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Outline

What is IS01?

IS01 is a professional multifunction serial programmer with small volume, fast programming speed, good stability and high cost performance; it supports almost all serial programmable devices and is very suitable for In-System or In-Application applications. It can also support IC offline programming with certain IC sockets .

General functions

- Very fast programming speed, which is selectable to adapt to cable length and load feature of user board.
- Supports online (USB2.0 high-speed) and offline mode simultaneously.
- Supports most ISP protocol, e.g. I2C, SPI, UART, BDM, MW, JTAG, CAN, RS232 etc.
- Have standard ATE interface to facilitate operation and control of external ATE device.
- Have overcurrent protection function to protect your equipment comprehensively.
- Apply to many fields attributing to stable and reliable design, for example, R & D, mass production as well as in-system programming etc.

Hardware functions

- Provides interfaces for I2C, SPI, UART, BDM, MW, JTAG, RS232, CAN etc.
- Provides VDD(0.5A) output line to supply light-load target system with power to directly (generally not recommended) and VPP (0.2A).
- Long cable drive circuit has ESD protection, I/O level can be adjusted by software in the range of 1.5V~4V.
- Online software operates the programmer and manages offline project via USB (2.0 high-speed).
- In offline state, the operations are shown through LCD screen, 6-key pad and LED status, and the project file is stored using SD card (max. 4GB).
- ATE interface provides the possibility of operating and controlling programmer through external signals. Among them, there are 6 project selection lines (SEL0~SEL5), 2 command input lines (START and STOP) as well as 3 status output lines (PASS, FAIL and BUSY). External signals are isolated from the system all through optocouplers.
- 12VDC/2A system external power input.

Software functions

- Support a wide range of devices, can support almost all the chips with ISP function (Attention: not all algorithms for programming are free of charge).

- Very fast programming rate, which is selectable (three gears as high, medium and low) to adapt to different cable length and load feature of user board.
- Support dynamic buffer function (each chip burns different contents, the application example includes serial number, MAC address, sensor calibration etc.), the interface is of open type.
- SD card supports FAT32, FAT16 etc.; can be managed using card reader.
- Provide good software interface (DLL, not free of charge) to facilitate third-party system integration. Typical application such as ICT (online tester).
- Operate up to 12 programmers through one USB HUB. Chips and files can be different.

System requirements

Minimum requirement for system is as follows: Pentium or above compatible computer, desktop or portable computer; at least there is a universal serial bus interface to USB2.0 standard; Windows XP/Vista operating system; CD-ROM; hard disc with at least 1GB free space.

Standard package of the programmer

The standard package includes the following items:

- One programmer ;
- One ISP cable, type A (supports interface other than CAN and RS232)
- One connecting cable for USB interface
- One power adapter (output DC12V)
- Installation software, one CD-ROM disc
- One sheet of user registration form.

Options:

- ISP cable, type B (supports CAN and RS232 interface)
- Adapter kit for offline programming. If you want to perform offline programming on the device like a universal programmer, you only need connect ISP cable to the kit board and insert the chip into the kit socket. The adapter kit consists of the upper and lower boards, the upper board is the adapter for SP 5000, the user can select it according to the chip package. The lower board is the jumper adapter.

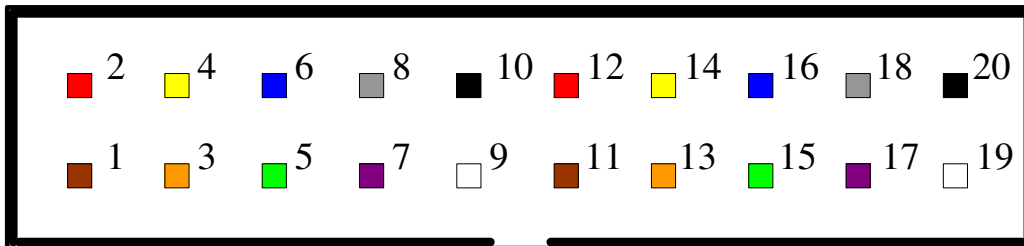
Hardware installation

Connection of ISP cable with the target system

Description of connection port

ISP connection port contains the signal ends required for programming of target system. The connection port is divided into group A and group B:

Port A is a 10X2 port. The programming interfaces required for most serial protocols are contained in this port, e.g. SPI, I2C, JTAG, UART, BDM etc., the pins of this port are defined as follows:



Pin #	Signal Name	Description
1	GND	Ground
2	GND	Ground
3	DIO0	Digital input/output 0
4	DIO1	Digital input 1
5	DIO2	Digital output 2
6	DIO3	Digital input 3
7	DIO4	Digital output 4
8	DIO5	Digital output 5
9	DIO6	Digital input/output 6
10	DIO7	Digital output 7
11	SCL	Special function Pin for I2C SCL
12	SDA	Special function Pin for I2C SDA
13	EVOL	target system power on detection(input)
14	Reserved1	Reserved digital input 1
15	Reserved2	Reserved digital output 1
16	Reserved3	Reserved digital output 1
17	VPROG1	Programmable voltage 1(max 5.5V, 500mA)
18	VPROG1	Programmable voltage 1(max 5.5V, 500mA)
19	VPROG0	Programmable voltage 0(max 18V, 250mA)
20	VPROG0	Programmable voltage 0(max 18V, 250mA)

Notes:

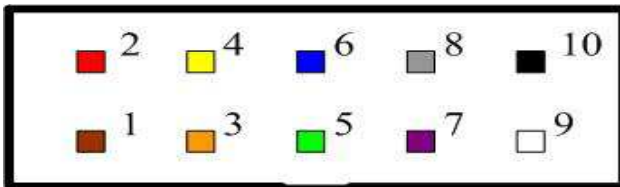
1. IS01 has a working mode called “mass production”, that is, once the programmer detects that the target board gets ready and ISP signal arrives, it immediately starts the functional operation defined by AUTO without keyboard operation. TPIN and TPOUT in

the port are provided for this purpose. TPOUT supplies high level, and TPIN is level detection input line. Short-circuit them on the target board, once ISP signal is applied to the test point, TPIN immediately detects high level, and AUTO command sequence can be started.

2. Reserved1-2 is only used when the multi-object system is programming. On some target board there are several identical I2C chips that need to be burned, and the chip that needs to be burned currently can be selected through address line, then, Reserved1-2 is connected to A0 and A2, respectively.

+

Port B is a 5X2 port. CAN and RS-232 come out from this port. The pins are defined as below:



Pin #	Signal Name	Description
1	EVOL	target system power on detection(input)
2	RX	RX(input, RS-232 levels)
3	TX	TX(output, RS-232 levels)
4	VPROG0	Programmable voltage 0(max 18V, 250mA)
5	GND	Ground
6	VPROG1	Programmable voltage 1(max 18V, 250mA)
7	RTS	RTS(input, RS-232 levels)
8	CTS	CTS(input, RS-232 levels)
9	CANH	CAN Bus difference signal for high
10	CANL	CAN Bus difference signal for low

Definition of several common interfaces

In order to facilitate use by customer, we have defined several common interfaces corresponding to ISP port (this definition only contains communication protocol pins, for the specific wiring method, please refer to the hint on the software of host computer), the pin correspondence table is as follows:

Pin #	Signal Name	IO Type	SPI	I2C	JTAG	BDM	UART
1	GND						
2	GND						
3	DIO0	Input/Output					
4	DIO1	Input					CTS
5	DIO2	Output	SPIMOSI		TDO		TXD
6	DIO3	Input	SPIMISO		TDI		RXD
7	DIO4	Output	SPICLK	SCL	TCK		RTS
8	DIO5	Output			TRST	RESET	
9	DIO6	Input/Output		SDA		BDM	
10	DIO7	Output			TMS		
11	SCL						
12	SDA						
13	EVOL						
14	Reserved1						
15	Reserved2						
16	Reserved3						
17	VPROG1						
18	VPROG1						
19	VPROG0						
20	VPROG0						

Note: SDA and SCL are reserved for test, and generally are not provided for user.

Examples for connection of target system

Before programming the target device, you must be familiar with the target device, learn the function of each pin of the device; read on the instructions on programming of this device with ISP programmer carefully; know the hardware programming interfaces on the target board; and confirm compliance of target board design with ISP requirements (see the section “ISP requirements for the target system” for detail).

The programming operation steps are as follows:

1. Search the type of the chip to be operated in ISP programming software and view the operation hint.
2. Exactly connect the signal lines (including GND) for the corresponding interfaces of ISP programmer with the target board.
3. If the above “mass production” function is to be used, TPIN and TPOUT signal lines should also be connected.
4. It is recommended that power of target board is supplied independently, especially for the target board with high power consumption and with multiple power systems. If it is confirmed that the power is supplied by programmer ISP cable, then, VCC (sometimes also need Vpp) should be connected.
5. The independent power supplier of target board switches on the power.
6. Operation functions for running the programmer chip.

Take AT Mega48 as an example, according to the operation hint, we should make line connection according to the table below:

ISP Programmer		Target system
Pin #	Signal Name	Connection
1	GND	GND
2	GND	GND
3	DIO0	No connect
4	DIO1	No connect
5	DIO2	MOSI
6	DIO3	MISO
7	DIO4	SCK
8	DIO5	RESET
9	DIO6	No connect
10	DIO7	No connect
11	SCL	No connect
12	SDA	No connect
13	EVOL	(1.8-12 VDC) Notel
14	Reserved1	No connect
15	Reserved2	No connect
16	Reserved3	No connect
17	VPROG1	Supply 1.8-5.0 VDC
18	VPROG1	Supply 1.8-5.0 VDC
19	VPROG0	No connect
20	VPROG0	No connect

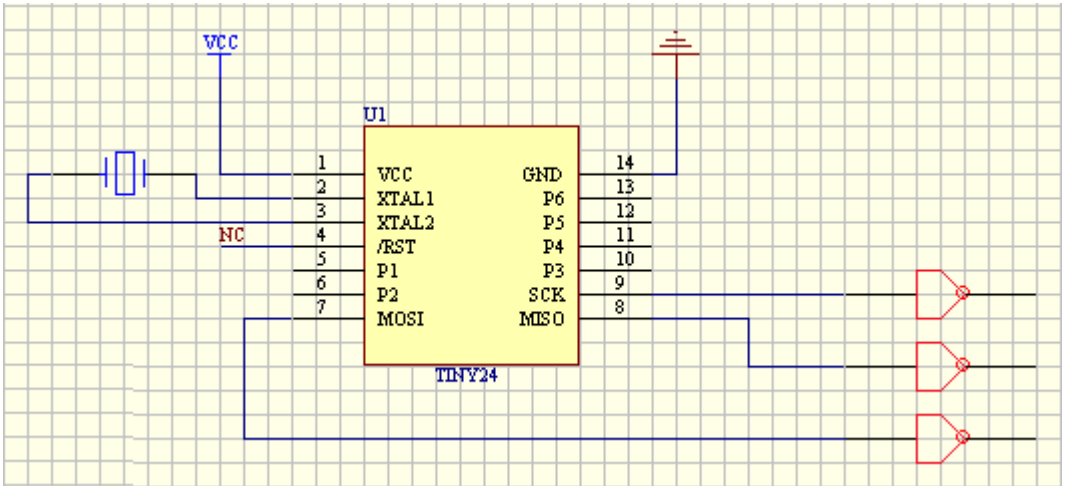
ISP requirements for target system

The first step to adopt ISP programming is to take into account the particularity of ISP at the design stage of target board. This point is often neglected by many people, they think it is enough as long as the control signal lines are connected to IC's corresponding pins.

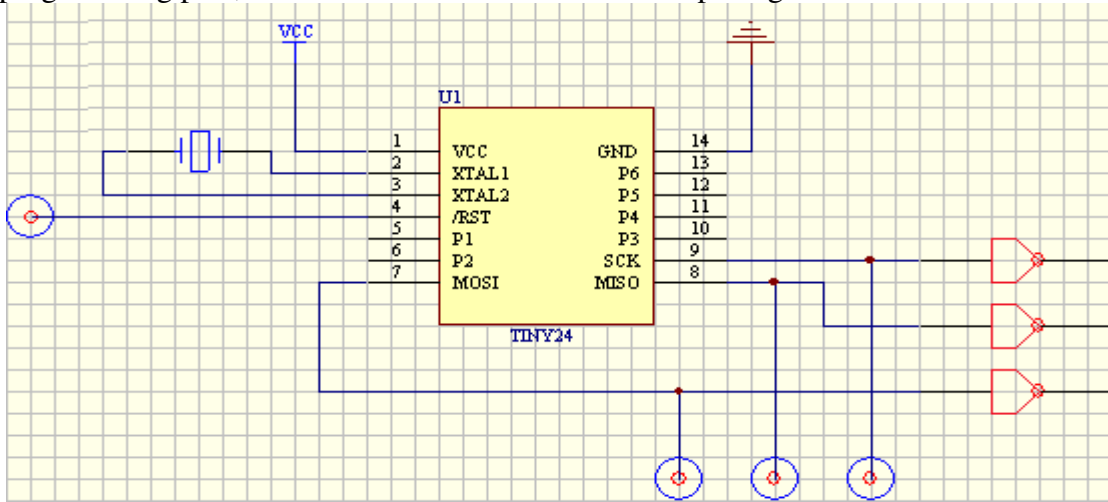
Attentions on pin connection

1. Pins required during the programming all should have interface terminals or measuring points in order to ensure that IS01 can be connected to them conveniently.
2. In order to prevent the required programming pins from incurring signal jump during the programming, it must be ensured that the PCB circuit board where programming pins locate is not connected with other circuits.

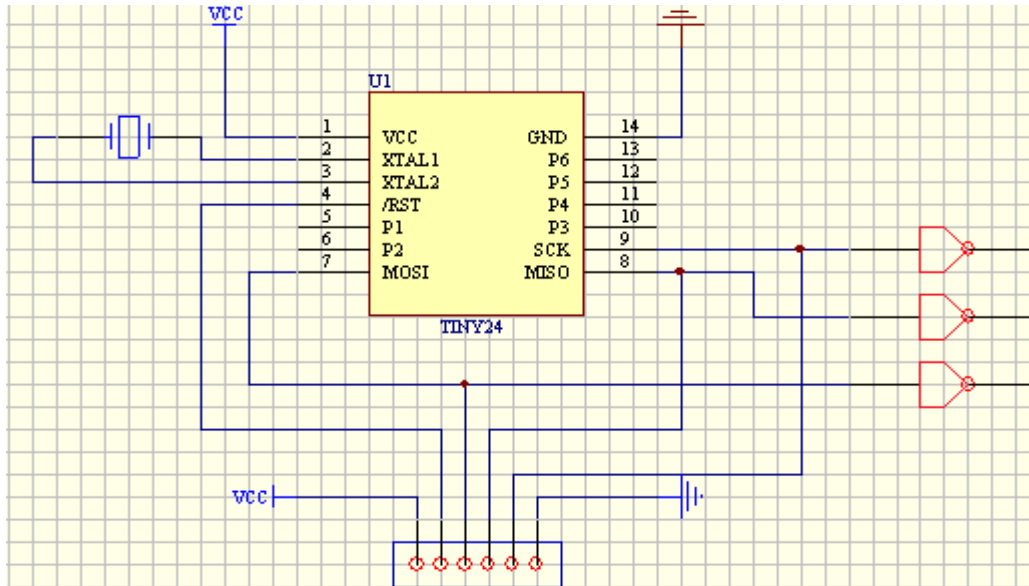
Below are some common circuit connection methods, we will describe their merits and demerits one by one.



Such design in above figure makes the programmer difficult to connect with the programming pins, and also makes difficult to test the pin signals.



All the programming pins in above diagram have test point, therefore, it is easy to measure the signal values. But since there are no connecting terminals for programming, it is still not easy to connect with the programmer.



The pins required for programming in above diagram are all connected to the interface terminals, therefore, it is very easy to test and burn record, therefore, such connection way is what we recommend.

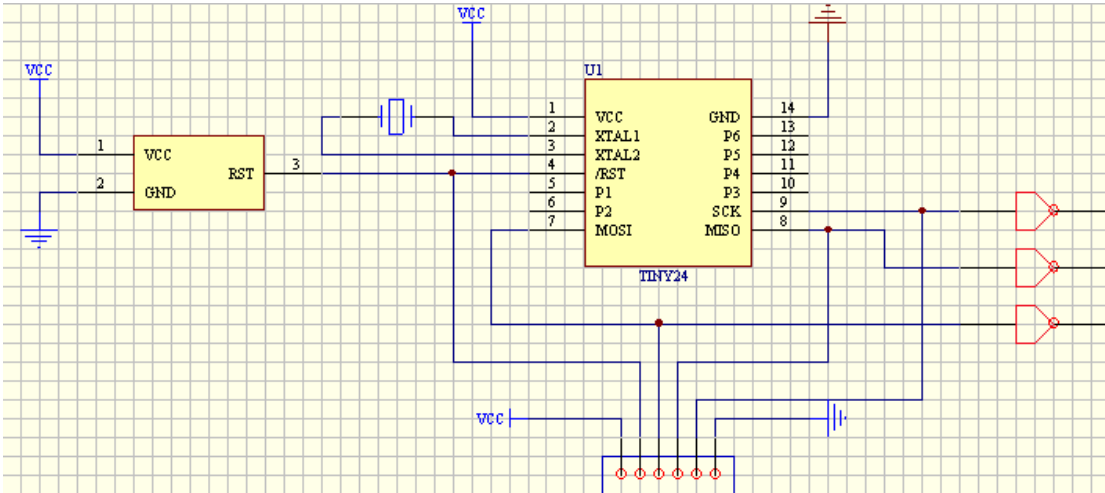
Precautions for power:

Though XELTEK ISP programmer can provide programming power (1.8-18V, 5W), in most cases the power provided by ISP programmer is not sufficient to make the target board work normally, therefore, we preferably recommend to use the self-contained power of the target board. During the programming, if the self-contained power of the target board is needed, that is, working voltage (VCC) and programming voltage (VPROG), all target boards must ensure their correct programming voltages, which are determined by the chips that need to be programmed and other circuits, please refer to the programming manual of this chip for detail.

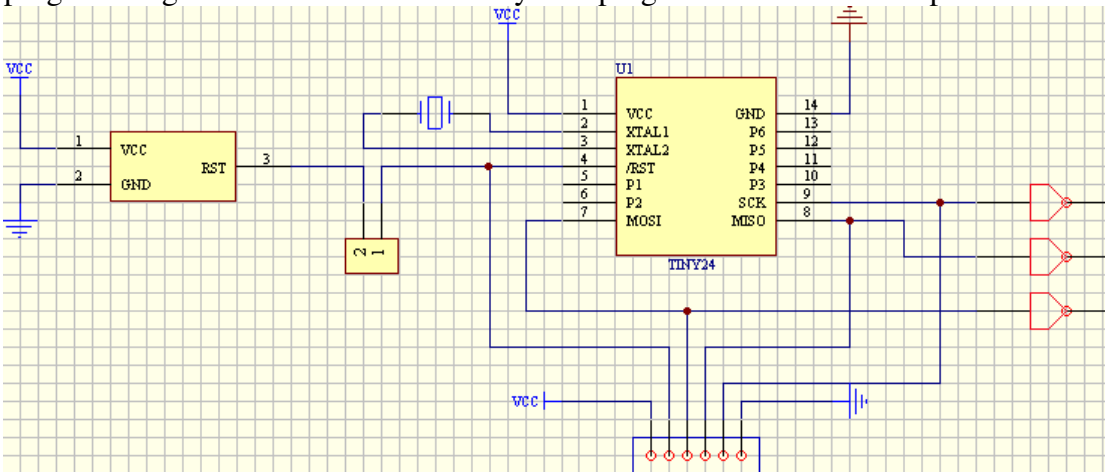
If it is required to verify the programming chip with different voltage, PCB board must be able to provide working voltage with different range of accuracy.

Precautions for the design with reset generator

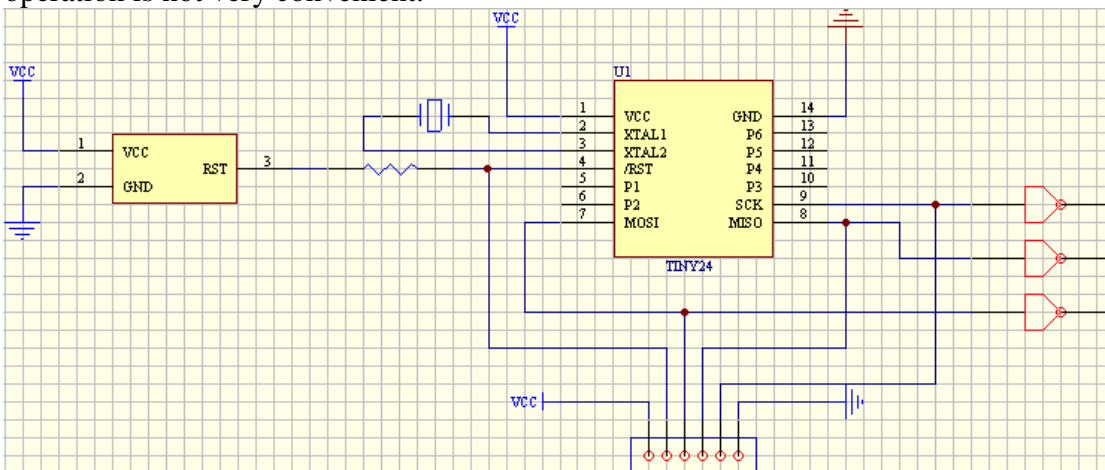
If ISP needs to use RESET pin, and when the RESET generator has already been provided on the target board, please take care. The RESET generator may conflict with the actuation signal of the programmer. Below they are described one by one.



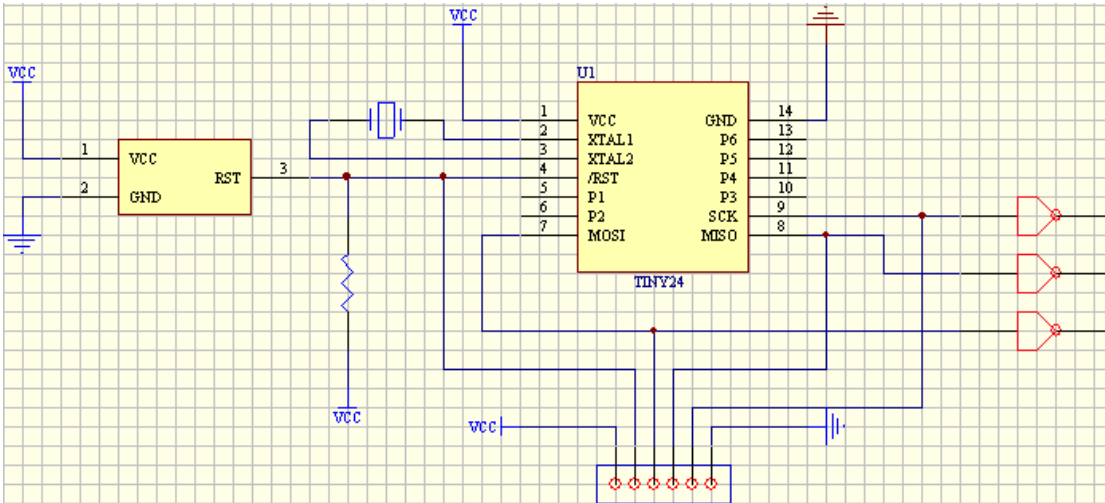
The reset generator in such connection in above diagram conflicts with the Reset pin for programming. Be careful when the In-System programmer drives Reset pin.



Such connection in above diagram eliminates pin conflicts by adding a jumper, but such operation is not very convenient.

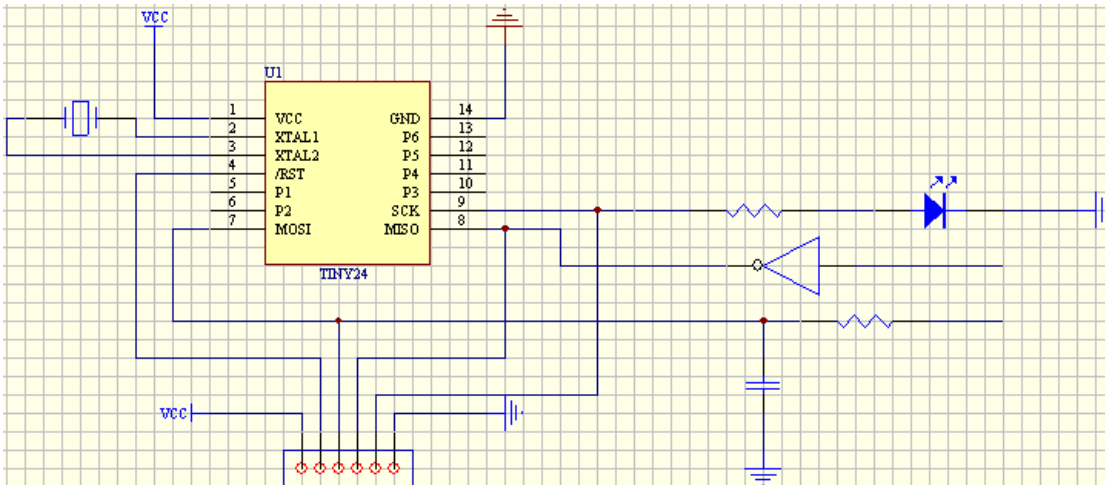


Such connection in above diagram eliminates the problem of pin conflict through adding a resistance of large value, but we still need to pay attention to the effect of pull-up resistance/pull-down resistance on input level signal of Reset pin.

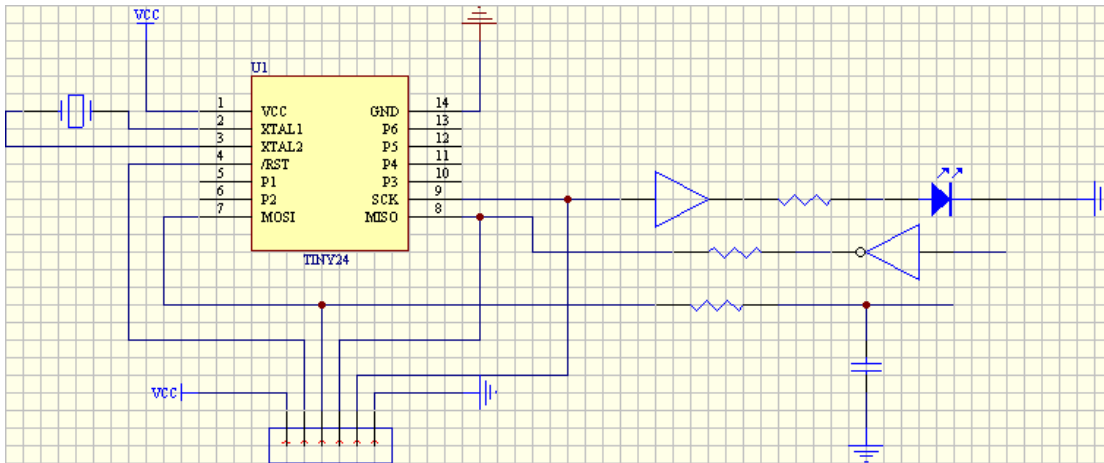


Such connection in above diagram is relatively reasonable, it settles the conflict problem through a pull-up resistance, and makes the equipment work well. It is important to note that some Resetters will automatically delay for a length of time after detecting external reset signal in order to meet the need of external equipment in this way.

Examples of common problems



There are three problems in above diagram ① LED lamp will extract large current from ISP programmer; ② external input signal on MISO pin conflicts with IS01 programming signal; ③ capacitance on MOSI pin may affect the value of level signal output from this pin.



This is the circuit diagram after improvement, it can be seen from the diagram, addition of a buffer before LED can alleviate limitation of IS01 on output current; the series resistances before MISO can eliminate signal conflict; changing connecting position of capacitance eliminates effect of filter capacitance on level signal.

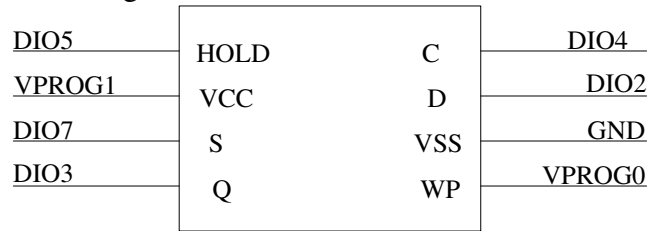
Other matters needing attention

- The watchdog circuit in the programming process can be triggered normally.
- If the bootloader of the chip need using during the programming, the bootloader must have been stored inside the chip before ISP programmer works, except that the bootloader has been stored in the mask ROM inside the chip or set by factory. For example, if there is a bootloader set by factory inside the chip, but if the space where bootloader stored by this chip is erased or modified by ISP, it is impossible to perform other ISP operation. In addition, some chips need special bootloader which makes them work well.
- If the chip contains encryption fuse operation or special function inhibit bit, it may contain online programming inhibit function, therefore, the programming last time may result in ISP function being disabled, please refer to chip manual for detail.
- If the serial working cable for ISP is too long, this may also make ISP unable to work normally. In this case, try selecting medium and low speed in the software.
- Some equipment manufacturers have indicated whether this chip has ISP function or not in the name of the chip. For example, some manufacturers use NIS to indicate the device doesn't support ISP function while use IS to indicate the device does.

Examples for connection of several common serial communication protocols

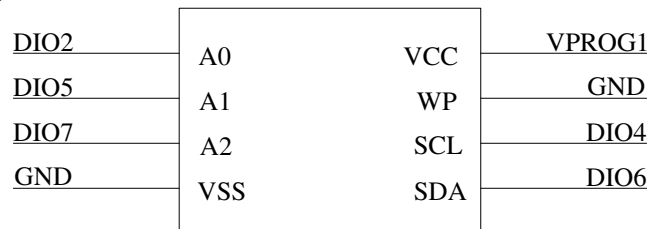
M25P64

M25P64 is a large-capacity serial ROM made by STM company, and programmed through SPI protocol, in this example, the chip packaging mode adopted is SO16, the schematic connection diagram is shown as below:



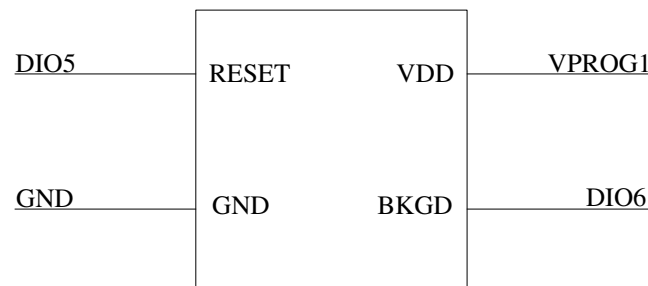
24C04

ST 24C04 is a universal serial ROM made by STM company, and programmed through I2C protocol, in this example, the chip packaging mode adopted is SO8, the schematic connection diagram is shown as below:



S9S08AW16

S9S08AW16 is HCS08 series low power consumption and high-performance 8-bit controller mainly widely used for consumer electronics manufactured by Freescale Comapany. This chip is programmed through BDM serial protocol, in this example, the chip packaging mode adopted is LQFP44, the schematic connection diagram is shown as below:



Use ATE interface to control the programmer

ATE control port is used for communication with external host or integration into the automatic programming and test equipment. Therefore, besides the keyboard, the user can also operate ISP programmer through ATE interface. ATE equipment interface adopts optocoupling device to isolate signals, in order to ensure security and accuracy of signals between the two equipments. In addition, while using ATE interface, it is required to set the power voltage of external equipment signal and appropriate reference voltage point correctly. For the signals of ATE port, please refer to the diagram below:

Pin #	Signal Name	Description
1	SEL0	Optoisolated, flow select input BIT0 (5-24 VDC, 20mA max)
2	SEL1	Optoisolated, flow select input BIT1 (5-24 VDC, 20mA max)
3	SEL2	Optoisolated, flow select input BIT2 (5-24 VDC, 20mA max)
4	SEL3	Optoisolated, flow select input BIT3 (5-24 VDC, 20mA max)
5	SEL4	Optoisolated, flow select input BIT4 (5-24 VDC, 20mA max)
6	SEL5	Optoisolated, flow select input BIT5 (5-24 VDC, 20mA max)
7	OPTO_GND1	Optoisolated input ground
8	OPTO_GND1	Optoisolated input ground
9	START	Optoisolated, flow START, (5-24 VDC, 20mA max)
10	RESET	Optoisolated, flow RESET, (5-24 VDC, 20mA max)
11	PASS	Optoisolated, flow PASS, (open-drain, 25mA max)
12	FAIL	Optoisolated, flow FAIL, (open-drain, 25mA max)
13	OPTO_GND2	Optoisolated output ground
14	OPTO_GND2	Optoisolated output ground
15	OPTO_VCC	Optoisolated output VCC(24V differential max)
16	OPTO_VCC	Optoisolated output VCC(24V differential max)
17	VCC	Non-isolated isp system power supply
18	VCC	Non-isolated isp system power supply
19	GND	Non-isolated isp system GND
20	GND	Non-isolated isp system GND

Time sequence of ATE interface

For the specific operation methods and communication protocols of ATE port, please contact XELTEK.

Installation of software

If you use Xeltek online programmer based on USB port for the first time, the content of this chapter will help you to correctly install the application software for the programmer and connect programmer hardware. USB equipment is a kind of plug & play equipment, in the first time installation, Windows will invoke “add new equipment wizard” and scan all available INF files, attempting to find appropriate driver.

Download the installation software from the Internet

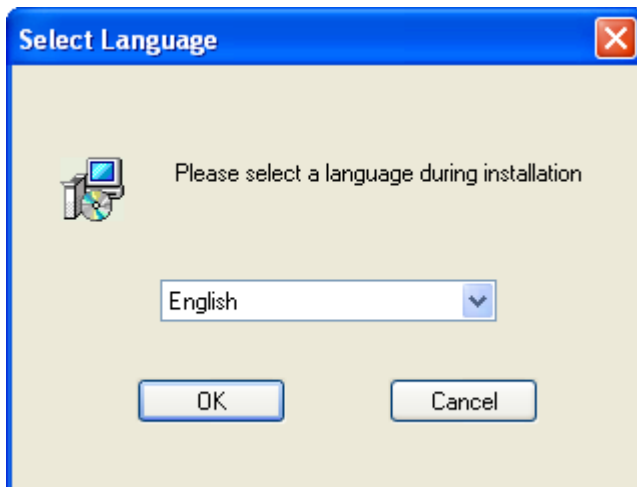
You can download the specific software for a certain model at Xeltek website: <http://www.xeltek.com>. It is usually a self-extracting file. You only need to run this file to setup the software.



Setup Process

The setup procedure goes step by step and you can change the default settings according to your needs in the setup process.

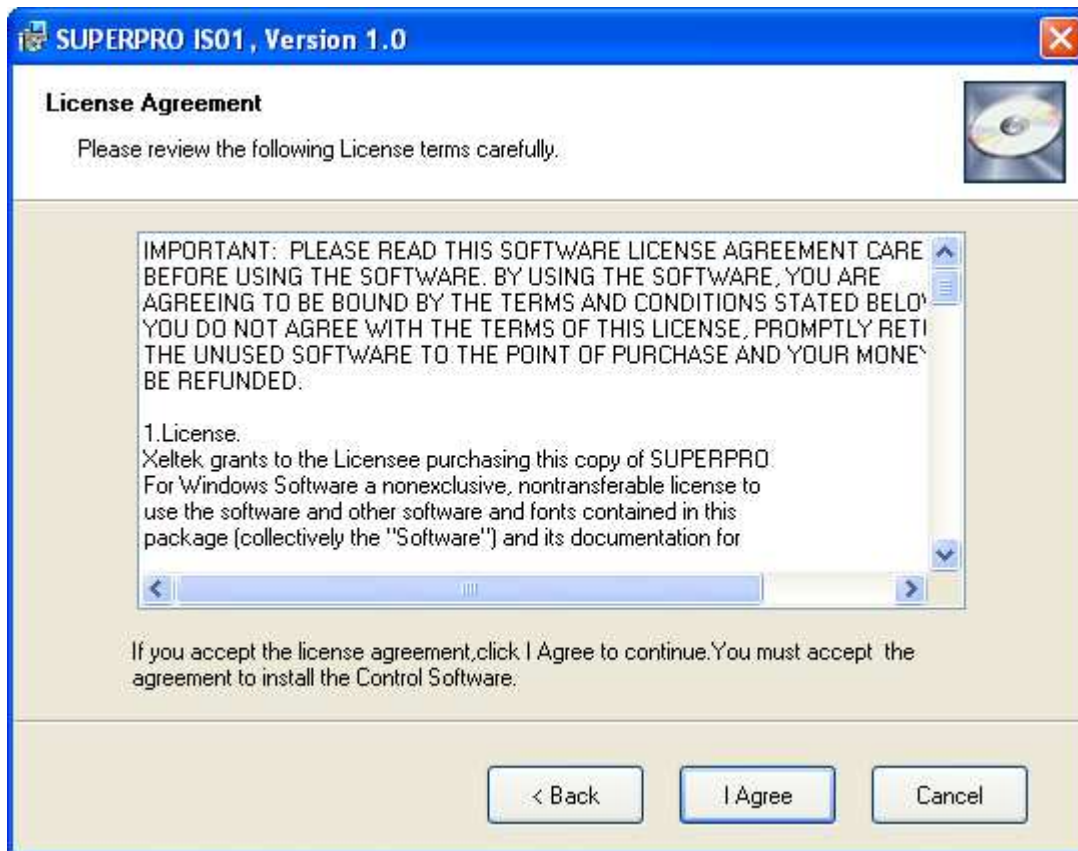
Step 1: Select the language that you want to use in the setup process, as shown in the following language selection interface.



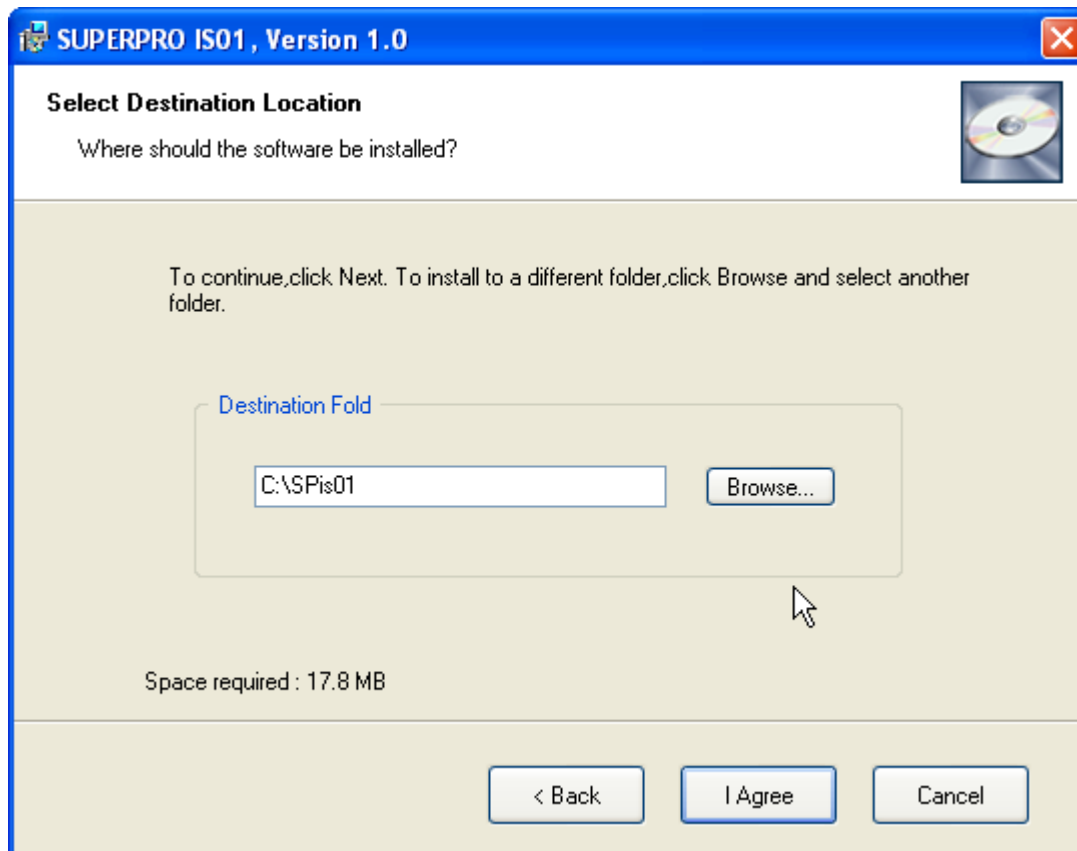
Click the "OK" button and a dialog box of "Preparing to install" appears.



Step 2: Click the "Next" button. The License Agreement appears.

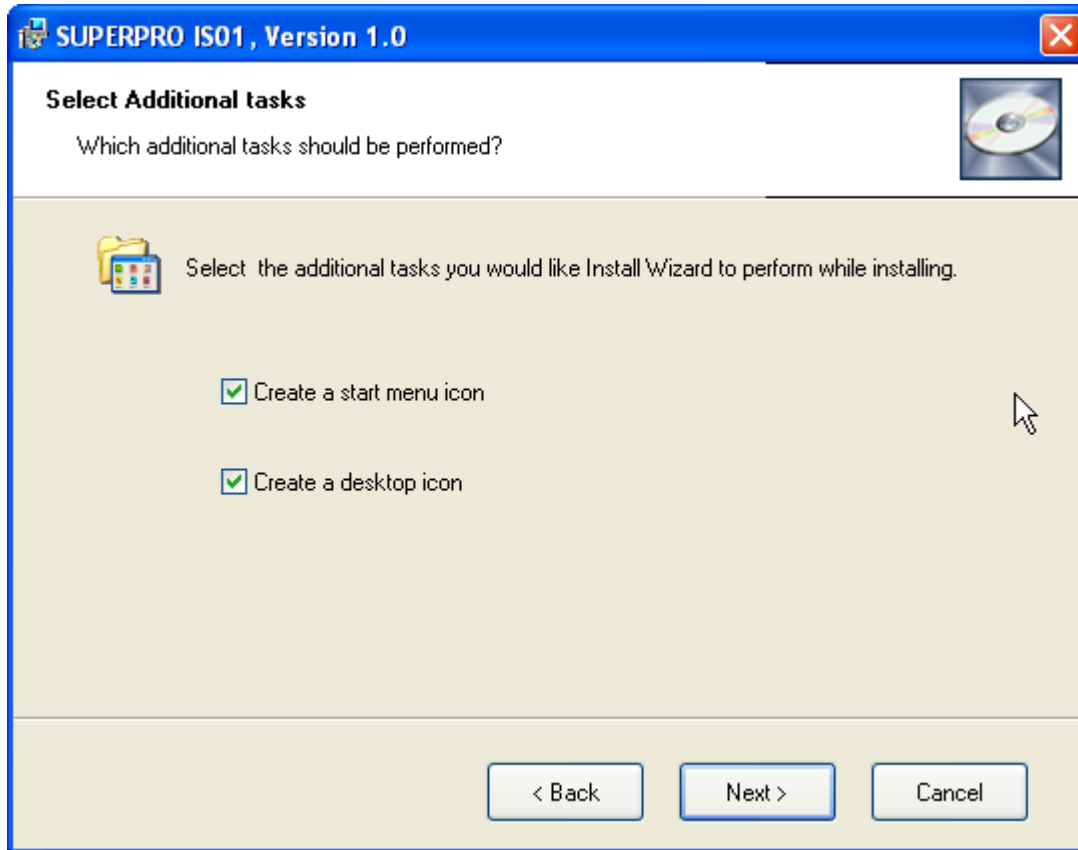


Step 3: Please read the license agreement carefully and click “I Agree” to continue the installation. Otherwise, click Cancel to exit the installation.



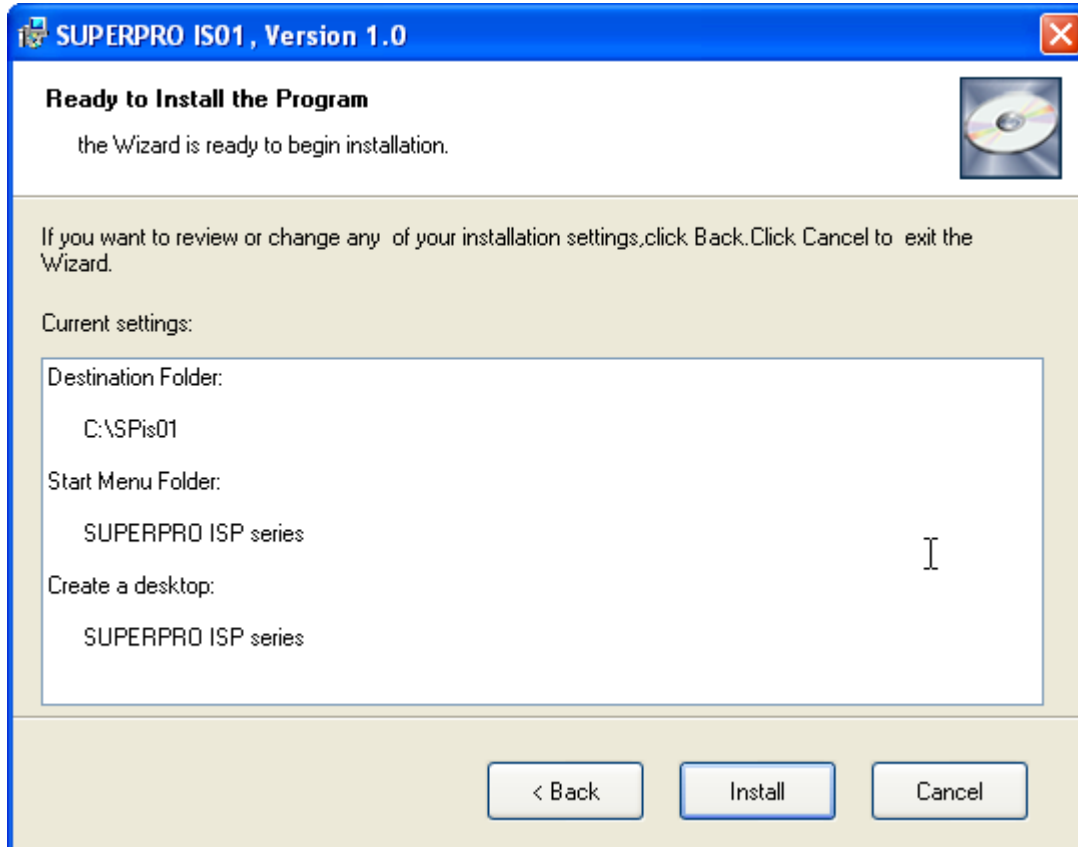
Step 4: You can select the installation path in this step. Click the “Browse” button to change the default destination folder. Click the “Next >” button to continue the installation.

Step 5:



You are asked whether to create a start menu icon and a desktop icon in this step. If you select the default setting, click the “Next” button to continue.

Step 6:

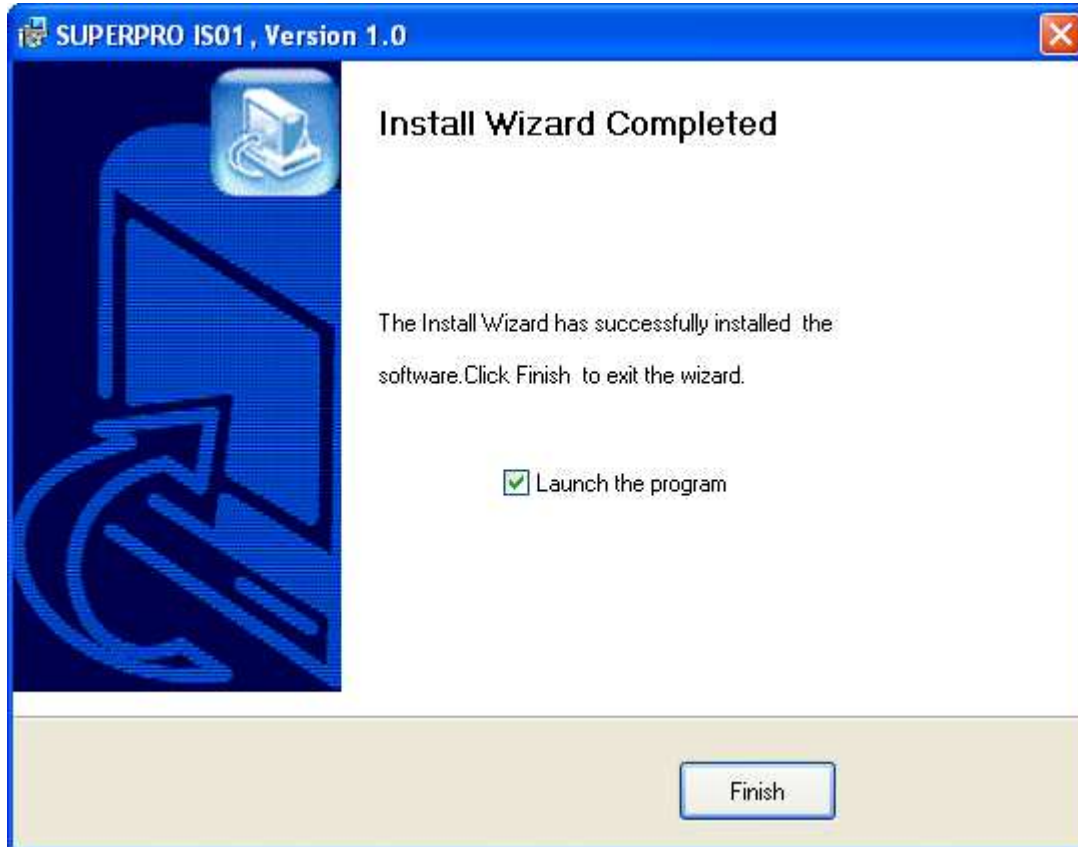


Check the above settings that you set in the setup process. Click the “Install” button to proceed to the next step.

Step 7:

In this step, the files are being copied, the drivers are installed, the software is registered, etc.

Step 8:



Click the “Finish” button to finish the setup.

The hardware and driver installation

Connect the programmer module to your computer through the USB port. Turn on the programmer power switch. After the application software is installed, the driver installation for the first time connection between the computer and the programmer module becomes very simple. You only need to wait until new hardware wizard finishes the installation. The following interfaces will appear on the screen one after another:





The actual interfaces may be somewhat different from the above ones. Anyway the user should wait until the installation finishes. Please don't run any other programs during the installation.

Running the application software for the programmer

The application software for the programmer has a standard Windows UI, including pull down menus and buttons, etc. The user should have some knowledge about the MS Windows OS and be able to use the computer mouse well. After the application software for the programmer is started, it will communicate with the programmer immediately and start the initialization. If the communication fails, please check according to the following steps:

- One programmer module. Check the connection between the programmer hardware and the computer, and turn on the power switch.
- Follow the correct installation steps. If the programmer hardware is connected to the computer before the programmer application software is installed, the computer will detect the new hardware and the following window will appear.



Please click the “Cancel” button lest the OS should install the driver with a compatible ID and cause some problems.

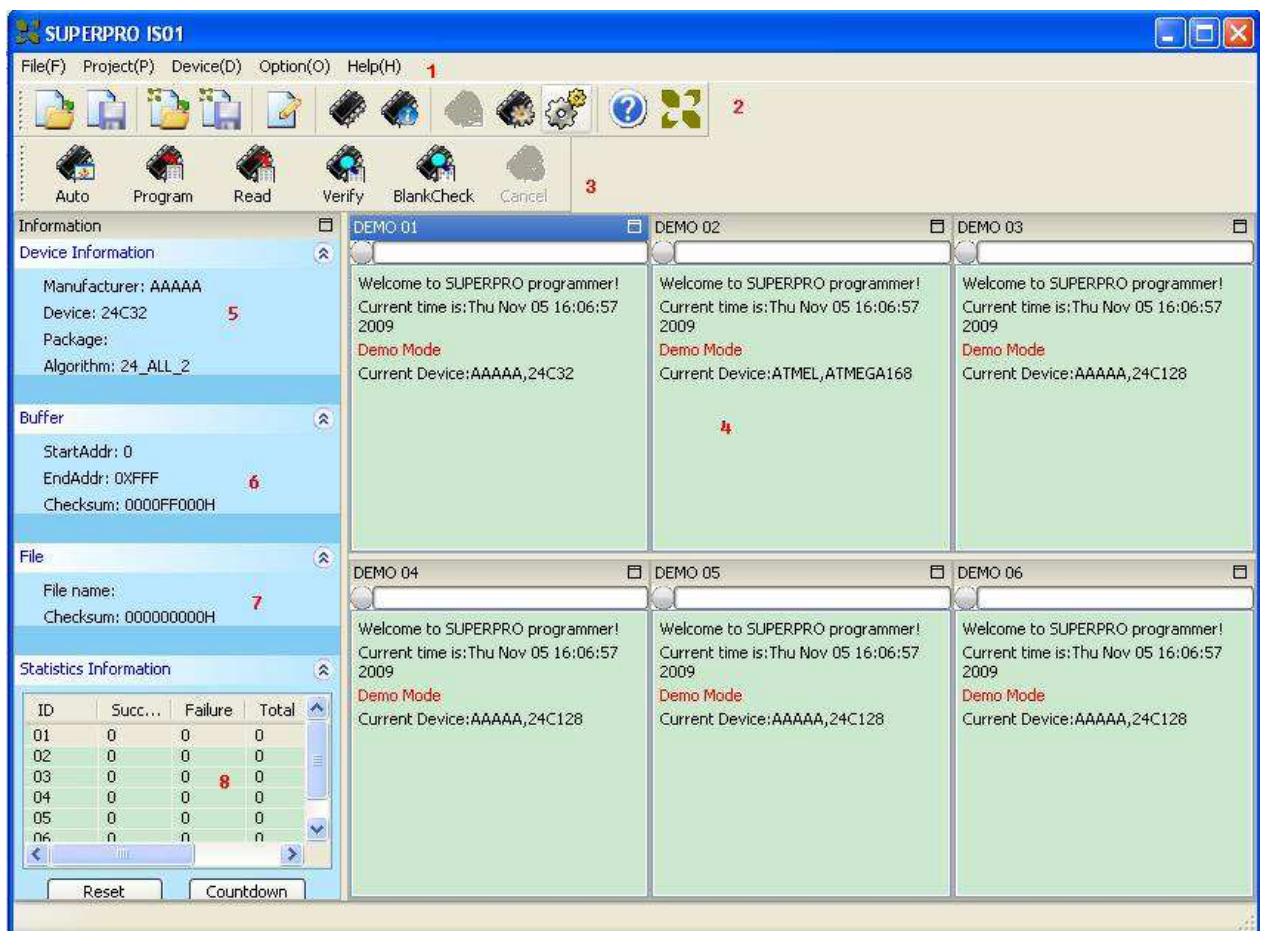
Quick start

This chapter will help you to understand the whole process of chip burn-recording operation from beginning to the end, the content includes:

- User interface of application software
- Steps of burn-recording device

Before you are ready to operate the burn-recording device of the programmer, please make sure that you have properly installed the programmer, and the computer has successfully communicated with the programmer.

User interface of application software



1. Menu bar
2. Main toolbar
3. Operation toolbar
4. Log window
5. Device information bar
6. Buffer information bar
7. File information bar
8. Statistic window

Note 1: The number of subwindows in the log window is determined by the number of modules set by the user. If there is no special description, the following description is