|  |  |
| --- | --- |
|  | **User Manual** |
| **Mass Production Programming Tool** | |

**Revision 5 – February 2021**

**Introduction**

SPINTROL mass production programming tool is an offline programming tool. The tool can help users to burn the developed program files (HEX files) into target chips quickly and conveniently. In addition, the tool can also program the user’s security information to the target chip, so as to achieve the security function of the chip.

Contents

[1 Introduction to the tool 5](#_Toc75720809)

[1.1 SPLink Programmer software 5](#_Toc75720810)

[1.2 SPLink hardware device 8](#_Toc75720811)

[1.3 Socket board 9](#_Toc75720812)

[1.4 Programming connector pin description 10](#_Toc75720813)

[1.5 Target circuit board programming 11](#_Toc75720814)

[2 Tool usage 12](#_Toc75720815)

[2.1 Tool installation 12](#_Toc75720816)

[2.2 User programs downloading 12](#_Toc75720817)

[2.3 Programming 13](#_Toc75720818)

[2.4 SPLink device firmware update 13](#_Toc75720819)

[3 Points for attention 14](#_Toc75720820)

[4 Revision history 15](#_Toc75720821)

**List of tables**

[Table 1‑1: SPLink Programmer software function description 6](#_Toc75720822)

[Table 1‑2: The icon meaning for the serial port communication 7](#_Toc75720823)

[Table 1‑3: SPLink hardware device function description 8](#_Toc75720824)

[Table 1‑4: LED indicator status description 9](#_Toc75720825)

[Table 1‑5: Socket board function module description 10](#_Toc75720826)

[Table 1‑6: 5x2 programming connector pin description 10](#_Toc75720827)

[Table 4‑1: Document revision history 15](#_Toc75720828)

**List of figures**

[Figure 1‑1: SPLink Programmer software interface 5](#_Toc75720829)

[Figure 1‑2: Serial port communication parameters setting interface 7](#_Toc75720830)

[Figure 1‑3: User program information interface 7](#_Toc75720831)

[Figure 1‑4: SPLink hardware device V5 8](#_Toc75720832)

[Figure 1‑5: Socket board 9](#_Toc75720833)

[Figure 1‑6: 5x2 programming connector pin definition 10](#_Toc75720834)

[Figure 1‑7: SPLink device and target circuit board connection 11](#_Toc75720835)

[Figure 2‑1: SPLink Programmer installation 12](#_Toc75720836)

[Figure 2‑2: SPLink device driver installation 12](#_Toc75720837)

# Introduction to the tool

The hardware and software resources of the tool are consist of:

* Software resource – SPLink Programmer
* Hardware resource – SPLink hardware device, Socket board or target circuit board, USB cable（Type A to Type B）

For the good operation of the software resources, the recommended computer configuration is as follows:

* Windows 7 or later operation system
* Microsoft .Net Framework 4.0 assembly

## SPLink Programmer software

SPLink Programmer software is responsible for downloading the users program files (HEX files) and security information to the SPLink hardware device. Figure 1‑1 shows the interface of SPLink Programmer software, and Table 1‑1 lists the description of the function modules.

Figure 1‑1: SPLink Programmer software interface

|  |
| --- |
|  |

Table 1‑1: SPLink Programmer software function description

|  |  |
| --- | --- |
| **Number** | **Description** |
| 1 | Select the target chip |
| 2 | Select the serial port for communication with SPLink hardware device |
| 3 | Open or Close the serial port for communication with SPLink hardware device |
| 4 | Serial port communication parameters setting and clicking it will pop up the interface as shown in Figure 1‑2 |
| 5(1) | Select the user program file, supporting HEX file format |
| 6 | Click the button, and a dialog will pop up to show the program information of the user program file, as shown in Figure 1‑3; If the program information is wrong, it will be highlighted with a red shade. |
| 7 | Click the button, the software will download the program and security information to the SPLink hardware device |
| 8 | Click the button, the software will erase the program and security information in the SPLink hardware device |
| 9 | Show the result of the Program or Erase operation |
| 10 | Show Program operation progress |
| 11 | Indication of serial port current status, the icon meaning is listed in Table 1‑2 |
| 12 | Current serial port communication parameters |
| 13 | If the option was checked, the random number protection would be enabled. The function is only valid for SPC11x8/SPD11x8/SPC2168. |
| 14 | The address for programming random number (must be a valid address in the target chip Flash memory). When the user checks the random number protection function, the random number related information will also be downloaded to the SPLink hardware device during the process of downloading the user program. Next, when programming the target chip with the SPLink hardware device, the random number of the target chip will be written to the specified address. |
| 15 | Click the button, the software will erase the firmware of the SPLink hardware device |
| 16 | Click the button, the software will program the firmware to the SPLink hardware device |

1. If containing several data blocks, the user program file should satisfy the rules defined by SPINTROL.

Figure 1‑2: Serial port communication parameters setting interface

|  |
| --- |
|  |

1. The serial port communication parameter settings of SPLink hardware device – Auto-baud detection, 8 data bits, no parity and 1 stop bit. Thus, it is recommended to use the parameter settings as shown in the figure except the baud rate setting. Otherwise, the communication between the software and the SPLink hardware device would be abnormal.

Table 1‑2: The icon meaning for the serial port communication

|  |  |
| --- | --- |
| **Icon** | **Description** |
| D:\hfhuang\Documents\Visual Studio 2013\Projects\chipSuite_1.5.2.0\chipSuite\Icon\Status_NoPort_16.png | Indicate that the SPLink Programmer software does not find available serial ports |
| D:\hfhuang\Documents\Visual Studio 2013\Projects\chipSuite_1.5.2.0\chipSuite\Icon\Status_Undefine_16.png | Indicate that the status of the selected serial port is un-known, it is the serial port status after the software starting up |
| D:\hfhuang\Documents\Visual Studio 2013\Projects\chipSuite_1.5.2.0\chipSuite\Icon\Status_Critical_16.png | Indicate that an error was occurred when opening or closing the serial port |
| D:\hfhuang\Documents\Visual Studio 2013\Projects\chipSuite_1.5.2.0\chipSuite\Icon\Status_Close_16.png | Indicate that close the serial port successfully |
| D:\hfhuang\Documents\Visual Studio 2013\Projects\chipSuite_1.5.2.0\chipSuite\Icon\Status_Open_16.png | Indicate that open the serial port successfully |

Figure 1‑3: User program information interface

|  |
| --- |
|  |

## SPLink hardware device

SPLink hardware device has two main functions:

* Receive and store the user program file and security configuration;
* Program user programs into the target chip and complete the security control of the chip.

SPLink hardware device is shown in Figure 1‑4, and Table 1‑3 lists the description of the function modules。

Figure 1‑4: SPLink hardware device V5

|  |
| --- |
|  |

Table 1‑3: SPLink hardware device function description

|  |  |
| --- | --- |
| **Number** | **Description** |
| 1 | USB Type B interface, connect it with PC through USB cable |
| 2 | LED indicator of the device power |
| 3 | LED indicators, the LED colors are green, red and yellow from left to right. See Table 1‑4 for details. |
| 4 | 5x2 programming connector (the silk screen printing marked with red dashed line are the definition of the connector pins), it is used to connect socket board or target circuit board. The connector pin definitions are shown in Figure 1‑6. |
| 5 | Optional LCD screen, it is used to display operation result and the checksum. |

Table 1‑4: LED indicator status description

|  |  |  |
| --- | --- | --- |
| **Situation** | **LED Status** | **Description** |
| Normal | Yellow LED on | The device finishes the initialization, and is ready for programming operation |
| Green LED on | Success to program target chip |
| Abnormal | Red LED on | Fail to program target chip |
| The three LEDs flash at the same time | The device initialization error |
| Red LED flash | Un-correct or No connection with socket board or target circuit board |
| Red LED and Yellow LED flash at the same time | Fail to initialize communication with socket board or target circuit board |
| Red LED and Yellow LED flash alternately | The user program in the SPLink device validation failed  Note: if the user program in the SPLink device was erased, the user program validation would also failed. |
| Red LED and Yellow LED on | SPLink hardware device has not been downloaded with user programs and is ready for downloading user programs |

## Socket board

The socket board is mainly composed of an IC socket, which is used to place the target chip. The socket board needs to be connected with SPLink hardware device. Figure 1‑5 is the socket board for SPC1068. Take it as an example to introduce the function modules of the socket board, which are listed in Table 1‑5.

Figure 1‑5: Socket board

|  |
| --- |
|  |

Table 1‑5: Socket board function module description

|  |  |
| --- | --- |
| **Number** | **Description** |
| 1 | 5x2 pin header, used to connect SPLink device |
| 2 | IC socket, used to place target chip |
| 3 | The mark of chip pin 1, here is the triangle mark  Note that the mark of chip pin 1 will also be printed on the circuit board in the form of silk screen printing. Users should pay special attention to it when using the socket board. |

## Programming connector pin description

The 5x2 programming connector pin definition of the SPLink device is shown in the figure below. The detailed description is listed in Table 1‑6.

Figure 1‑6: 5x2 programming connector pin definition

|  |
| --- |
|  |

Table 1‑6: 5x2 programming connector pin description

| **Pin** | **Name** | **Description** |
| --- | --- | --- |
| 1 | VDD | 3.3V power supply, it is used to provide 3.3V power for target chip |
| 2 | TRSTn | JTAG reset signal, it is used to connect the TRSTn pin of the target chip |
| 3 | GND | Ground, it is used to connect GND pin of the target chip |
| 4 | RESETn | Reset signal, it is used to connect hardware reset pin of the target pin |
| 5 | TXD | UART TXD signal, it is used to connect the UART RXD pin of the target chip (Not used during programming target chip) |
| 6 | NC/5V | Not connect (SPLink V2/V3) or  5V power supply (SPLink V4 or later) |
| 7 | RXD | UART RXD signal, it is used to connect the UART TXD pin of the target chip (Not used during programming target chip) |
| 8 | SWDIO | SWDIO signal, it is used to connect the SWDIO pin of the target chip |
| 9 | PROG | It is used to connect the BOOT pin of the target chip |
| 10 | SWCLK | SWCLK signal, it is used to connect the SWCLK pin of the target chip |

## Target circuit board programming

If the chip needs to be programmed on the circuit board before programming, the chip pins related with programming are needed to layout when designing the circuit board. When programming, these pins need to be connected to the 5x2 connector of the SPLink device with wires, as shown in Figure 1‑7. The chip pins related with programming are: DVDD（3.3V）、GND、SWDIO、SWCLK、TRSTn、RESETn (chip reset pin) and BOOT pin.

Please see Figure 1‑6 for details on 5x2 connector signal description of the SPLink device. In addition, if both the target circuit board and the SPLink device have independent power supply, the VDD signal of the 5x2 connector is not need to be connected with the DVDD (3.3V) pin of target chip.

Figure 1‑7: SPLink device and target circuit board connection

|  |
| --- |
| D:\hfhuang\Documents\WXWork\1688850820547519\Cache\Image\2019-08\12ad7a79bb584a125b8c97950f7aac92.jpg |

# Tool usage

## Tool installation

Use the USB cable to connect the SPLink device and PC, and the SPLink device can be powered through the USB port. The SPLink device has been powered on normally if the LED power indicator is on; otherwise, disconnect the USB cable in time to find out the cause. Figure 2‑1 shows the connection and installation.

Figure 2‑1: SPLink Programmer installation

|  |
| --- |
|  |

When the SPLink device is connected to the computer for the first time, the computer will automatically install the device driver, as shown in Figure 2‑2. When the driver is installed successfully, the user programs can be downloaded to the SPLink device by using the SPLink Programmer software.

Figure 2‑2: SPLink device driver installation

|  |
| --- |
|  |

## User programs downloading

Connect the hardware device according to Figure 2‑1, then the user programs can be downloaded to the SPLink device. Firstly, run the software SPLink Programmer.exe, then, operate as follows:

1. Connect SPLink device with computer through USB cable, and wait until yellow LED on (if SPLink device has not been downloaded with user programs, the red LED will also on). Make sure that the SPLink device does not program the target chip;
2. Run SPLink Programmer software, select and open the serial port related with the SPLink device;
3. Load the user program file (HEX file);
4. Click the ‘Erase’ button to erase the old user programs in the SPLink device;
5. Wait until erase operation complete. If erase successfully, yellow LED and red LED will flash alternately, and finally, keep light on;
6. Click the ‘Program’ button to download the user program and security information into the SPLink device.

## Programming

After downloading the user program and security information into the SPLink device, then use the SPLink device to program target chip. The steps are as follows:

1. Connect SPLink device with computer through USB cable, and wait until yellow LED on. If other LED indicator on, find out the cause according to Table 1‑4;
2. Place the target in the socket or connect the SPLink device with the target board with wires;
3. After that, the SPLink device will program the target chip automatically;
4. The programming result will be shown via the LEDs on the SPLink device. If programming successes, green LED on; otherwise, red LED on;
5. Take out the target chip from the socket or disconnect the target circuit board with the SPLink device;
6. If continue programming target chips, please repeat the steps 2 ~ step 5.

## SPLink device firmware update

Actually, the user need to update the firmware in the SPLink device according to the target chip. The SPC1068/SPD1078 use the same firmware and the SPC11x8/SPD11x8/SPC2168 use another firmware。The steps to update the SPLink device firmware are as follows:

1. Connect SPLink device with computer through USB cable. For SPLink V5 or later, check the option ‘SPLink V5’;
2. Click the ‘Erase Firmware’ button to erase the firmware in the SPLink device;
3. Select the target chip;
4. Click the ‘Program Firmware’ button, wait until the firmware downloading successfully.

# Points for attention

1. Do not take out the target chip from the socket during programming;
2. After the socket is used for a period of time, it may cause poor contact with chip pins due to aging. At this time, the user should replace the socket board in time.

# Revision history

Table 4‑1: Document revision history

|  |  |  |
| --- | --- | --- |
| **Date** | **Revision** | **Changes** |
| 2019-07-13 | 1 | 1. Initial release. |
| 2019-08-21 | 2 | 1. Modify Section 3. 2. Add Figure 1‑7: SPLink device and target circuit board connection. |
| 2020-03-26 | 3 | 1. Modify Section 1.5. |
| 2021-01-06 | 4 | 1. Modify Section 1.2. 2. Add Section 1.4. 3. Add Section 2.4. 4. Modify Section 2.3. |
| 2021-02-24 | 5 | 1. Modify Section 1.2. 2. Modify Section 1.4. 3. Modify Section 2.2. 4. Modify Section 2.3. |