SFLY® 硕飞

SP20B/SP20F/SP20X/SP20P
Programmer User Manual

深圳硕飞科技有限公司
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CONTENTS

Chapter 1   Introduction

SP20 series (SP20B/SP20F/ SP20X/SP20P) programmers are the latest highspeed mass production programmers for SPI FLASH launched by Shenzhen SFLY Technology. It fully supports the high-speed programming of SPI NOR FLASH, I2C / MicroWire and other EEPROMs from domestic and foreign manufacturers.

1.1 Performance Characteristics

Hardware features

- USB Type-C communication interface, no need for external power supply when used in USB mode;
- Support USB and standalone mode high-speed mass production programming;
- The built-in large-capacity memory chip saves the engineering data for standalone programming, and multiple CRC data verification ensures that the programming data is absolutely accurate;
- Replaceable 28-pin ZIF socket, which can be supported by conventional universal programming bases;
- OLED display, visually display the current operating information of the programmer;
- RGB three-color LED indicates the working status, and the buzzer can prompt the success and failure of the programming;
- Support poor pin contact detection, effectively improve programming reliability;
- Support ISP mode programming, which can support on-board programming of some chips;
- Multiple programming startup methods: button startup, chip placement (intelligent detection chip placement and removal, automatic startup programming), ATE control (independent ATE control interface, providing accurate and reliable programming machine control signals such as BUSY, OK, NG, START, extensively support automatic programming equipment of various manufacturers);
- Short circuit / overcurrent protection function can effectively protect the programmer or chip from accidental damage;
- Programmable voltage design, adjustable range from 1.7V to 5.0V, can support 1.8V/2.5V/3V/3.3V/5V chips;
- Provide equipment self-check function;
- Small size (size: 108x76x21mm), simultaneous programming of multiple machines only takes up a very small work surface;

Software features

- Support Win7/Win8/Win10/Win11;
- Support switching between Chinese and English;
- Support software upgrade to add new devices;
- Support project file management (project file saves all programming parameters, including: chip model, data file, programming settings, etc.);
- Support the reading and writing of additional storage area (OTP area) and configuration area (status register, etc.) of the chip;
- Support automatic recognition of 25 series SPI FLASH;
- Automatic serial number function (can be used to generate product unique serial number, MAC address, Bluetooth ID, etc.,);
- Support multi-programmer mode connection: one computer can be connected with 8 SP20 series programmers for simultaneous programming,The automatic serial number function is active in multi-programmer mode;
- Support log file saving;

Note:

The above functions depend on the product model. For details, please refer to the product parameter table in section 1.2

1.2 SP20 series programmer parameter table

Product parameter		SP20P	SP20X	SP20F	SP20B
Product Appearance					
Supported chip voltage range		1.8-5V	1.8-5V	1.8-5V	1.8-5V
Maximum memory of supported chips (Note1)		1Gb	1Gb	1Gb	1Gb
Support chip series (interface type) (① I2C EEPROM ② Microwire EEPROM ③ SPI Flash)		①②③	①②③	①②③	①②③
Multi connection (One computer can connect 8 programmers)		Y	Y	Y	Y
Mass production with USB (Auto detect the chip insert and remove, auto programmer)		Y	Y	Y	Y
Automatic serial NO. (Serial numbers programming)		Y	Y	Y	Y
RGB LEDs work indicator		Y	Y	Y	Y
Buzzer prompt		Y	Y	Y	N
Standalone programming (programming without computer, suitable for mass production)		Y	Y	Y	N
Support automation equipment (Control the automatic equipment with ATE)		Y	Y	N	N
ISP programming (Support some models)	**Using usb mode**	Y	Y	Y	Y
	in stand-alone mode	Y	N	N	N
Start button for programming		Y	N	N	N
OLED display		Y	N	N	N
Programming speed (Programming + verification) Full data	GD25Q16(16Mb)	6s	6s	6s	7s
	W25Q64JV(64Mb)	25s	25s	25s	28s
	W25Q128FV(128Mb)	47s	47s	47s	52s
"Y" means it has or supports the function, "N" means it does not have or does not support the function					

Note 1　Supports up to 1Gb in usb mode and 512Mb in standalone mode.

Chapter 2   Programmer Hardware

2.1 Product Overview

Item	Name	Illustrate
①	28P ZIF socket	Insert DIP packaged chip, programming socket (Note: Does not support programming of on-board chips by connecting wire from the ZIF socket.)
②	Three color indicator	Blue: BUSY; Green: OK(successful); Red: FAIL
③	OLED display	Display current operating status and results (only SP20P has this component)
④	Programming start button	Start programming by pressing the button (only SP20P has this component)
⑤	USB interface	USB Type-C interface
⑥	ISP/ATE multiplexing interface	● Provide programming machine control signals (BUSY, OK, NG, START) (only SP20P and SP20X have this function) ● ISP programming for chips soldered on boards

2.2 Product Add-ons

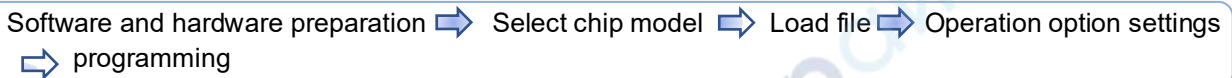Type-C data cable   ISP cable   5V/1A power adapter   Instruction manual

⚠️ ● The color/appearance of accessories of different batches may be different, please refer to the actual product;
● SP20B does not include a power adapter, just use the USB port for power supply;
● The standard configuration of the programmer does not include a programming socket, please choose according to your needs;

Chapter 3 Quick To Use

This chapter takes a piece of SOIC8 (208mil) packaged SPI FLASH chip W25Q32DW as an example to introduce the SP20P programmer's method of programming the chip in USB mode. The conventional programming includes the following 5 steps:
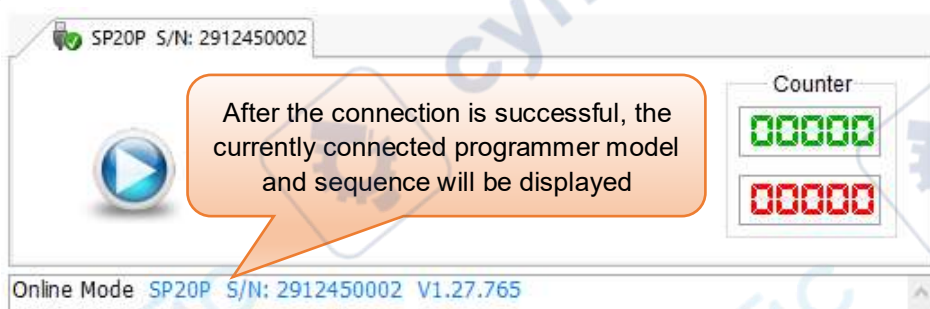
Software and hardware preparation ⇨ Select chip model ⇨ Load file ⇨ Operation option settings ⇨ programming

3.1 Preparation work

1) Install "SFLY FlyPRO II" series programmer software (includes USB driver, the USB driver will be installed by default when installing the software), support Win7/Win8/Win10/Win11, the software download URL:
http://www.sflytech.com;
2) Connect the programmer to the USB port of the computer with a USB cable, and the green light of the programmer will be on when the connection is normal;
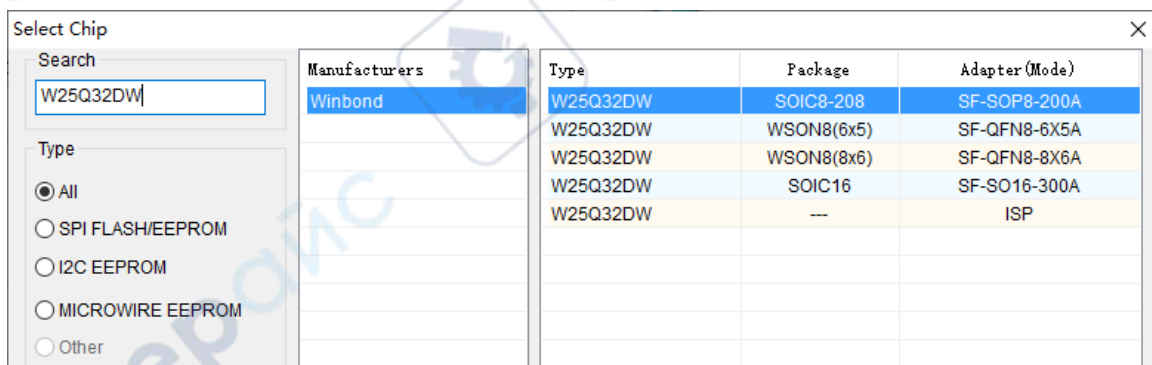
Connect to the computer USB port

3) Start the programmer software "SFLY FlyPRO II", the software will automatically connect to the programmer, and the right window of the software will display the programmer model and product serial number. If the connection fails: please check whether the USB cable is plugged in; check whether the USB driver is successfully installed in the computer device manager (if the USB driver is not installed correctly, please manually update the USB driver: locate the "USB_DRIVER" in the programmer software installation directory Folder, just update the driver);

SP20P S/N: 2912450002

Counter
00000
00000

After the connection is successful, the currently connected programmer model and sequence will be displayed

Online Mode SP20P S/N: 2912450002 V1.27.765

3.2 Programming your chip

1) **Select the chip model:**

Click the toolbar button 🔲 Chip ▾ , and search for the chip model to be programmed in the pop-up dialog box for selecting chip model: W25Q32DW. Select the matching chip brand, model and package type (selecting the wrong brand and model will result in programming failure).

Select Chip

Search
W25Q32DW

Type
◉ All
○ SPI FLASH/EEPROM
○ I2C EEPROM
○ MICROWIRE EEPROM
○ Other

Manufacturers	Type	Package	Adapter(Mode)
Winbond	W25Q32DW	SOIC8-208	SF-SOP8-200A
	W25Q32DW	WSON8(6x5)	SF-QFN8-6X5A
	W25Q32DW	WSON8(8x6)	SF-QFN8-8X6A
	W25Q32DW	SOIC16	SF-SO16-300A
	W25Q32DW	---	ISP

2) Load file:

Click the toolbar button 📂 Load ▾ to load the data file, which can support Bin and Hex formats.

3) Operation option setup:

Make the corresponding settings on the "Operation Options" page as needed. **Tip:** The non-empty chip must be erased.

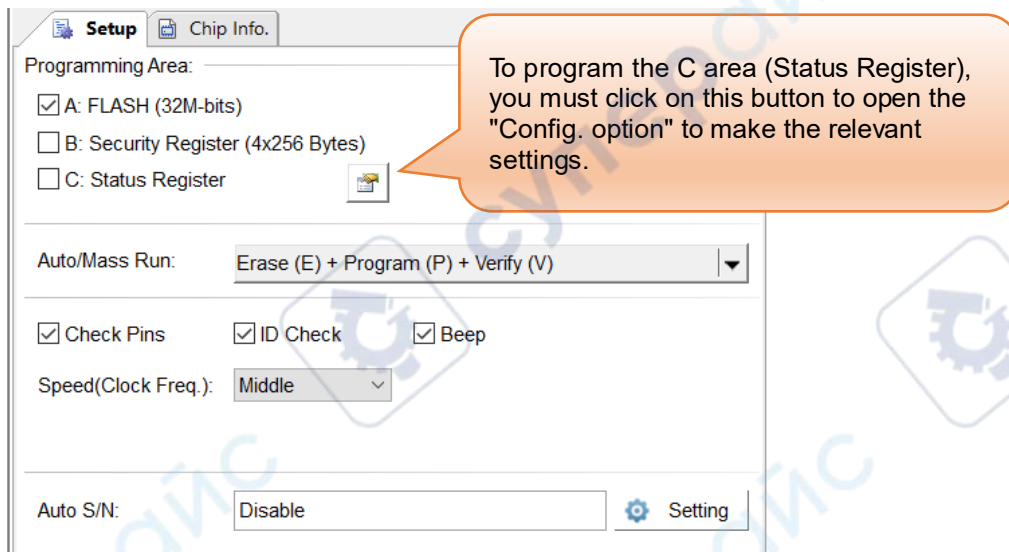To program the C area (Status Register), you must click on this button to open the "Config. option" to make the relevant settings.

4) Place the chip:

Raise the handle of the ZIF socket, insert the bottom row of the programming socket aligned with the bottom of the ZIF Socket, press down the handle, and then put the chip into the programming socket. Note that the direction of pin 1 of the chip should not be placed in the wrong direction. **Tip:** You can view the corresponding programming socket model and insertion method on the "chip information" page.
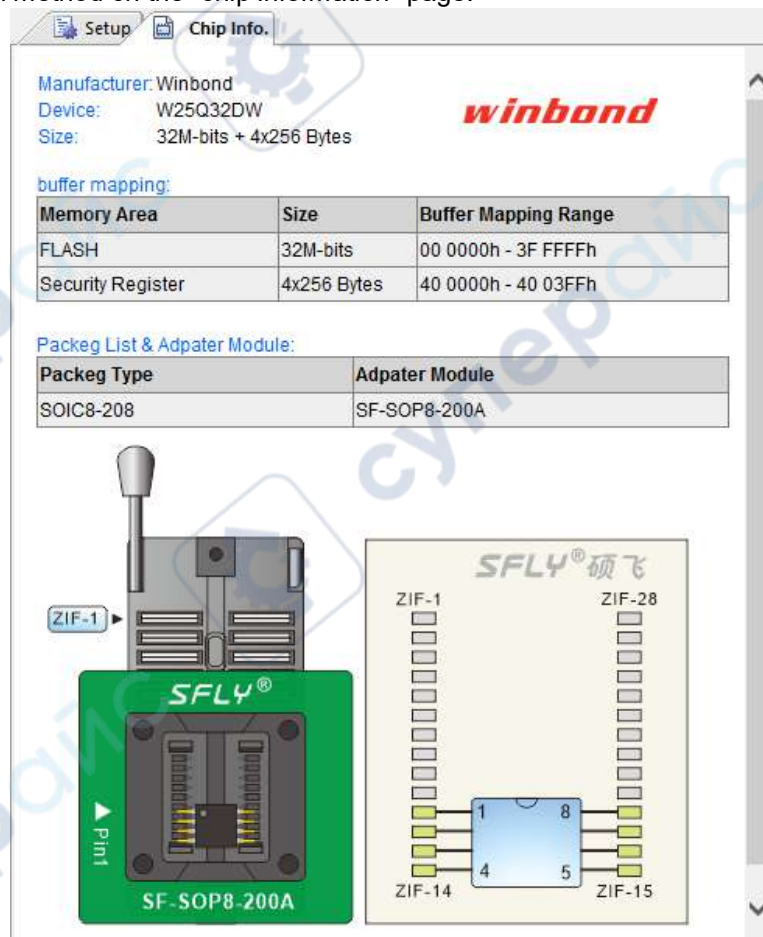
5) Programming operation:

Click the toolbar button ▶ Auto to start programming:

When the programming is completed, the status icon changes to "OK" to indicate that the programming is successful:

3.3 Read chip data and programming new chip

1）Follow the steps in section 3.2 to select the chip model, install the socket and the chip to be read;

Tips:

① You can automatically identify most SPI Flash chips through the "Check Model" button 🔍 in the toolbar;

② The pins of the desoldered chip need to be cleaned up to avoid poor contact;

2) Click the read button 📲 in the toolbar, and the "Read Options" dialog box will pop up;
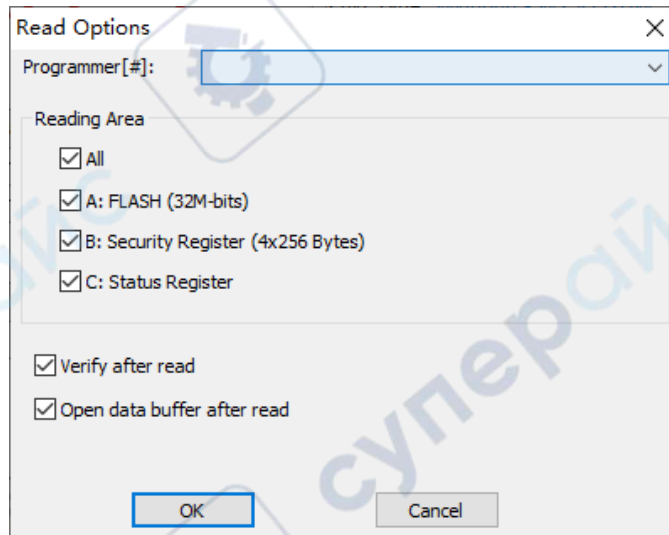
3) Click the "OK" button, the programmer will automatically open the "Data Buffer" after reading the chip data, and click the "Save Data" button to save the read data to the computer for subsequent use;
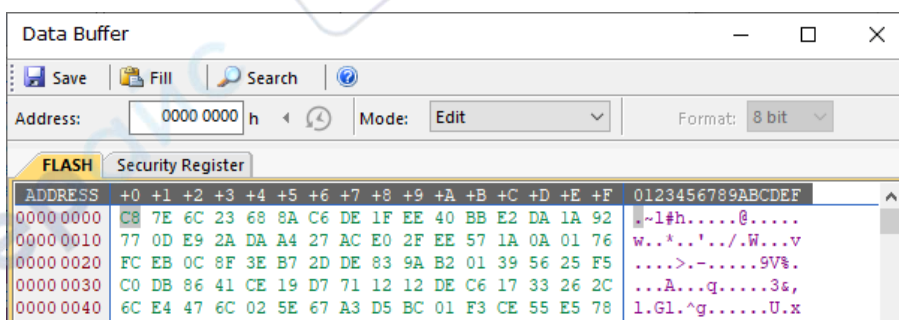
4) Click the "Save Data" button of the "Data Buffer", the Save Data dialog box pops up, the default save all the storage area, you can select the memory area as needed, such as the main memory area Flash, save the file can be used later;

5) Close the "data buffer" and put in a new chip of the same model;

6) Click the button ▶ Auto to write the read content into the new chip.

Tip:

① Select all programming areas in the Setup options, otherwise the pramming data may be incomplete and the master chip may work normally, but the copied chip may not work normally;

② After setting the programming parameters or successfully reading the data of the mother chip, you can save it as a project file (click the toolbar 🖼 button, or click the menu bar: File->Save Project), and then you only need to load the saved project file, and do not need to reset the parameters in order to programming the new chip.

3.4 Indicator status in USB mode

Indicator status	State description
Steady blue	Busy state, the programmer is performing operations such as erasing, programming, verification, etc.
Flashing blue	Wait for the chip to be put in
Steady green	Currently in standby mode, or the current chip is successfully programmed
Steady red	Chip programming failed (you can check the reason for the failure in the software information window)

Does not support programming of on-board chips by connecting wire from the ZIF socket, because of the interference of the external circuit will lead to the failure of programming, and in the case of the external circuit board with electricity, it may also damage to the hardware of the programmer, if the programmer is damaged due to this incorrect use, it will not get the warranty service. Please use the standard programming socket to program the chip, Or use the ISP interface of the programmer to programmer the on-board chip (see Chapter 5　Programming in ISP mode)

Chapter 4   Standalone Programming

SP20F,SP20X,SP20P support standalone (withourt computer) programming, suitable for mass production. The basic operation process is as follows:

Download standalone data ⇒   Disconnect the USB cable and connect to the 5V power supply   ⇒

Start standalone programming

4.1 Download standalone data

1) Connect the programmer to the computer USB port with a USB cable, and start the "SFLY FlyPRO II" software;
2) Follow the steps in section **3.2** to select the chip model, load the data file, and set the necessary operation options;
3) In order to ensure that the standalone data is correct, you can first programming a few chips and do the actual verification of the product;

4) Click the button 📠 to save the current project (Tip: the saved project file can be loaded and used later to avoid the trouble of repeated settings);

5) Click the button 🔽 to download standalone data, and the "Download Project" dialog box will pop up;

```
Download Project                                    ✕

  Chip Type: Winbond  W25Q32DW  [SOIC8-208]
  Data File: 32Mb.bin
  Data File: 1FE451FEh (1FE261E2h + 0001F01Ch)

  Programming Area: A+B+C
  Programming Actions: E+P+V         Note: When manually programming, select "Chip Insert"
                                     or "KEY Sart" (only SP20P supports KEY start). When
  Chip ID Check: Enable              using with an automatic programming machine, please
  Check Pins: Enable                 select "ATE control (machine mode)"

  Auto S/N: Disable


  Start Mode:    Chip Insert        ⌄
                 Chip Insert
                 KEY Start
                 ATE Control
                            OK             Cancel
```
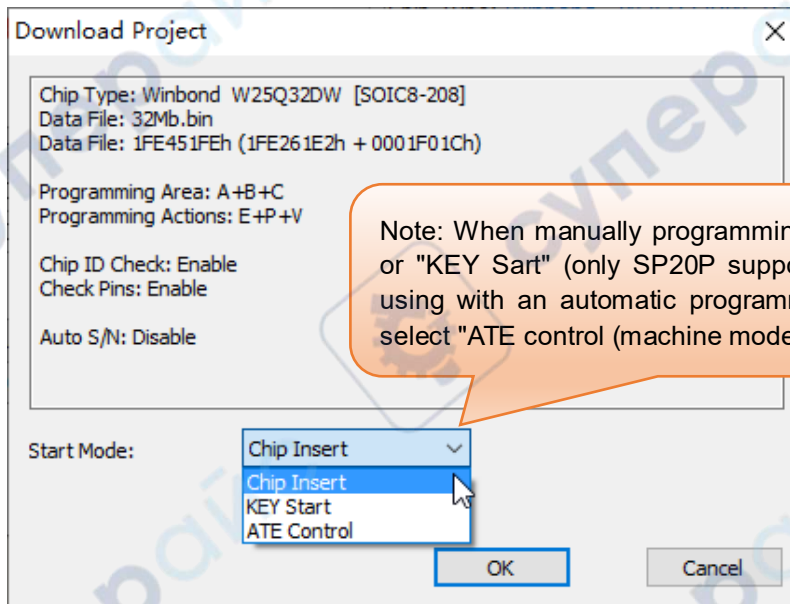
6) Click OK to download the standalone data to the programmer's built-in memory
   Tips: standalone data will not be lost after the programmer is powered off, and you can continue to use it next time.

```
  🖥 SP20P  S/N: 2912450002                    Counter

       70%      Download project...          00002

                                             00000
```
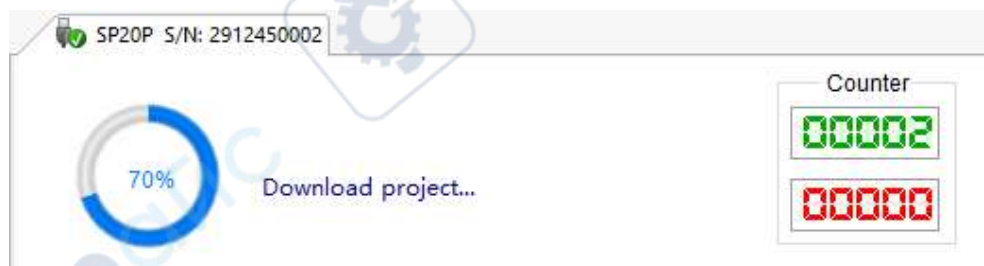
4.2 Standalone programming operation

Manual mode

Programming method of picking and placing chips manually. The manual operation steps in standalone mode are as follows:

1) Download standalone data according to the method in section **4.1.** Note that when downloading standalone data, select the startup control mode as "Chip Placement" (SP20P can also select "Key Start");

2) Unplug the USB cable from the computer and connect it to the 5V power adapter. After the programmer is powered on, it will first check the internal standalone data to verify the integrity and accuracy of the data. This takes 3-25 seconds. If the test is passed, the indicator light flashes blue, indicating that the programmer has entered the standalone programming mode. If the test fails, the indicator shows a red flashing state, indicating that there is no valid standalone data in the programmer, and standalone programming cannot be started;

Connect to 5V power adapter for Standalone programming
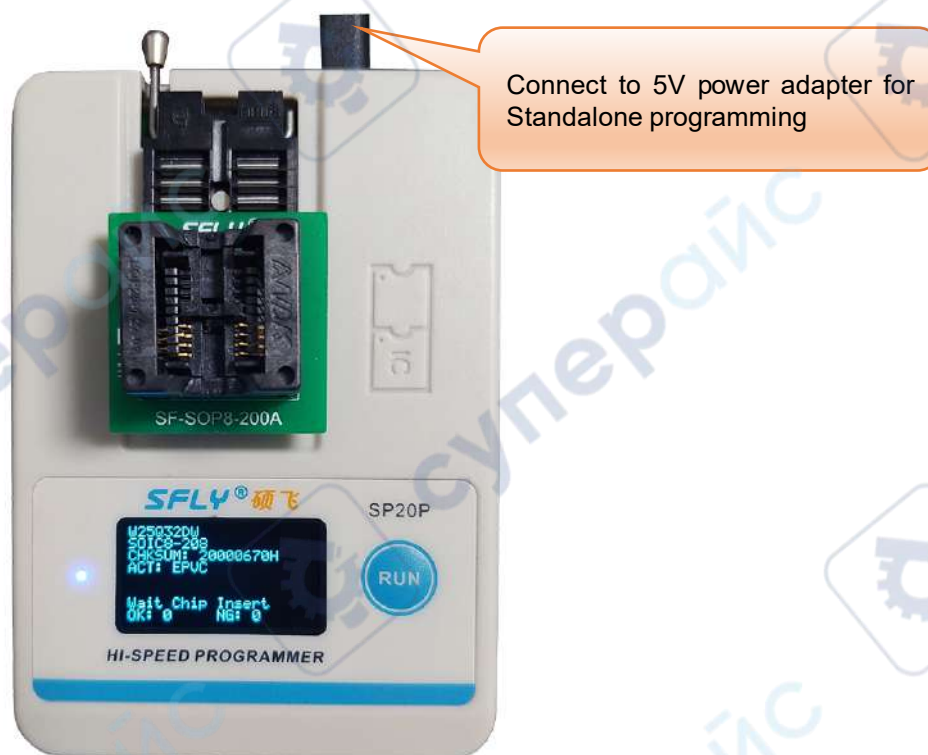
Note: Only SP20P can display the working status of the programmer more intuitively through the OLED screen, as shown in the figure above, it prompts to wait for the chip to be inserted.

3) Put the chip to be programmed on the ZIF socket, the indicator light changes from flashing blue to steady blue, indicating that the programmer has detected the chip and is programming;

4) When the indicator light turns steady green, it means that the chip programming is completed and the programming is successful. If the indicator light turns red, it means that the current chip programming has failed. At the same time, the programmer waits for the current chip to be removed from the ZIF socket. If the buzzer prompt function is turned on, the programmer will beep when the programming is completed;

5) Take out the chip and put it in the next chip, repeat this step until the programming is completed.

Automatic control mode (control via ATE interface)

SP20X/SP20P has an ISP/ATE multiplexing interface, which can be used with automatic programming machines and other automatic equipment to realize automatic programming (automatically pick and place chips, automatic programming). Proceed as follows:

1) Download standalone data according to the method in section **4.1**. Note that when downloading standalone data, select the start control mode as "ATE control (machine mode)". In this working mode, the ATE interface of the programmer can provide START/OK/NG/BUSY indicator signal;

2) Lead the chip pin line from the ZIF socket to the programming machine;

3) Connect the machine control line to the programmer "ISP/ATE interface", the interface pins are defined as follows;

ISP/ATE interface

3--BUSY   5--OK   9--NG
7--START   2--VCC   4/6/8/10--GND

4) Start programming.

4.3 Indicator status in standalone mode

Indicator status	State description (manual method)	State description (automatic control mode, only SP20X, SP20P)
Flashing red	The programmer did not download standalone data	The programmer did not download standalone data
Flashing blue	Wait for chip placement	<No such status>
Blue	Programming chip	Programming chip
Green	The chip programming is completed and the programming is successful (Waiting for chip removal)	The chip programming is completed and the programming is successful
Red	Chip programming failed (Waiting for chip removal)	Chip programming failed

Chapter 5 Programming in ISP mode

The full name of ISP is In System Program. In ISP programming mode, you only need to connect a few signal lines to the relevant pins of the onboard chip to realize the read and write operations of the chip, which can avoid the trouble of desoldering the chip. SP20 series have a 10P ISP/ATE multiplexing interface, the chips on the circuit board can be programmed through this interface.

5.1 Select ISP programming mode

SP20 series programmers can support ISP mode programming of some chips. Click the "chip model" button in the software to search for the chip model to be programmed, and select "ISP mode programming in the "Adapter/Programming Mode" column "(If there is no ISP mode programming in the searched chip programming method, it means that the chip can only be programmed with the programming socket). Refer to the picture below:
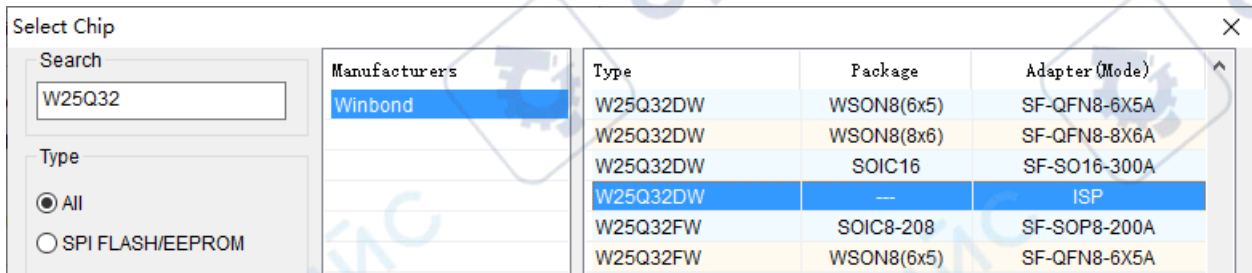

5.2 ISP interface definition

The ISP interface definition of SP20 series programmer is as follows:

ISP/ATE interface

A 10P color ISP cable is randomly distributed to connect the ISP interface and the target board chip. The 5x2P plug is connected to the ISP interface of the programmer, and the other end is connected to the corresponding pin of the target chip through the DuPont header terminal.

Connect the target chip through the DuPont head
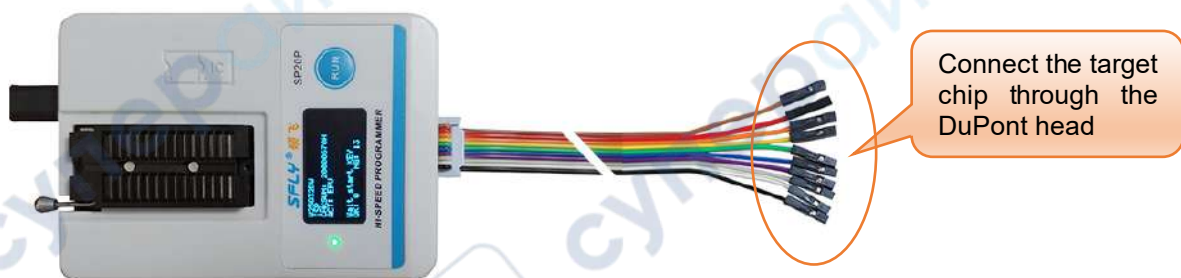
The corresponding relationship between the color of the ISP cable and the pins of the ISP interface is as follows:

| Colour	Corresponding to ISP interface pins	Colour	Corresponding to ISP interface pins
Brown	1	Blue	6
Red	2	Purple	7
Orange (or pink)	3	Grey	8
Yellow	4	White	9
Green	5	Black	10

5.3 Connect the target chip

Click the "chip information" page on the main software interface to view the connection schematic diagram of the ISP interface and the target chip. Refer to the picture below:
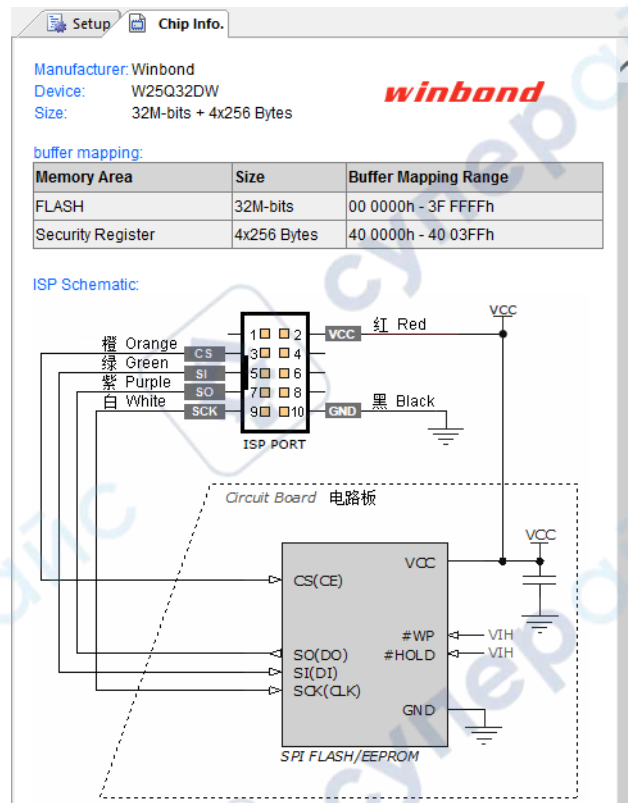
Different chips have different connection methods. Please click the "chip information" page in the software to view the detailed connection methods of the chip.

5.4 Select ISP power supply mode

During ISP programming, the target chip has two power options: powered by the programmer and self-powered by the target board. Set whether to check "Provide power to target board" on the "Project Settings" page of the software:
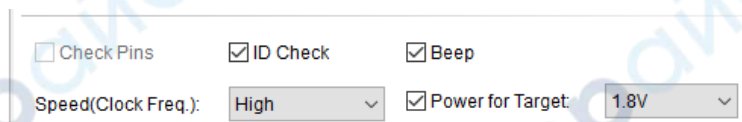
Check "Provide power for target board", the programmer will provide power for the target board chip, please choose the power supply voltage according to the chip's rated working voltage. The programmer can provide a maximum load current of 250mA. If the load current is too large, the programmer will prompt over-current protection. Please uncheck "Provide power for the target board" and change to the target board's self-powered (SP20 programmer can support 1.65 V~5.5V target board operating voltage range, ISP signal driving voltage will automatically adjust with the target board's VCC voltage).

5.5 Programming operation

Check that the hardware connection and software settings are correct, and click the button ▶ Auto to complete the ISP programming of the chip.

⚠ ● ISP programming is relatively complicated, and you must be very familiar with the circuit;
● The connecting wires may introduce interference and the interference of other circuits on the circuit board, which may lead to the failure of ISP programming. Please remove the chip and use the conventional chip socket to program;

Chapter 6   Programming in Multi-machine Mode

The programmer software supports simultaneous operation of up to 8 programmers connected to one computer (mass production or download standalone data).

6.1 Hardware connection of programmer

1) Use USB HUB to connect multiple programmers to the computer's USB port (USB hub must have an external power adapter, and an external power supply is required). Note that in multi-machine mode, only programmers of the same model can be used together, and different models cannot be mixed.

2) Start the SP20 programmer software, the software will automatically connect to all connected programmers and enter the multi-machine mode. If the programmer software is already running, you can click Menu → Programmer → Reconnect, and the software will pop up the "Connect to the programmer" dialog box:
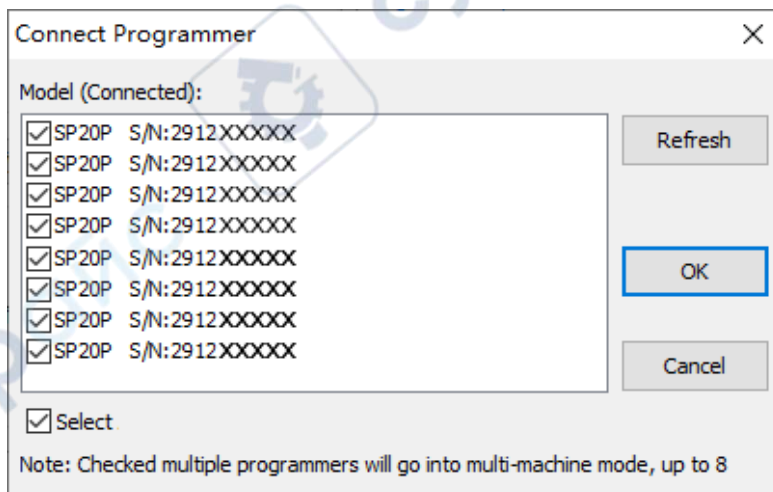
Select the programmer to be connected and click OK. After the connection is successful, the software enters the multi-machine mode, and the interface is as follows:

6.2 Programming operation

1) The programming operation is the same as the programming procedure in section 3.2: select chip model → load file → set operation options → install programming socket;

2) Click the ▶ Mass Chip Insert ☑ button(Note: SP20P can choose two mass programming modes: "Chip Insert" and "Key Start". In this example, select the "Chip Insert" mode), and the programmer will wait for the chip to be placed;

3) Put the programmed chips in the programming socket one by one, and the programmer will automatically start programming after detecting that the chips are put in. Each programmer works independently, programming in full asynchronous mode, no need to wait for synchronization. The software programming interface is as follows;

4) Pick and place the chips according to the indicator status description in Section **3.4** or the prompts on the display screen to complete the entire mass of chip programming.

Tips:
SP20F,SP20X,SP20P support standalone programming. You can use the existing USB port on the computer to connect one or more programmers to download standalone data, and then use the standalone method for mass programming. Compared with the USB method, it is more convenient and more efficient. SP20B does not support standalone and can only be connected to a computer for mass programming.

Appendix 1   FAQ

😞 **Can the programmer support img files?**

- The programmer software supports binary and hexadecimal file encoding formats. The conventional suffix of binary files is *.bin, and the conventional suffix of hexadecimal files is *.hex;
- img is just a file suffix, and does not represent the file encoding format. Normally (above 90%) such files are binary encoded. Just load it directly in the software, the software will automatically recognize whether the file is binary code, and load it in the recognized format;
- To ensure the accuracy of file loading, we recommend that users check the buffer checksum and file checksum with engineer (or file code providers/customers) after loading such files. (These information will be displayed at the bottom of the main window of the writer software.)

😊 **What are the common reasons for programming failure (including erasing failure/ programming failure/verification failure/ID error, etc.)?**

- The chip manufacturer/model selected in the software does not match the actual chip;
- The chip is placed in the wrong direction, or the programming socket is inserted in the wrong position. Please check the correct placement method through the "Chip Information" window of the software;
- Poor contact between the chip pins and the programming socket;
- Connect chips that have been soldered on other circuit boards by wires or IC programming clips, which may cause programming failure due to circuit interference. Please put the chips back into the programming socket for programming;
- The chip may be damaged, replace with a new chip for testing.

😊 **What are the precautions for ISP programming?**

ISP programming relatively complex to realize, suitable for people with certain professional knowledge, you need to know how to read the circuit schematic and know the circuit diagram of the target board. The software supports ISP programming of some commonly used FLASH and EEPROM, first of all, you need to select the ISP programming method of the current chip in the software. When using the ISP programming method, you need to pay attention to the following matters:

- Ensure that the main controller (e.g. MCU/CPU) connected to the target Flash does not access the target chip, and all the connected IO ports of the mian controller should be set to high resistance (you can try to set the mian controller to RESET state).
- Some control IO ports of the programmed chip must meet the normal working conditions of the chip, for example:
  The HOLD and WP pins of SPI FLASH must be pulled up to a high level.
  SDA and SCL of I2C EEPROM must have pull-up resistors, and WP pin must be pulled down to low level.
- Keep the connect wires as short as possible. Some chips fail to program with the included ISP cable
- Set the appropriate voltage/clock parameters for ISP programming in the Setup options:
  Only one of the two options can be used: powering the target board itself or powering the target board from the programmer.
  No matter which power supply method is used, the VCC must be connected.
- The ISP method is affected by the peripheral circuitry of the target board or the connecting wires, so it is not guaranteed that all chips can be burned successfully. If the connection and settings are repeatedly checked and still cannot be progrmmed successfully, it is recommended to remove the chip and programming it with a standard chip Socket. In mass production, try to use the first programming and then SMT method.

😊 **Why does the 24 series chip have no erase function?**

- The chip is based on EEPROM technology, the chip data can be directly rewritten without pre-erasing, so there is no erasing operation available;
- If you need to clear the chip data, please write FFH data directly to the chip.

🙂 **How to upgrade the programmer software and firmware?**

● Click the programmer software menu: Help-Check for updates. If there is an update, an update wizard will pop up. Please follow the prompts to download the upgrade package and install it;

● Enter the download center of Sfly official website (http://www.sflytech.com), download the latest programmer software and install it;

● Only need to upgrade the programmer software, no need to upgrade the programmer firmware.

🙂 **What should I do if there is no chip model in the programmer software?**

● First upgrade the programmer software to the latest version;

● If there is no chip model to be programmed in the latest version of the software, please send an email to apply for addition. Indicate the following information: programmer model, chip brand to be added, detailed chip model, package (reminder: SP20 series programmers can only support SPI NOR FLASH, EEPROM, other types of chips cannot be supported).

Appendix 2 Disclaimer

Shenzhen Sfly Technology Co., Ltd. does its utmost to ensure the correctness of the product and its related software and materials. For possible product (including software and related materials) defects and errors, the company will do its best to solve the problem with its commercial and technical capabilities. The company is not responsible for all kinds of incidental, inevitable, direct, indirect, special, extended or punitive damages arising from the use or sale of this product, including but not limited to the loss of profit, goodwill, availability, Business interruption, data loss, etc., shall not be liable for any direct, indirect, incidental, special, derivative, punitive damages and third-party claims.