OPERATION MANUAL

WIRE HARNESS TEST SYSTEM

CATALOG

Chapter 1 Open-case inspection

This chapter describes some of the checks you must perform when you receive the instrument, and the conditions you must know and have before installing the instrument.

1. Unpack and check

Thank you for purchasing and using our products. After unpacking, you should first check whether the instrument is damaged due to transportation. We do not recommend you to power the instrument when the appearance is damaged. Then confirm according to the following packing list.

Host

1、wire harness tester X1
2、Power cord X1
3、24V power transformer X1
4、search pin pen X1
5、RS232 TO USB cable X1
6、RS232 cable X1

Slave (above 640pin)

1、 slave X1
2、 One in two power cable X1
3、 DB25 connect cable X1
4、 RS232 cable X1

2. Power supply

Power supply voltage：100 ～ 242 Vac。
Power supply frequency：47 ～ 63 Hz。
Power range：above 100 VA
Power input phase line L, neutral line N, ground line E should be the same as the power plug of the instrument.
This instrument has been carefully designed to reduce clutter caused by AC power input, however, it should still be used in a low noise environment as much as possible, if it cannot be avoided, please install a power filter.
Warning: In order to prevent leakage from causing damage to the instrument or people, the user must ensure that the ground wire of the power supply is reliably connected to the ground.

3.Usage Environment

3.1 Please do not use in dusty, vibration, direct sunlight, corrosive gas.

3.2 The normal operation of the instrument should be in the temperature of 0℃ ~ 40℃, relative humidity ≤75% environment, so please try to use the instrument under this condition to ensure the accuracy of measurement.

3.3 The rear panel of the test instrument is equipped with a cooling device to avoid internal temperature rise. In order to ensure good ventilation, do not block the left and right ventilation holes to maintain the accuracy of the instrument.

3.4 This instrument has been carefully designed to reduce clutter caused by AC power input, however, it should still be used in a low noise environment as much as possible, if it cannot be avoided, please install a power filter.

3.5 If the instrument is not used for a long time, please store it in the original packing box or similar box in a ventilated room with a temperature of 5 ° C ~ 40 ° C and a relative humidity of no more than 85%RH. The air should not contain harmful impurities that corrode the instrument and should be kept away from direct sunlight.

3.6 The instrument, especially the test wire connected to the part under test, should be kept away from strong electromagnetic fields to avoid interference with the measurement.

4. Precautions for the use of external fixtures and conversion cables

Please use our test fixture or test cable. User made or other company's test fixture or test cable may result in incorrect measurement results.
Note:
4.1 The shorter the adapter cable, the better
Too long external wiring is burdened with additional conduction flux, which is easy to cause mismeasurement for on-impedance specification testing or short-circuit endpoint judgment.
4.2 Replace the adapter frequently
After the adapter is used for a long time, the conduction will be unstable in contact, which will cause false detection phenomenon for low conduction impedance specification test; Therefore, when the same good wire is measured many times, there will occasionally be poor conduction impedance or instant break, and the adapter needs to be replaced.
4.3 Keep fixture and adapter clean
After the machine is used for a long time, there will be some dust on the fixture, and when it encounters rainy days or high air humidity, it will produce bad insulation phenomenon affecting the insulation impedance specification test.

5 .Preheat

In order to ensure the accurate measurement of the instrument, the preheating time should not be less than 15 minutes

Do not switch the instrument on or off frequently to avoid internal data confusion.

Company statement:

The description in this manual may not be all the contents of the instrument, UCE Electronics has the right to improve the performance, function, internal structure, appearance, accessories, packaging, etc., without further explanation! The confusion caused by the inconsistency between the instructions and the instrument can be contacted by the address on the cover.

Chapter2 Wire Harness Test System Overview

This chapter describes the basic operating characteristics of the RB6601X series instruments. Before using the RB6601X series instruments, please read this chapter in detail so that you can quickly learn the operation of the tester.

1.System composition

1.1 Overview

This test system is mainly used to detect the connection forms of various wiring harnesses, including the on-off, short circuit, the positive and negative connection of diodes (not connected), the resistance, capacitance and inductance of some circuits, and the functional integrity test of relays. The system can record and keep test data.

The test system is mainly composed of test bench, test system, test module (customized), printer, speaker and scanning gun. It is widely used in the test of automobile wire harness, home appliance wire harness, track wire harness, new energy wire harness and aerospace wire harness.

1.2 Test bench style and size

1.2.1 Inclined mode

Inclined test table is a common test table, more ergonomic, accepted by most users. The specifications of this kind of testing table are mainly 1.2m, 1.8m, 2.4m, 3.6m, 4.8m and so on.

1.2.2 Platform

Platform testing platform is mainly used in vehicle wiring harness and other large wiring harness, this kind of wiring harness is relatively long, relatively heavy, platform is convenient to place. This type of testing table can be customized according to customer requirements.

1.2.3 Special Types

Mainly divided into H type, L type, etc., This type of workbench is mainly customized according to customer requirements.

1.3 Test bench structure

1.3.1 Materials

The platform is mainly composed of aluminum profile structure, and the sealing plate is aluminum-plastic plate and wooden board.

1.3.2 Main components

1, testing bench, tester, and computer host
2, 24V power switch
3. Oil-water separator
4, internal electrical components
5, table cover
6. Test module
7, the main control board (total pop-up, search interface, etc.)
8. Transfer board

Chapter3 Test Instrument Introduction

3.1 Function description of the test instrument

1) On (open circuit, short circuit, dislocation)

2) Diode (positive and negative, leakage, breakdown)

3) Terminal in place detection

4) Verticality detection

5) Air tightness test

6) Block (secondary lock) detection

7) Relay box detection

8) Printer support

9) Support code scanning

10) Intelligent voice test

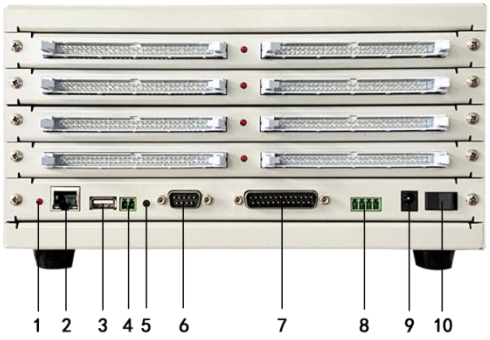
11) Can be combined with other test items comprehensive test

12) Airbag parts testing

3.2 Introduction to test instrument interfaces

3.2.1 Instrument Composition

3.2.2 Host Introduction



1. Status indicator

The indicator blinks normally for 1S. When the device enters the upgrade mode, the indicator blinks rapidly for 0.2s.

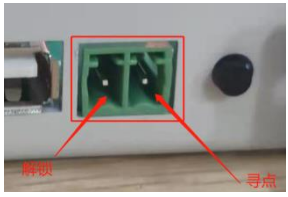
2. LAN port

Network port, used for data communication (expansion).

3. USBHOST

Used to upgrade instruments

4. Search pin and unlock pins



Search point: The search point interface connects to the right

Unlock: Short circuit the left and right pins to unlock the test system, mainly used to unlock the system hardware after the system test fails.

5. Upgrade button

Upgrade method:

Step 1: Power off the host.

Step 2: Press and hold the black button.

Step 3: Turn on the power supply, at this time, the instrument status light flashes quickly, and hear "beep" two times, release the black button.

Step 4: Insert USB flash drive (copy the upgrade program to the USB flash drive).

Step 5: Wait for the instrument to restart (the status light will be off), and the instrument upgrade is successful.

Note: When you hear the "beep beep" 3 sound, it indicates that there is no corresponding upgrade program in the USB flash drive.

6. DB9 communication port

It is used for computer communication and exchange with PC software.

7. DB25 expansion interface

Used to expand channels

8. relay output

Normally closed interfaces: 1,2 interfaces

Normal ports: 3 and 4 ports

9.24V power interface

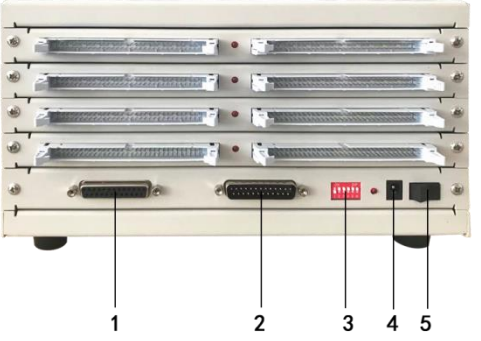
Dedicated power adapter 24V

10. Power switch

Switch on and off

11. System interface location definition

3.2.3 Slave Machine Description



1. DB25 Extended input port
2. DB25 extended output
3, set the dip switch from the machine number

NO.1 NO.2 NO.3 NO.4

NO.5 NO.6 NO.7 NO.8

4, 24V power input port
5. Power switch

Chapter4 Software Introduction

4.1 Software Installation Guide

Hardware requirements for software installation:
Win7 and above system, 2G memory, 100G or more hard disk, i3 or above processor

4.1.1 Installation Contents

1. Install the running environment
microsoft_dot_net_framework_v452_cn_win-x86-x64.exe
2. Install VisualBasicPowerPacksSetup. Exe (VB) plugin for short
3. Install the USB-to-serial port driver
4. Install the printing software
5. Install the database
6. Install office2007

4.1.2 Operating Environment Installation Procedure

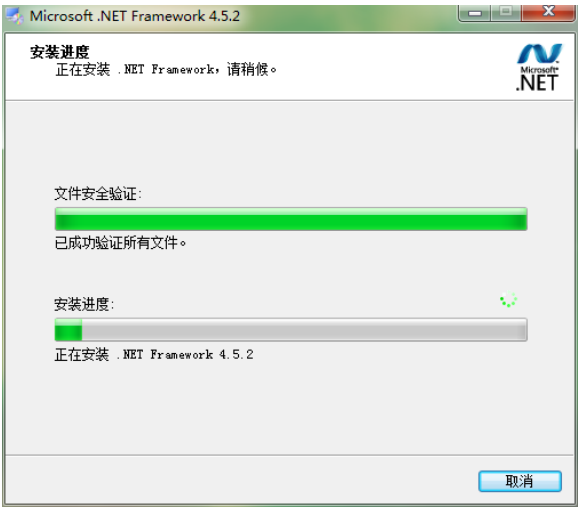
This step needs to be installed in the win7 system, and does not need

to be installed in the win10 system.

1.click“microsoft_dot_net_framework_v452_cn_win-x86-x64.exe”

2. Install

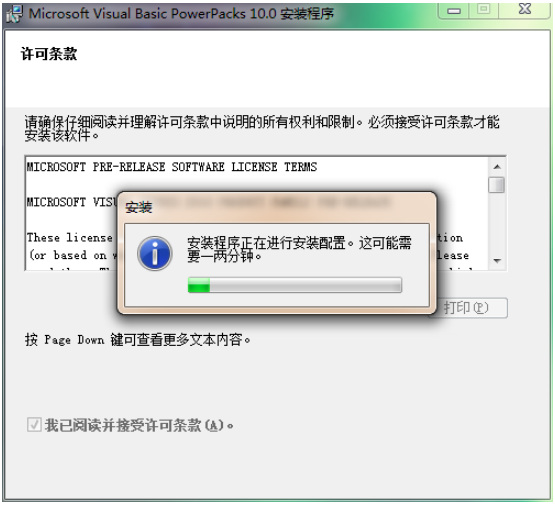
3. Finish installation



4.1.3 VB plug-in installation

The first step: double-click install "VisualBasicPowerPacksSetup. Exe"

Step 2: Check the installation license terms and click "Install"

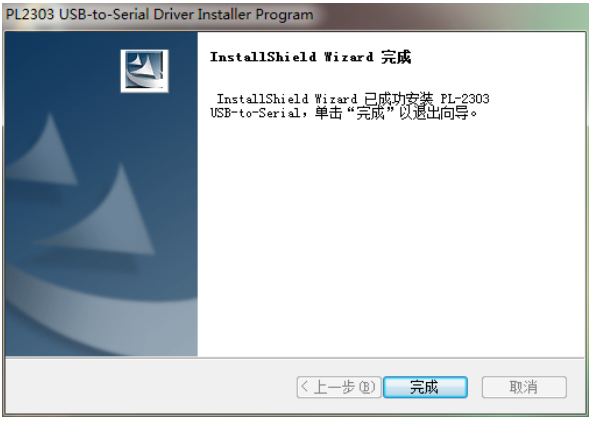


Step3, finish installation

4.1.4 Installing the USB to Serial Port Driver

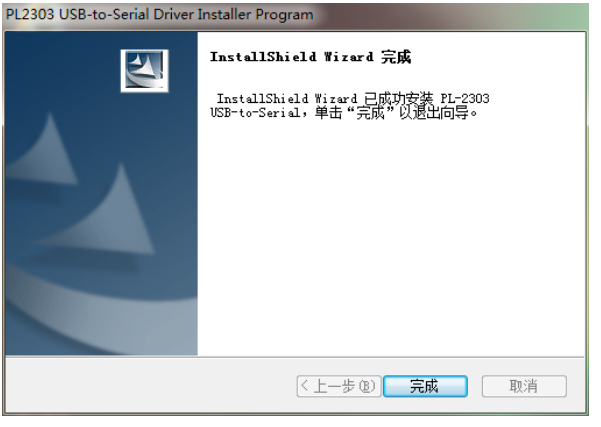
This step is required when a USB-to-serial cable is required. Statement: This program does not necessarily adapt to the user's own configuration of the USB to serial cable, only applicable to the company's own USB to serial cable.

Step 1: Double click to install



"PL2303_Prolific_DriverInstaller_v1.10.0.exe"

Step 2: Click "Next"

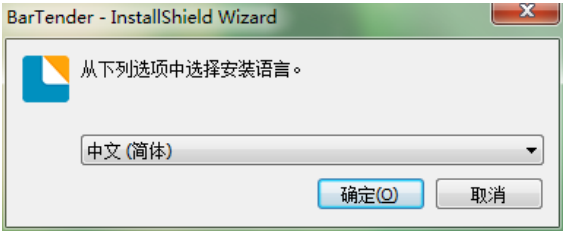


Step 3: Click "Done"

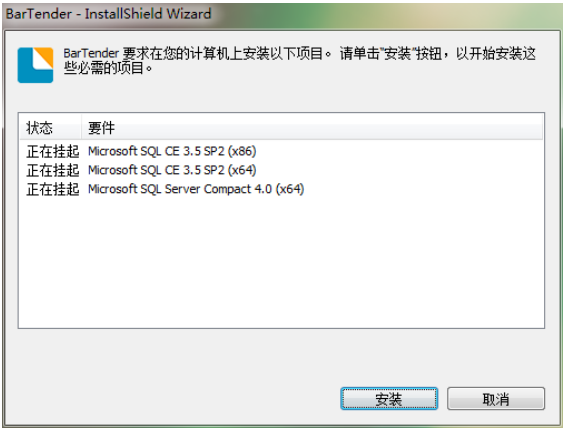
4.1.5 Installing Printer Software

First, "Bartender" label editing software installation

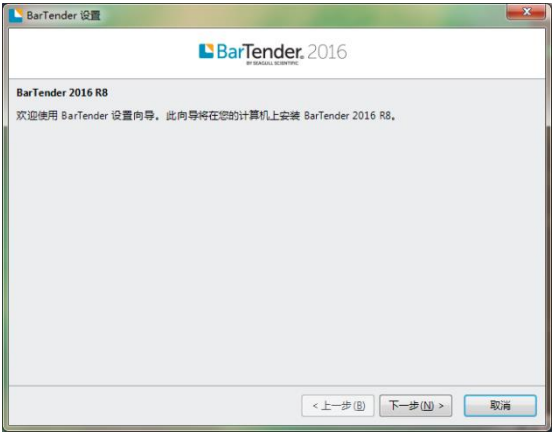
Step 1: Double-click BT2016_R8_3153_Full.exe to install it.



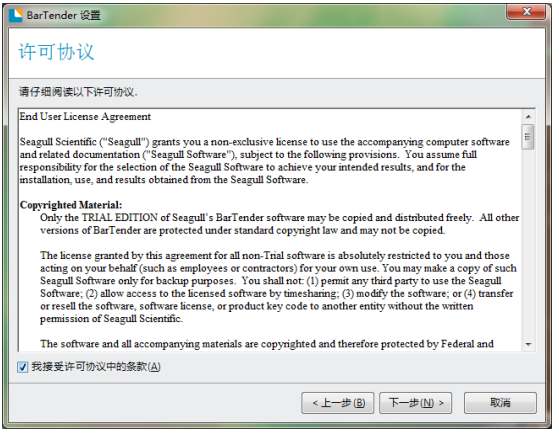
Step 2: Click "OK"



Step 3: Click "Next"

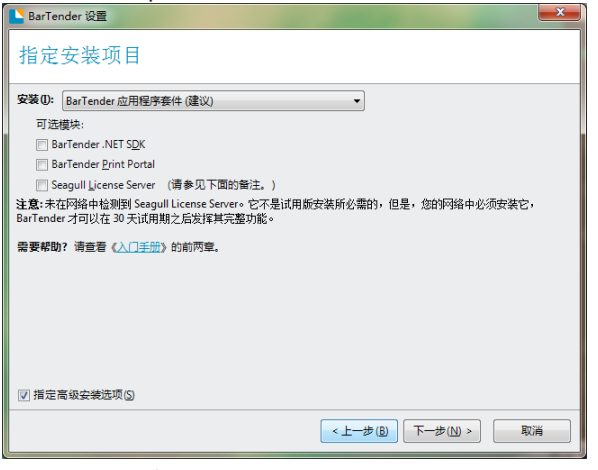


Step 4: Click "Next"

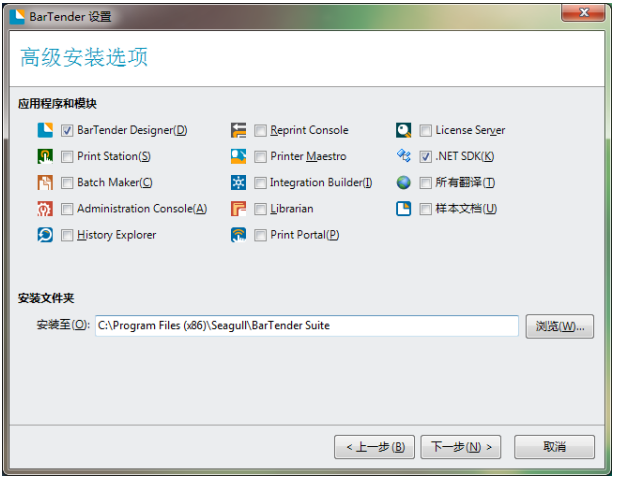


Step 5: Click "Next"

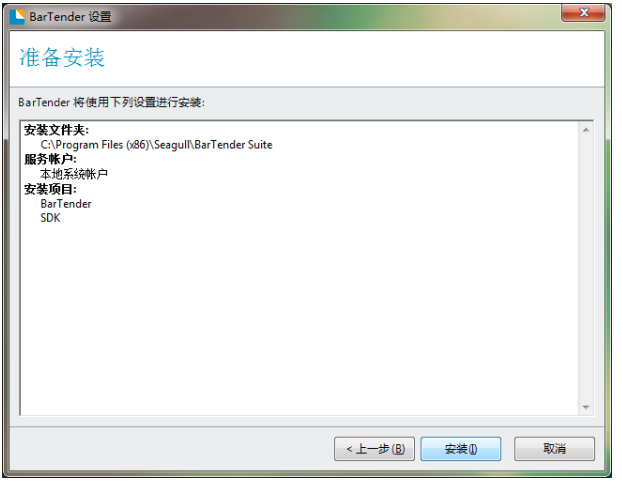
- Step 6: Click on "Enterprise Automation"



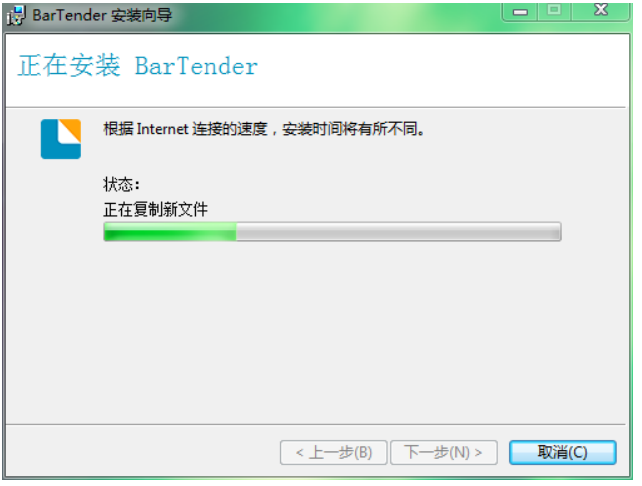
- Step 7: Click on "Specify Advanced Installation"



- Step 8: Select. NET SDK



- Step 9: Click "Install"

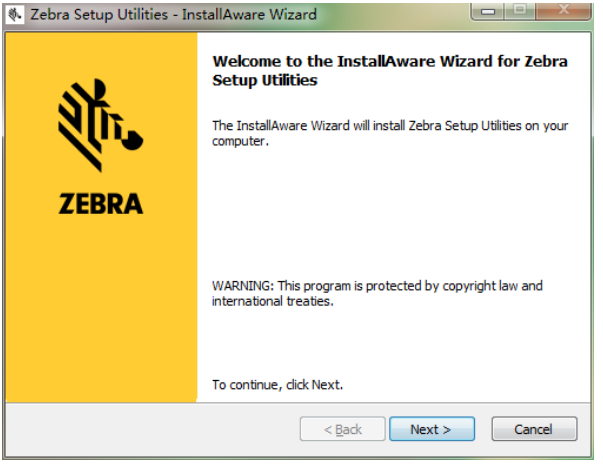


➢ Step 10: Click "Done". The installation is successful.

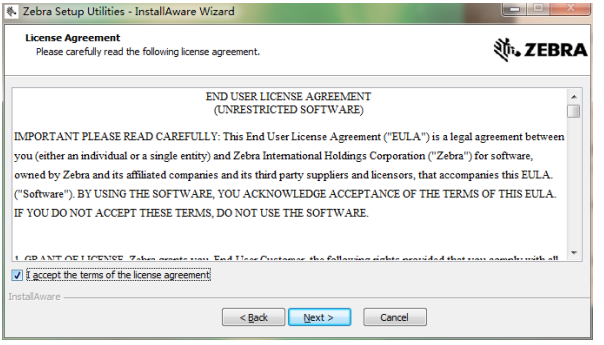
➢ Step 11: Register the software.

Printer driver installation, taking Zebra's GK888T as an example.

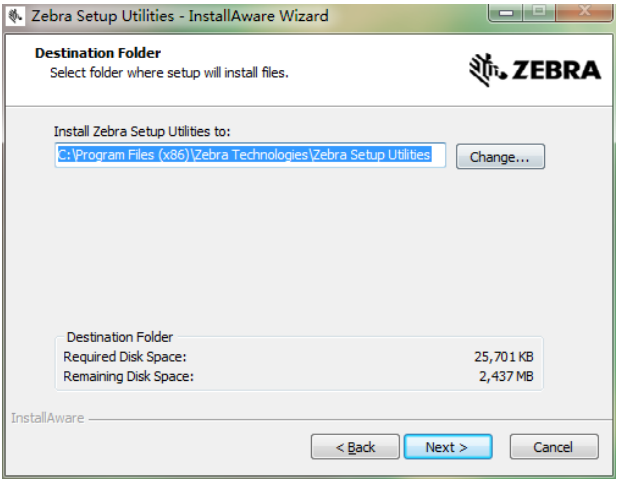
- Step 1: Plug the printer in and plug in the USB port
- Step 2 click operate ZebraSetupUtilities -“Setup.exe”



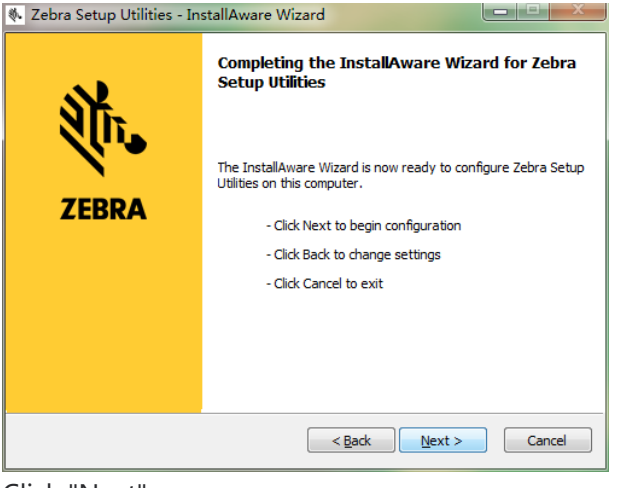
- Step 3: Click "Next"



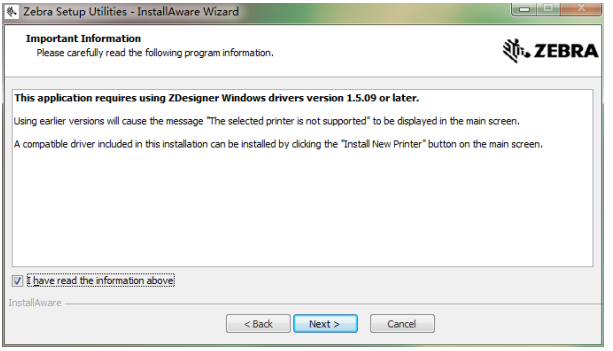
- Step 4: Click "Next"



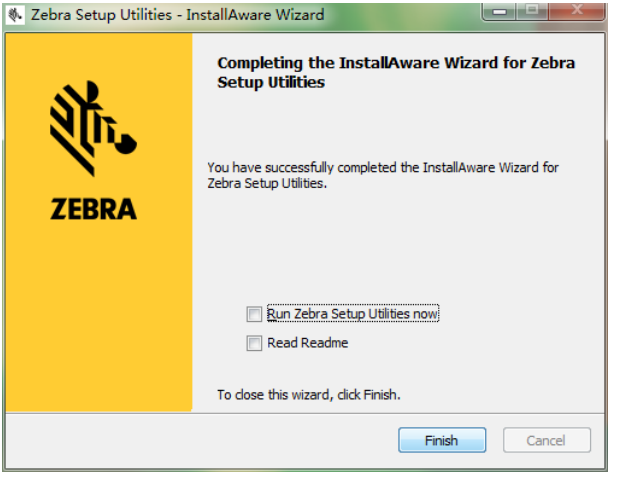
- Step 5: Click "Next"



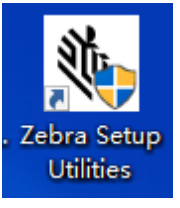
- Step 6: Click "Next"



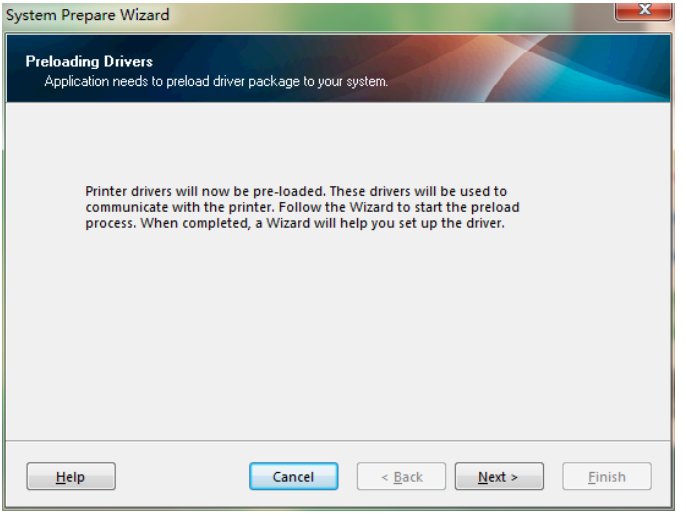
- Step 7: Click "Finish" to complete the installation



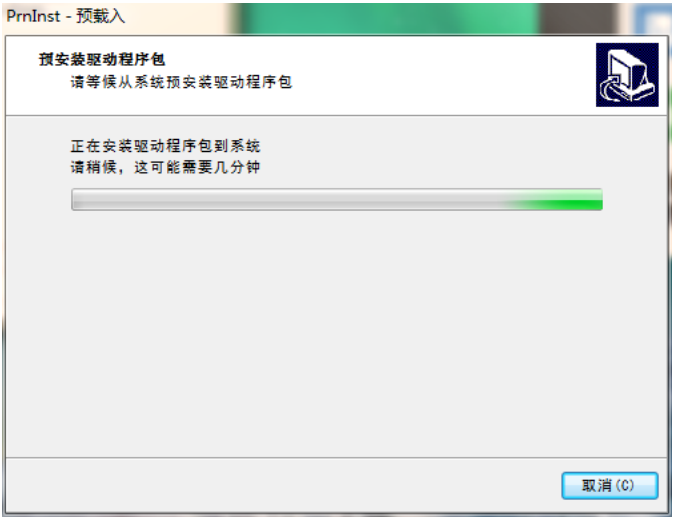
- Step 8: Click the desktop icon



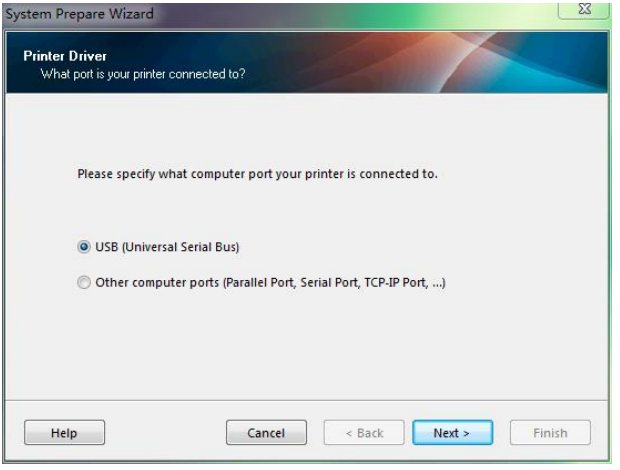
- Step 9: Click "Next"



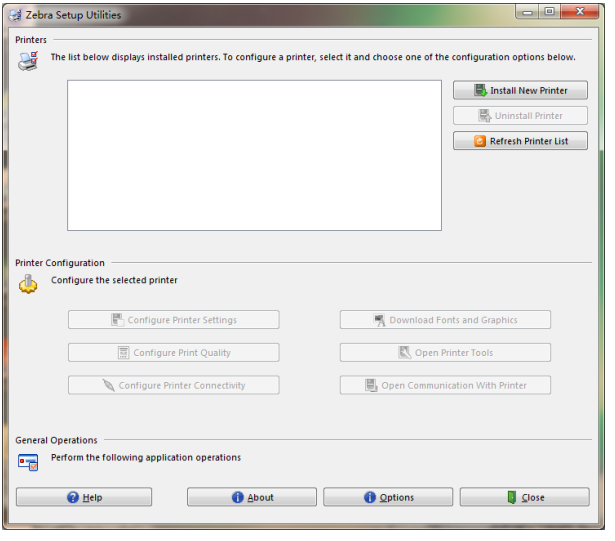
- Step 10: Wait for the installation to complete



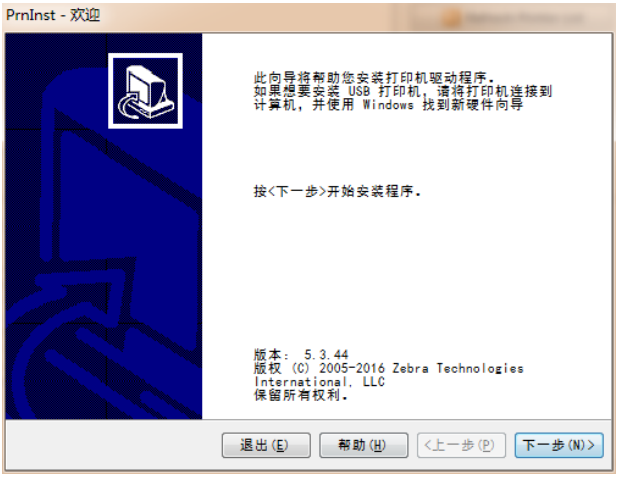
- Step 11: Click "Next"



- Step 12 Click on "Install New Printer"

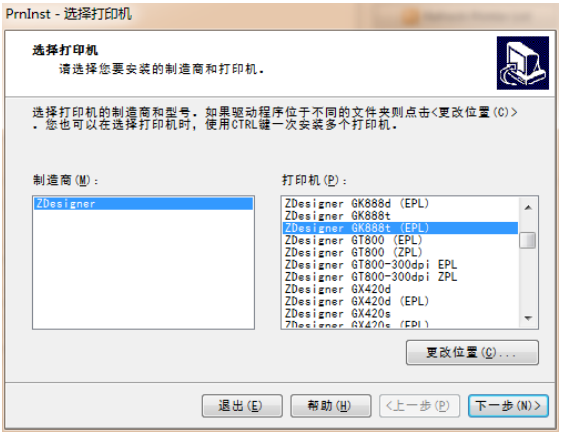


- Step 13: Click Next

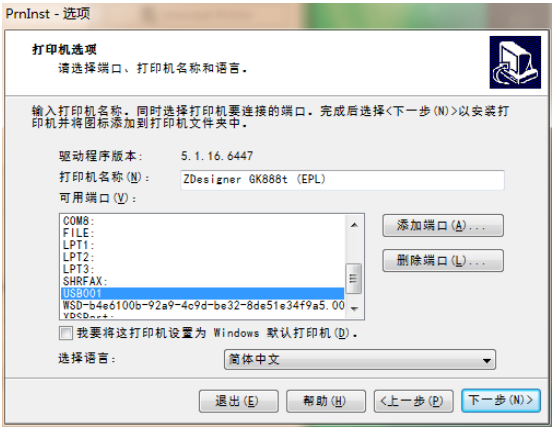


- Step 14: Install the printer

- Step 15: Select "GK888t(EPL)" and click Next

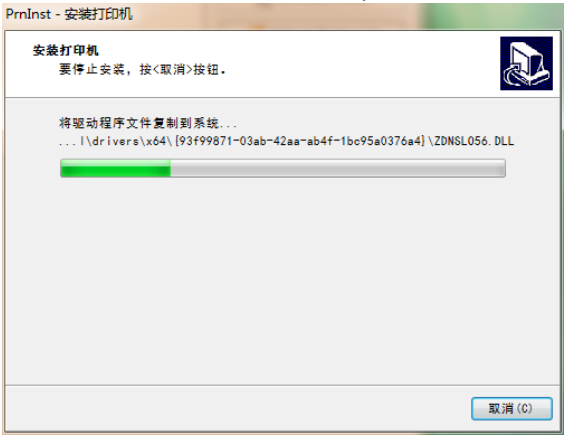


- Step 16: Select "USBXXX" and click "Next"

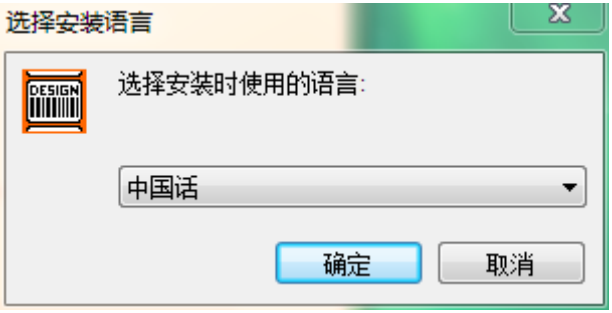


- Step 17: Click "Done"

- Step 18: Wait for the installation to complete

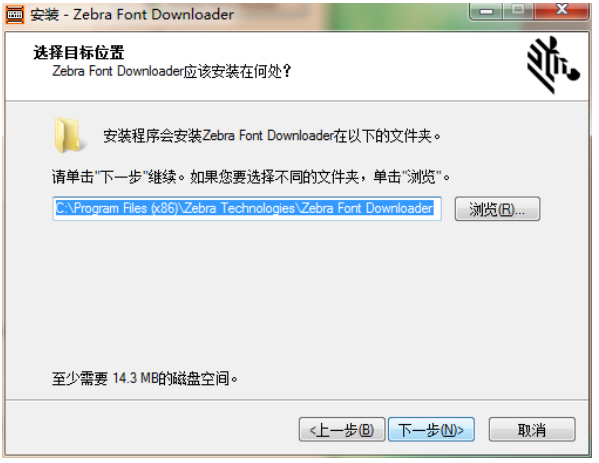


- step 19: Click "OK"

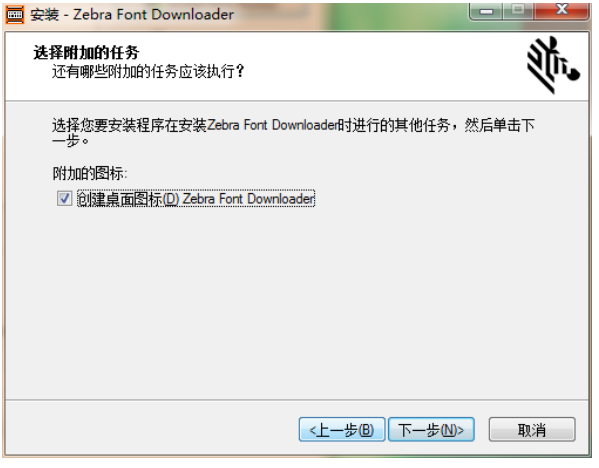


- Step 20: Click "Next"

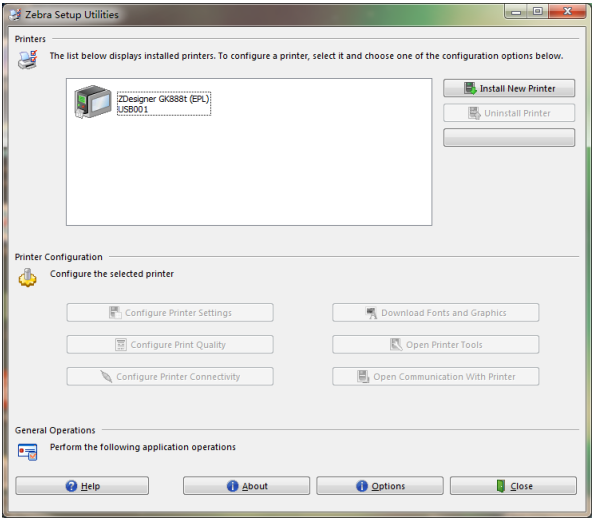
➢ Step 21: Click "Next"



➢ Step 22: Click "Next"



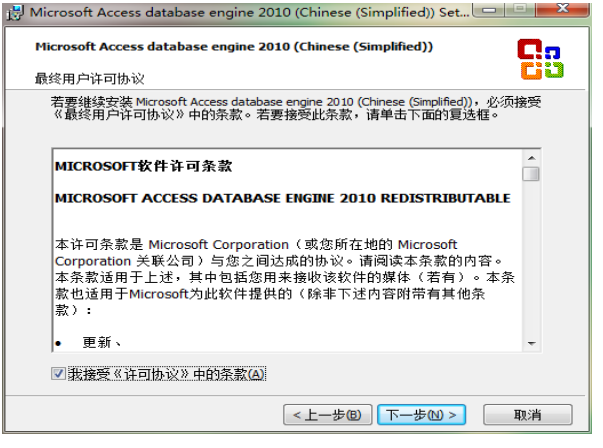
➢ Step 23: The driver is installed



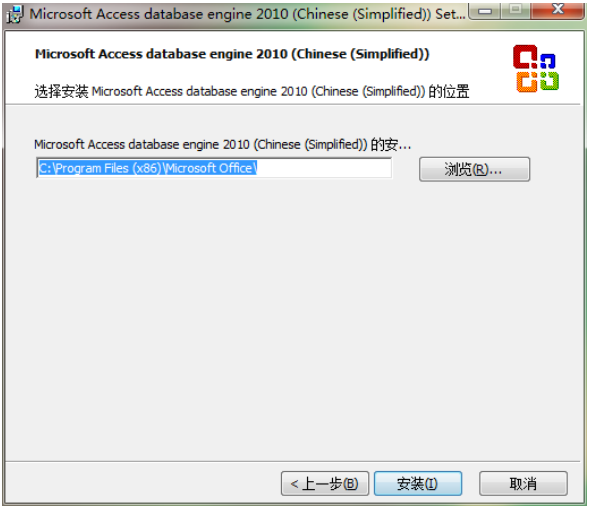
4.1.6 Installing the Database

The installation of the database is mainly used to record the test data. To use this function, you must install the database file.

➢ Step 1: Double-click "AccessDatabaseEngine.exe", agree the license, next step



- Step 2: Click "Install"



- Step 3: Wait for the installation to complete

4.1.7 Installing Office2007

- Step 1: Double-click to run "setup.exe"

- Step 2: Enter the key

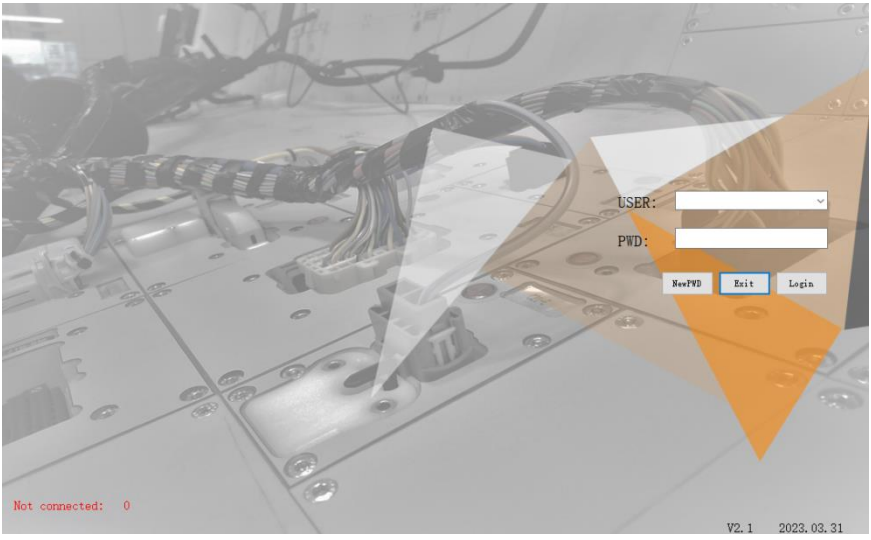
- Step 3: Accept the license agreement

-

- Step 4: Install now

- Step 5: Wait for the installation to complete

4.2 Login Page



4.2.1 Overview of the Login Page

When you double-click the software icon, the software will automatically connect the tester, after the connection is successful, the serial number of the instrument will be displayed, and the pin position of the instrument will be displayed.

Below the software, the version number of the instrument is displayed.

4.2.2 Login Description

System default initial account:

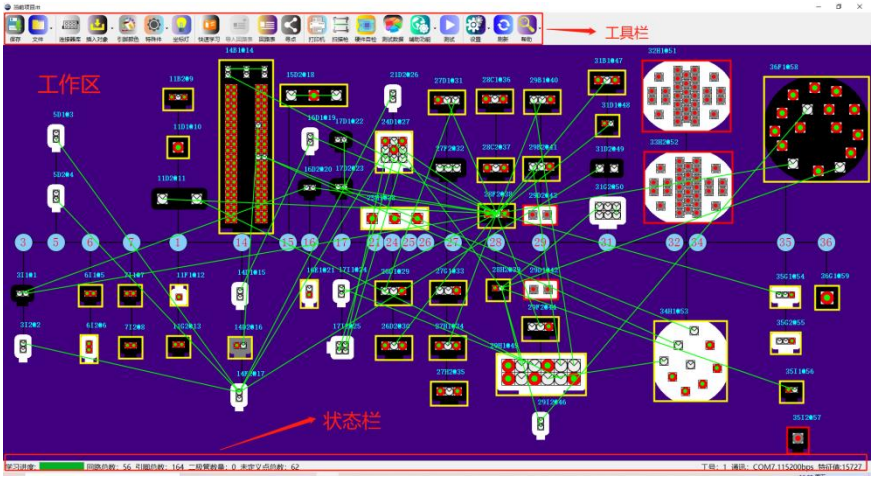
Administrator: Username: 1 Password: 1

Operator: Username: 2 Password: 2

Note: The administrator account has the highest permissions and can create and edit the current test project. After logging in, the operator can only enter the test page and has no permission to edit the project.

4.3 Project editing page

4.3.1 Page Introduction



The current page is used to create and edit the test project and configure the system parameters

Icon description:

1.Save

It is used to save the project when it is created or edited.

2.File

You can create, open, copy, and delete project files.

3.Connector library

Used to test creating and editing connector libraries

4. Insert objects

Insert the created connectors into the project file, along with the horizontal lines, vertical lines, nodes, and user input text used in the layout.

5. Pin color Settings

Used to set the wire color of connector terminals

6, special parts set

7, coordinate light setting

All coordinate light pins used to view the current project

8. Self-learning

Used to read sample loop table

9. Import the loop table

The externally edited loop table file is imported into the system

10. Loop table

Used to view the loop table

11. Search pin

When the user needs to search point can click this button.

12. Printer Settings

Set the print label selection, turn the Settings on and off.

13. Scanning gun Settings

Used to set the item identifier Settings.

14. Hardware self-test

Self-check the hardware.

15. Data recording

View data records

16. Auxiliary functions

The main function is to export project files, convert the coordinates of the tester, manage the system personnel, set the line number, set the system color when importing the loop table, rename the project, set the ground point of the test point, etc.

17.Testing

Go to the test page

18. Setup

Set the test parameters and system parameters of the project.

19. Refresh

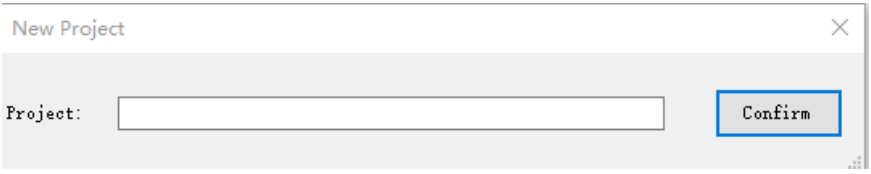
Refresh the current project

20. Help

4.3.2 File Management

4.3.2.1 Creating a Project

Enter the file name and click "OK" to set the file successfully.

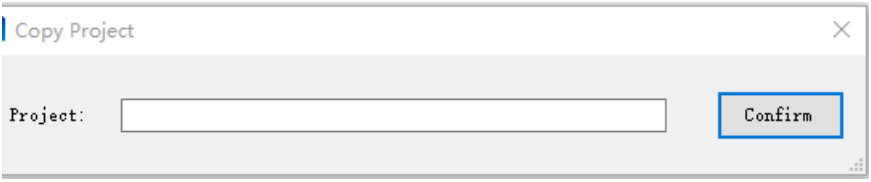


4.3.2.2 Opening a Project

Select the item you want to open and click the "OK" button to open successfully.

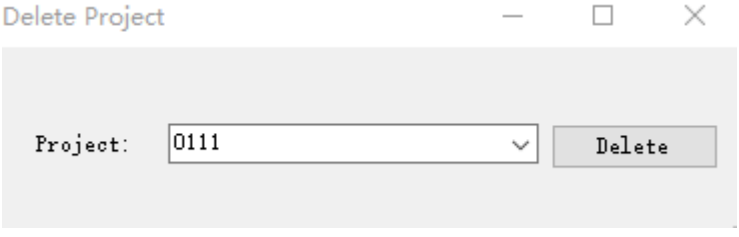
4.3.2.3 Copying a Project

Enter a new project name and click the "OK" button to copy successfully.

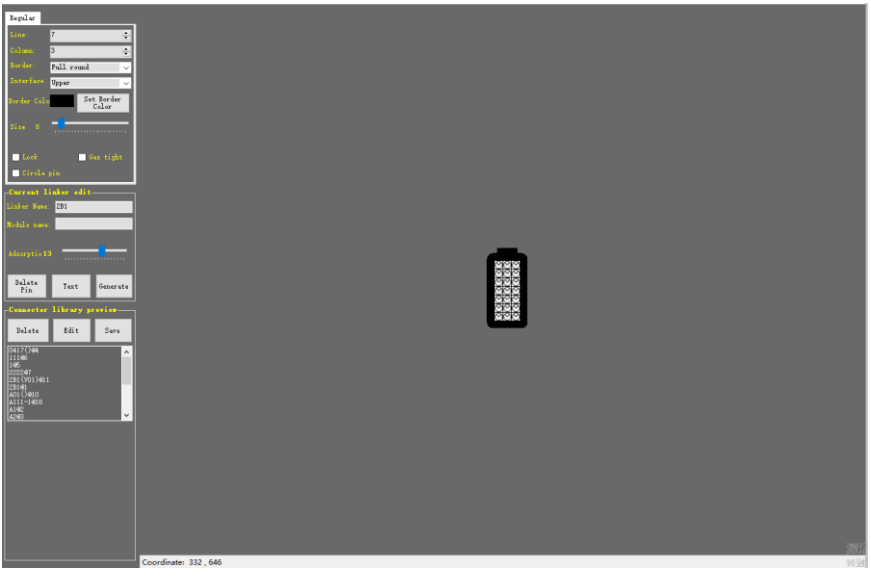


4.3.2.4 Deleting the project

Select the item you want to delete and click "Delete".



4.3.3 Creating Connectors



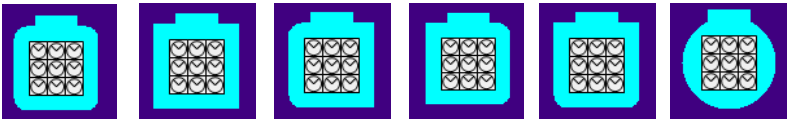
This area is mainly to create the connector, the system does not need to manually draw, through the software we can automatically draw, greatly increase the work efficiency. More than 5 times more efficient than normal drawing mode.

Function introduction:

1, the number of rows: the total number of rows of the connector, the system will automatically draw the connector after the number of columns.

2, column number: the total number of columns of the connector, the system will automatically draw the connector after the number of columns.

3. Border style:



4. Interface direction:

5, border color: the color of the sheath can be set freely by the user.

6, scaling: the user can scale the sheath, when the number of connectors in the project is relatively large, then it is recommended to reduce the connector, the minimum value is 6, when the number of connectors in the project is relatively small, the user can enlarge the

connector, so that the connector is more intuitive.

7, secondary lock, airtight, and round check box:

Second lock airtight Round

8, connector name: naming rules, do not allow symbols. It is recommended to name the connector after the coordinate station position. For example, "6B2" indicates that the module is in the sixth column of the conduction station and the second row of B.

9, adsorption point: move the number of mouse cells, convenient for users to fine-adjust the position of the terminal hole.

10, Delete the selected pin: first select the pin to be deleted, hold down the "Ctrl" key can quickly select the need to delete the pin.

11. add text: the hole number can be added to the border part of the connector, and only the text added to the border is effective.

12. Generate: Clicking this button will redraw the connector.

13, delete: First select the name in the preview box, and then click this button, will delete the button in the connector library.

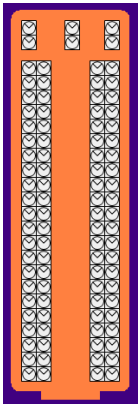
14. Edit: re-edit the connector that has been drawn.

15. **Save:** Confirm the save. After the save is successful, the system automatically assigns a unique ID to the connector and automatically adds it to the end of the connector name, for example, 6B2@5:6B2. 5 Indicates the automatically assigned name

16. Use tips:

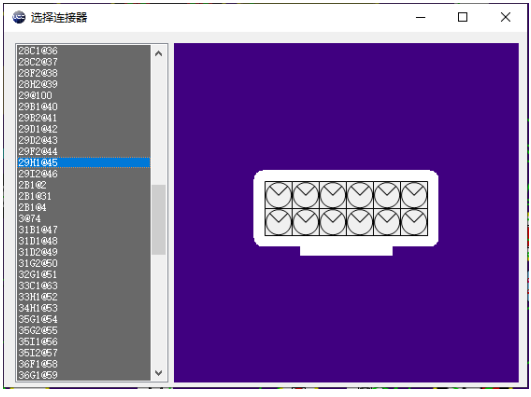
1, users can quickly select multiple connector pins through the box selection.

2, the user can drag the connector pin through the mouse to place it in the appropriate position.
3, the user can quickly Delete the connector through the "Delete" key on the keyboard



4.3.4 Inserting an Object

1、 Insert the connector

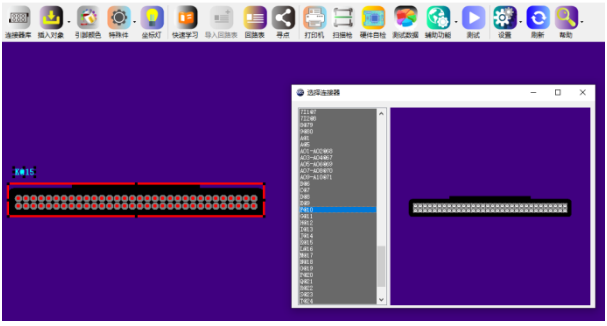


Insert steps:

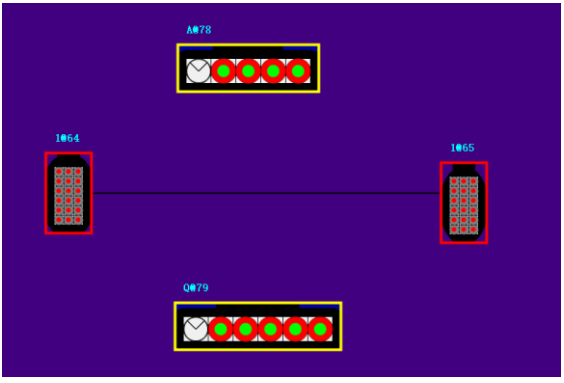
Step 1: Click on the "name" of the connection you want to place, as

shown in the picture.

Step 2: Click on the empty space in the project workspace to add



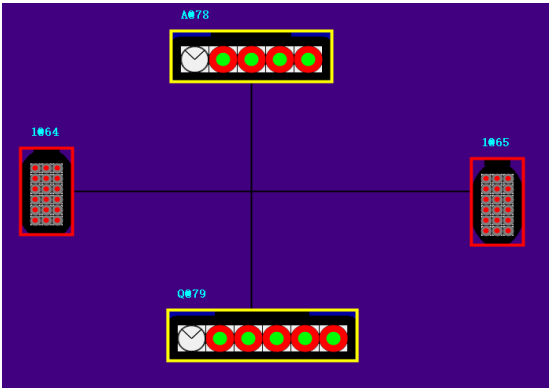
2、 Insert horizontal line



Insert steps:

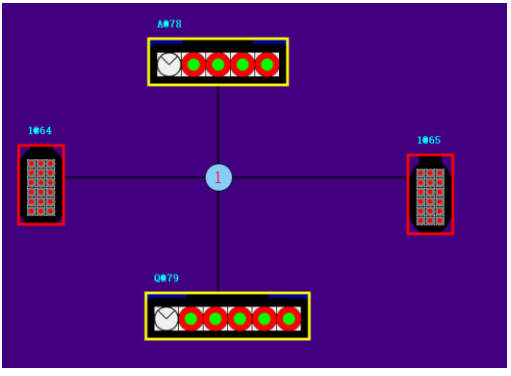
- Step 1: Select the Horizontal Line tool.
- Step 2: Click on a connector border.
- Step 3: Click on another connector border and the drawing is finished.

3、 Insert the vertical line



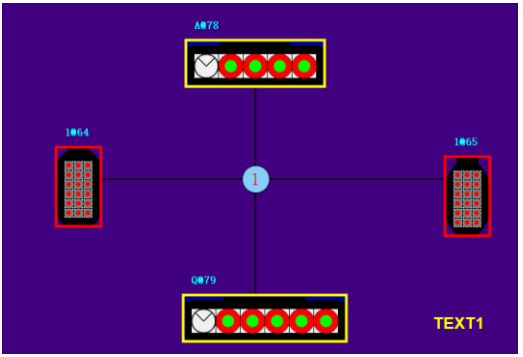
Same steps as above

4、 Insert a node



- 1、 Select Node
- 2、Click on the blank space in the workspace and insert is complete.
- 3、Double-clicking the node allows the user to change the number

5、 Insert text



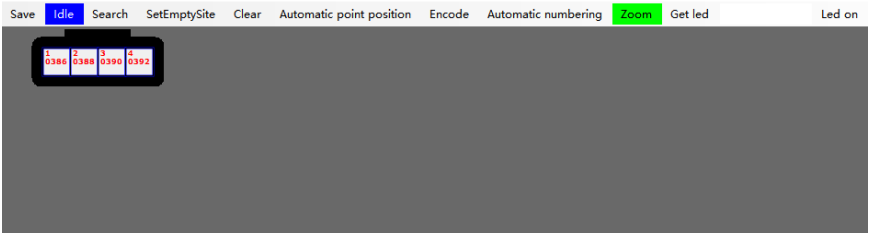
Insert step

- Step 1: Click Insert "Text"
- Step 2: Click the button in the workspace and place it.
- Step 3: Double-click TEXT1 to enter the text modification window. In this window, the user can modify the text, set the font, and set the color. Click OK to complete the setting

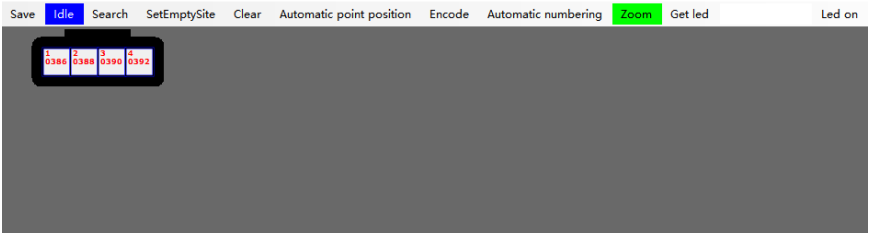
4.3.5 Search Pin

Step 1: Press the right mouse button connector to display the dialog

box.



Step 2: Select the "Automatic number" in the dialog box, select the appropriate number, there are 8 kinds. Manual numbering can be set for complex connectors, as shown in the figure.



Step 3: Click "Search" to enter the probe mode. After the probe is completed, the system will prompt "complete", while the system will automatically jump to the next connector pin, when the last pin is detected, the system will prompt "probe complete".

Step 4: Click save to complete the search pin

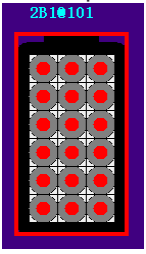
Key tips:

1. If the user finds a detection error after detection, the user can clear it by clearing the "Clear" option.

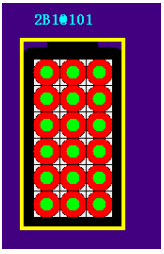
2. "Empty pin Setting", when the machine pin is empty, you can click this function key to set the empty pin. After the setting is completed, "K" will appear behind the hole, indicating that the pin is empty.

3, "enlarge display mode", mainly used when the sheath is large, reduce the display to facilitate viewing.

4、Connector pin searched and unsearched are shown as follows:



Not searched



Pin searched

Unsearched connectors show a red border, and searched connectors show a yellow border.

6, coordinate light setting, please see the coordinate light setting chapter for details.

4.3.6 Secondary Lock、Airtight setting

- **Step1：** Click“Accessories”→“Secondary Lock”or“Airtight”
- **Step2：** Place in a blank space in the workspace, as shown

- **Step3：** Double-click "Lock", the following dialog box will pop up, where the detection pin 1 and detection pin 2 correspond to the test pin of the tester respectively. There are three ways for users to enter

  1. Self-learning

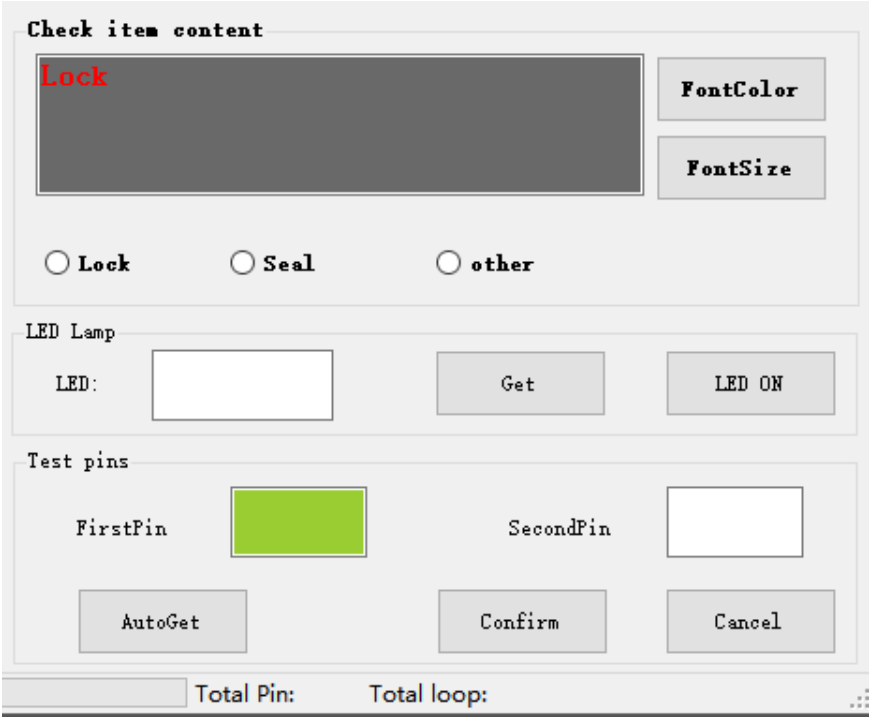
  Unplug all wiring harnesses and manually press down the switch pin detection pin of the fixture to make the switch pin close. Through Automatic Learning on the interface, the system automatically determines the detection pin.

  2, through the search pin pen search point

  Find the location of the detection pin and use the marker to detect the pin.

3. Manually enter the test pin

For example, detect pin 1:0004 Detect pin 2:0005



Description: When not search pin, there is a red box on the lock. When the probe is complete,the red box disappear

Not searched pin

pin searched

4.3.7 Diode editing

The system can detect diode break, reverse, breakdown and so on.

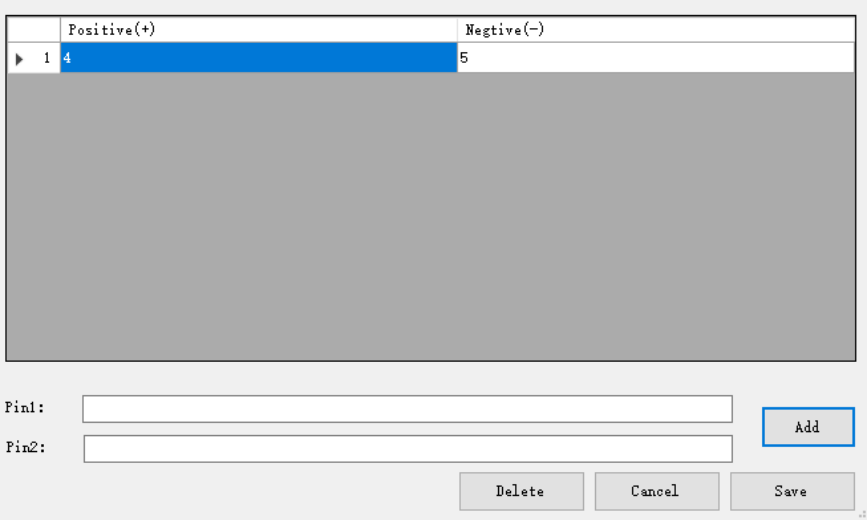
Setting method:

Step 1: Select pin set 1 and probe one end of the diode.

Step 2: Select pin set 2 and probe the other end of the diode.

Step 3: Click "Add", the system will intelligently judge the positive and negative electrodes of the diode (must plug in the cable harness to be tested, and ensure good contact).

Confirm and save the Settings.



4.3.8 Edit resistance test

The system supports coarse resistance measurement, the accuracy is 1%~10%. Mainly used to distinguish resistance can not be inserted wrong. And the fault line problem of parallel 120 resistance in the loop.

Setting method:

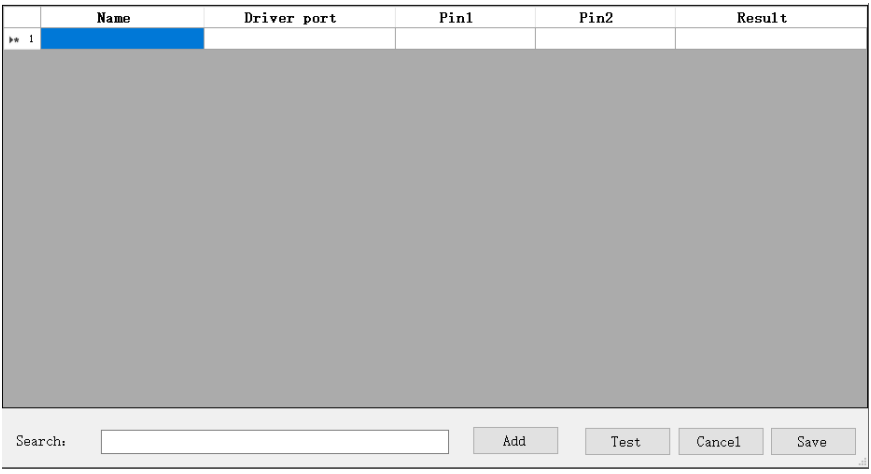
Step 1: Enter the name of the resistance, so that the customer can easily identify which test resistance.

Step 2: Select the pin that you want to set the resistance to. You can probe the pin of the resistance under test through the finder pen and click "Add".

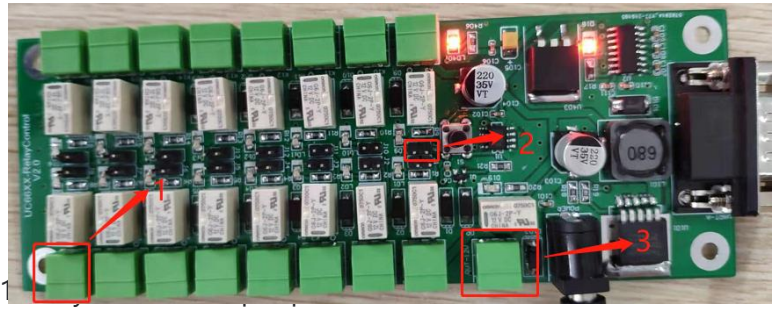
Step 3: Plug in the harness and click "Get Resistance Pin" to verify that the resistance is set correctly.

Step 4: Click Save.

4.3.9 Relay test editing



Relay test needs to be equipped with the relay detection board provided by our company, as shown below.



1

2. Connect the test pin of the conduction machine.

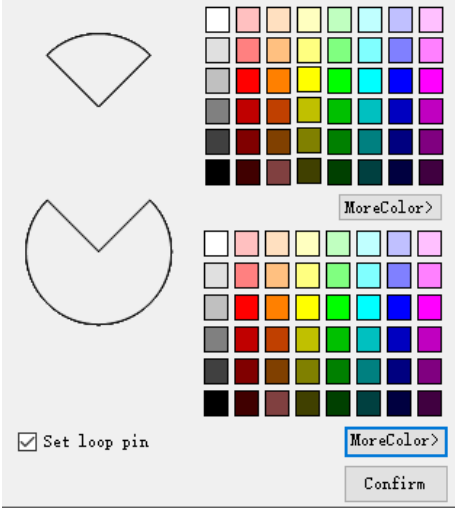
3, 12V drive power output.

Setting steps:

Step 1: Click "Special Parts" -> "Relay Settings".
Step 2: Enter the relay name.
Step 3: Enter the location of the driver port. If you do not know the location of the driver port, you can search by using the search pointer.
Step 4: Test verification.
Step 5: Save and exit.

4.3.10 Color Setting

The system supports quick setting of the test pin color, and the pins of the same loop will be set together.

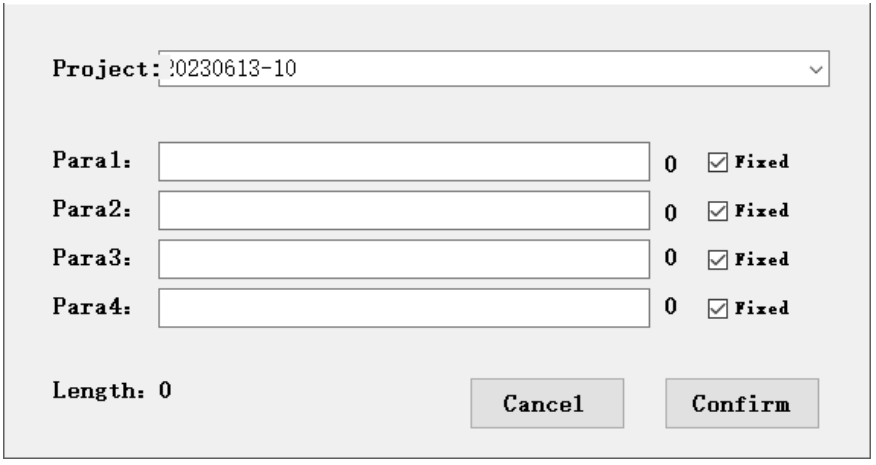


Setting steps:

- Step 1: Click the icon
- Step 2: Double-click the pin that you want to color.
- Step 3: Select the primary and secondary pin colors for the pins.
- Step 4: Click "OK".
- Step 5: Reclick the icon to close the Settings.

4.3.11 Scanning Gun Settings

This system supports the code scan file test, to use this function, you must check this function in "test parameter setting" first.



Setting steps:

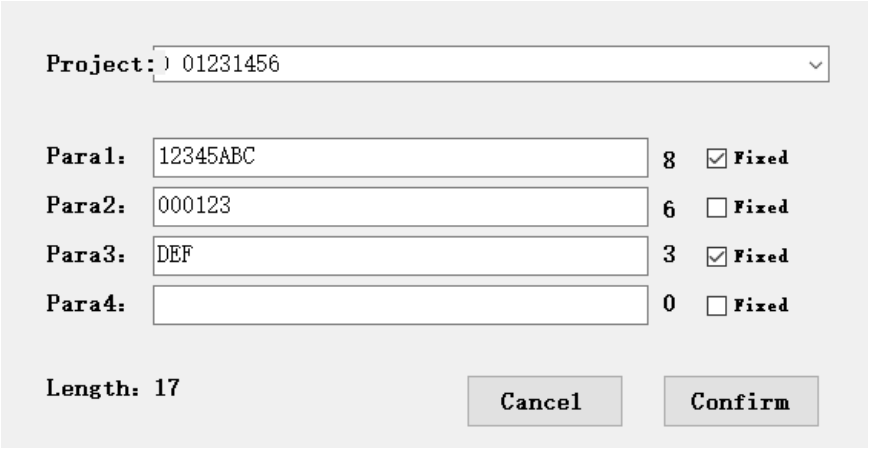
Step 1: Click the icon

Step 2: Select the project name you want to set.

Step 3: Set parameters to confirm which bar codes are fixed.

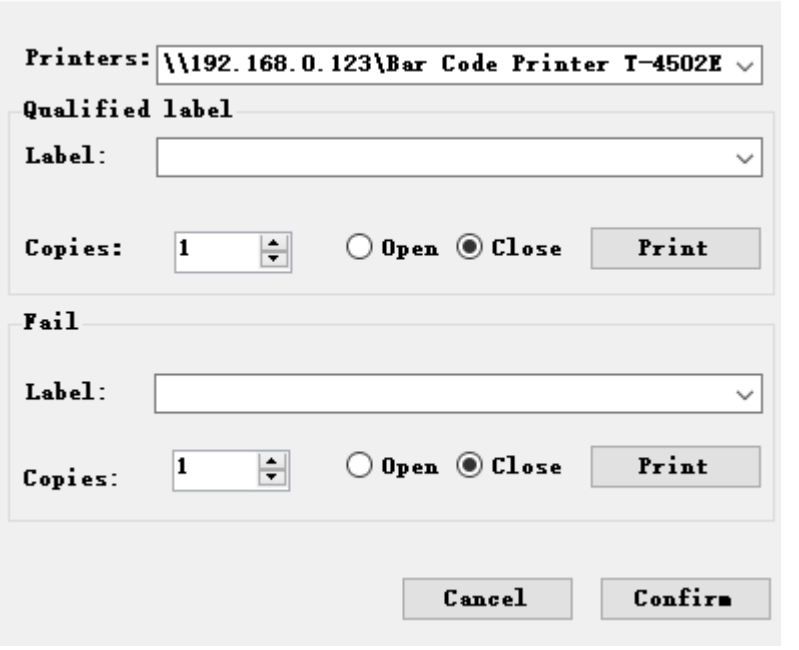
Step 4: Confirm the save.

For example, if the user bar code is 12345ABC000123DEF, the Settings are as follows:



4.3.12 Print Bar Code Settings

You need to install 32-bit Bartender as required. For details, see the software installation section.



Step 1: Select the printer.

- Step 2: Select the label to be printed and set the parameters.
- Step 3: Print the test.
- Step 4: Confirm the save.

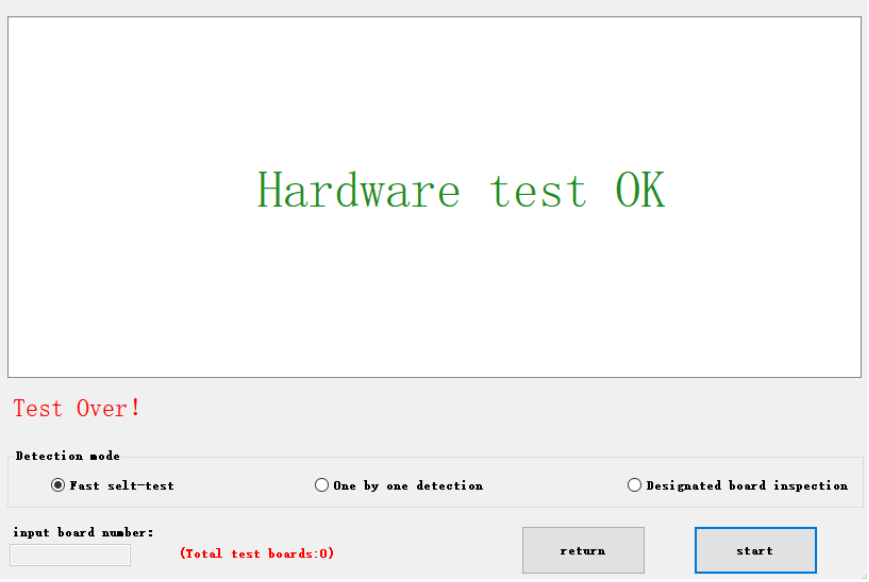
4.3.13 Hardware Self-Check

The system supports three kinds of hardware detection methods.

1, rapid detection.

2, general detection (board by board scanning).

3, designated board detection.

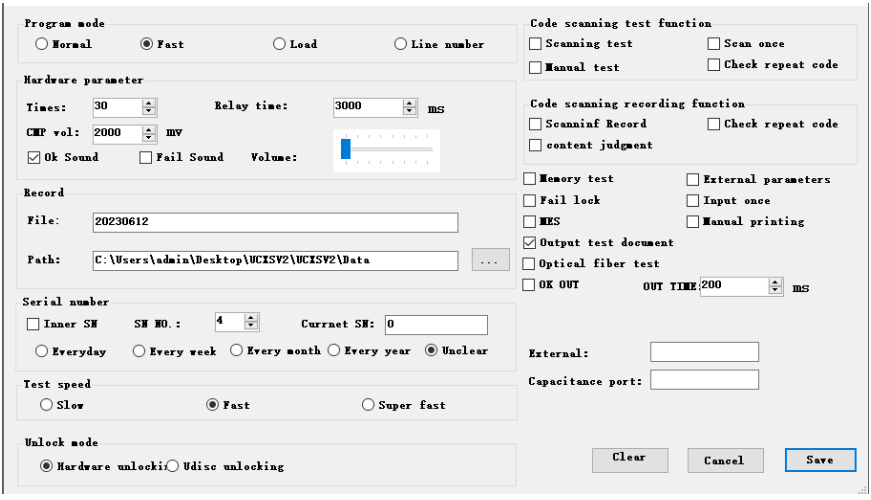


Instructions:

Fast self-test, the main detection system when there is no short circuit, rapid detection, can not accurately test the transceiver function of each pin.

General detection and designated board detection, can be detailed detection of each pin transceiver function.

4.3.14 Test parameter setting



Brief description of setting parameters:

1. programming mode

General learning: The traditional slow test, the speed is slower.

Fast learning: Combined with new test algorithms, fast learning tests.

Loop table import: The test program needs to be customized according to the customer's loop table.

Line number programming: By entering the line number, the loop relationship table is obtained.

2. hardware parameters

Read times: This parameter needs to be adjusted when testing a special harness.

Comparison voltage: Generally do not need to be modified.

Relay delay time: when the test is qualified, the total pop-up delay time.

Qualified sound and volume: You can set this parameter.

3.Data recording

Set the file name and path for saving data records. The data recording function needs to be enabled.

4. Set the serial number

Here, the serial number of the system is set, the length of the serial number is specified, and the mode of clearing the serial number.

5. Scan the test function

Scanning code test function: The user scans the bar code or two-dimensional code on the wiring harness, and the system will set the identification code according to the user and automatically access the program.

Manual test: Whether to press the R key to enter the test state after the code scan is successful.

No repeated scanning code: The system will judge whether there is a test in the system record according to the barcode or two-dimensional code used for scanning. If the user has tested, the system will not enter the test state and wait for the user to re-enter the new value.

6. Scan record function

When there is no bar code or two-dimensional code on the user's wiring harness, the system can automatically generate two-dimensional code through the printer, then if the user needs to record that the wiring harness has been measured, the user can scan the barcode or two-dimensional code after the test is completed, and record the test.

7. Others

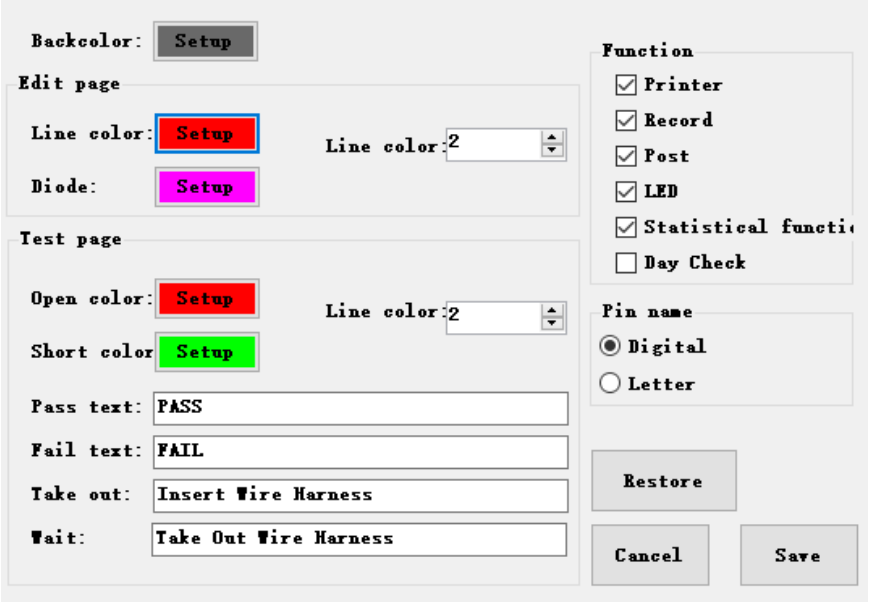
1, memory test: the test qualified loop will not enter the secondary test, for the test fixture contact is poor, this function is more convenient, but there is a certain risk (use this function with caution).

2, test failure lock: When the test harness test fails, the system will automatically lock, waiting for the user to unlock, so as to enter the next test.

3, docking MES: MES system for docking (customized).

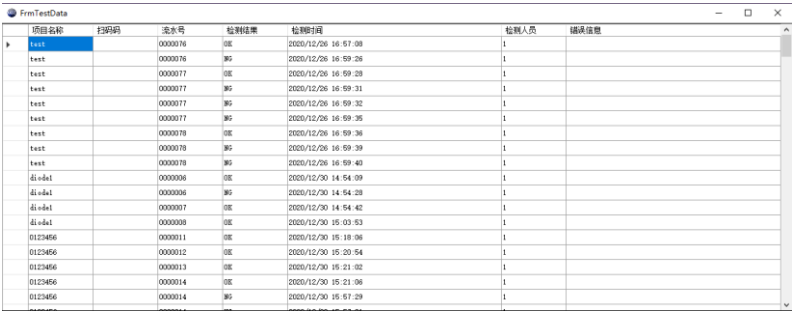
4, output test document: used to record the test file.

Here mainly set the system parameters, and function configuration.



4.3.15 Test Data

To view the data logging function, the user must install the necessary plug-ins to be successful!



The items recorded here are the item name, scan code, serial number, test result, test time, test user, and test error information.

4.3.16 Auxiliary Functions

Main functions:

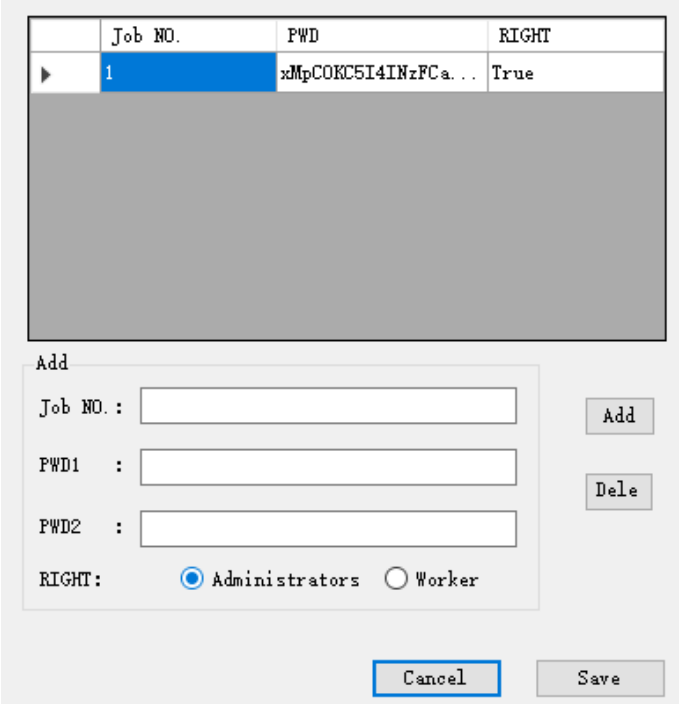
1. Export the project file

This function is mainly used to export project names to facilitate user statistics and verification.

2. Coordinate conversion

Input coordinate points, users can quickly find the use of the module coordinates, as well as the board location.

3. People management

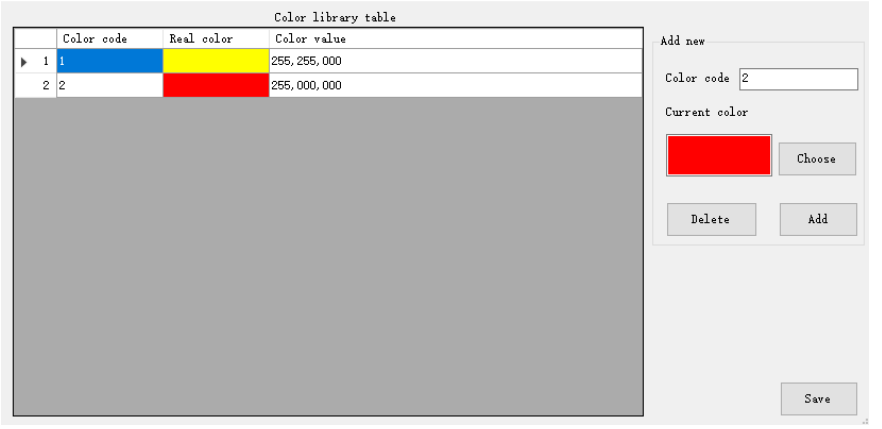


This function is mainly used to add and reduce users, password display is encrypted users.

4.Color management

This function is mainly used to set the color code when importing loop

table and line number programming



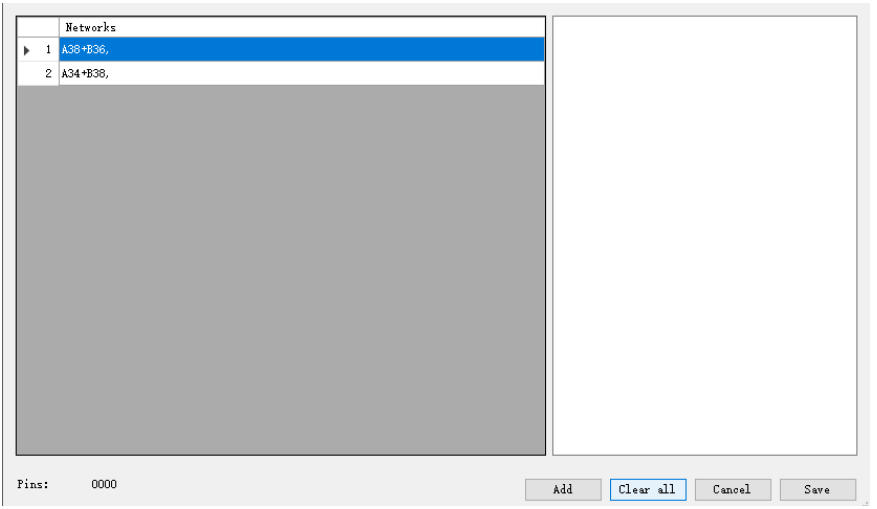
For example: "R" indicates that the actual code of the red color is 255,000,000, and the user only needs to enter R and the system will automatically replace it with the color code.

5. Rename project

The user can rename the current project, enter a new project name and click OK

6. Ground point management

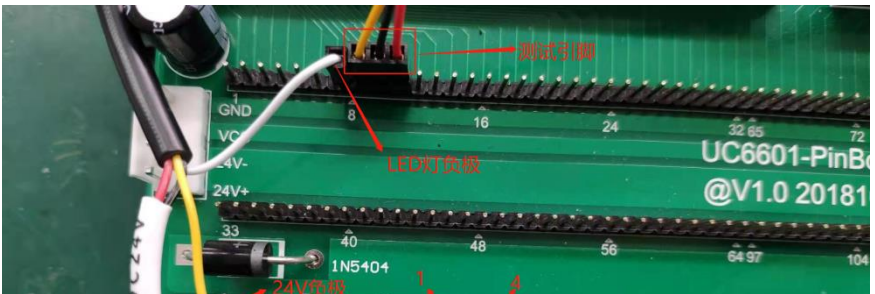
The ground point is mainly used for rail transit, testing of electrical control boxes, or special wiring harnesses that are actually connected to the earth.



4.3.17 Setting of coordinate light

Coordinate light setup steps

First, hardware connection



First, pin description:

1, 24V negative electrode

2, 24V positive electrode

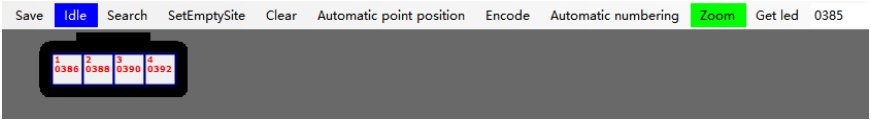
3. 5V positive electrode

4, 5V negative electrode

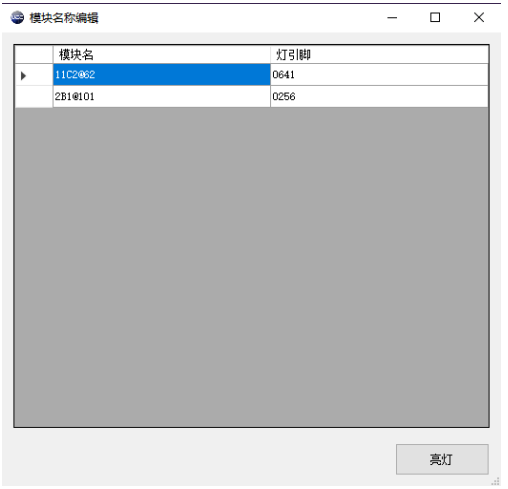
2. Connection description

The negative electrode of the LED lamp is connected to the front of the test pin of the fixture, as shown in the figure.

software setting



On the probe page, the user can click "Get light point", and the system will automatically calculate the position of the light pin, as shown in the figure, the minimum pin of the module is 0257, then its previous pin is 0256.



Users can light all module LED lights used in this project with this window

4.3.18 Troubleshooting Bad Contact and software prompt Description

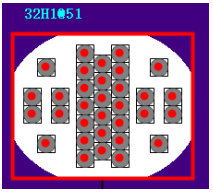


Figure1

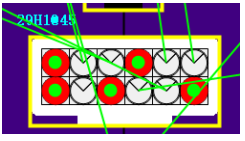


Figure2

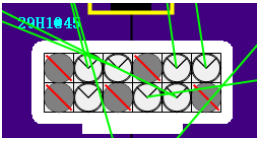
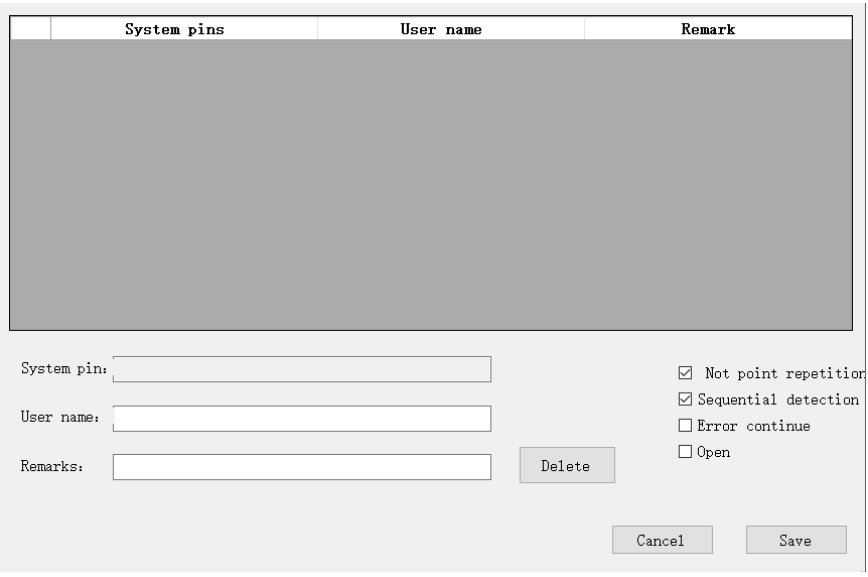


Figure3

1. As shown in Figure 1, the red box indicates that there is no probe.

2, As shown in Figure 2, the yellow box indicates that the connector has a wiring problem, and the red dot indicates the problem point.
3. As shown in Figure 3, when the user sets the empty pin, the yellow box disappears, indicating that the module is connected normally.
4, when there is poor contact, the user can find the point to determine whether there is real contact.

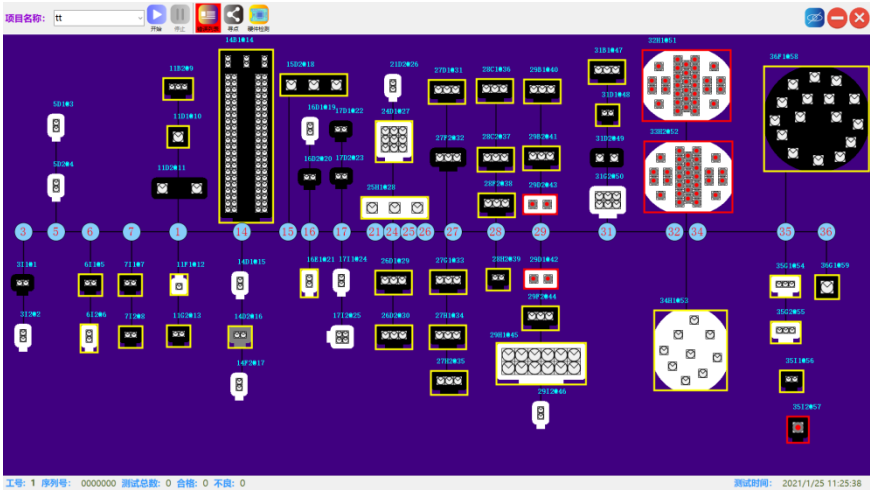
4.3.19 Single point detection



Single point detection is used to detect a special wire harness with terminals on one side and bare wires on the other side, and its operations are as follows:
Step 1: Open the "Single point Detection window" as shown in the figure above.
Step 2: Click the bare end through the "search pin pen".
Step 3: Click bare wire terminals one by one.
Step 4: Check "Turn on Detection"

Step 5: Confirm whether the detection method is "sequential detection" and whether "point duplication" is allowed.
Step 6: Confirm the save
Noun explanation:
Sequential detection: In the detection must be in accordance with the original point test order, click test one by one.
Point duplication: When you click the bare terminal, there will be some bare wires connected together, if there is a need to open the function.

4.4 Project Test page



This page is accessible to both testers and administrators.
Main test steps
Step 1: Scan the bar line code or two-dimensional code (need to turn on the scanning function), the system will automatically retrieve the program.
Step 2: Select the test program.

Step 3: Enter the test state.
Step 4: Insert the cable harness
Step 5: Pass the test
Step 6: Print the bar code
Step 7: Scan and print the bar code and record the data
Step 8: The system always pops up.
Step 9: Remove the test harness and return to step 1.

4.5 Operation Shortcut Keys

Create a page:
1. Key "A" : shortcut key for automatic learning.
2. Press G to view the loop table of the learning loop.
3, key "P" : quickly open and close the search function search.

Test page
1. Arrow keys ↑→↓← To switch test items.
2. Press "R" to start the test.
3. Press "T" to stop the test