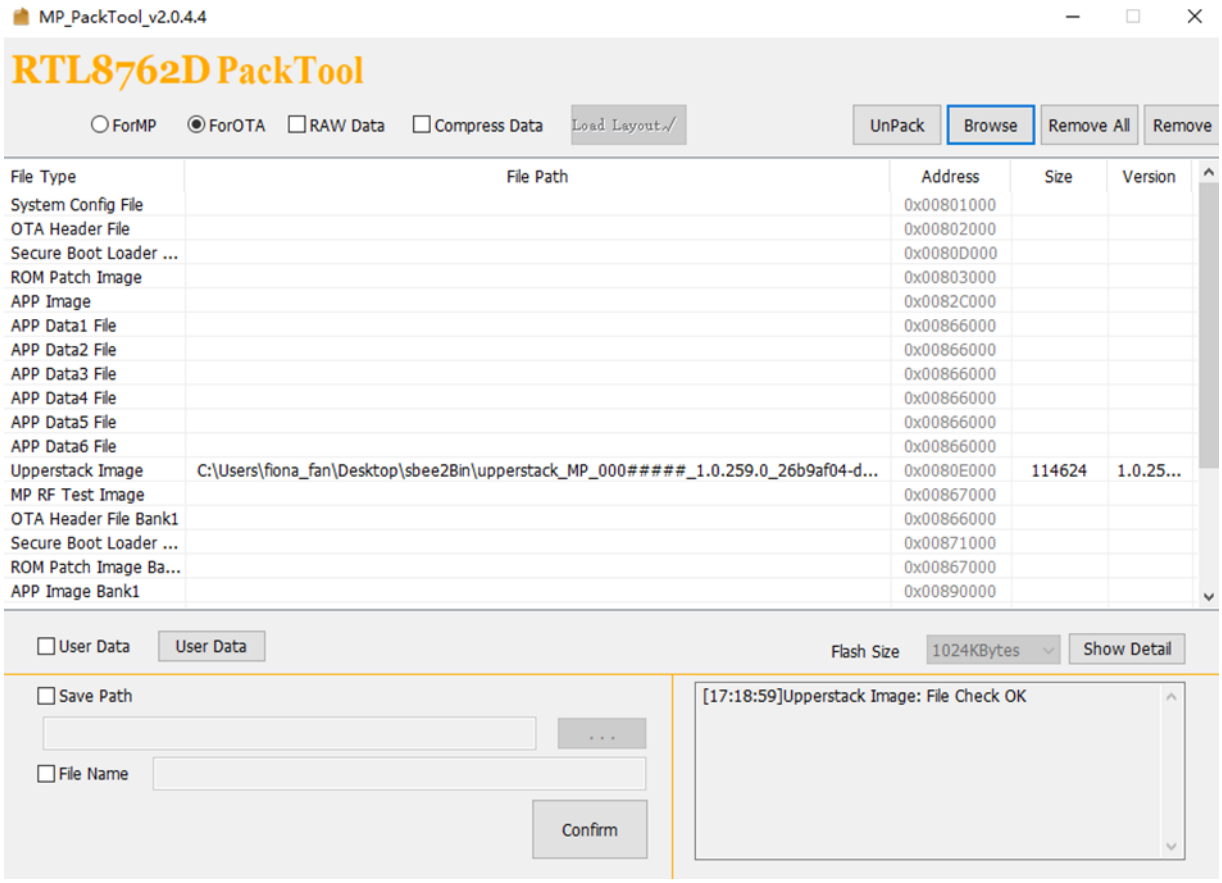

Figure 2-7 MP Pack Tool UI

2.3 RegistrySet Tool

RegisterSet tool is used to enable RD mode. In MP Tool, RD mode is closed by default. User needs to use “RegistrySet.exe” to enable it. If users want to use the RD mode on computer, they just need to run the “RegistrySet.exe” at the first time. Then they can select the RD mode in MP Tool’s menu. User can switch between RD mode and MP mode by the “type” item of menu, as is shown in Figure 2-.

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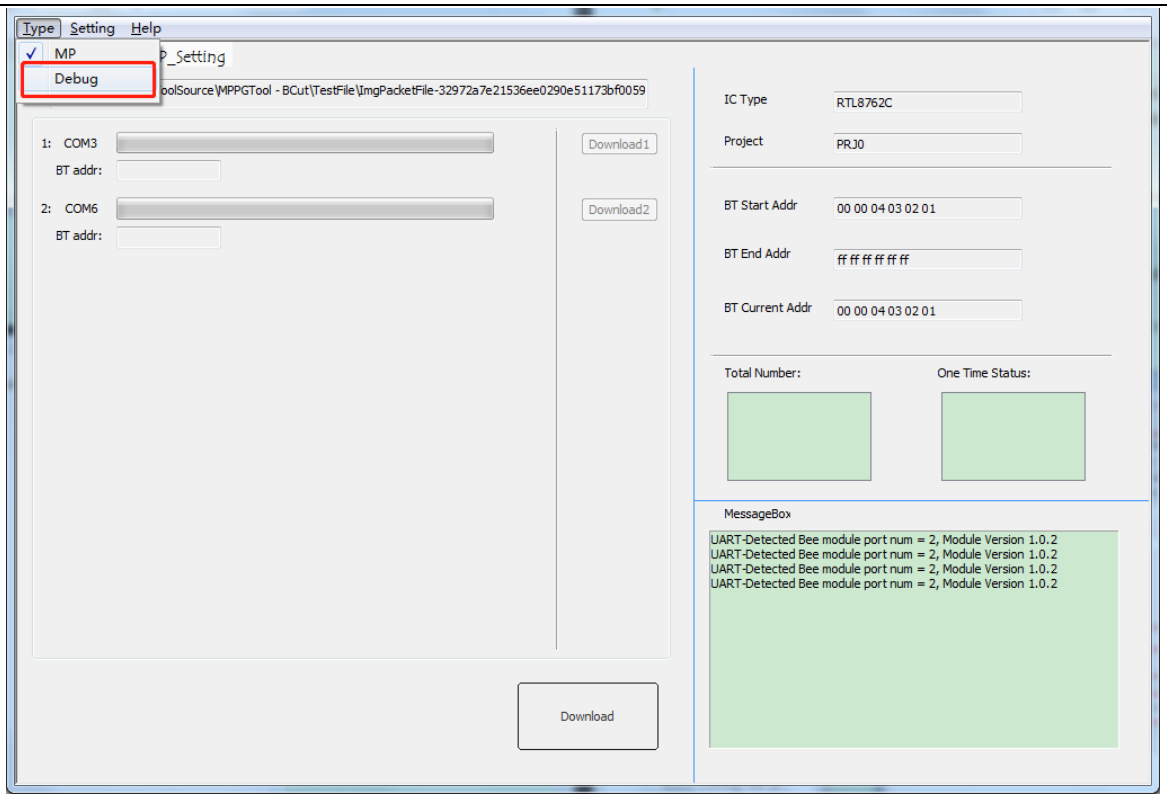

Figure 2-8 Select RD mode

3 MP Environment Preparation

3.1 Factory State of Chip

In all of the operation procedures of the document, the factory state of chip must be guaranteed. That means, no image should be downloaded to the chips. If ever downloaded, user needs to perform chip erase to return to factory state.

3.2 System Environment (above Windows7 SP1)

MP Tool only supports Windows7 SP1 above system and should be used in Windows7 SP1 above.

1. MP Tool will detect all serial ports in the system, COM ports irrelevant to downloading may cause opening failed. If there are too many irrelevant ports in PC (total number of download ports and irrelevant ports exceeds number of 8), RTL8762X device will be captured by other irrelevant ports, resulting in RTL8762X device unable to download. As a result, users need to turn off irrelevant ports before downloading.

2. How to turn off serial ports:

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1) As is shown in Figure 3-1, right click on “Computer” icon, and select “Manage” in menu.

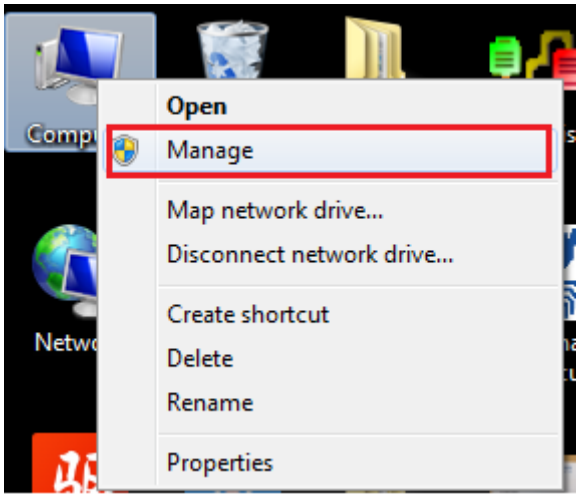

Figure 3-1 Manage Computer

2) As is shown in Figure 3-2, “Computer management” -> “Device manager” -> Forbid other irrelevant COM ports in “Ports”

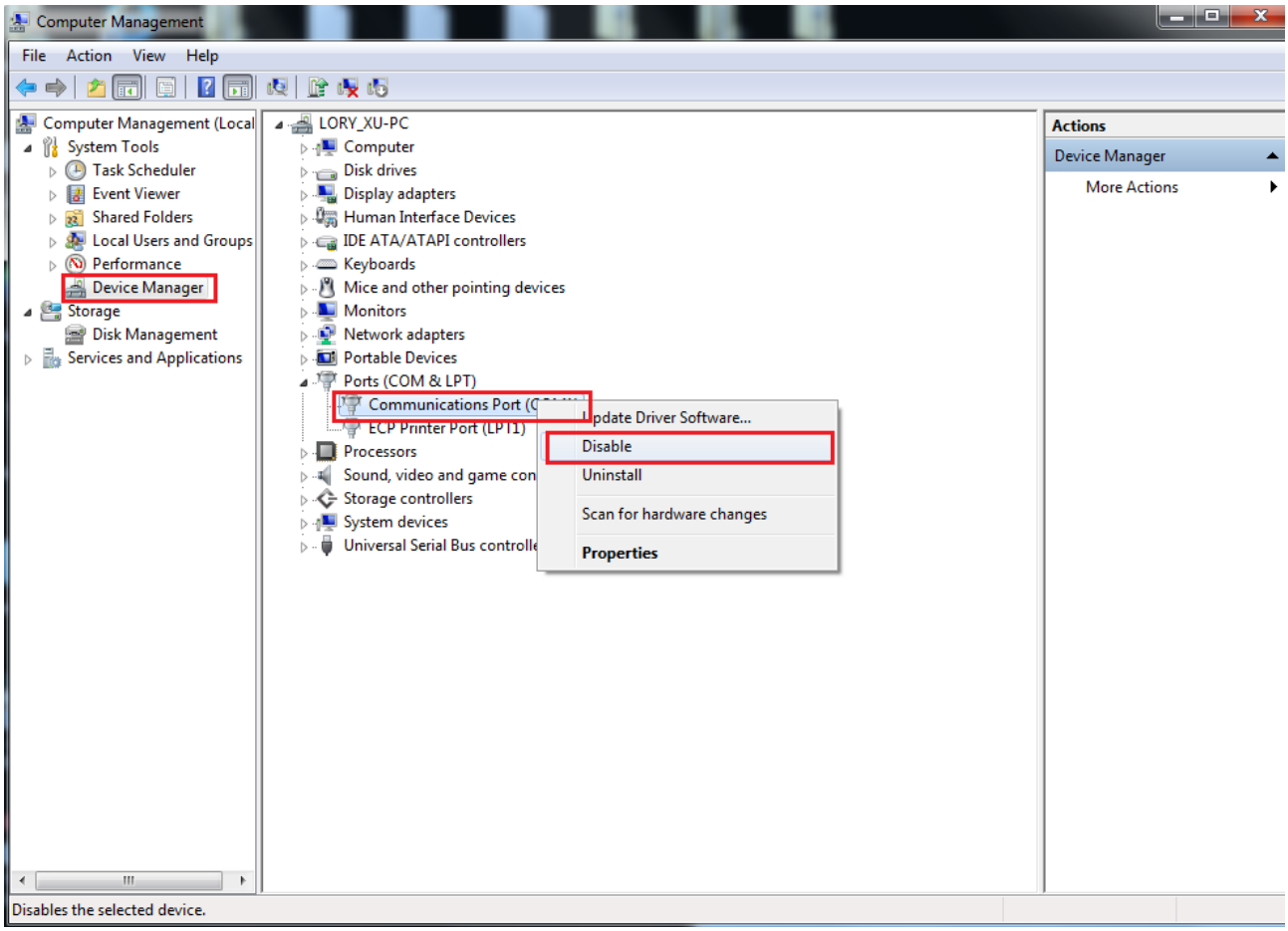

Figure 3-2 Forbid Irrelevant COM

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3.3 UART Connection

MP Tool can support one-to-one downloading and one-to-many downloading. It is suggested to use USB to UART transfer board which has good stability, as is shown in Figure 3-3.

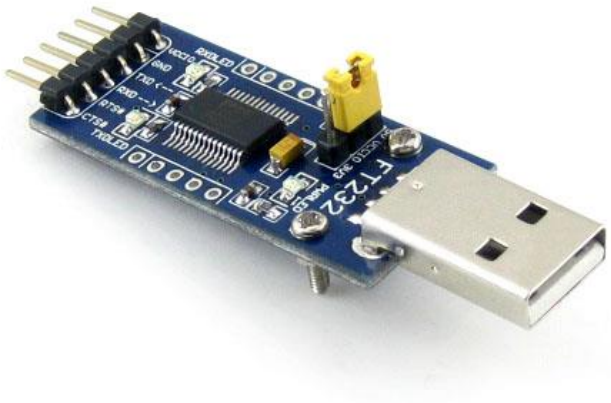

Figure 3-3 FT232 UART Transfer Board

Communication wiring between UART port and RTL8762X is shown in Figure 3-4.

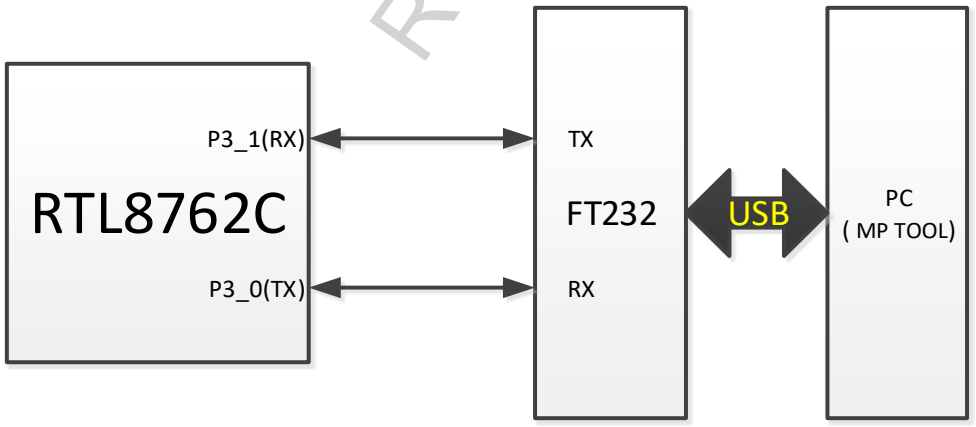

Figure 3-4 UART Wiring

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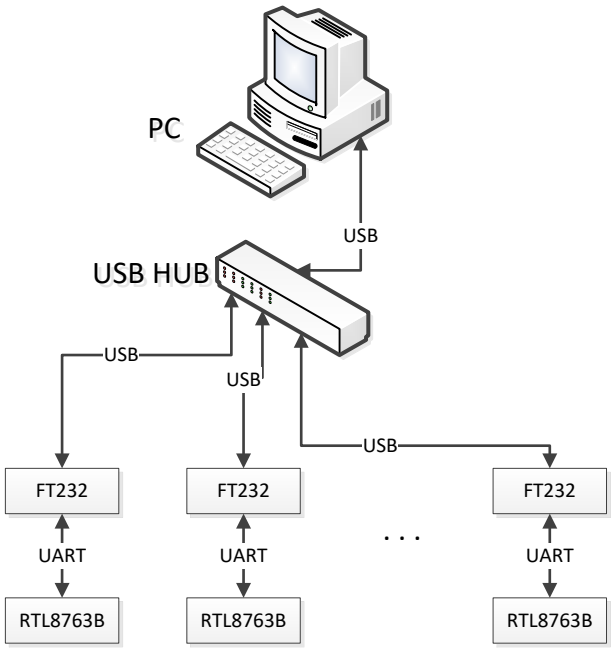

Figure 3-5 One-to-Many Wiring

When downloading by one-to-many way and using USB HUB without external power source as communicating interface, UART downloading may fail because of insufficient power supply capacity of USB port. So it is suggested to use USB HUB with external power source to ensure the stable downloading.

Note: Repeatedly insert or pull out FT232 USB to UART transfer board may result in dead halt because of windows drive problems of FT232.

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MP Tool Installation

Unzip Bee2MPTool_kits.zip file, double click MPtool.exe to operate MP Tool.

4 MP Flow Overview

4.1 Download Image Only

Tool just downloads image and doesn't check frequency offset, as is shown in Figure 4-1. As for The environment preparation, please refer to chapter "*MP Environment Preparation*". As for the download procedures, please refer to chapter "*Flash Download*".

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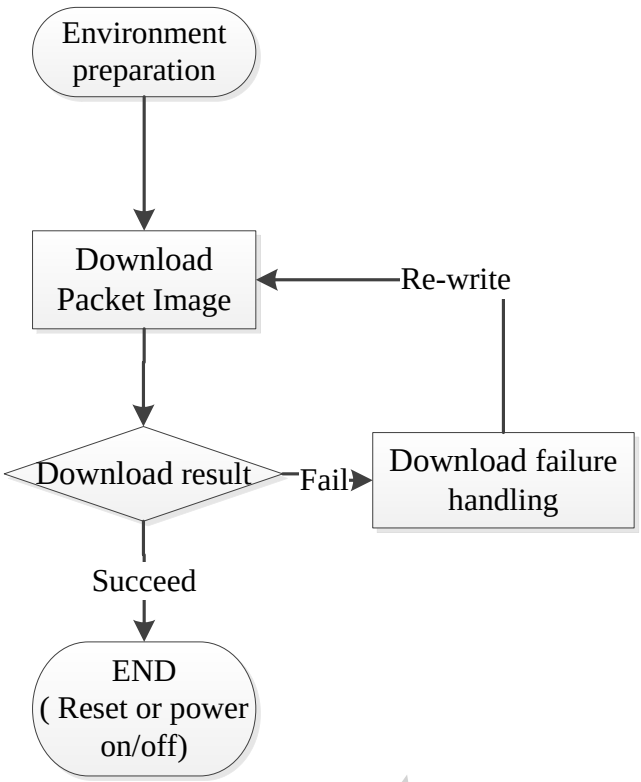

Figure 4-1 Download Image Only process flow

4.2 Download Image & Frequency Offset Test

As is shown in it is necessary to adjust frequency offset of crystal first. User can calibrate the optimum value of crystal capacitance and frequency offset calibration capacitance of internal chips before Mass production.

Refer to chapter "*MP Environment Preparation*" for detailed operations of environment preparation, refer to chapter "*Flash Download*" for detailed operations of downloading, and refer to chapter "*Frequency Offset Calibration*" for how to preset the crystal capacitance and test the optimum value of frequency offset registers of product.

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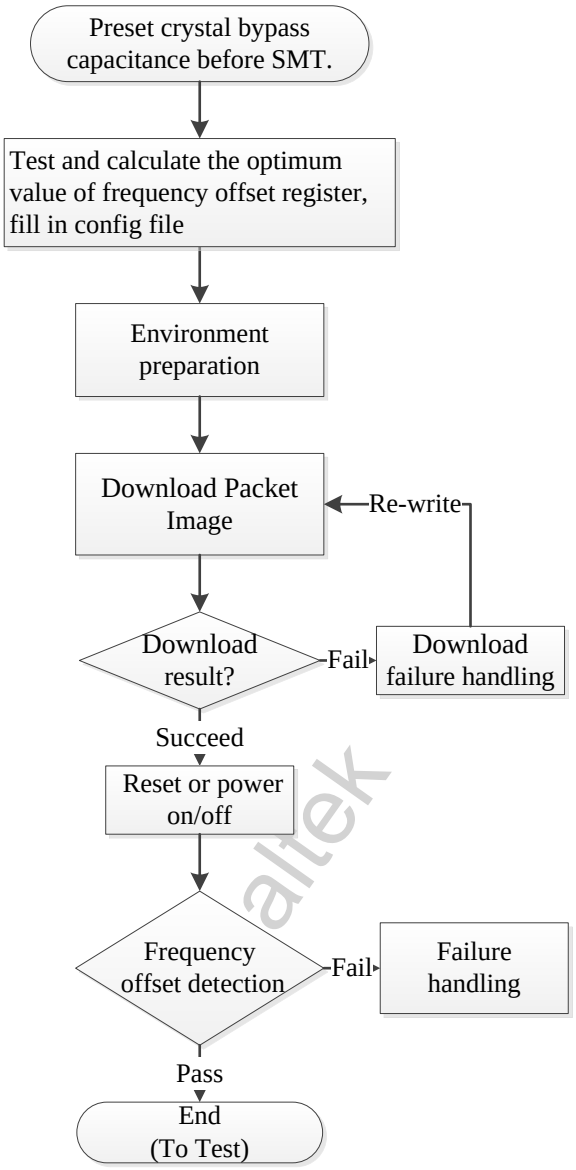

Figure 4-2 Download + Frequency Offset Detection Flow

Note: user needs to preset crystal bypass capacitance before SMT. The crystal needs to be in the same batch to ensure that characters of crystal stay the same. Otherwise, the frequency offset can't be calibrated to target range.

5 Image File Preparation

There are three kinds of image files that need to be prepared.

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5.1 Config files

5.1.1 Config settings

MP Tool supports setting configuration items and generating Config bin files in RD mode. The file can be downloaded to flash directly in RD mode or packed in a packet. The Config setting interface is shown in Figure 5-1.

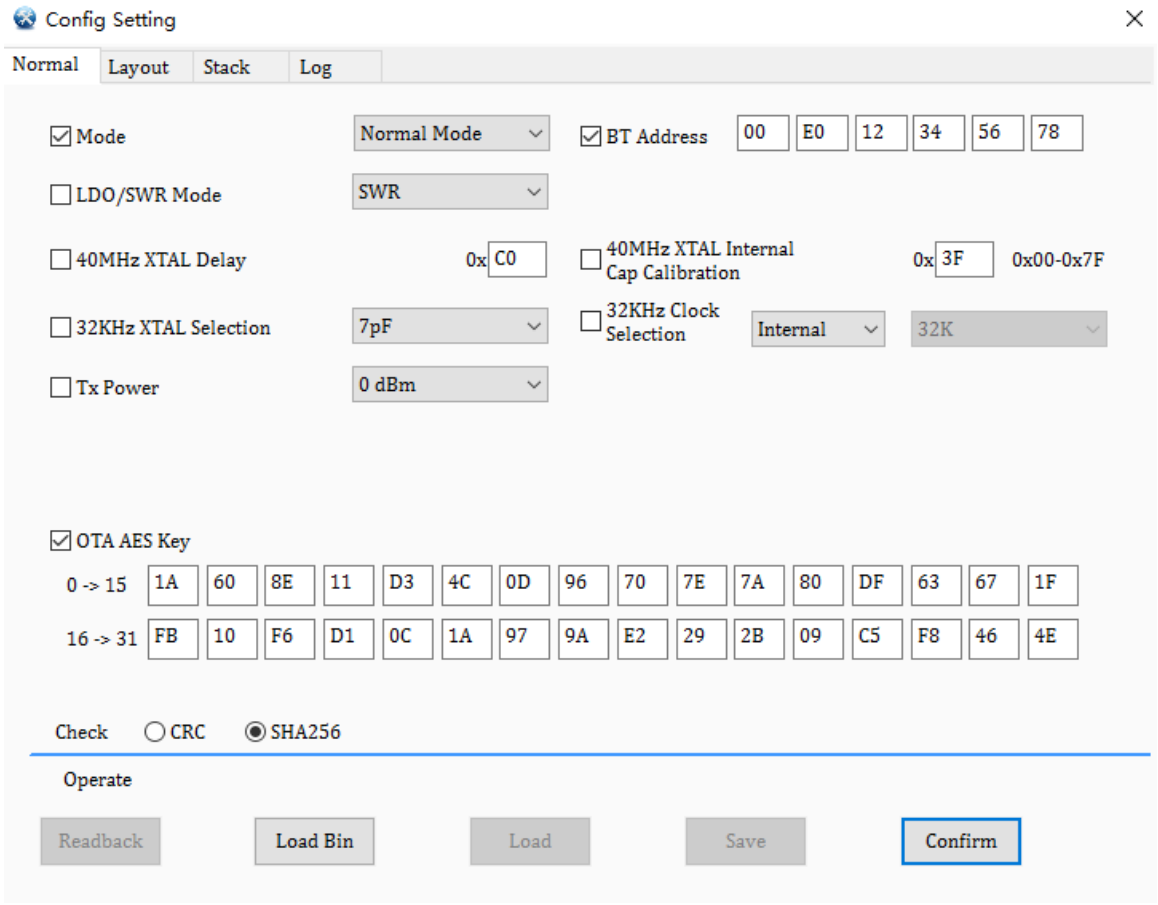

Figure 5-1 Config setting interface

There are 4 pages in Config setting dialog. Users can choose their configuration according to their needs. Usually you only need to configure the relevant config item in the Normal page to meet your needs.

The following is a description of the normal setting options in the Config settings interface.

a) Mode selection has MP Mode and Normal Mode to determine the working mode of the IC (default is Normal Mode). The interaction with the app can be achieved in Normal Mode.

b) The LDO/SWR Mode option can select LDO or SWR mode (the default is SWR mode), and the power consumption in SWR mode is lower.

c) 40MHz XTAL Delay is used to set the XTAL delay time. The default value is 0xc0.

d) Tx Power is used to set the power of tx , there is -20dBm, 0dBm, 3dBm, 4dBm, 7.5dBm to be choose.

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e) BT Address is used to set BT MAC address. This is checked by default. if you want to use the Automatic Bt Address function, you must select this check box when configuring config.

f) 40MHz XTAL Internal Cap Calibration is used in Normal Mode to set the XTAL capacitance value to achieve frequency offset adjustment. The default value is 0x3F and the setting range is 0x00~0x7F.

g) 32KHz XTAL Selection is used to select the capacitance value of XTAL, which can be selected between 7pF and 12pF. This option does not directly adjust the internal capacitance value, but adjusts the drive capability.

h) 32KHz Clock Selection can be used to select internal 32K or external 32K.

i) The OTA AES Key option is used to set whether the OTA needs to be encrypted for transmission, and the AES Key used for encrypted transmission can be input by the user according to requirements.

j) The check mode that can be selected is CRC or SHA256.

Note that, every time finishing configuration, click "Confirm" button to generate the Config file to make sure the file being downloaded is correct.

5.1.2 Generate a Config file

Config file can only be generated in RD mode. In RD download dialog, click the "Config Set" button to open the Config setting dialog. Users can select configuration items according to their own projects, then import RSA key and click the "Confirm" button to generate Config file. The Config file will be saved as a bin file and stored under the tool folder. Users can choose their own key or choose the default RSA Key in SDK (Figure 5-2).

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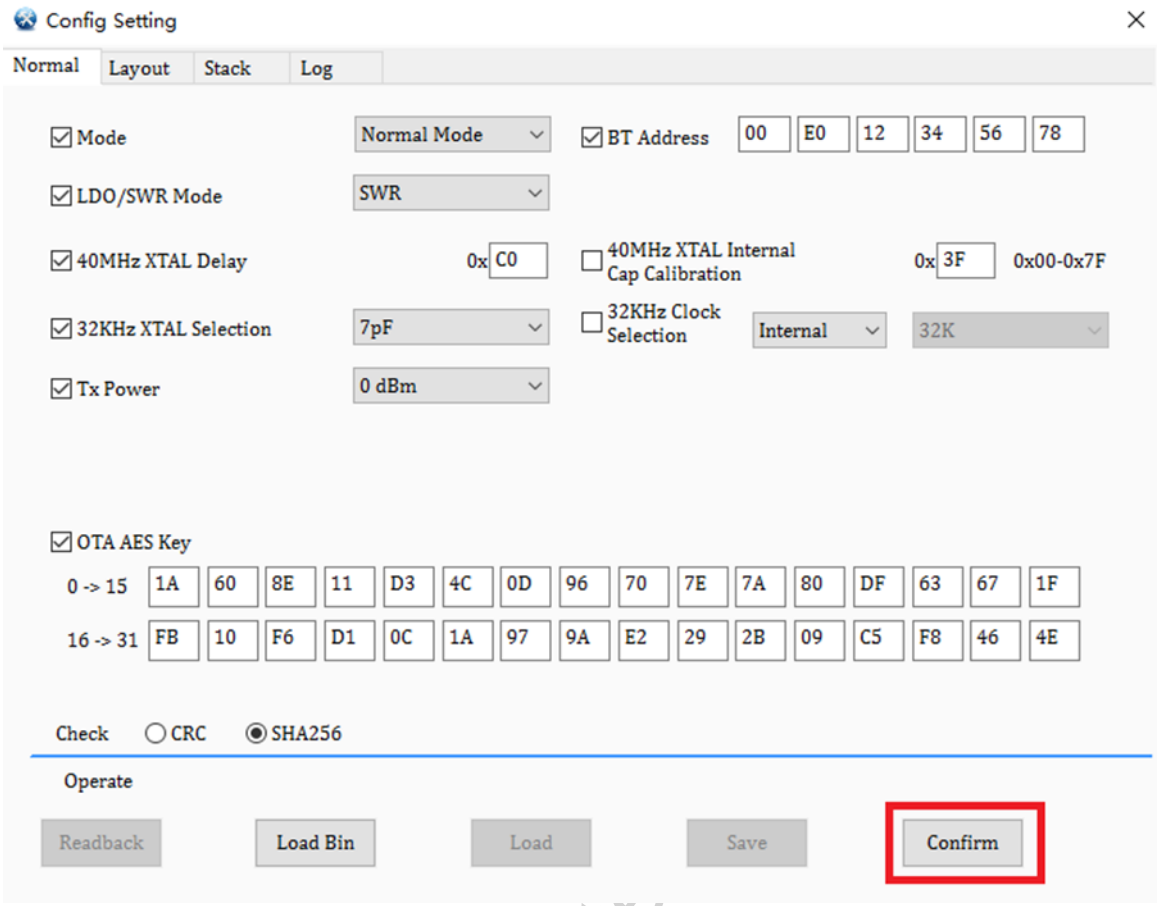

Figure 5-2 Generate a Config file

5.2 Separate Image Preparation

Separate image files can be downloaded directly to chips, and can also be packed to packet file to download to mass-produced products.

These image files including:

1. Patch Image: patch image provided by Realtek
2. APP Image: image file for user application
3. APP Data: private data file of user, can be downloaded as needed
4. Config File: chip configuration file, can be generated in tool
5. OTA Header File: file of OTA bank structure, determined by user

5.3 Generate Packet Image for MP

Before using MP Packet tool to generate packet image, user needs to add file path and set start address. Then click

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"Confirm" button to generate file.

In MP Packet tool, user can save packet file to the specified path through selecting "Save Path" item of check box and click "Confirm" button. If custom path has not been set, packet file will be saved to tool's path. Information of image file and generation time of packet file will be saved in the "PacketInfo.txt" of the same path. It is shown in Figure 5-3

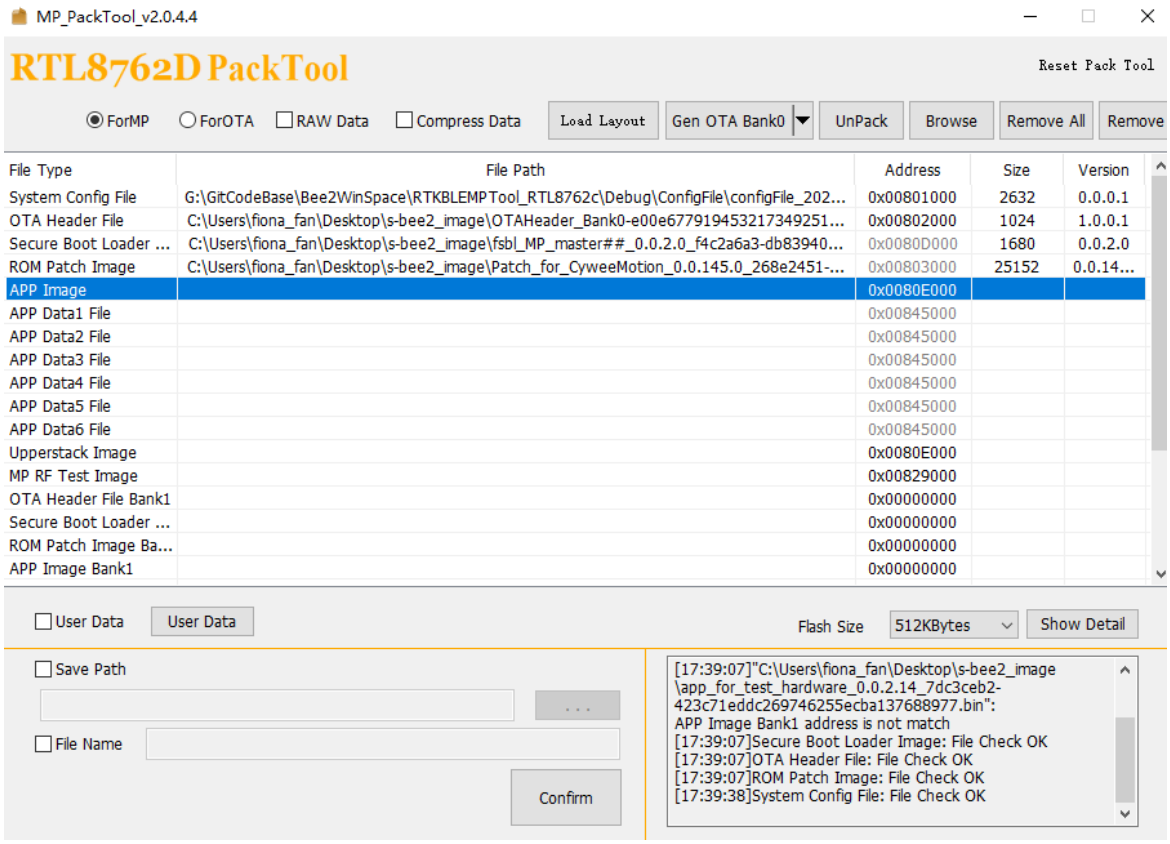

Figure 5-3 Generate a Packet file

6 BT Address Settings

If the BT address has already been downloaded to IC before MP, this function can be ignored. User can open/close this function through the "Set Mac Addr on Tool" item of check box on MP_Setting page. It is shown in Figure 6-1.

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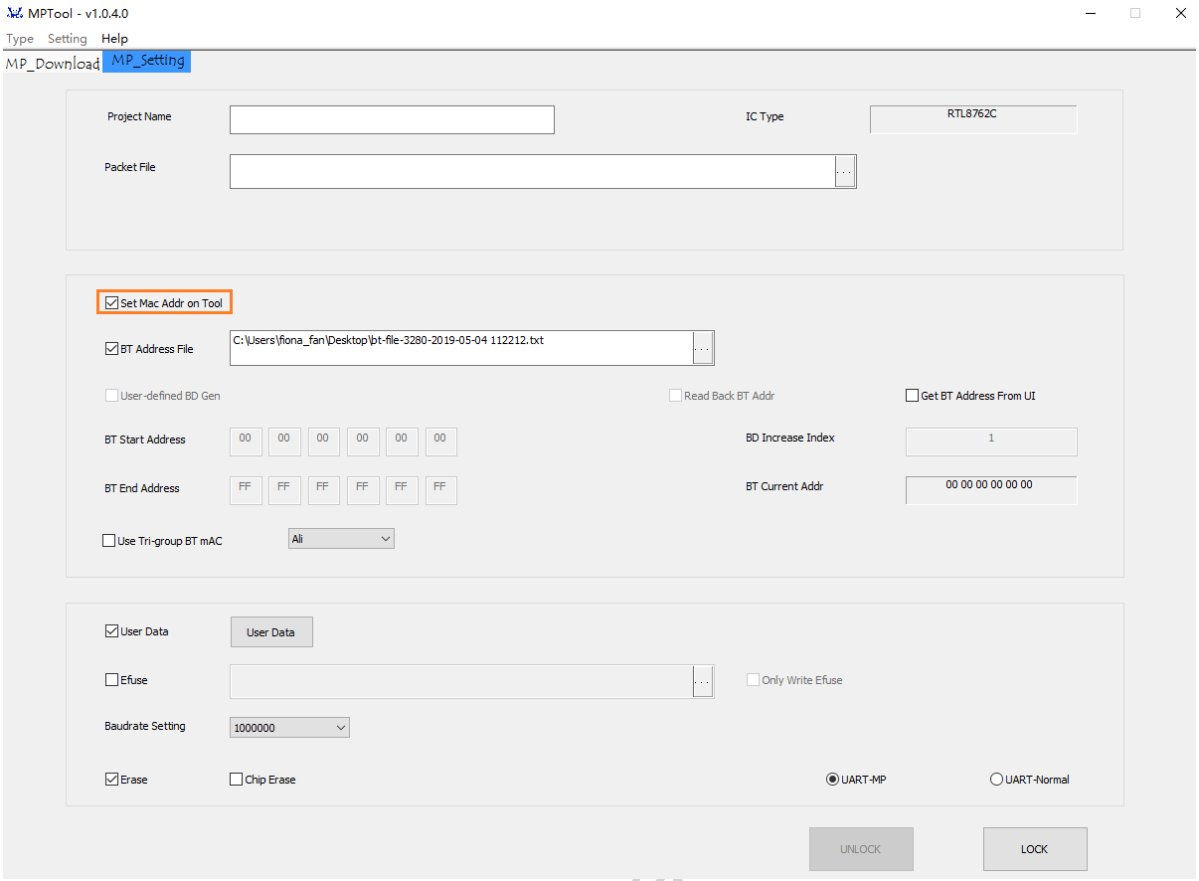

Figure 6-1 Open/Close BT Address Set

6.1 BT Address Settings in MP Mode

6.1.1 BT Address Increase by Tool

After clearing menu items of “BT Address File” and “user-defined BT Gen”, user should set menu item of “Set Mac Addr On Tool”. After that, user just needs to set the BT start address, BT end address and increment index (0-99). BT address will be increased automatically by MP Tool. It is shown in Figure 6-2.

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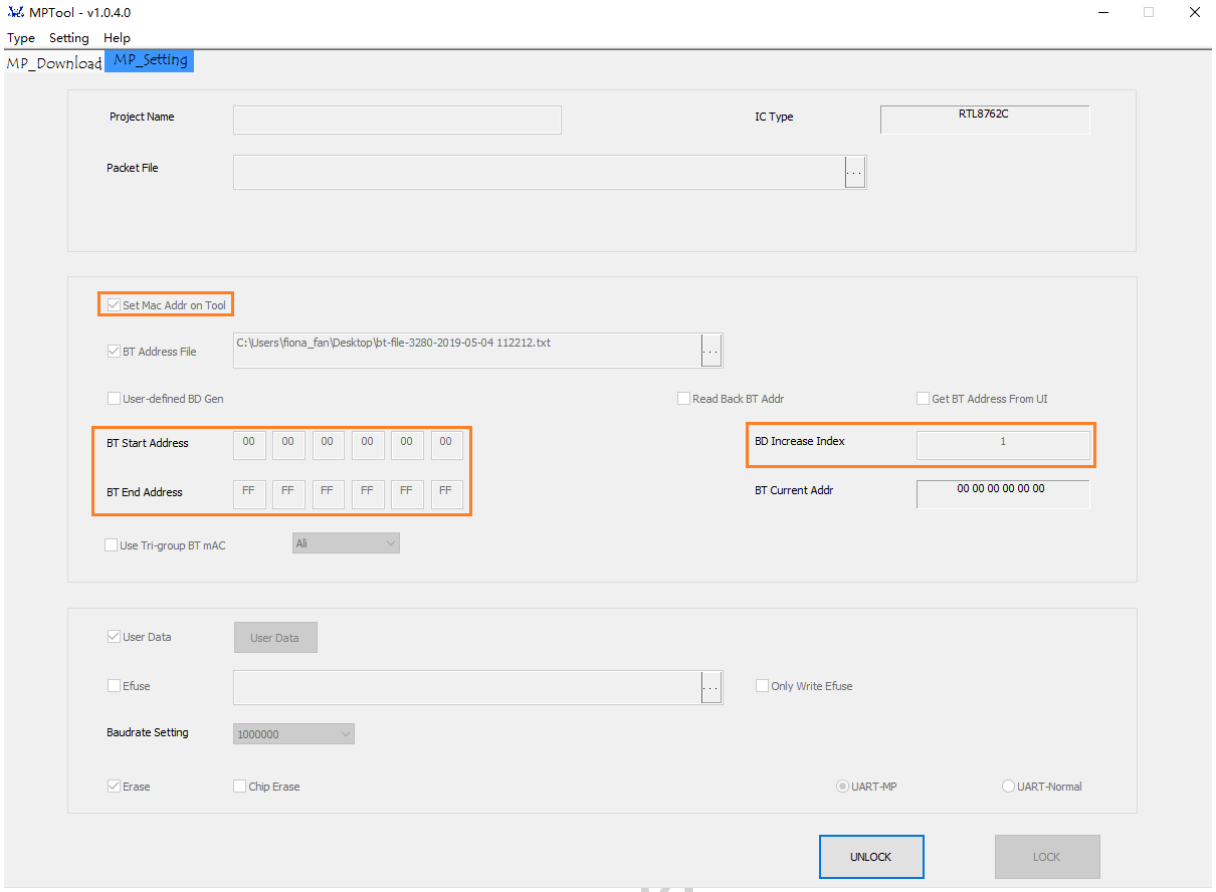

Figure 6-2 BT Address increased by MP Tool

6.1.2 Get BT Address from File

MP Tool also supports to get BT address from txt file. The BT address's format in txt file is shown in Figure 6-3.

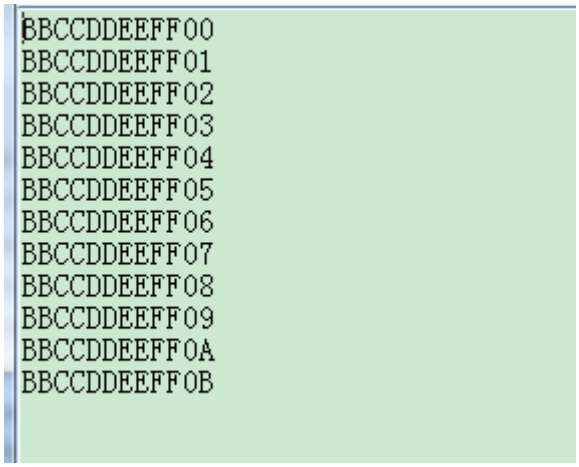

Figure 6-3 BT address format on txt file

On MP Setting page, select the "BT Address File" checkbox and set the file path to enable this function, as is shown in Figure 6-4. If the "BT Address File" is selected, it means that MP Tool will get BT address from txt file.

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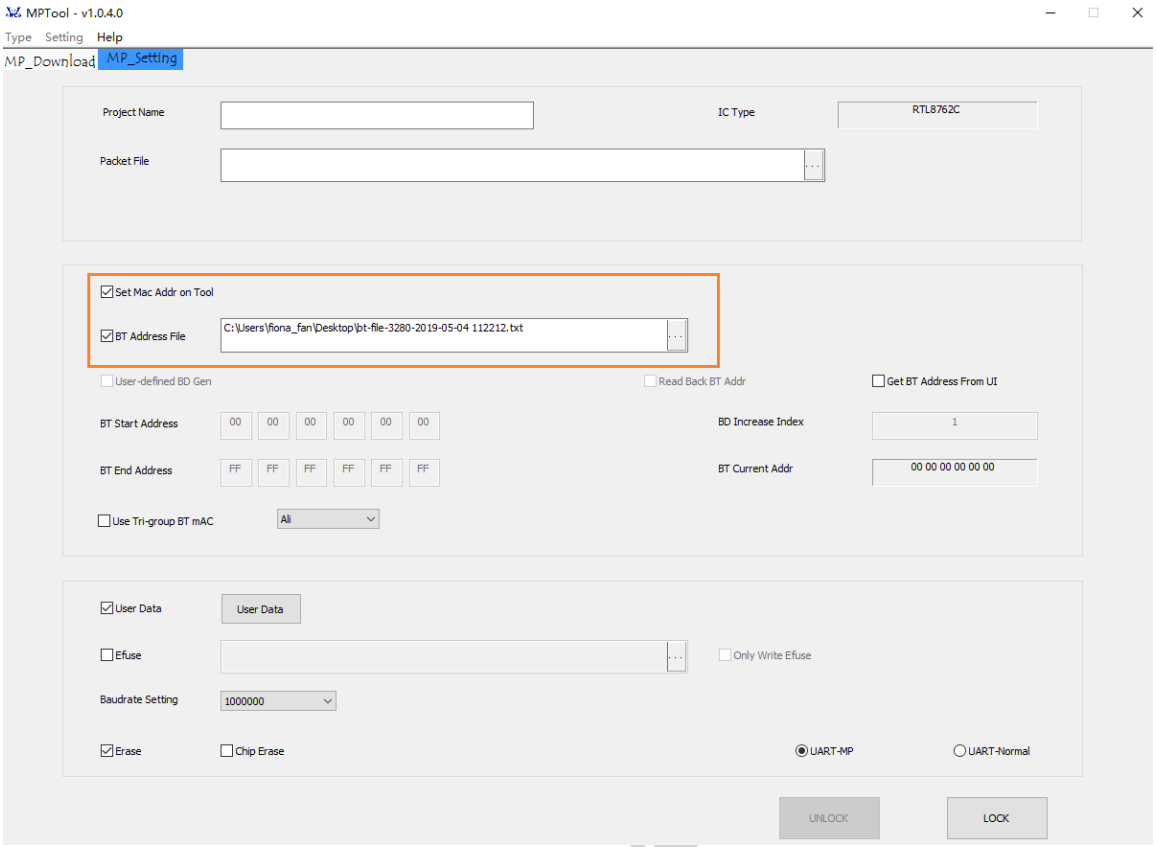

Figure 6-4 Get BT address form file

6.1.3 User-defined BT Address Generation

Customers need to provide DLL or Lib files to use user-defined BT address generation function, MP Tool will call the API which is provided to generate BT address. Select “user-defined BD Gen” checkbox to use this function, as is shown in Figure 6-5.

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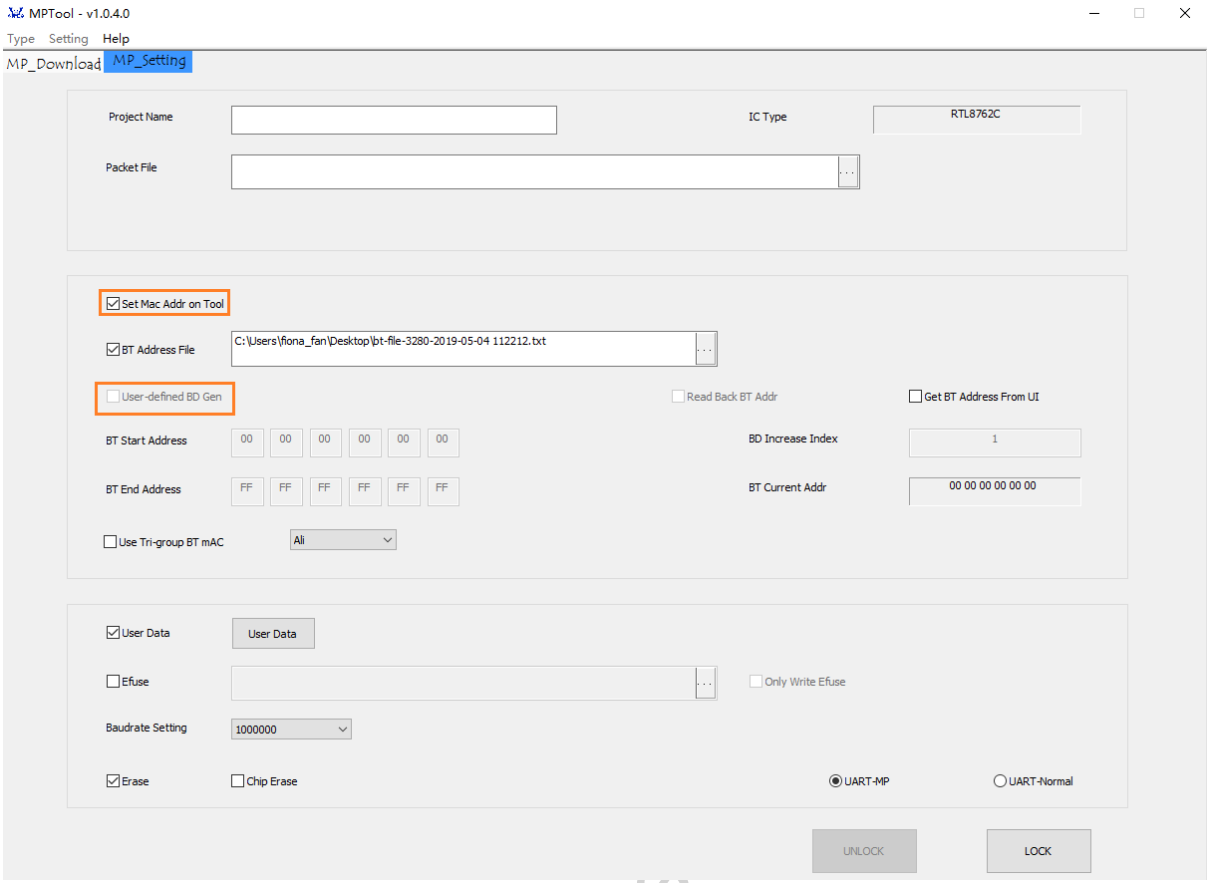

Figure 6-5 User defined BT Address Gen

6.2 Set BT Address in RD mode

In RD mode, user can set BT address only through the “BT Address” item of “Config Setting” page, as is shown in Figure 6-6. At the same time, it supports automatic addition one by one of Bluetooth address.

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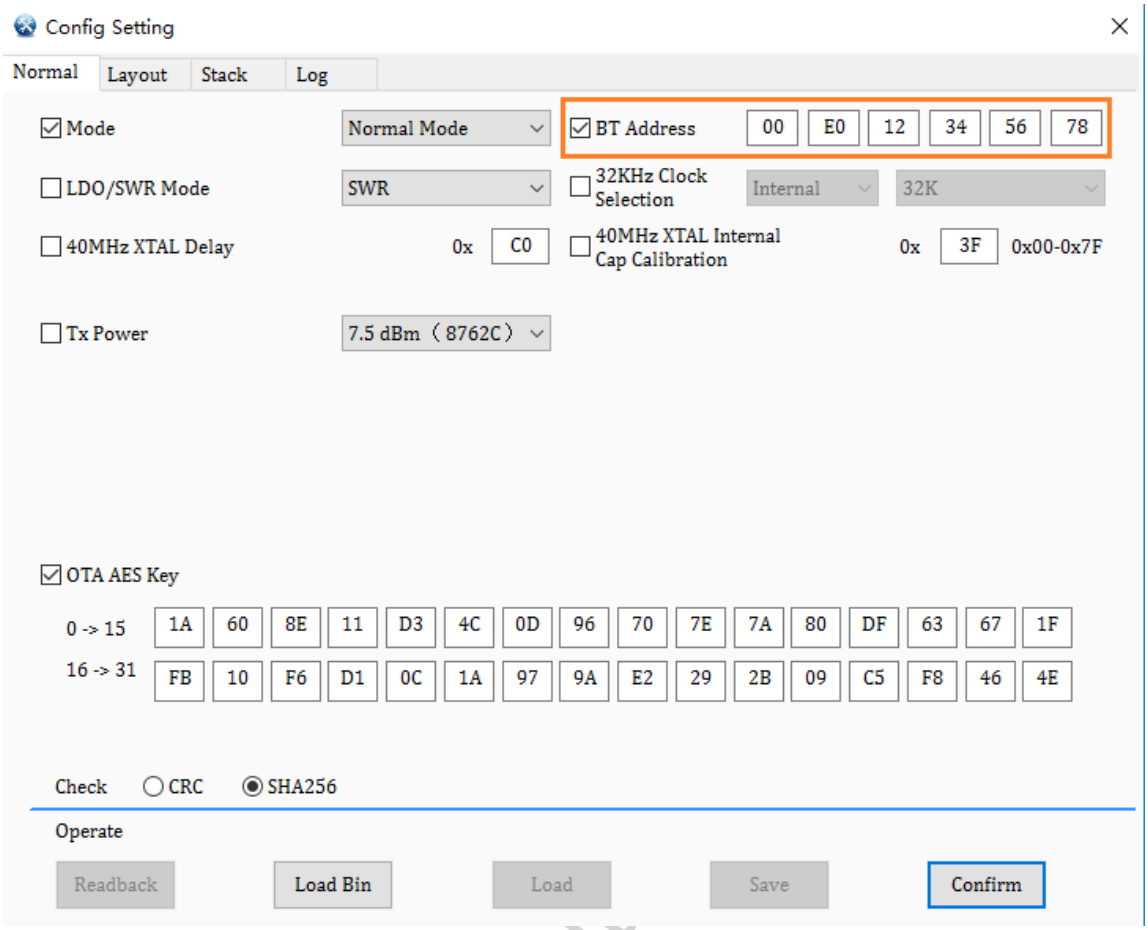

Figure 6-6 Set BT address in RD mode

7 Flash Download

Flash download contains two processes: mass production download process in factory and download process in RD mode.

7.1 File Type Check & MD5 Verify

A packet image generated by MP Packet Tool (shown in 6rd chapter) is required for MP mode. Patch image, APP image, Config file and other images are required for RD mode. Each file to be downloaded (including separated files, constructed packet file) would be checked by file type and MD5 algorithm. It is shown in Figure 7-1.

RD mode and MP Packet Tool would check Image first by MD5 to make sure the file is not damaged in the procedure of copying and transmission. Image files are named in “Image name-MD5 check code.bin” format, take APP-fda45b548a8e6ee08631d047996bfbbe.bin as an example, “APP” is the file type, while “fda45b548a8e6ee08631d047996bfbbe” is MD5 check code.

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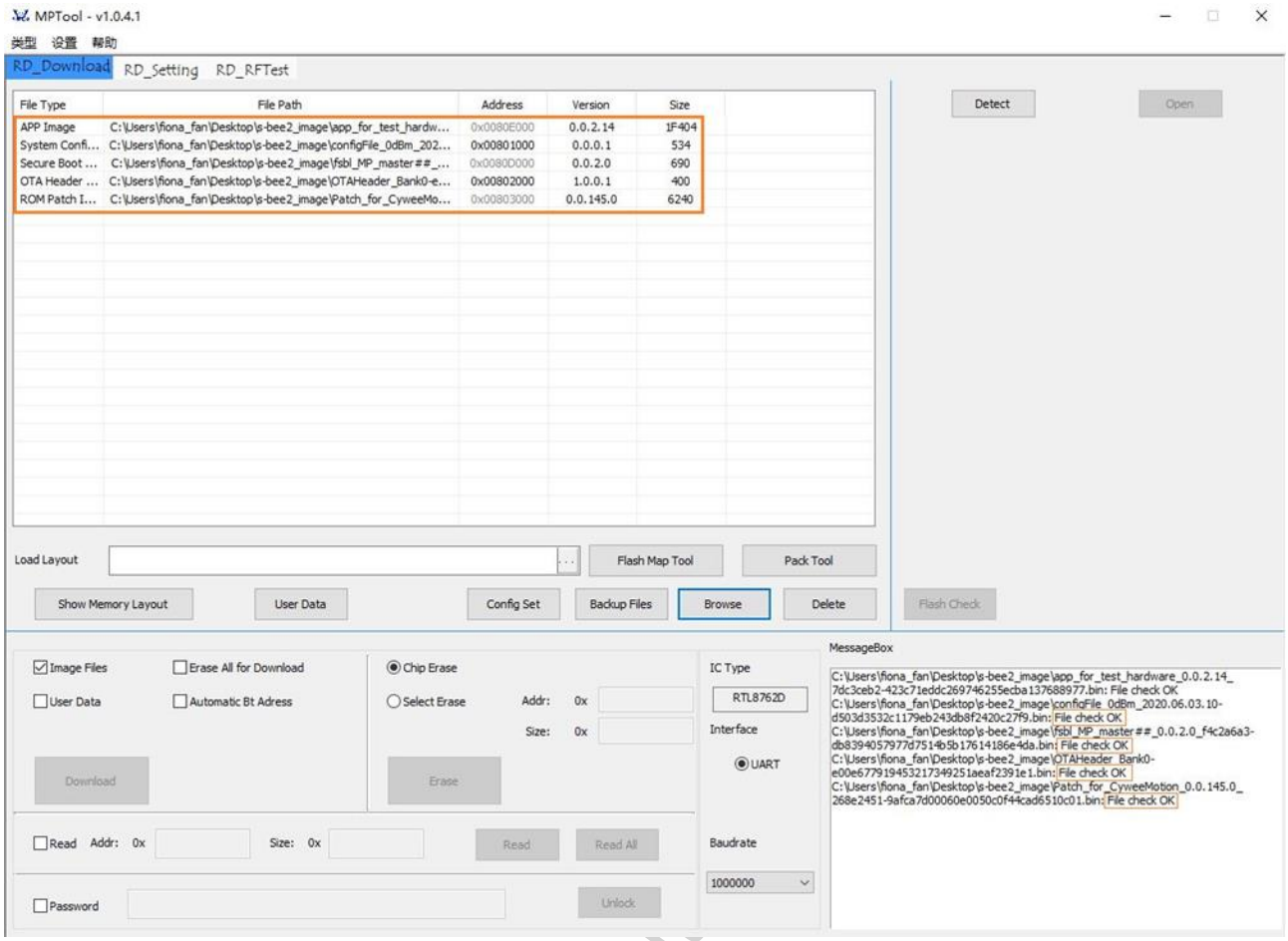

Figure 7-1 Add image file and check

Image with MD5 check code can be automatically generated by our SDK Project, as is shown in Figure 7-2.

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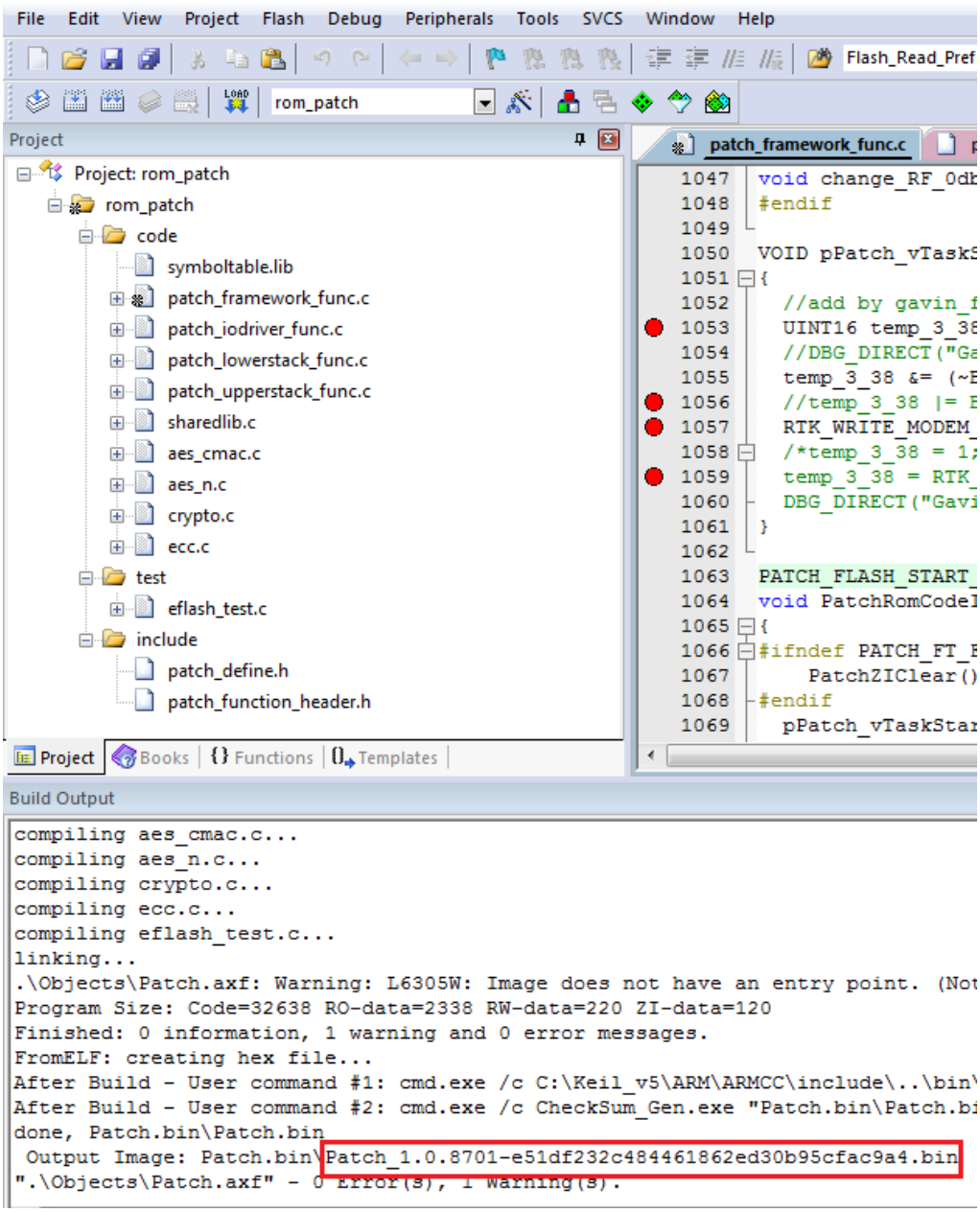

Figure 7-2 Image generation with MD5 Check Code

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7.2 File Download on Mass Production

7.2.1 Select download on mass production

Open MPTool.exe and select “MP” item of “Type” option in menu to enter into MP mode. It’s shown in Figure 7-3.

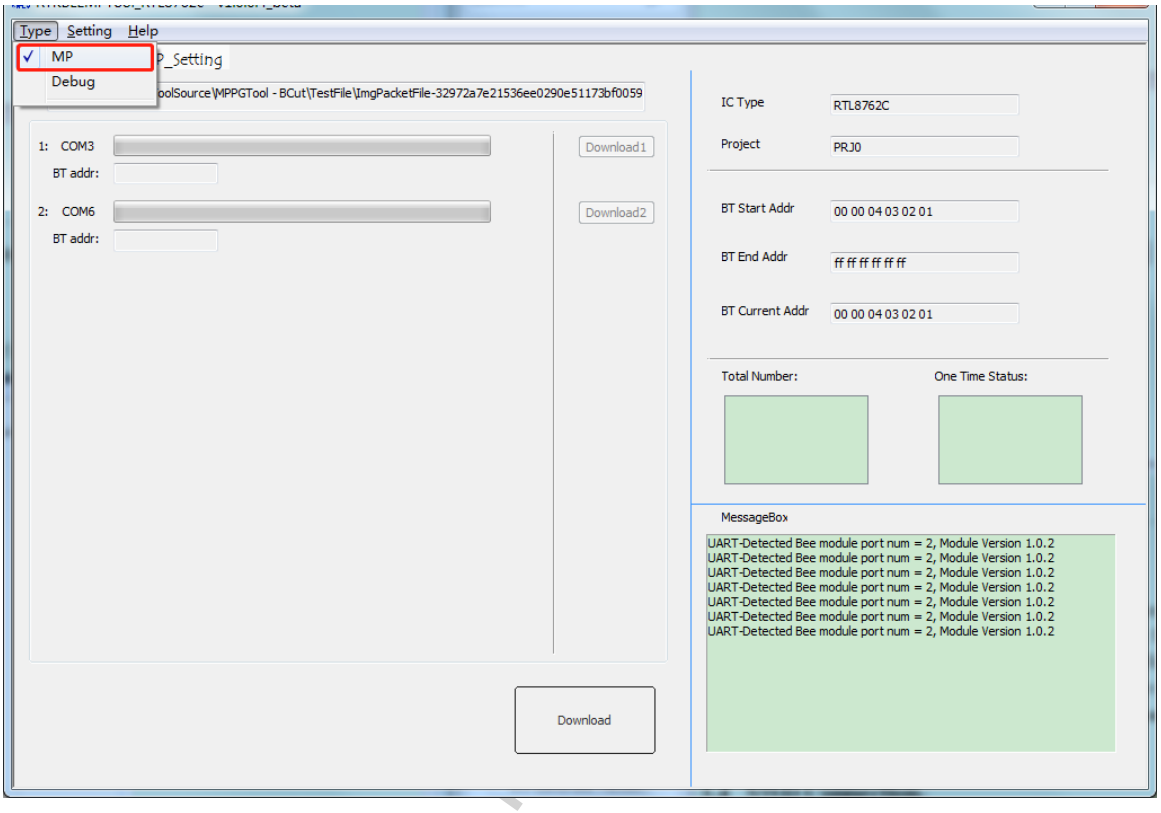

Figure 7-3 Type Switch

7.2.2 Set parameters

Parameters can be set by developer or loaded by MP Tool’s “MPToolSetting.ini” file.

1. Set MP Setting page parameters by developer:

Before mass production in factory, developer needs to configure the MP Tool’s parameters on MP Setting page. The parameters include packet image path, BT address settings. MP Tool supports to change BT address through BT address’s txt file or client’s API. MP Setting page is shown in Figure 7-4. Please click “LOCK” button to generate settings after configuring parameters.

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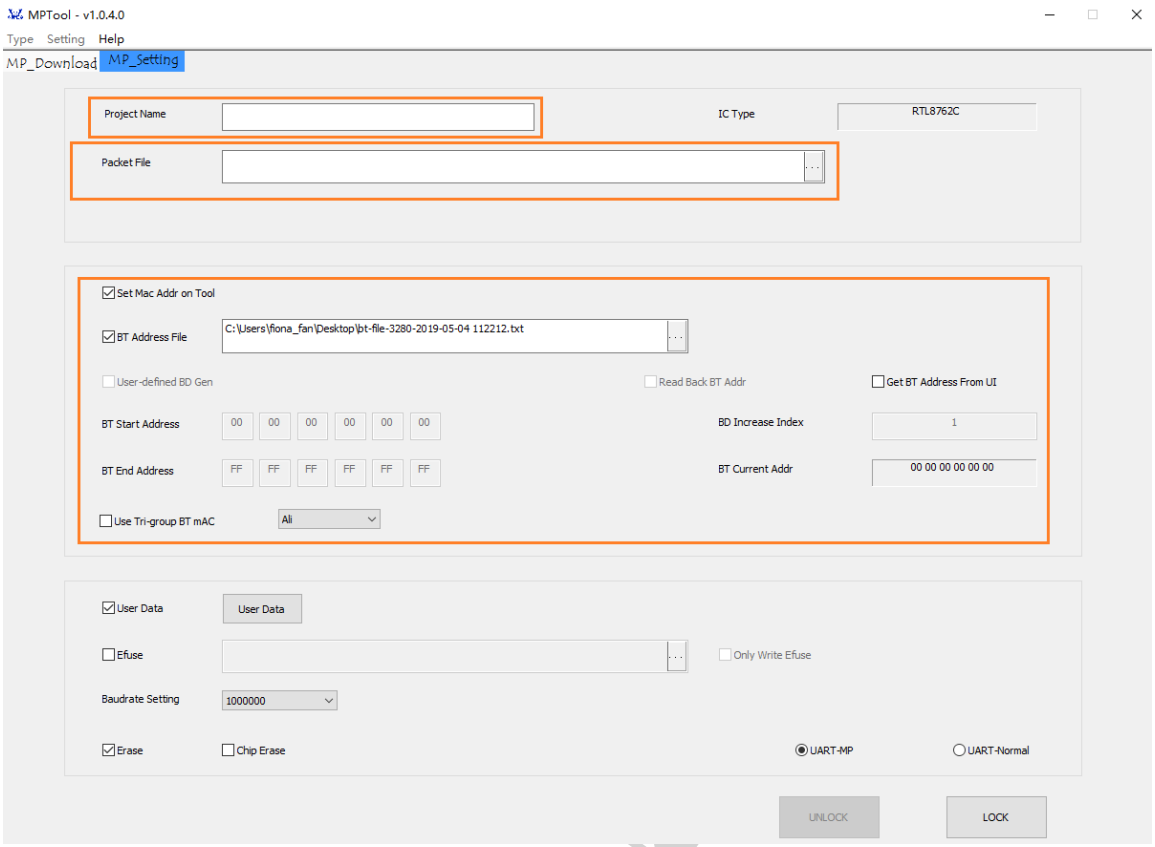

Figure 7-4 MP Settings before downloading

2. Set MP Setting page parameters through configuration file

MPTool supports user to load the *MPToolSetting.ini* file and automatically generate settings before downloading. Developer sends the *MPToolSetting.ini* file which is generated on local environment to factory. Operator in factory receives the *MPToolSetting.ini* file and saves it to MPTool.exe's folder. Operator can load the MPToolSetting.ini file through the "Load Setting File" item of "Setting" option in menu. It's shown in Figure 7-5.

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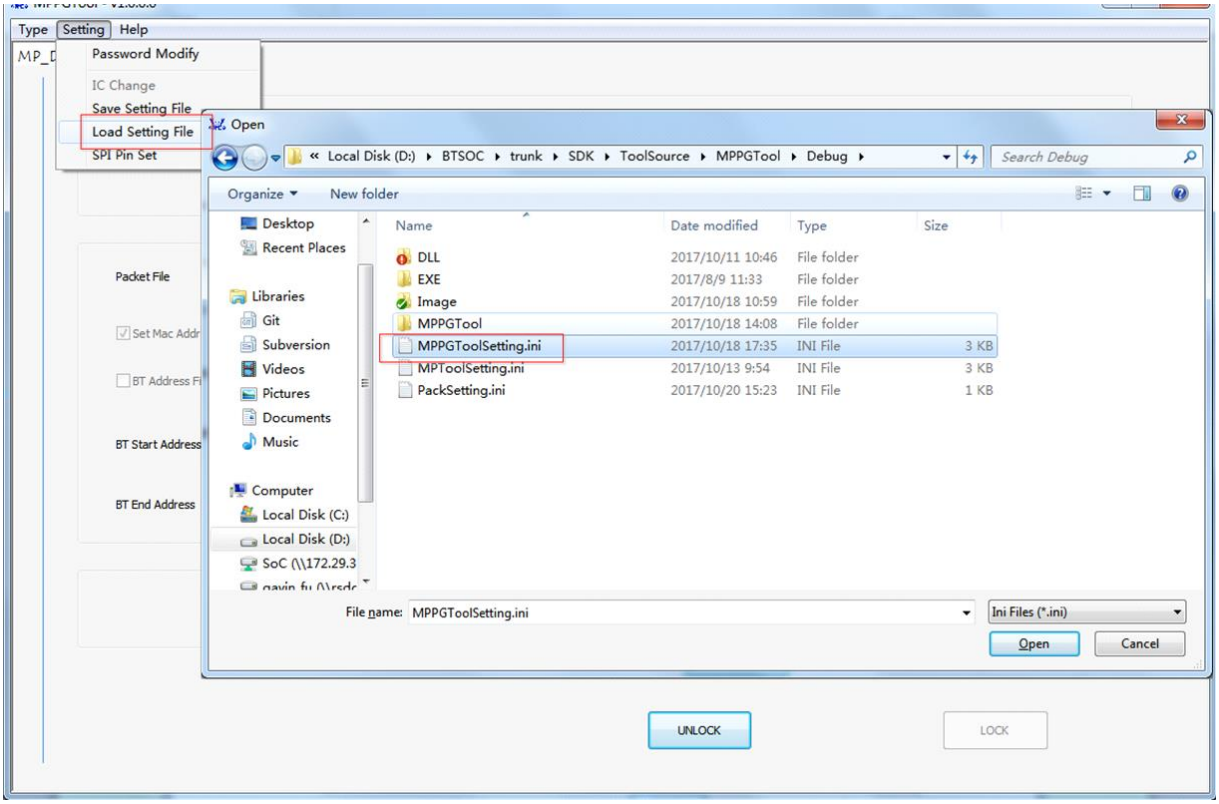

Figure 7-5 Load Parameter Configuration File

7.2.3 File Download

In factory, operator just needs to click “Download” button to download image to RTL8762X. It’s shown in Figure 7-6. As for the failed port, MP Tool will save the BT address of the port in the txt file of the local directory.

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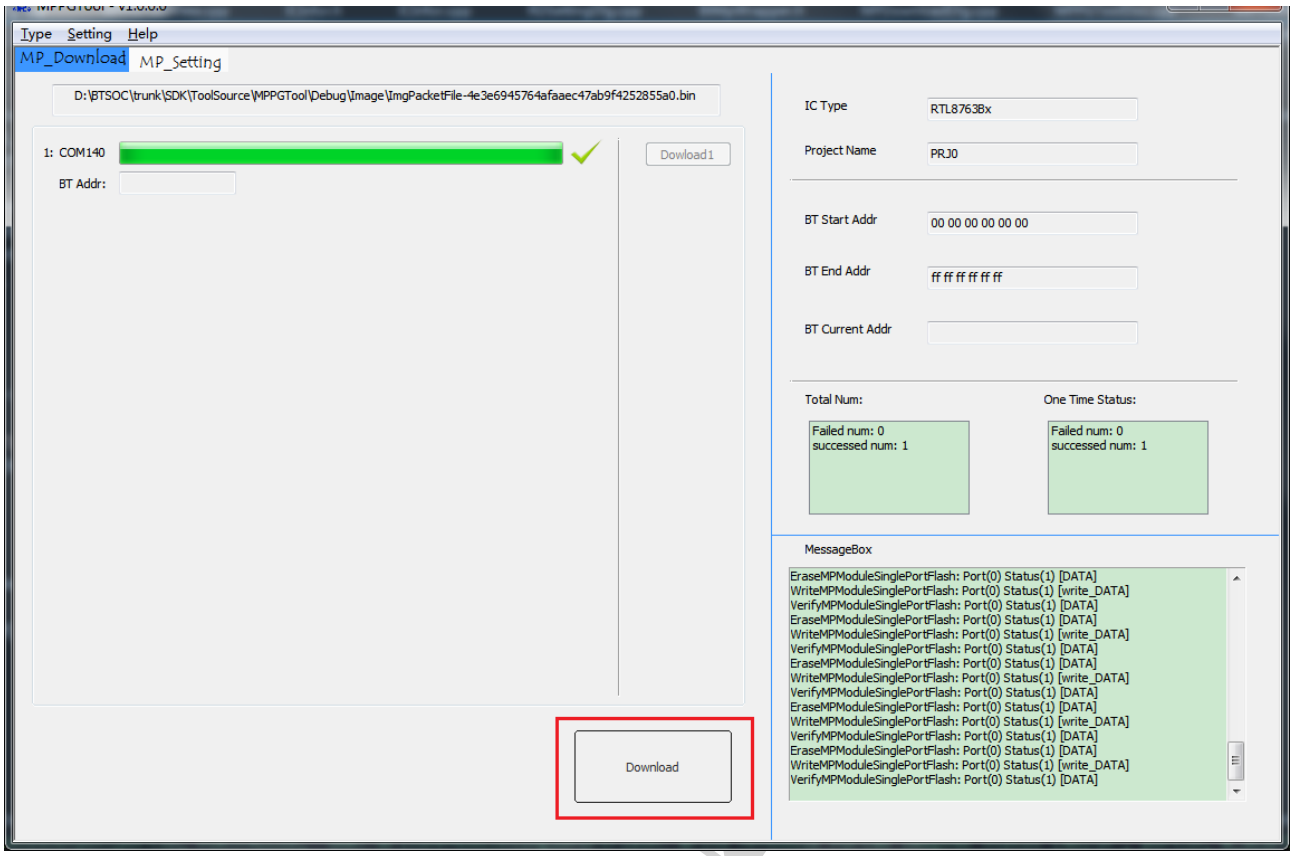

Figure 7-6 MP One-click download

7.3 File Download on RD mode

MP Tool supports UART (one-to-one or one-to-many) downloading modes.

7.3.1 UART Download Mode

UART download flow steps are shown as follows:

1. Set Config file parameters.
2. Add image files to be downloaded.
3. Select UART download mode.
4. Scan to detect serial ports.
5. Open serial ports.
6. Start downloading.
7. The next downloading can directly start from step 5.

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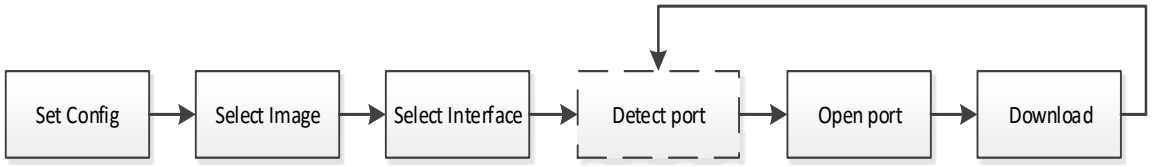

Figure 7-7 UART Download Process

Use MP Tool to download image through UART interface, the steps are as follows:

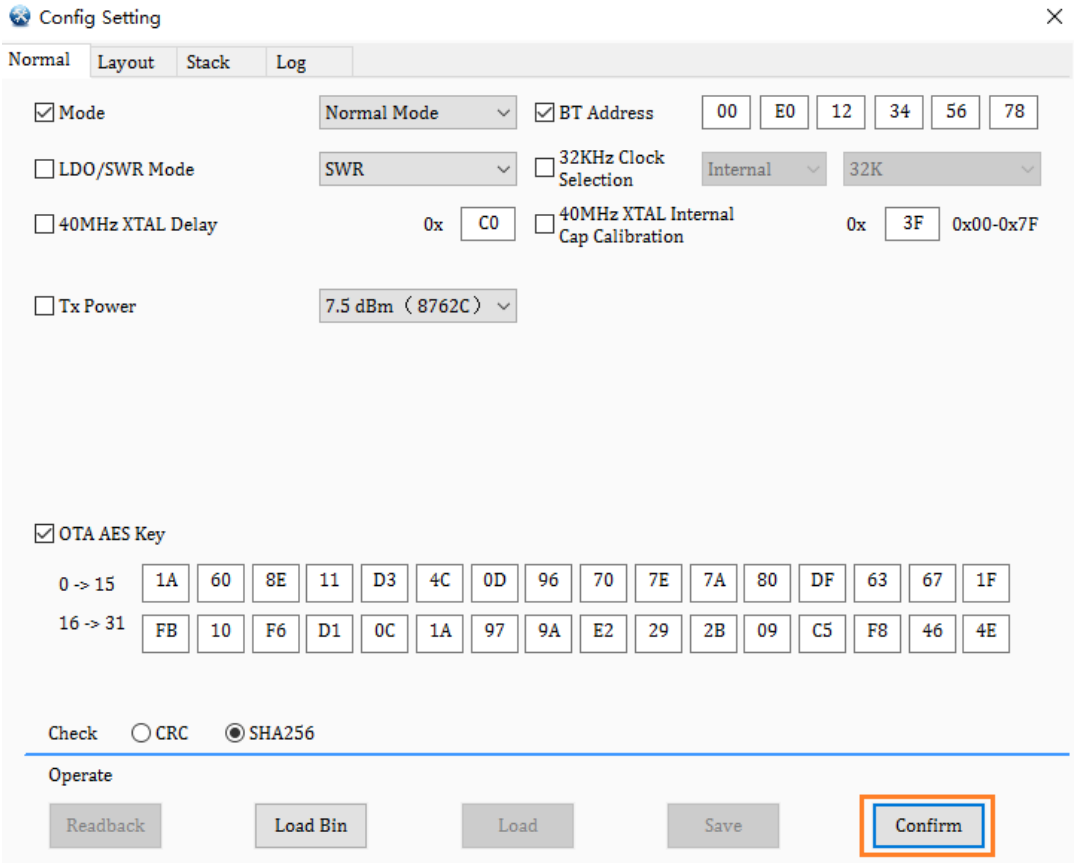

Figure 7-8 (UART) Parameter Configuration

1) Click “Config Set” button to access Config Setting page. Set up Config parameters and confirm the settings, as is shown in Figure 7-8.

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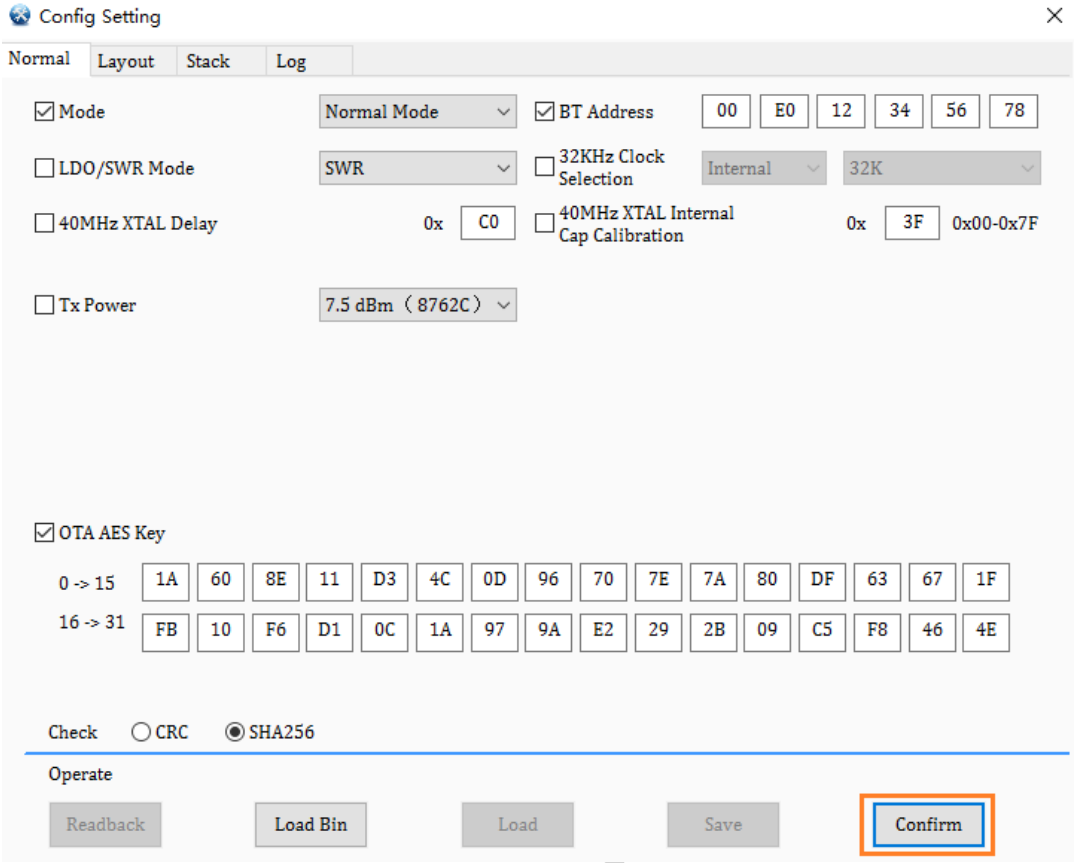

Figure 7-8 (UART) Parameter Configuration

2) Select the image files to be downloaded, click “Browse” button to batch import Image files as is shown in Figure 7-9 Batch import image file, or select image file in the “file path” item of list box as is shown in Figure 7-10 to add single image file;

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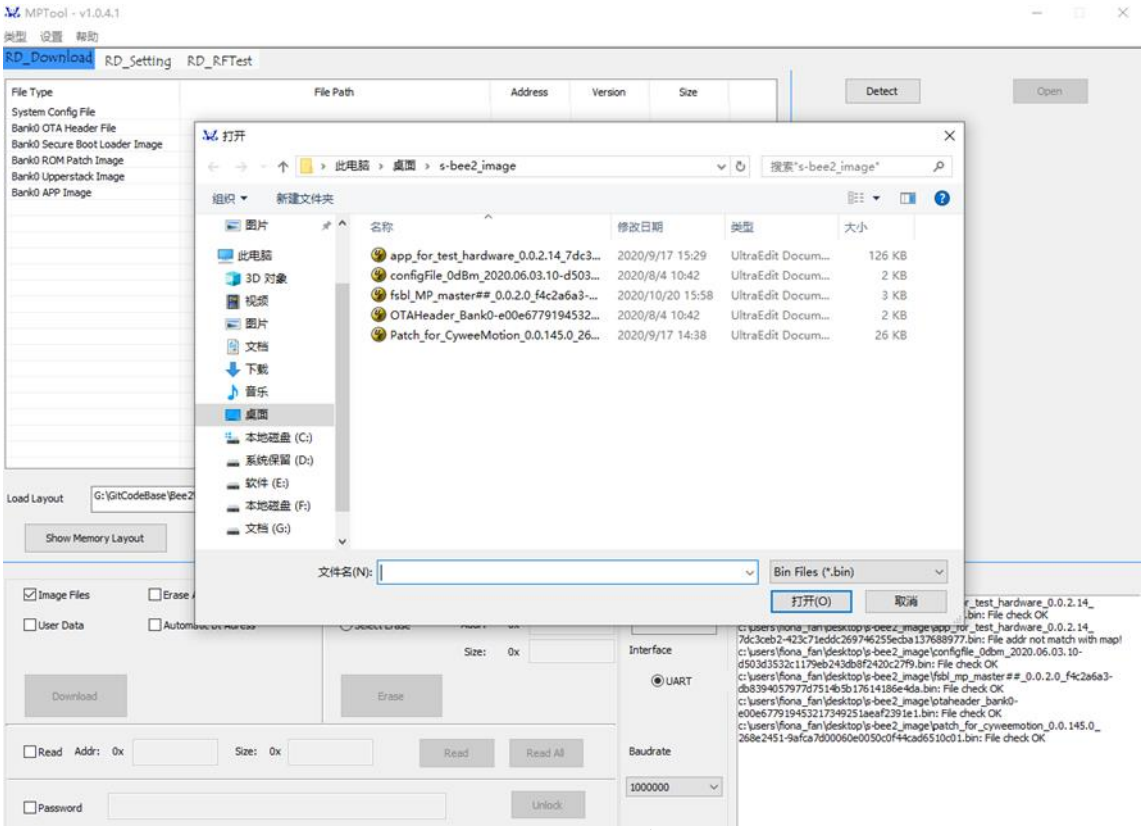

Figure 7-9 Batch import image file

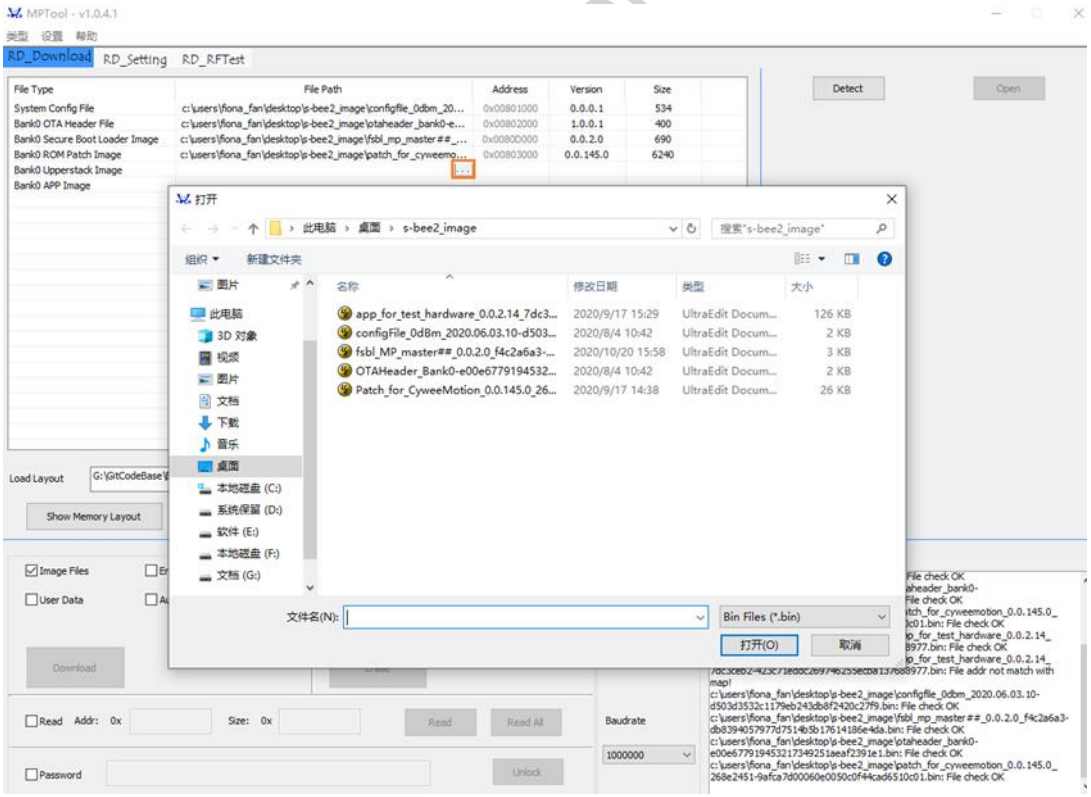

Figure 7-10 Add single image file

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3) Select UART downloading mode, as is shown in Figure 7-11

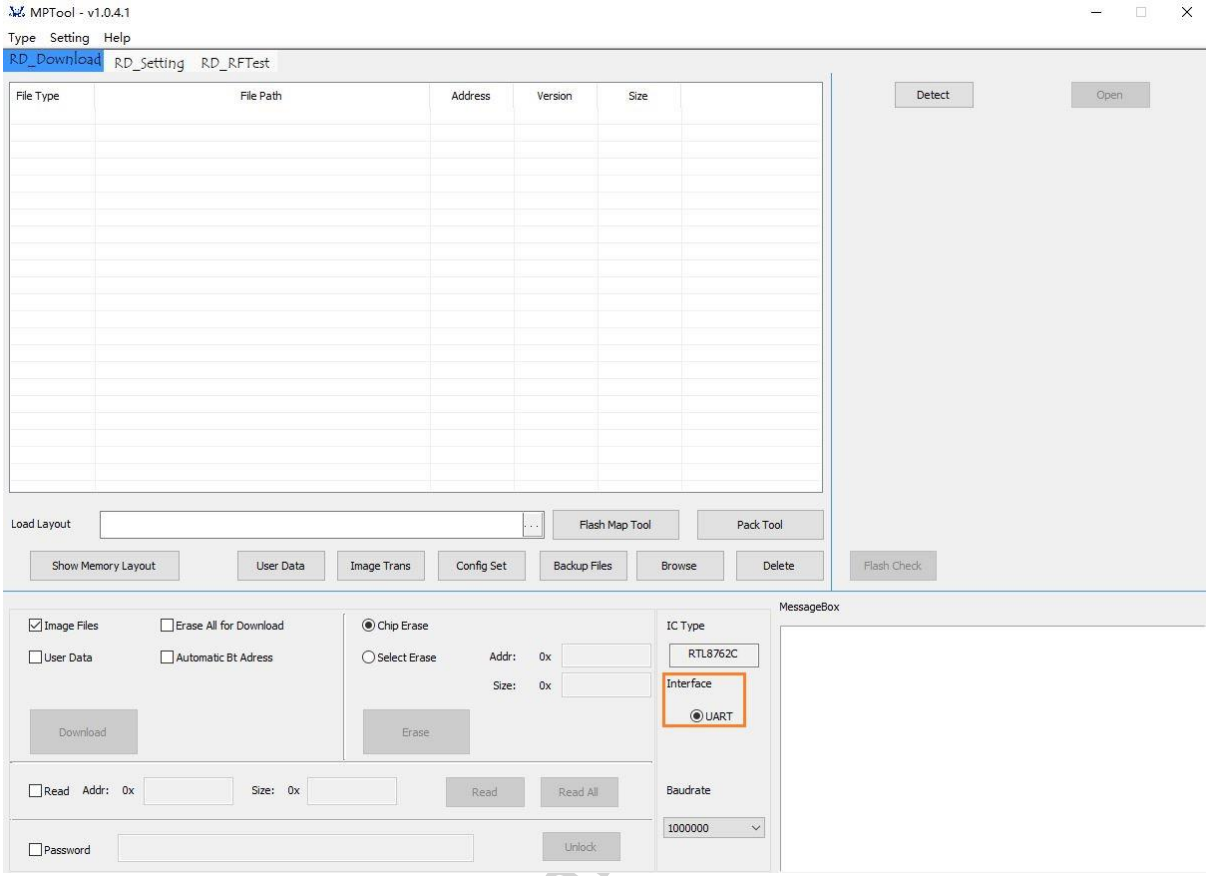

Figure 7-11 Interface for UART-Normal

4) Click “Detect” to detect port numbers, the port displays “Ready” status after detection, as is shown in Figure 7-12;

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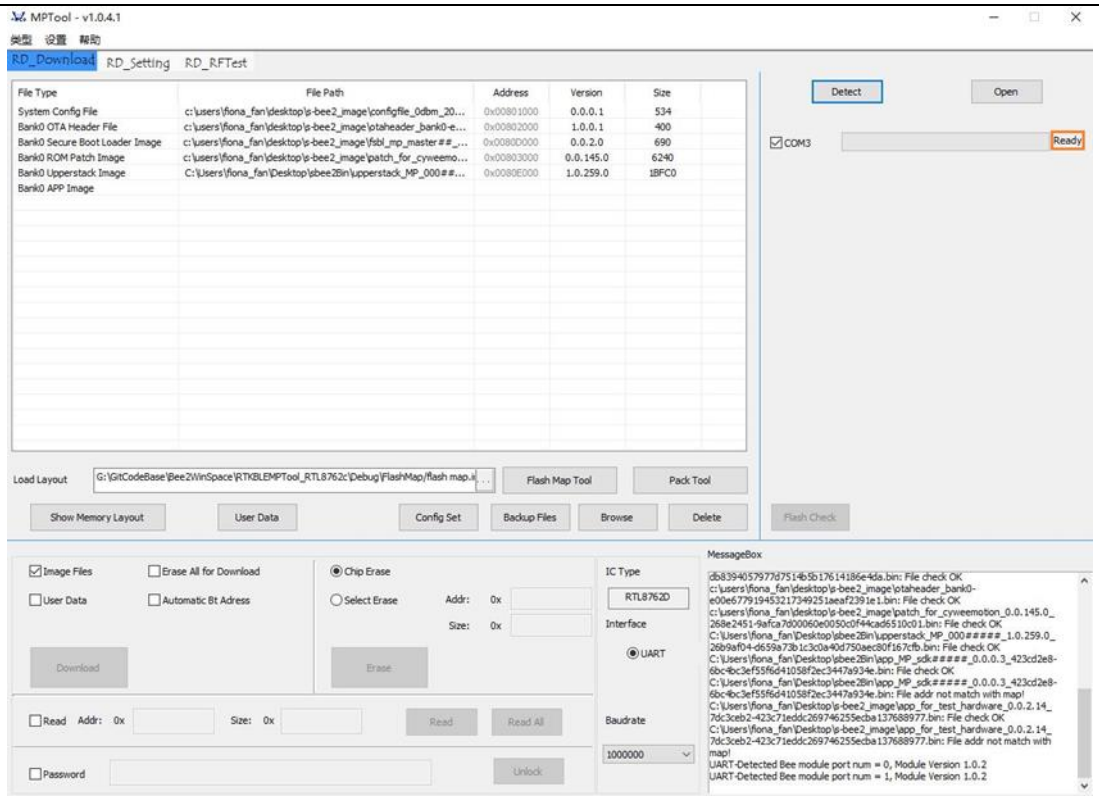

Figure 7-12 Detect Port

5) Click “Open” to open the port, the port displays “OK” status after being opened successfully, as is shown in Figure 7-13.

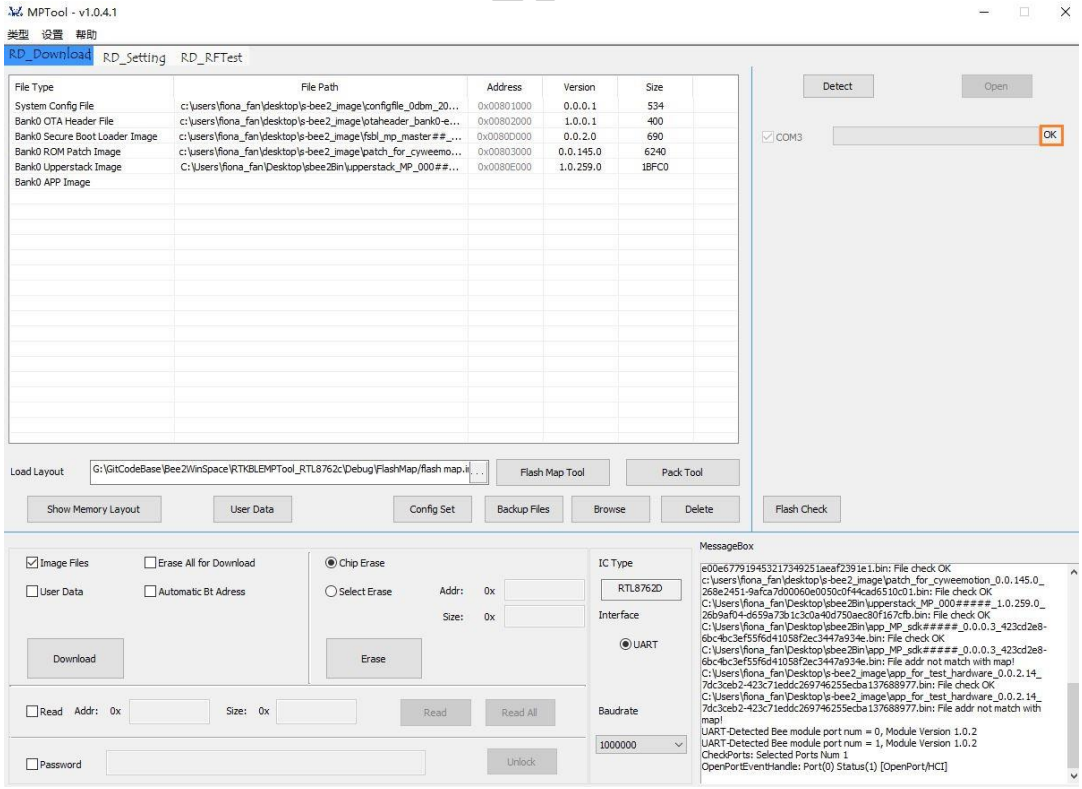

Figure 7-13 Open Port

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6) Select “Erase All for Download” check box. It’s shown in Figure 7-14.

“Erase before Download”: If no image has been downloaded in the chip, don’t need to select “Erase before Download” check box. If any image has been downloaded in the chip, and user want to erase all the flash space can check this box, then the flash will be erased firstly before downloading.

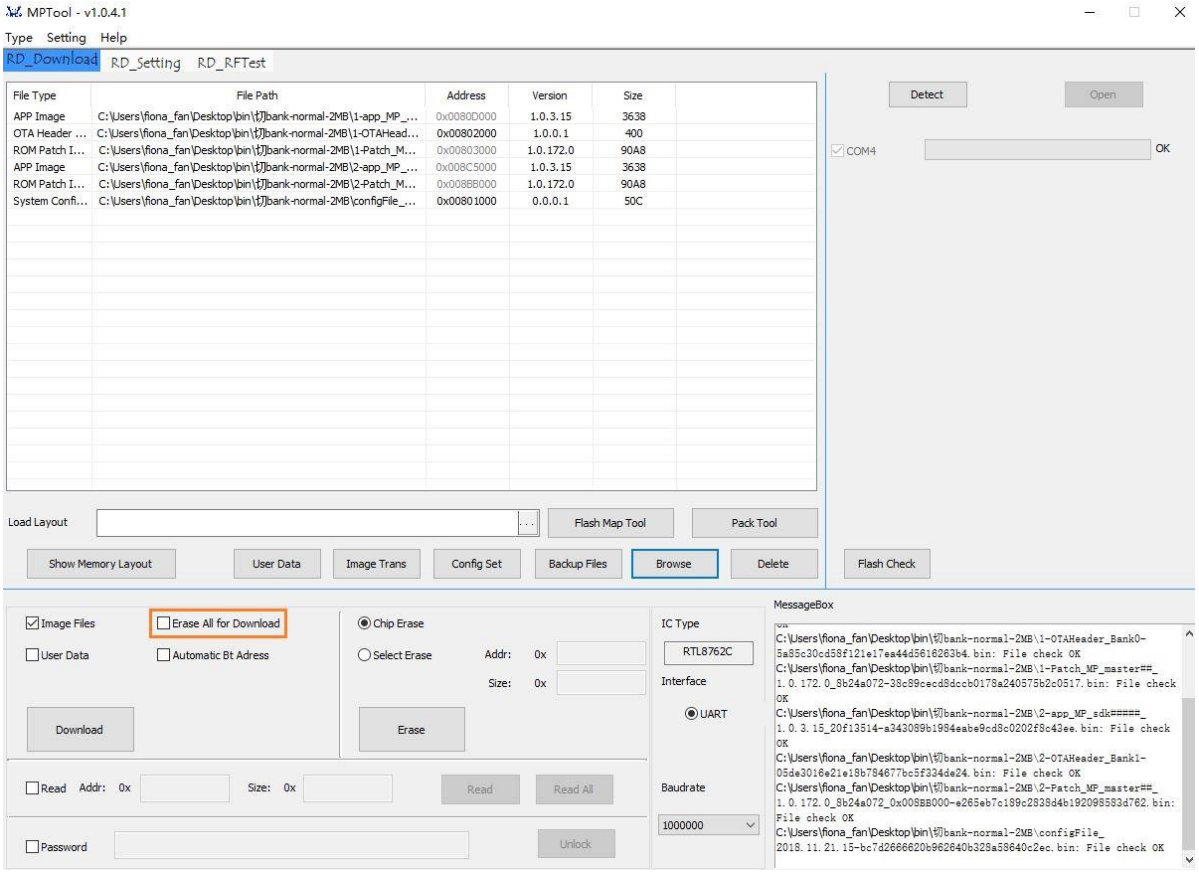

Figure 7-14 Select “Erase before Download”

7) Click “Download” button to start downloading, as is shown in Figure 7-15.

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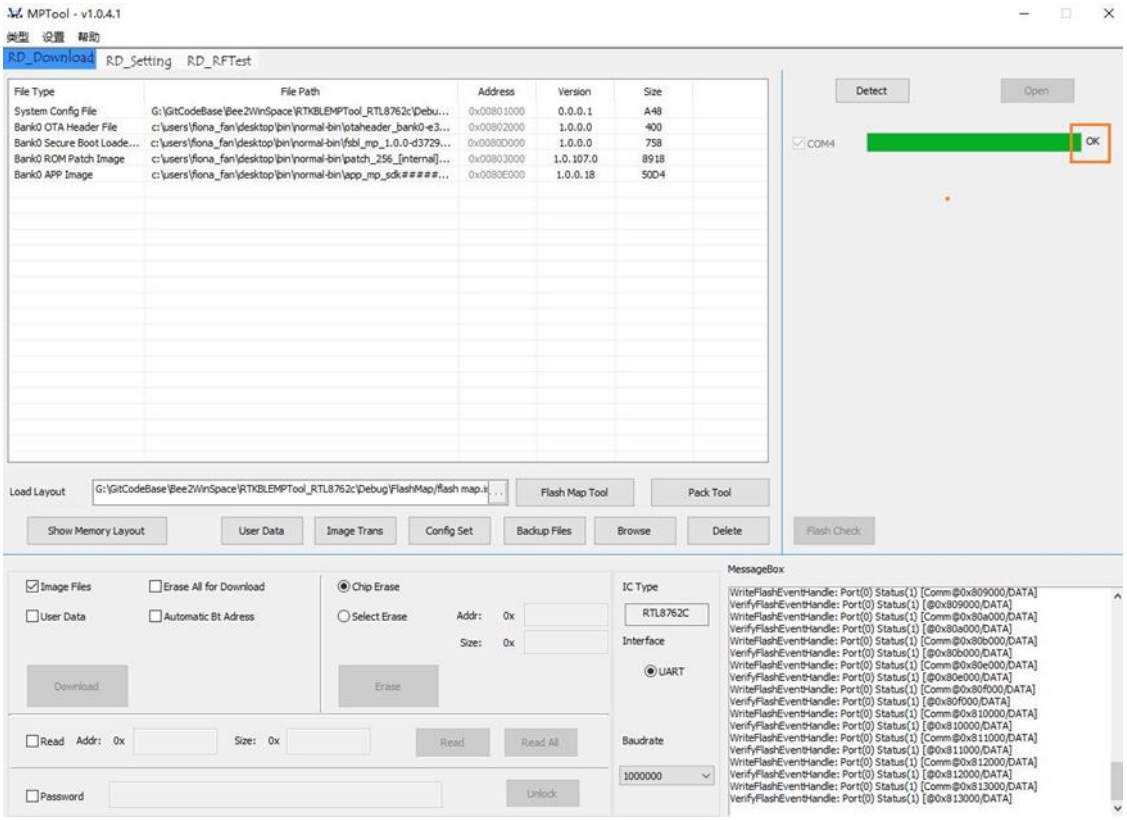

Figure 7-15 UART Download in RD mode

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7.4 Exception Handler of Download

Errors may occur when using MP Tool for downloading, some error status and corresponding error messages are listed in 错误!未找到引用源。 Error Status & Error Message

Table 7-1 Error Status & Error Message

Error status	Error meaning
Status(0)	Failed
Status(1)	Succeeded
dwEvent 0x102	Wait Event timeout

When downloading image by MP Tool, user may encounter exception of open port failed or image download failed. The following are some common handling methods for the exception.

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7.4.1 Exception Handling in UART Download Mode

Fail to open port:

1. Incorrect hardware connection results in open failed. **Solution:** check hardware connection, detect and open the port again after making sure the connection is correct.
2. The port is not an effective device port. **Solution:** check all ports of PC, remove the useless and interferential COM port, then detect and open the port again.
3. Open failed caused by chip in normal mode. **Solution:** pull down P0_3 and reset MCU, then system mode will switch to MP mode. User can detect and open port again.
4. Other errors. **General Solution:** pull down P0_3 and reset MCU, then detect and open port again.

Fail to download:

1. UART communication is not stable. **Solution:** use stable power source to supply power to UART, select FT232 chip with good performance.
2. Pull down P0_3 and reset MCU, then detect and open port again.

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8 Flash Erase

8.1 Erase Flash on RD mode

On RD mode, MP Tool supports erasing flash through UART interface. User should make sure the corresponding port can be opened successfully.

8.1.1 Erase Image through UART

Only chips in RD mode, can the flash be erased through UART interface. Select UART interface in MP Tool and open ports, then select “chip erase” or “select erase”. It is shown in Figure 8-1

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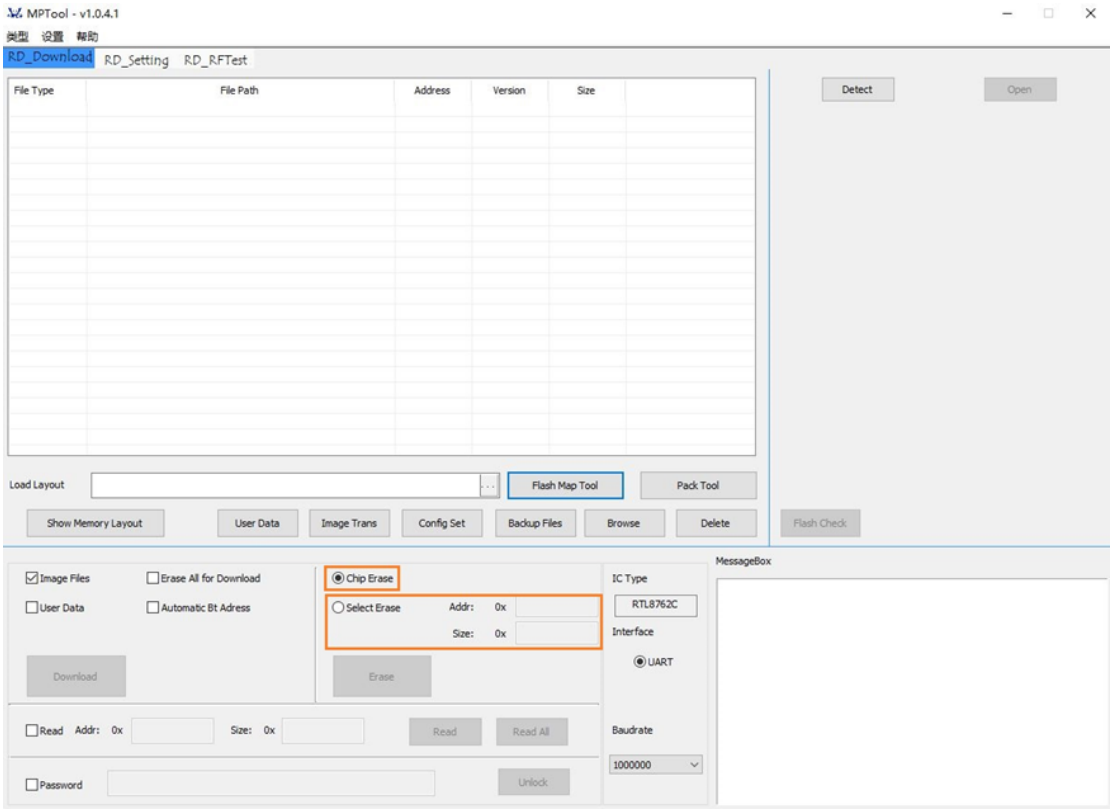

Figure 8-1 Erase flash through UART

9 Flash Read back (RD mode only)

9.1 Flash read back and save

On RD mode, user can read flash and save in UART way.

9.1.1 Read back through UART

Make sure the chip is in MP mode before reading through UART. When using MP Tool to read flash through UART interface, user can detect and open ports first, and then set the start address and size of the flash to read back. The maximum size can't exceed 16Mbytes. At last, click "read" button to finish reading back. The reading back bin file is saved in the path of MP Tool. User can also click read all button to read all packet downloaded in flash ,the files will be stored in a folder named "Read All".It is shown in Figure 9-1

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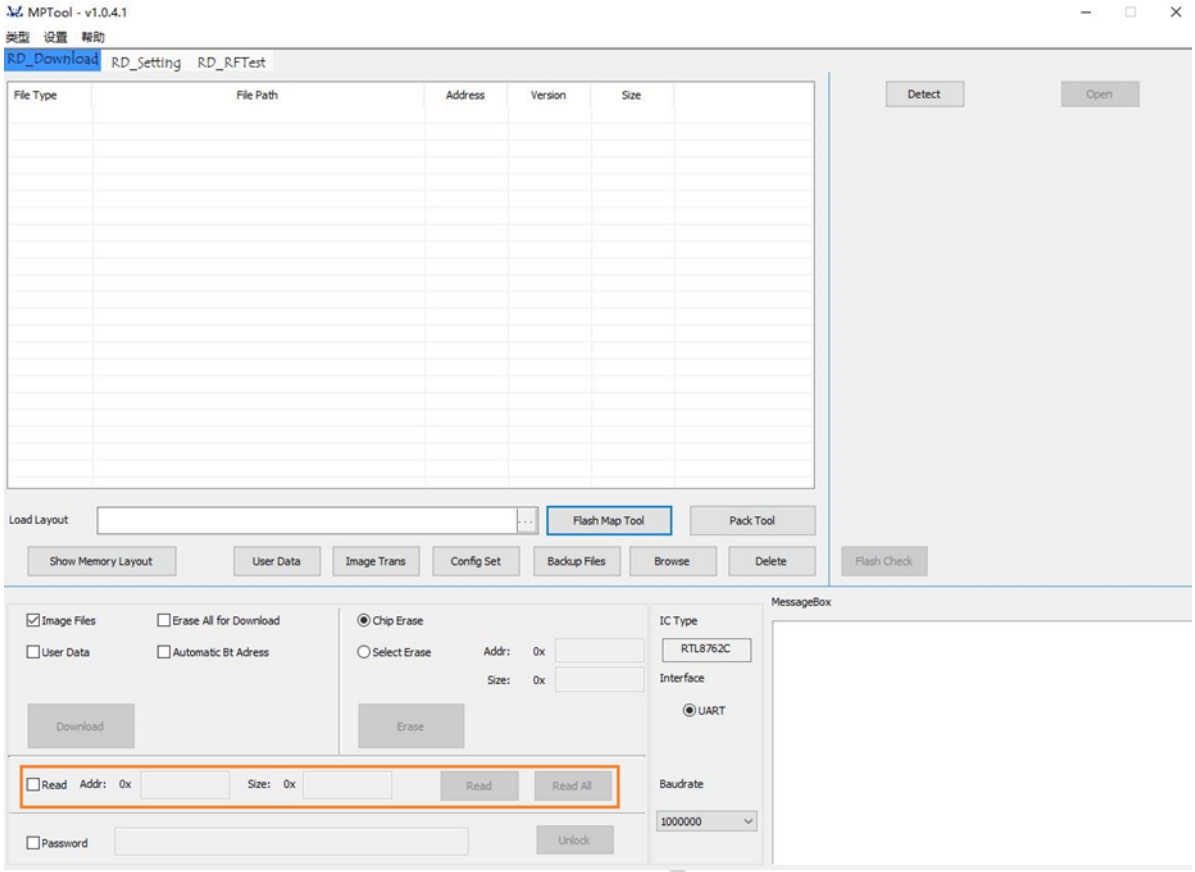

Figure 9-1 UART Flash read back

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