



# UM1503 User Manual

## PY32 ISP (In System Program) Application Software

### Preface

This document is used to describe the installation and use of the PY32IspTool software. This software enables ISP download of PY32 MCUs by using USB-TTL, emulator PY-LINK and other serial tools with the bootstrap program embedded in the PY32 MCU System Memory. It supports erase, download, verify, and read functions.

This software can also be nested in Keil MDK software for easy development and debugging.

Table 1: Applicable products

Type	Product Line
Micro controller series	PY32F002A, PY32F002B py32f003, py32f030, py32f031, py32f072, py32f071, PY32F403

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# 1 Bootstrap procedure

## 1.1 Device related bootstrap program parameters

Table 1-1. Device related bootstrap program parameters

MCU	USART	RCC(MHz)	PID	BL ID	SRAM	System Memory
PY32F002A PY32F003 PY32F030	USART1(TX/RX): PA2/PA3 USART1(TX/RX): PA9/PA10 USART1(TX/RX): PA14/PA15	HSI_24	0x0440	0x10	0x20000000 - 0x200001FF	0x1FFF0000 - 0x1FFF0D7F
PY32F071 PY32F072	USART1(TX/RX): PA9/PA10 USART2(TX/RX): PA14/PA15	PLL_48 (HSI_24 x 2)	0x0448	0xA0	0x20000000 - 0x200007FF	0x1FFF0000 - 0x1FFF2F00
PY32F403	USART1(TX/RX): PA9/PA10 USART3(TX/RX): PB10/PB11 USART4(TX/RX): PC10/PC11 USART2(TX/RX): PD5/PD6	PLL_48 (HSI_8 x 6)	0x0413	0xA0	0x20000000 - 0x200007FF	0x1FFF0000 - 0x1FFF4F00

## 1.2 Cautions

(1) For PY32F030/PY32F003/PY32F002A series MCUs, the RX pin of the peripheral not used in this bootstrap program must remain at a known level (low or high) and must not be left open during the detection phase, as described below:

If the application software uses USART1(TX:PA2, RX:PA3) to connect to the bootstrap program, the USART1\_RX (PA10, PA15) pins must be held high or low during the detection phase and must not be left open.

If the application software uses USART1(TX:PA9, RX:PA10) to connect to the bootstrap program, the USART1\_RX (PA3, PA15) pins must be held high or low during the detection phase and must not be left open.

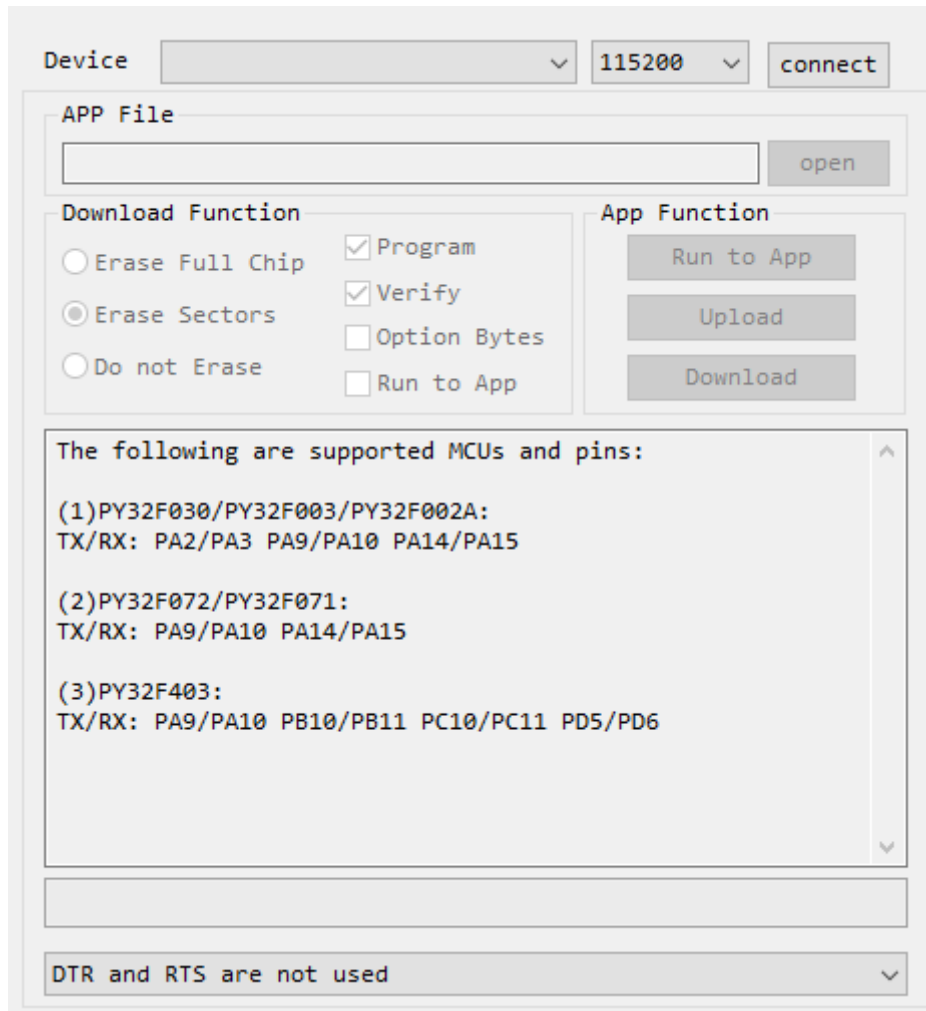
If the application software uses USART1(TX:PA14, RX:PA15) to connect to the bootstrap program, the USART1\_RX (PA3, PA10) pins must be held high or low during the detection phase and must not be left open.

(2) The PY32F002B requires the user to download the IAP (In Application Program) program in advance.

## 2 Software Installation

This software is green and free to install, unzip it and double click PY32IspTool\_x64.exe or PY32IspTool\_x86.exe to use it.

Figure 2-1. PY32IspTool main interface



### 3 Hardware Connection

Before hardware connection, please make sure the MCU's BOOT0 pin is connected high, nBOOT1 is 1, and select System memory as boot area.

Table 3-1. Boot Configuration

Boot mode configuration		Mode
nBOOT1 bit	BOOT0 pin	
X	0	Select Main flash as the boot area
1	1	Select System memory as boot area
0	1	Select SRAM as boot area

The boot loader program is stored in System memory and is used to download the Flash program through the USART interface.

#### 3.1 Using USB-TTL

Table 3.1-1. USB-TTL connection Schematic table

USB-TTL	MCU	Required/Optional
5V/3.3V	VCC	Optional
GND	VSS	Required
TXD	USARTx_RX	Required
RXD	USARTx_TX	Required
DTR	BOOT0/ RST	Optional
RTS	BOOT0/ RST	Optional

#### 3.2 Using PY-LINK

Table 3.2-1. PY-LINK Connection Schematic Table

PY-LINK	MCU
5V/3.3V	VCC
GND	VSS
USART1_TXD	USARTx_RX
USART1_RXD	USARTx_TX

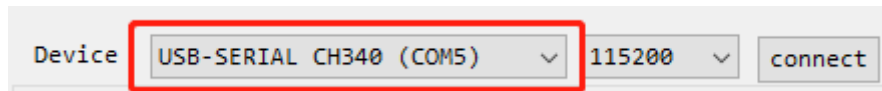
## 4 Software Use

### 4.1 Serial port settings

- Selecting a serial device

When the PY32 series MCU is connected to a PC computer via USB-TTL or PY-LINK, the software will automatically detect and add the serial port number to the software's serial port number selection list, and the user selects the correct serial port number.

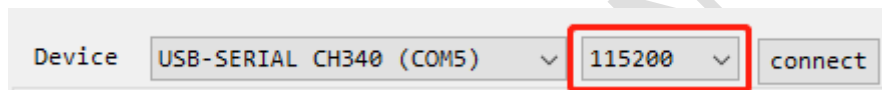
Figure 4.1-1. Selecting a serial device



- Select Baud Rate

The USART of PY32 MCU supports adaptive serial port baud rate detection function, and the application software can select the baud rate range 1200bit/s-1Mbit/s.

Figure 4.1-2. Selecting Baud Rate



- Select DTR/RTS

Referring to [the "USB-TTL wiring diagram"](#), the software controls the BOOT0/RST pins by controlling DTR/RTS for boot region selection and reset operation of the MCU. The following configurations are available:

No DTR and RTS

Low level (<-3V) reset of DTR without RTS

DTR low level (<-3V) reset, RTS low level into Bootloader

DTR low level (<-3V) reset, RTS high level into Bootloader

High level of DTR (>+3V) reset without RTS

DTR high level (>+3V) reset, RTS low level into Bootloader

DTR high level (>+3V) reset, RTS high level into Bootloader

Low level (<-3V) reset of RTS without DTR

RTS low level (<-3V) reset, DTR low level into Bootloader

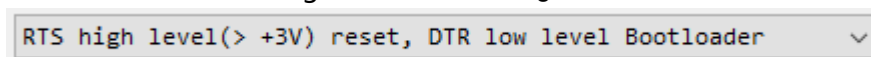
RTS low level (<-3V) reset, DTR high level into Bootloader

High level of RTS (>+3V) reset without DTR

RTS high (>+3V) reset, DTR low into Bootloader

RTS high (>+3V) reset, DTR high into Bootloader

Figure 4.1-3. Selecting DTR/RTS



### 4.2 Connecting Devices

After the serial port is set up, click the "connect" button in the software to connect to the PY32 MCU. The status bar shows the word "Connect FAIL" with red background.

Figure 4.2-1. Connect PASS

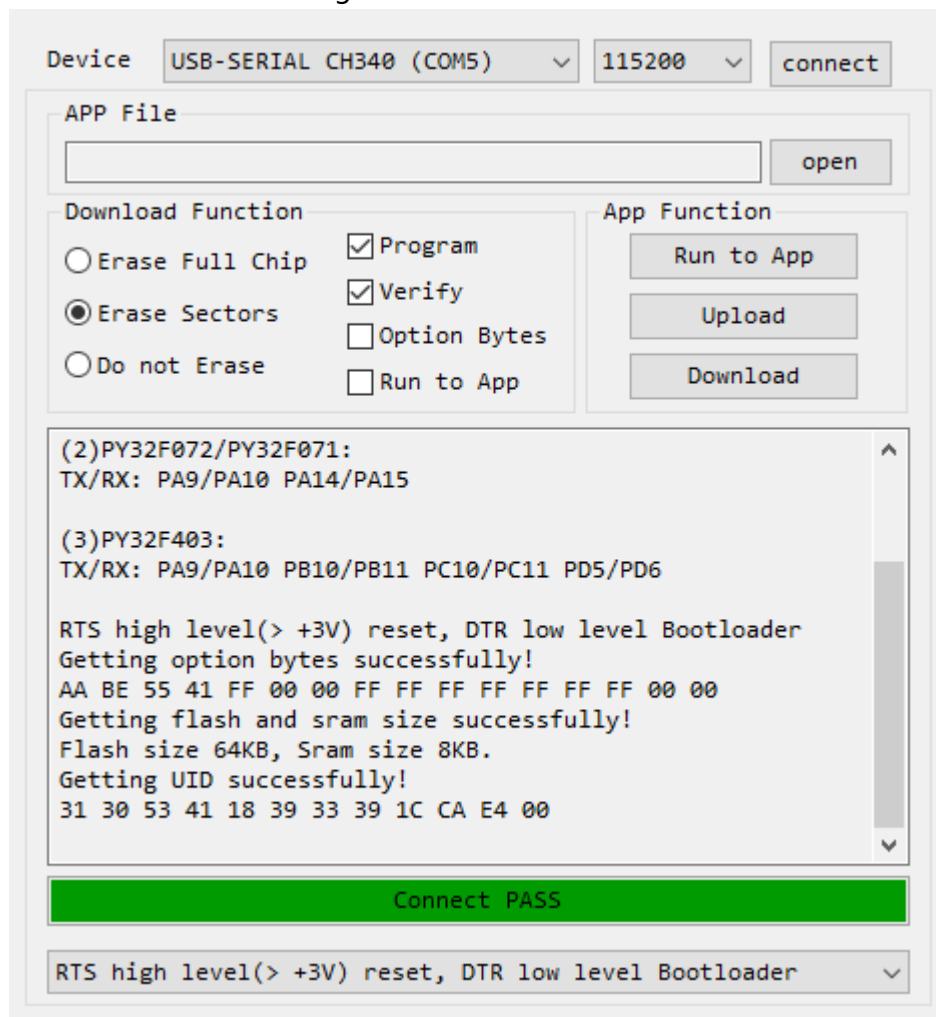
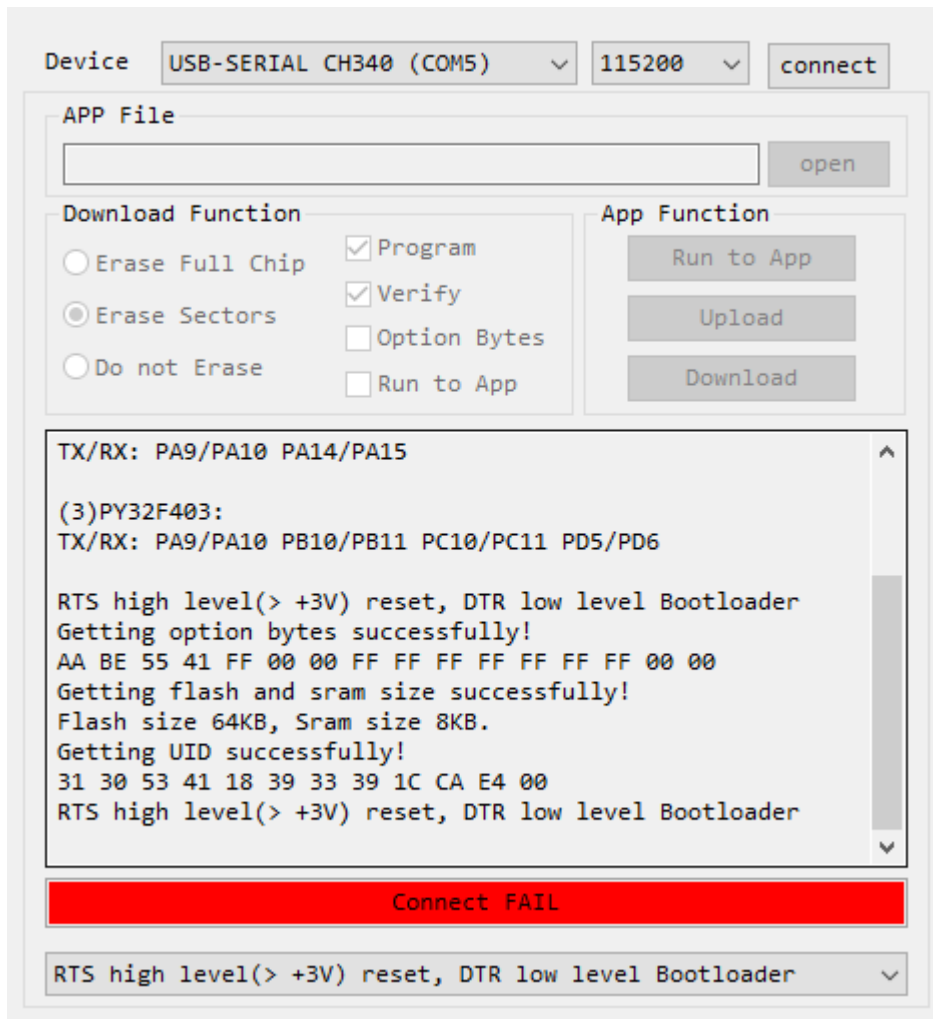


Figure 4.2-2. Connect FAIL



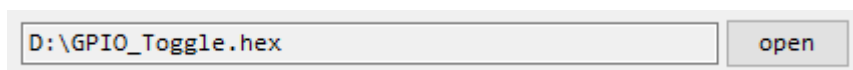
### 4.3 Open file

The software supports opening files in both \*.hex/\*.bin formats.

If the software opens a file in hex format, the software automatically sets the programming start address and the program run address.

If the software opens a bin format file, the software sets the programming start address and the program run address to 0x08000000.

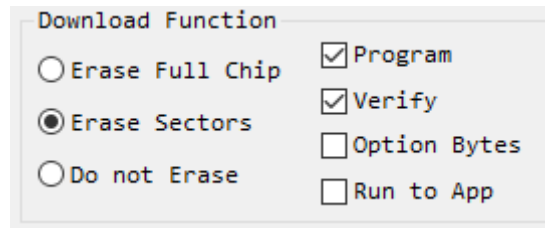
Figure 4.3-1. Open file





## 4.4 Download Settings

Figure 4.4-1. Download settings



Download Function	
<input type="radio"/> Erase Full Chip	<input checked="" type="checkbox"/> Program
<input checked="" type="radio"/> Erase Sectors	<input checked="" type="checkbox"/> Verify
<input type="radio"/> Do not Erase	<input type="checkbox"/> Option Bytes
	<input type="checkbox"/> Run to App

- **Erase Full Chip**

"Erase Full Chip" means mass erase, which corresponds to the whole address area of Main Flash. If you check this box, clicking the "Download" button will perform the Erase Full Chip operation.

- **Erase Sectors**

The software automatically adjusts the sectors to be erased according to the loaded program code. If you check this box, clicking the "Download" button will perform the Erase Sectors operation.

- **Do not Erase**

"Do not Erase" applies to both of the following:

- The area of the chip to be programmed has been erased
- SRAM Programming

If you check this box, the Erase operation will not be executed when you click the "Download" button.

- **Program**

If you check this box, clicking the "Download" button will execute the Program operation.

- **Verify**

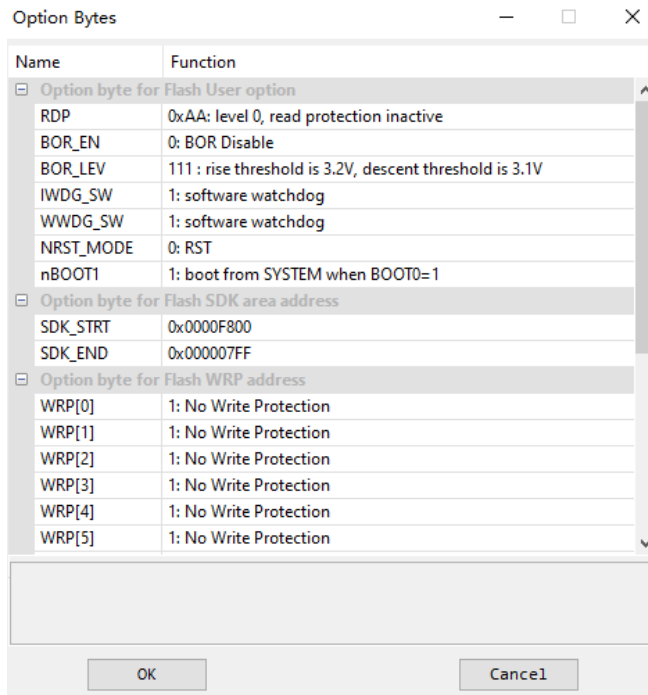
If you check this box, clicking the "Download" button will perform the Verify operation.

- **Option Bytes**

By default, the software only performs erase, write, and read operations on the Main Flash area.

If you check this box, clicking the "Download" button will perform the write Option Bytes operation.

Figure 4.4-2. Setting Option Bytes



- Run to App

If this is checked, clicking the "Download" button will cause the MCU to jump from the bootstrap program area to the user program area.

#### 4.5 Software Operation

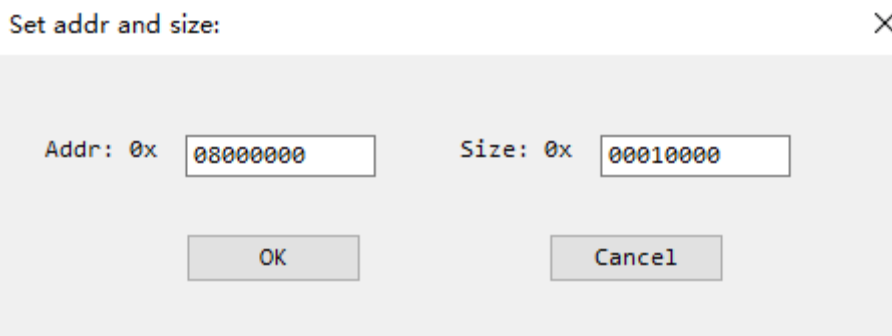
- Run to App

If this button is clicked, it will cause the MCU to jump from the bootstrap program area to run in the user program area.

- Upload

Retrieve data to the local disk at the specified address and size.

Figure 4.5-1. Setting the read data address and size



- Download

According to the settings in the "Download Settings" section, the software executes "Erase Full Chip/Erase Sectors/Do no Erase", "Program", "Verify", "Option Bytes", and "Run to App".

## 5 Embed into MDK for use

Open MDK, go to Option for Target 'XXXXXX' settings, switch to Utilities tab and Select Use External Tool for Flash Programming.

Select the installation location of PY32IspTool in Command, such as D:\Program Files\PY32IspTool\_x64.exe.

Type #H in Arguments

Click OK, the settings are finished. Then click "LOAD" on the toolbar to download.

Using this method requires MDK software to generate a hex format file.

Figure 5-1. MDK software calls PY32IspTool software to download Flash

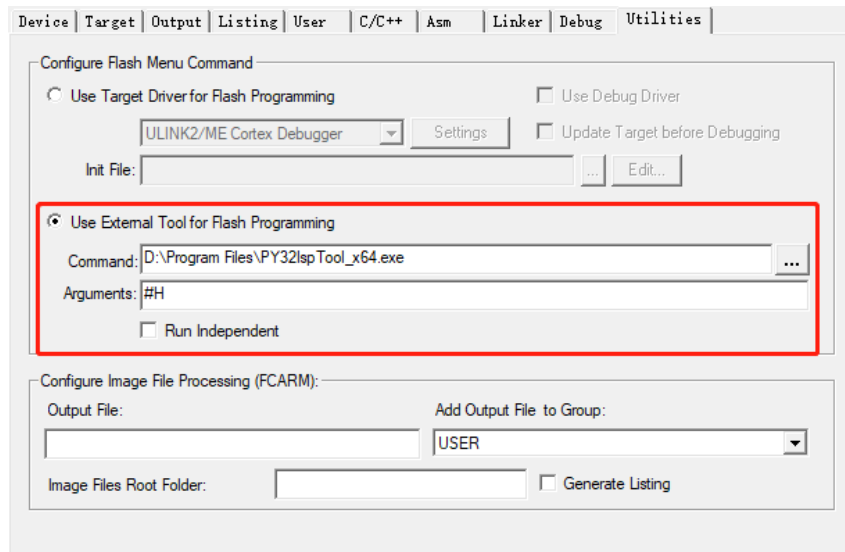
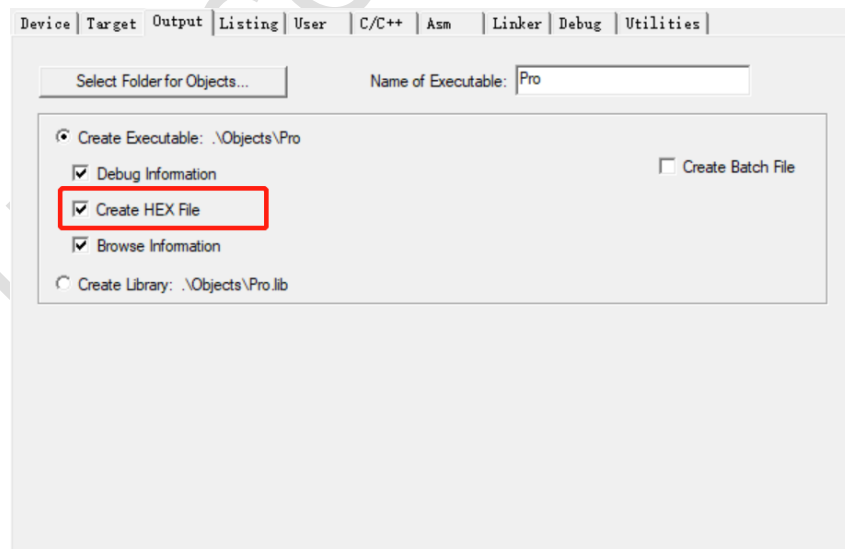


Figure 5-2. MDK software Create HEX File



## 6 Version History

Versions	Date	Update Record
V1.0	2023.4.2	First Edition



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