



# TS-32

## Automated Nucleic Acid Extractor

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## Operation Manual



**TransGen Biotech Co., Ltd.**



## Catalogue

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## I Instruction

Welcome to use the TS-32 Automated Nucleic Acid Extractor. This manual gives a detailed description of the purpose, function and use of the TS-32 Automated Nucleic Acid Extractor. Please read this manual carefully before use, to make sure you use it correctly and understand its functions when you turn on the instrument, and ensure the safety of the operator. Please place this manual nearby the instrument for a timely reading if necessary.

Product name: TS-32 Automated Nucleic Acid Extractor

Product model: TS32

Date of manufacturer: See the label

Product Shelf life: 5 years

Date of issue and edition: August 2020, version: A

## **About the Manual**

This manual provides information on the proper use of the TS-32 Automated Nucleic Acid Extractor.

It is divided into seven chapters.

Chapter 1 "Introduction": It chapter introduces the safety requirements while using the product, and the restriction conditions of transportation and storage environment, etc.;

Chapter 2 "Control and Function": It mainly illustrates the product function, structure, key performance indicators, product characteristics, range of application and product principles;

Chapter 3 "Preparation before Use": It mainly introduces the site selection, consumable item installation, and the usage of keys on instrument before use;

Chapter 4 "Operation Instructions": It mainly introduces the functional modules of the Nucleic Acid Extractor;

Chapter 5 "Repair and Maintenance": It mainly introduces the professional preventive inspection of the instrument, the methods and cycles of maintenance and cleaning, and the analysis of common malfunctions;

Chapter 6 "Electromagnetic Compatibility": It mainly introduces the electromagnetic compatibility requirements and also clarifies the cautions needed to pay attention for normal operation of the instrument;

Chapter 7 "After-sales Service": It mainly explains the product warranty and maintenance services, and also provides the contact information of after-sales service units.

## 1.1 About Warning Symbols

### 1.2.1 The Meaning and Extend of Warnings

 Note: Failure of following the requirements may cause personal injury or instrument damage;

 Warning: Failure of following the requirements may cause personal casualties, accidents or fire hazards.

### 1.2.2 Description of Warning Symbols

 Caution; Indicates the user need to pay attention on the important cautionary information;

 Prohibited operation, failure of complying with the requirements may cause instrument damage, failure to work or injury to the operator;

 Peremptory instructions.

### 1.2.3 Description of Safety Symbols

#### (1) Instrument Safety Mark Description

 Protective Earth Terminal

 Dangerous Voltage

~ AC Power

 Biological Hazard

| On (Power)

○ Off (Power)

 Beware of burns

 IVD (In vitro diagnostic medical devices)

#### (2) Outer Packaging Label Description

 To be protected from rain;

 The stacking layer limit is 3 layer;

 Top: Indicates that the correct position of the transport package is upright;

 Fragile, handle with care;

 Do not roll: Indicates that the transport package cannot be rolled during transportation.

## 1.3 Safety Instructions

● To enable you successfully complete your work and give full play to the functions of this instrument. Please read this manual carefully before use. Please feel free to contact us in case of any inquiries or comments on our product or this manual.

● To ensure the safe and reliable operation of the instrument, the user shall comply with the following requirements in daily operation:

1) To ensure the safety of the product, maintenance, repair and replacement of parts shall be carried

out by our company's professional engineers or qualified maintenance personnel trained by our company;

- 2) The instrument shall only be replaced with parts recommend by our company. It is essential to ensure the safety and effectiveness of the instrument;
- 3) To ensure that the instrument shall adopt the correct voltage and frequency as required;
- 4) In case of a lightning in the surrounding, it may cause voltage shock in TS-32 which may cause danger. It is recommended to unplug the power cord from the AC outlet and stop using.

### **1.3.1 Instrument Classification**

Overvoltage Category: Class II

Pollution Degree: Level 2

Management Category: Class I

### **1.3.2 Safety Usage Instructions**

1. Before using the TS-32 Automated Nucleic Acid Extractor, make sure to read this section to ensure safe and correct operation. The following measures are related to safety and must be strictly followed.

2.  Warning: General requirements

-  Please read this manual carefully before using the instrument;
-  Do not spill or pour liquid into the instrument, do not put the instrument in liquid, or place the instrument where it may fall into the liquid; if the device becomes visibly wet, unplug the power cord immediately;
-  When the instrument is connected to the power supply, do not leave the equipment unattended;
-  Use this equipment only for the purposes described in the manual, do not use it for other purposes;
-  Please do not use accessories not provided or recommended by the manufacturer;
-  If the equipment is not working properly or is damaged, please do not use the device;
-  Do not allow the device or the flexible cord of the device touch overheated surfaces;
-  Do not block the vents, or place the device on a soft surface that may block the vents, and keep the vents away from soft cloth, fluff, soft hair, etc.
-  Do not place any objects on the top of the device;
-  Do not use outdoors;
-  Protective Measures: Do not open the hatch door during operation.

3.  Warning: Connecting part

 If the power cords of several different instruments are connected together through a multi-purpose socket, the increase of the leakage current of the enclosure may cause potential danger;

 Before connecting to the power supply, ensure that the setting of the connected voltage matches the power supply voltage required by the device.

4.  Warning: Power requirements

 Be sure to connect the AC power cord to the medical three-core power socket. If there is no such socket, please use a ground wire to connect the instrument securely.

5.  Warning: Anti-explosion requirements

 Do not operate TS-32 in a working environment with potential explosion hazards, and do not operate TS-32 in the presence of flammable anesthetic gas;

 Do not use a high pressure sterilizer, strong oxidants for sterilization, or immerse the nucleic acid extractor in disinfectant.

6.  Warning: Preventive check and maintenance

 In order to make the instrument run under safe conditions and prevent from potential problems during use, preventive check and maintenance is essential. Generally, preventive maintenance is carried out at least once a year, including a thorough inspection of the instrument and all connecting cables. Before using the instrument, if the following physical damage occurred, it must be maintained immediately.

If the instrument is subjected to excessive impact, such as after a heavy fall;

If solids or liquids fall on or flow into the instrument;

If the instrument cannot work normally or an abnormality occurs during operation;

If some parts of the outer case are cracked or damaged;

If the power cord shows signs of damage.

7.  Note: Transportation and storage

TS-32 shall be packed in specific packaging materials, and transported and stored under specific conditions.

8.  Note: General precautions

 Do not store the instrument in a place with potential liquid corrosion;

 Do not place the device in a location where the power switch is difficult to reach or operate,

such as: the power switch faces the wall;

- ⊘ Do not expose the instrument under strong impact or vibration, and do not fall it down;
- ⊘ If the equipment needs to be lifted or transported, please apply a uniform external force greater than its weight at the bottom of the device and move it steadily to avoid overturning or falling;
- ⊘ Avoid of strong impact for display screen; improper impact may damage its components;
- ⚠ When unplugging the power cord, please pull out the plug, do not directly pull the power cord itself. Besides, do not plug and unplug the power cord with wet hands, which may cause electric shock, short circuit or personal injury;
- ⚠ Please use a soft cloth or cloth dipped in clean water or neutral solution to wipe the dust and dirt adhere to the surface of the screen.

#### **1.4 Transportation and Storage Conditions**

1. Ambient temperature range:  $-20^{\circ}\text{C} \sim +55^{\circ}\text{C}$ ;
2. Relative humidity range:  $\leq 80\% \text{ RH}$ ;
3. Atmospheric pressure range:  $75\text{kPa} \sim 106\text{kPa}$ .

#### **1.5 Operating Environment Conditions**

1. Ambient temperature range:  $+5^{\circ}\text{C} \sim +40^{\circ}\text{C}$ ;
2. Relative humidity range:  $\leq 80\% \text{ RH}$ ;
3. Atmospheric pressure range:  $75\text{kPa} \sim 106\text{kPa}$ .

#### **1.6 Power Conditions**

1. Working voltage:  $\text{AC}220 \sim 240\text{V}$ ;
2. Voltage frequency:  $50/60\text{Hz}$ ;
3. Input power:  $350\text{VA}$ .

#### **1.7 Basic Parameters**

1. Maximum sample extraction: 32;
2. Temperature control range: room temperature  $\sim 120^{\circ}\text{C}$ ;
3. Processing volume:  $20\text{-}1000 \text{ uL}$ ;
4. Product size:  $394 \times 420 \times 370 \text{ (mm)}$ ;
5. Net weight:  $22\text{Kg}$ .

## **1.8 Connect to the Power Supply**

1. Please connect to AC power.
2. Use an AC power socket with a ground wire, and ensure the ground wire is effectively connected with the device.
3. In case of a lightning in the surrounding, which may bring voltage shock in TS-32 and cause potential danger, it is recommended to unplug the power cord from the AC outlet and cease using the device.
4. After the nucleic acid extraction is completed, you can click the Power Off button on the display screen to shut down the device and then turn off the power.

## II Controls and Functions

### 2.1 Function introduction

The TS-32 Automated Nucleic Acid Extractor is an in vitro diagnostic device, which is used to extract and purify nucleic acids from biological samples. Through the mixing of liquids, the collection, release and transfer of magnetic beads, the extraction and purification of nucleic acids are automatically realized. The equipment has a temperature control function and can extract 1-32 samples at the same time, which truly realizes the high-throughput, rapid and automated extraction of nucleic acids. The equipment is equipped with different types of nucleic acid extraction kits, which can extract and purify nucleic acids from biological samples such as blood, plasma, saliva, oral swabs, viruses, animal and plant tissues, bacteria, microorganisms.

### 2.2 Main Structure

#### 2.2.1 Front View



Figure 1-1 Front View

## 2.2.2 Back View



Figure 2-2 Back View

## 2.2.3 Input and Output Connection

Table 2-1

Serial No.	Interface Name	Description of Functions
1	LAN Port	Reserved
2	USB2.0 Port	Used to connect U disk, keyboard or mouse
3	Power Input Port	Single-phase AC input power, with grounding protection

## 2.3 Functions

1. Open door pause function;
2. Emergency stop function;
3. Prompt function by the end of nucleic acid extraction;
4. Program import and export functions;
5. Ultraviolet lamp disinfection function.

## 2.4 Main Performance Indicators

1. Working temperature: setting range: room temperature to 120° C;  
temperature accuracy:  $\pm 5^{\circ} \text{C}$  ( $\leq 90^{\circ} \text{C}$ ),  $\pm 8^{\circ} \text{C}$  ( $> 90^{\circ} \text{C}$ );
2. The recovery rate of magnetic beads: >98%;

## 2.5 Product Features and Scope of Application

### 2.5.1 Product Features

1. With temperature control function, it realizes the temperature conversion from room temperature to 120°C, which can meet different temperature requirements of the nucleic acid extraction process.
2. Fast extraction speed: A whole nucleic acid extraction process can be completed in about 30 minutes.
3. Ultraviolet disinfection function avoid cross contamination.
4. User management function, with different user permissions to meet different occasions.
5. USB interface can fast input and output running programs.
6. A 7-inch LCD screen can synchronize the nucleic acid extraction process.
7. With its touch function, users can easily create and edit running programs on the device.

### 2.5.2 Intended Purpose

This instrument is used for the extraction and purification of nucleic acids in clinical samples.

**2.5.3 Scope of Application:** All people.

### 2.5.4 Contraindications

Not found.

## 2.6 Product Principle

The TS-32 nucleic acid extractor realizes the separation and extraction of nucleic acid through the transfer of magnetic beads. The device uses the movement of the magnetic rod to realize the transfer of magnetic beads from the sample lysis solution, washing solution, and then to the eluent, and automatically completes the whole process of nucleic acid extraction and purification through temperature control.

The process and principle include the following steps:

- 1) Lysis: Add the sample to be processed into the lysis solution containing magnetic beads, fully mix, and lyse the cells under appropriate heating conditions;
- 2) Binding: the released nucleic acid is specifically adsorbed to the magnetic beads, and the lysed protein and other molecules which are not adsorbed remain in the reagent solution;
- 3) Washing: Under the action of the magnetic field of the magnetic rods, the magnetic beads are separated from the solution, and the magnetic beads are transferred to the washing solution through the movement of the magnetic rods. Through repeated washing, impurities such as protein and

inorganic salts are removed;

4) Elution: After the washing step, the magnetic beads are transferred to the eluate by the movement of the magnetic rods, and the nucleic acid is eluted from the magnetic beads. At last, the magnetic beads are removed by the movement of the magnetic rods and thus complete the whole process of extraction and purification of the nucleic acid.

## III Preparation before Use

The TS-32 Automated Nucleic Acid Extractor is composed of mechanical parts and electrical parts, and is used with the kit to realize the separation and extraction of nucleic acids in test samples.

Before using the device, make sure that you fully understand the information of the kit and read this manual carefully.

### 3.1 Selection of Working Site

1. Please install the nucleic acid extractor in strict accordance with the following method.

(1) Use a three-wire AC power socket with a ground wire, and ensure the ground wire is effectively connected with the device;

(2) If there is strong electromagnetic radiation around, it will cause different degrees of interference to the machine, such as leakage current, electrostatic induction, electromagnetic induction, coupling magnetic flux, etc. Please make sure that there are no high-voltage lines and heavy-load power lines passing nearby the device.

2. Please use it under the specified temperature, humidity and atmospheric pressure.

3. The equipment should be placed in a wide place for easy operation and use, with good ventilation condition. Don't place the equipment where it is difficult to operate the power switch.

4. The weight of the device is 22kg. In order to prevent the platform for placing the machine from collapse, the load-bearing capacity of the platform is required to be at least 30kg.

### 3.2 Installation and Removal of Supporting Consumables

This instrument is used together with magnetic bead method nucleic acid extraction kit and consumables.

Well plate installation, as shown in Figure 3-1 below.

Please pay attention to the direction: A1 is inward.

If you are operating the instrument for the first time, install the magnetic rods first. Enter the Maintenance Function module prescribed in 4.1 and 4.6 of the manual. Click the "Replace the Magnetic Rod" button, and the magnetic rod will move to a suitable position. Take out the magnetic rods from the packaging box and screws from the self-sealed bag, and install the magnetic rods on the

magnetic rod holder in sequence with the hexagon ring wrench. After installation, click the back button to return to the main interface.

 Note: The magnetic rod is fragile, please do not put it under force during installation.



Figure 3-1 Well-plate Installation

The installation of the magnetic rod sleeve is shown in Figure 3-2.

During installation, make sure the magnetic rod sleeve end clips into the alignment hole of magnetic rod sleeve holder.



Figure3-2 Installation of Magnetic Rod Sleeve

After the nucleic acid extraction, please loosen the clip by hand to exit the magnetic rod sleeve and remove the well plate.

 Note: Please check the expiration date of the matching kits and consumables. Do not use if it

exceeded the expiration date.

Please perform personal safety and hygiene protection as required on the experimental site; Waste disposal after use shall be subject to the *National Medical Waste Management Regulations*, relevant regional laws and regulations or relevant laboratory management regulations;

Please read the instructions and precautions of the kits and consumables carefully, and operate according to the regulations.

 **Note:** Do not slide the magnet rod and the magnet rod holder in the standby status. Do not use the device in hazardous environments or use hazardous materials beyond the designed range.

### 3.3 Power Connection

Connect the power cord to the power socket at the back of the device, and the other end to an adaptable AC power outlet. Turn on the power switch at the back of the device to startup.

### 3.4 Keyboard Instructions

The instrument pops up the keypad where you need to input information.

**Keypad:** The keypad pops up where you need to enter numbers, as shown in Figure 3-3.



Figure 3-3 Keypad



: Confirm Key, to confirm and return after entering numbers.



: Back Key, to delete the entered number.



: Positive and negative value key. The default value is positive. When a negative value is required, enter the number, and then click the button.

**Smart keyboard:** The keyboard pops up when you need to enter characters or numbers, as shown in Figure 3-4.



Figure 3-4 Smart Keyboard

You can enter letters and numbers by default. Press Ctrl and followed by the space bar to enter Chinese characters.

Other functions are consistent with computer keyboard functions.

## IV Operating Instructions

### 4.1 Switch On

Turn on the switch of the Automated nucleic acid extractor, the device will startup and then enter the login interface after the self-check is completed, as shown in Figure 4-1.

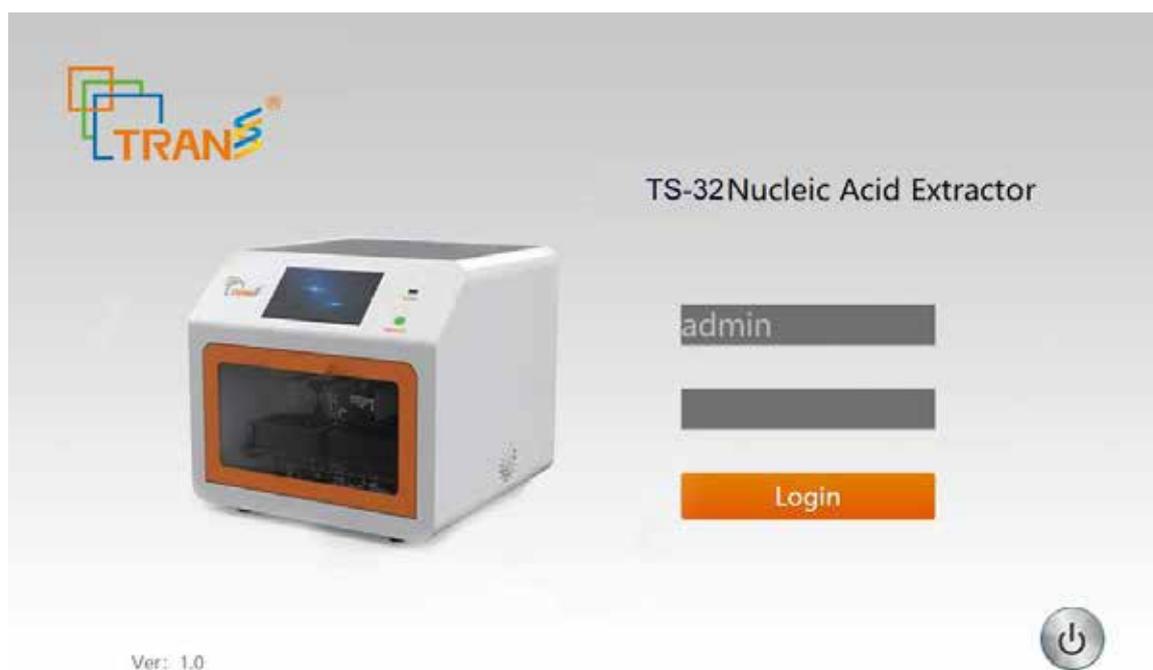


Figure 4-1 Login Interface

After entering the login interface, the device will initialize, reset and self-check each moving part, and the progress of the self-check will be displayed in the left corner of the interface.

After the self-check, the operator can enter the user ID and password on the login interface and click the "Login" button to enter the main interface. On the login interface, the default user ID for the first login is **admin**, the default password is **000000**, and each login defaults to the last login user name.

Enter the main interface from the login interface, as shown in Figure 4-2.

The main operation interface includes the following 8 major functional modules of the device, which are "Program ", "Program Management", "UV Lamp ", "User Management", "Extraction Record", "Change Password" "Maintenance" " "System Settings", and other functions for logout, shutdown and time display.

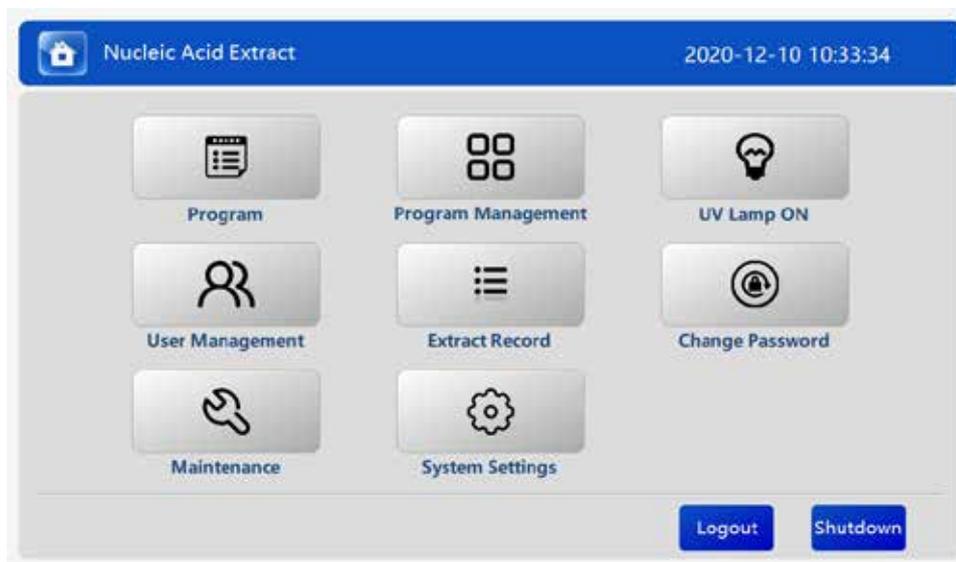


Figure 4-2 Main interface

## 4.2 Program Management Function

This function is to add and edit the extraction process program and parameter settings to be executed by the device.

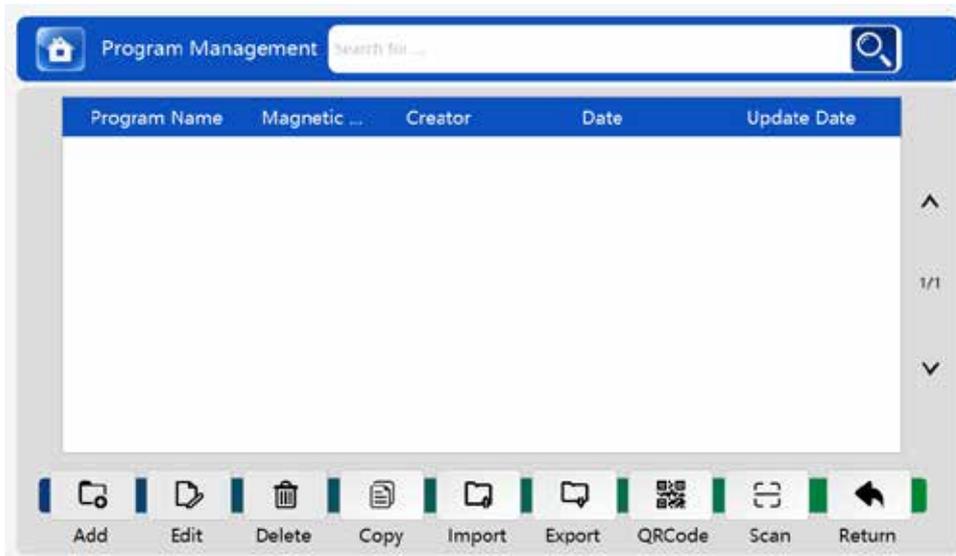


Fig.4-3 Program Management

Click the "Program Management" button on the main interface, the program list interface shows, as shown in Figure 4-3, and at the same time it also displays "Create", "Edit", "Delete", "Copy", "Import", "Export", "Back" function buttons. The program list interface displays the information of

the program that has been programmed, including program name, the row number of the magnetic rod used, the creator, creation date, and editing time. Every compiled program will be displayed in the program list. Each compiled program is displayed in the program list and ranged by the last edited time.

#### 4.2.1 Add

Click the "Add" button to enter the program interface for programming.

The programming is mainly composed of 7 functional modules: "Abstract", "Reagent", "Mix", "Collect", "Release", "Pause" and "Dry".

**Summary:** When programming, enter the "Abstract" interface by default, as shown in Figure 4-4.

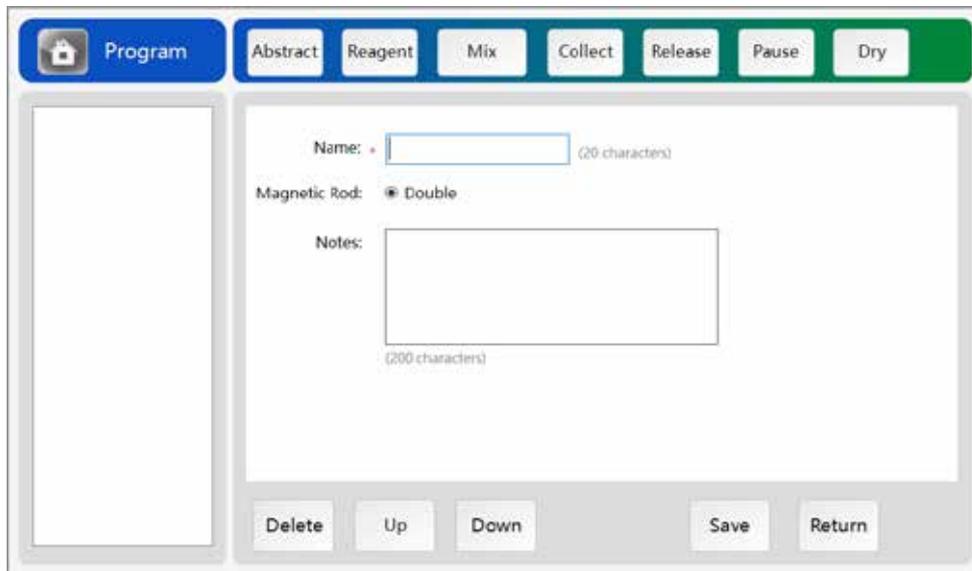


Figure 4-4 Abstract

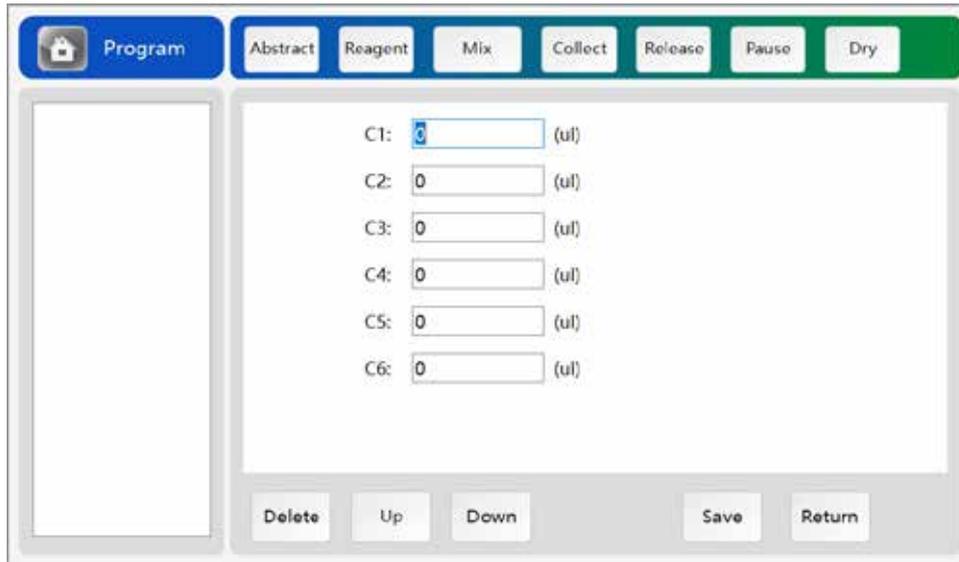
Name: used to fill in the name of the compiled program;

Magnetic Rod: The device selects double-row magnetic rods by default;

Remarks: fill in other information of the program;

**Reagents:** fill in the volume of reagents and samples to be added in each well of each work station.

Click the "Reagent" button to enter the reagent interface, which is used to fill in the volume of reagents added in the cartridge column, as shown in Figure 4-5.



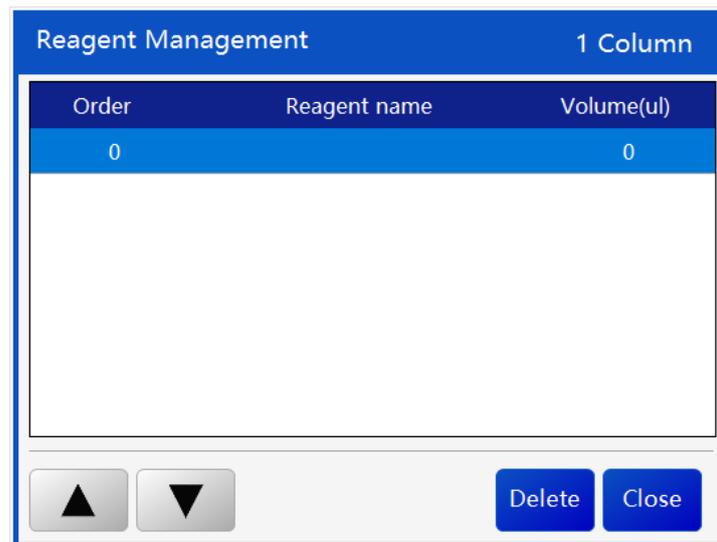
Program | Abstract | Reagent | Mix | Collect | Release | Pause | Dry

C1: 0 (ul)  
 C2: 0 (ul)  
 C3: 0 (ul)  
 C4: 0 (ul)  
 C5: 0 (ul)  
 C6: 0 (ul)

Delete | Up | Down | Save | Return

Figure 4-5 Reagent

In the reagent interface, Click the space after each cartridge column to enter the reagent setting interface to set the reagents and volumes required for each cartridge column, as shown in Figure 4-6.



Reagent Management | 1 Column

Order	Reagent name	Volume(ul)
0		0

▲ ▼ Delete Close

Figure 4-6 Reagent Management

As shown in the figure, fill in the reagent name, set the volume of the reagent. It is allowed to fill in multiple columns of reagent information, and move sequence through up and down buttons.

 Note: Please fill in the reagent name first, then fill in the reagent volume;

The maximum volume of liquid in each well is 1000uL, please do not exceed the maximum amount when adding reagents and samples, otherwise the device will give a prompt.

For unnecessary reagent column information, select and click the " " button to delete.

After the setting is completed, click the "Return" button to save and close the reagent setting.

Follow the above steps to set the reagent information in other columns, as shown in Figure 4-7.

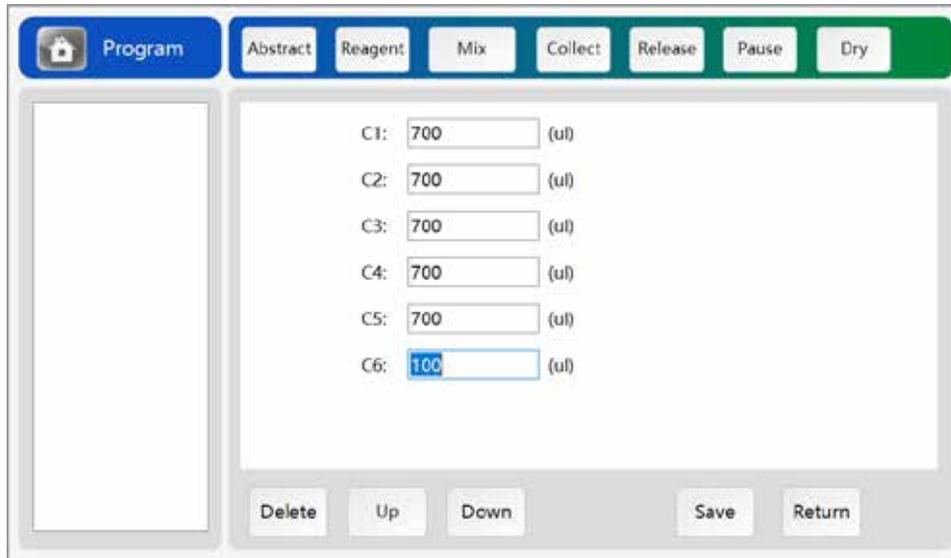


Figure 4-7 Reagent Information

Note: The reagent information shown above is for illustration only, and operator needs to insert the corresponding reagent information based on actual condition;

**Mix:** This function is mainly to complete the mixing of reagents and samples in the deep well plate, including the mixing speed, time, temperature, whether to collect and release magnetic beads, etc.

In the "**Initial Mixing**" interface, see Figure 4-8, select the column number of the liquid to be mixed, and choose whether to release the magnetic beads before mixing.

**Name:** Mixed by default, 1 represents the first mixing, if you click "**Mix**" again, it will show "**Mix 2**", "**Mix 3**" ..., the operator can modify by the keyboard;

**Column:** select the column where the mixing step is located;

**Release magnetic beads:** select whether to release magnetic beads before mixing;

**Time:** set the vibration time when releasing the magnetic beads;

**Speed:** set the speed of vibration when releasing the magnetic beads;

**Enable:** Select whether this mix step is enabled. It is enabled by default. If not selected, skip the step during the extraction process and proceed directly to the next step; if the step is skipped, the color on the left of the list will be in grey by default.

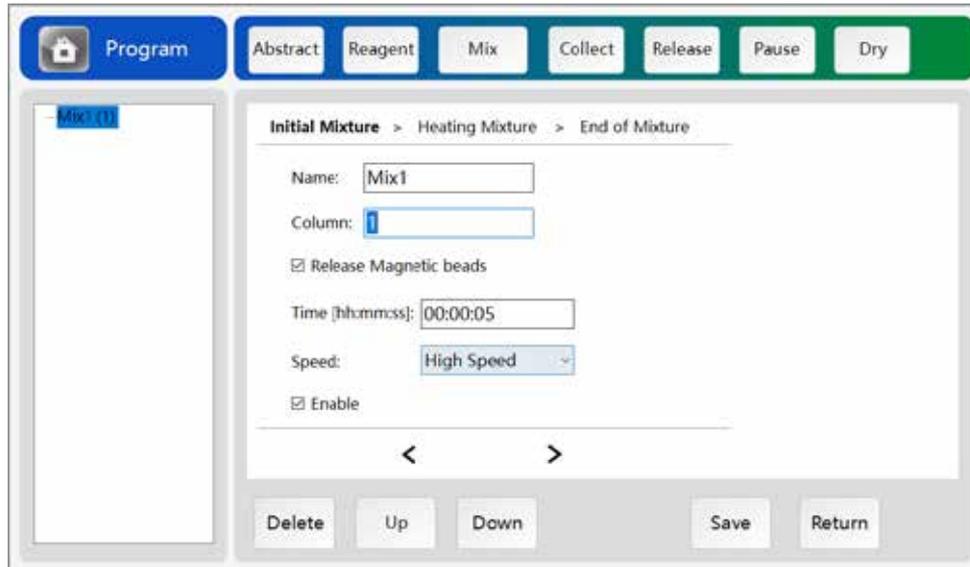


Figure 4-8 Mix- Initial Mixture

Click the right arrow to switch to the right and enter the "**Heating Mixture**" interface. You can also click the left arrow to switch to the left interface.

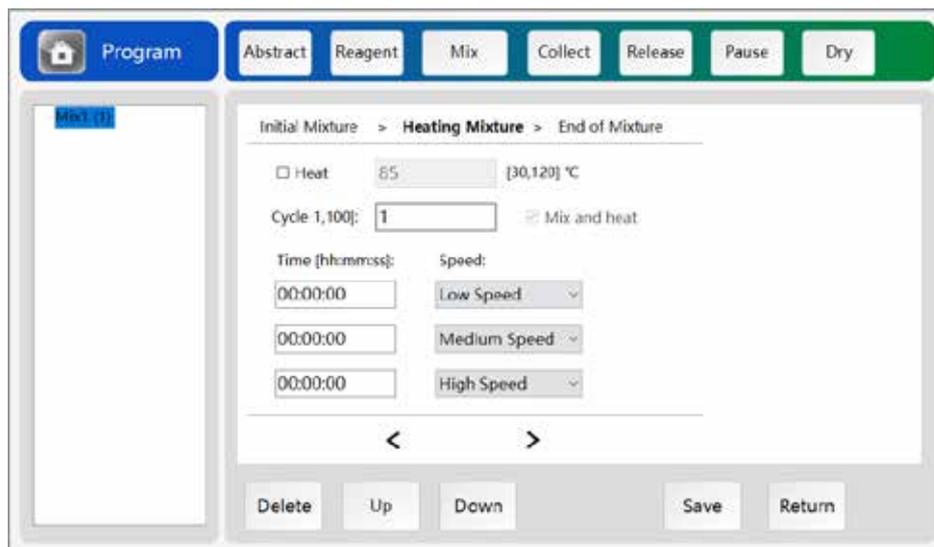


Figure 4-9 Mix- Heating Mixture

In the "**Heating Mixture**" interface, see Figure 4-9, the heating option is mainly used to set whether to heat, heating method and the time and speed of mixing.

Heating: It is not heating by default. If heating is needed, click "check"

Temperature: Set the temperature when heating, if the set temperature is lower than the current temperature, it is by default not to heat;

Heating and Mixing: If selected, mixing will start while heating is started; if not selected, the mixing will start when the temperature reaches the set temperature;

Cycles: Select times of vibration;

Time: Set the time for the liquid to mix in the well plate;

Speed: Select the mixing speed. There are four gears of speed, including high, medium, low and neutral position respectively; two mixing positions, including bottom vibration and middle vibration;

High speed: mixing at a fast speed;

Medium speed: mixing at a medium speed;

Low speed: mixing at a low speed;

Bottom Vibration: mixing at the bottom, mainly used in liquid mixing with volume less than 100uL;

Middle Vibration: mixing in the middle of the liquid;

---: no operation performed, skip the step;

In the "End Mixing" interface, see Figure 4-10, select whether to collect magnetic beads and the collection method after the end of mixing.

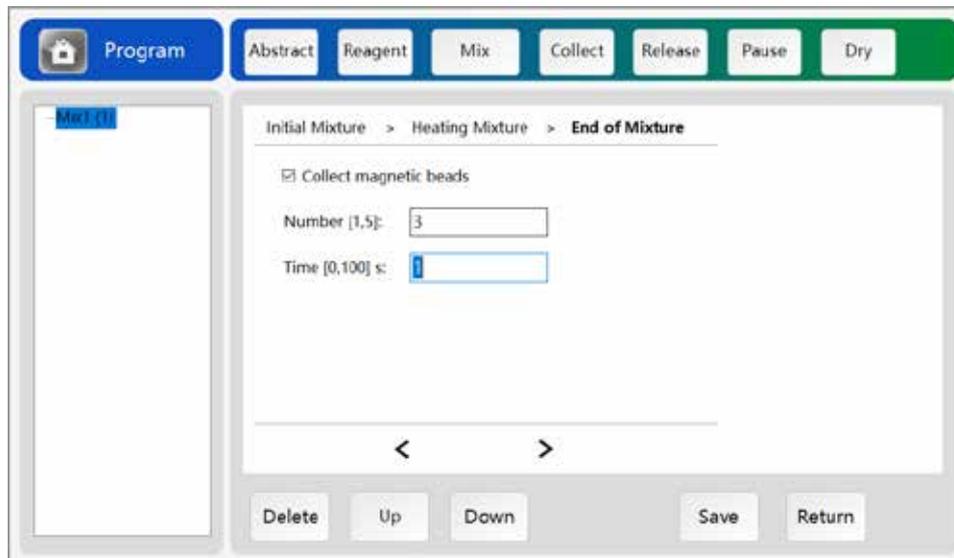


Figure 4-10 Mix- End Mixing

Collect magnetic beads: Select whether to collect magnetic beads after end mixing;

Times: Select number of times to collect magnetic beads, 1-5 times is optional.

Time: Select the time to collect the magnetic beads, 0-100 seconds is optional;

**Collect:** the same as the collect magnetic beads function in the "End Mixing " above, collecting magnetic beads function in this step can be set separately to collect the magnetic beads in a column for users flexible use, as shown in Figure 4-11.

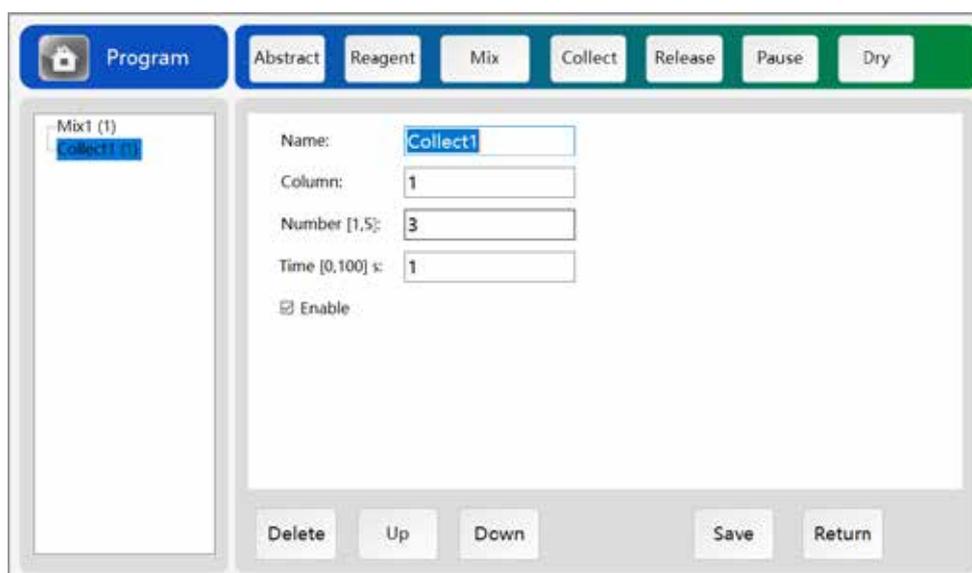


Figure 4-11 Collect

Name: Action name by default which can be modified by users according to their needs;

Column: Select the column of magnetic beads to be collected;

Times: Select the number of times the magnetic beads are collected in the corresponding column, optional 1-5 times;

Time: Select the time for each magnetic bead collected, optional 0-100 seconds;

**Release:** The same function as the release magnetic beads in the " Initial Mixture" Function above. The release magnetic beads in this step can be set to put the collected magnetic beads from a certain column into the corresponding column for flexible use by users, as shown in Figure 4-12.

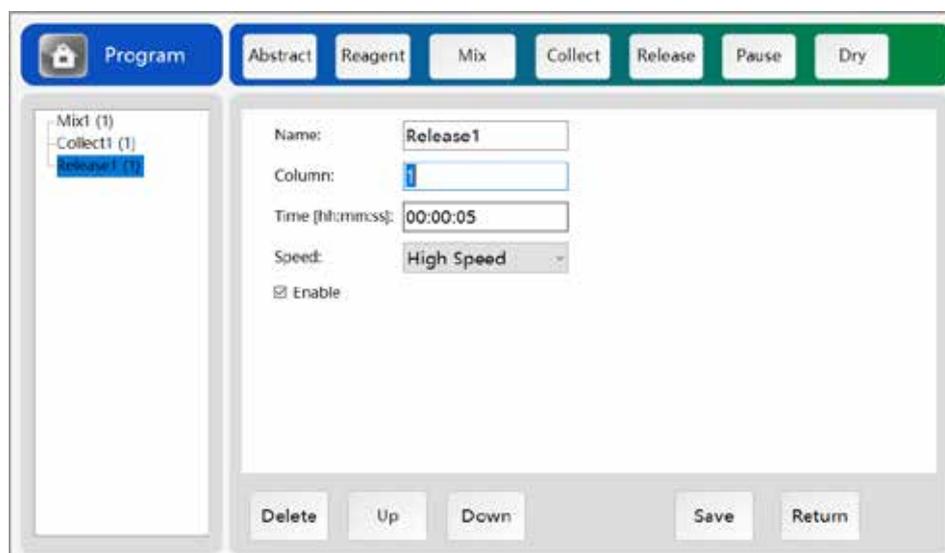


Figure 4-12 Release

Name: Action name by default which can be modified by users according to their needs;

Column: Select the column to put the magnetic beads;

Time: Select the time to release the magnetic beads;

Speed: Select the speed of releasing the magnetic beads;

**Pause:** This step is used to pause the ongoing process, mainly used to add reagents or samples during the extraction process, as shown in Figure 4-13.

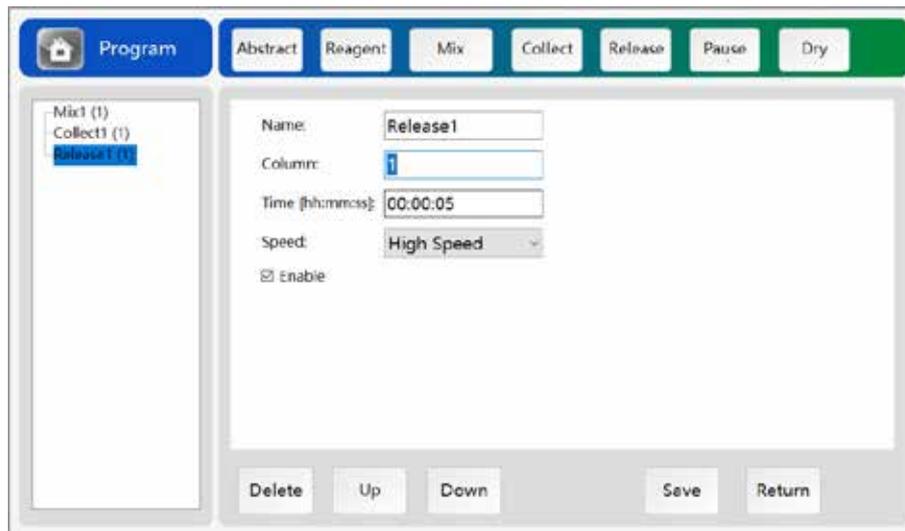


Figure 4-13 Pause

Name: Action name by default which can be modified by users according to their needs;

Column: Select the column to be paused;

Reagent: Set the reagents and volume of reagent to be added during pause;

Prompt Message: Add prompt message to users during pause;

**Dry:** This function is to take the magnetic rod sleeve out of the liquid and to dry the liquid on the surface of the magnetic rod sleeve, as shown in Figure 4-14.

Name: Action name by default which can be modified by users according to their needs;

Column: Select the columns to be dried;

Time: Select the time for drying;

Position: Select whether to dry the surface or the outside place of the reagent

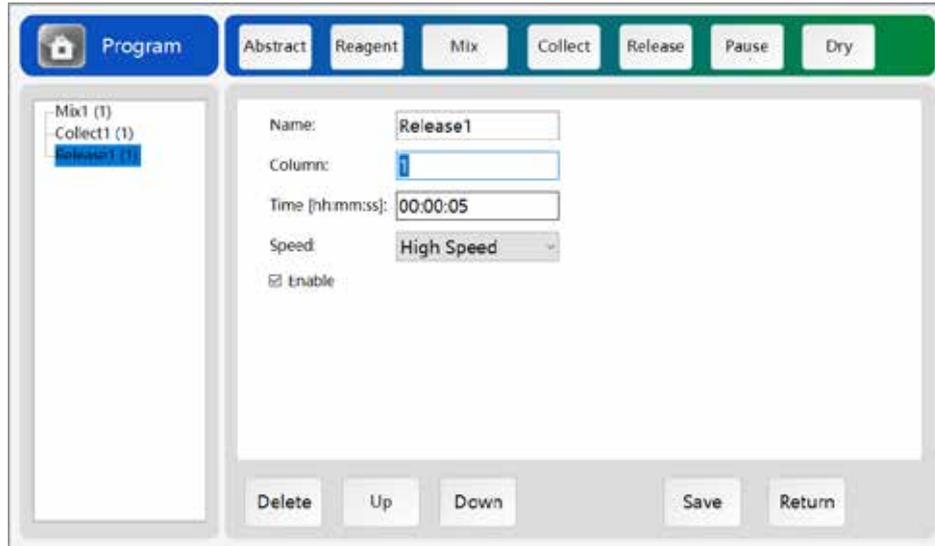


Figure 4-14 Dry

The program compiled by the user will be displayed in the form of a list on the left side of the page, and users can directly see the execution flow of the program that was compiled. The number in parentheses after each step represents the column where the step is executed.

Each step has an option to enable or disable the step. By default, it is enabled. If not, the color of the step will be in grey in the list on the left. And the step will not be automatically skipped.

The user can select a step in the list on the left, adjust the position of the step through t

"▼" buttons on interface, and select the "🗑️" button to delete the step.

In the process of programming, you can click the "Save" button to save at any time. After the programming is complete, click the "Return" button to return to the program list.

#### 4.2.2 Edit

In the program list, select the compiled programs and click the "Edit" button to edit the selected program. Interface and operating method of the editing interface is consistent with the "Add" interface.

The main purpose is to modify the compiled program.

#### 4.2.3 Delete

This function is used to delete the compiled program in the program list. In the program list, select the program to be deleted, click the "Delete" button to delete the program.

#### 4.2.4 Copy

This function is used to copy a program that is the same as in the program list. Select a program in the

list and click the "Copy" button, the same program the same as the selected one appears in the list. The program name is automatically added with (1). If you continue to copy, the number in the parentheses continues to extend.

#### 4.2.5 Import

This function is used to import the programs compiled and stored in the U disk into the program list for use.

Click "Import" and a list of programs in the U disk will appear. Select the program to be imported and click "Import" again to import the program into the program list. As shown in Figure 4-15.

Note: Please insert the U disk before performing this step and the following "Export" function.

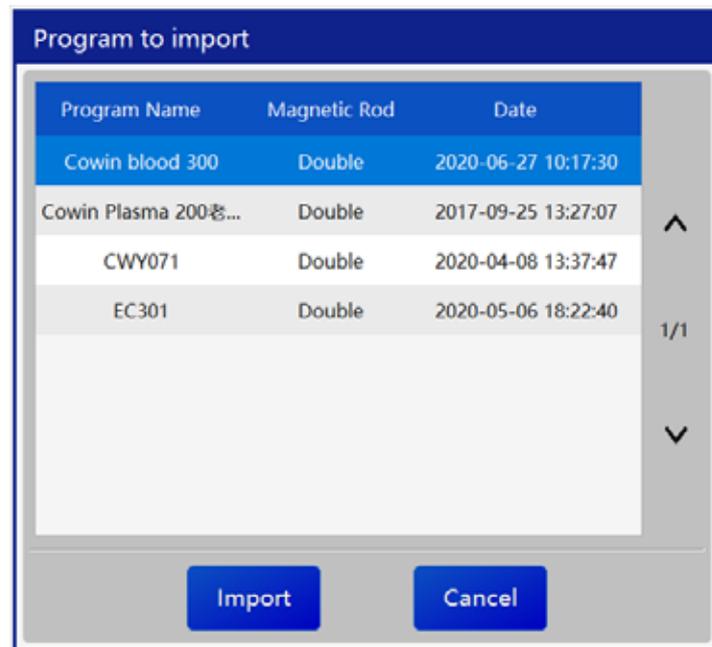


Figure 4-14 Import

#### 4.2.6 Export

This function is used to export a certain program selected from the program list to the U disk for storage, as shown in Figure 4-16.

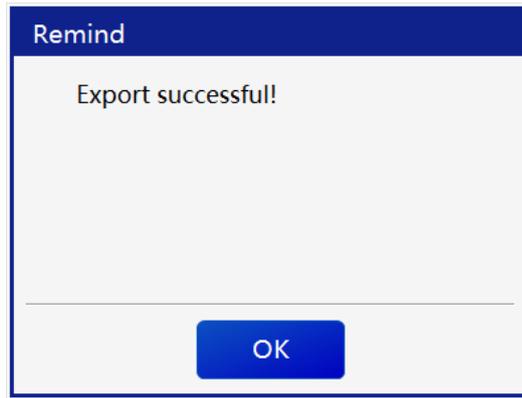


Figure 4-14 Export

#### 4.2.7 Scan

The function is used to scan the compiled program with generated QR code into the device, as shown in Figure 4-17.

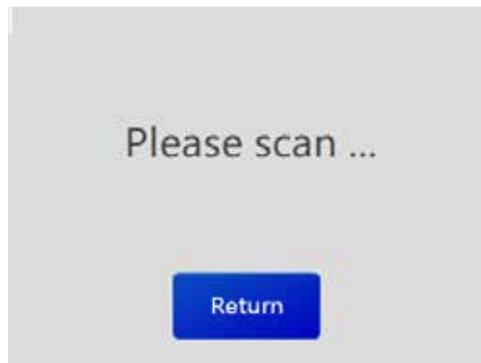


Figure 4-14 Scan

#### 4.2.8 Return

Click the "Return" button to return to the main interface.

### 4.3 Pre-set Extraction Function

The main function of this module is to select the prepared program, execute and run the corresponding program for the nucleic acid extraction from the biological sample.

In the main interface, select "Extraction " to enter the program extraction interface, see Figure 4-18, the newly added or edited program in the program management will be displayed in the pre-set program.

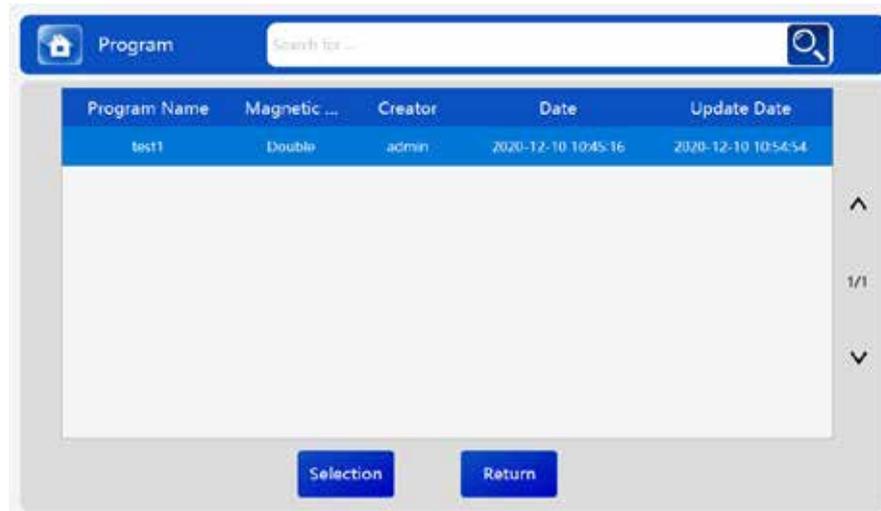


Figure 4-18 Pre-set Program Extraction

Select the program to be run on this interface. At this time, the program is displayed in blue. Click "Select" to enter the pre-set program- program information interface, as shown in Figure 4-19. The left side displays the information and execution steps of the selected program. The right side displays the heat plate position.



Figure 4-19 Program Extraction-Program Information

Click "OK" on this interface, the device will prompt a message to install the corresponding magnetic rod and magnetic rod sleeve according to the pre-set information of the heat plate.

Click "OK" to enter the extraction display interface, as shown in Figure 4-120, the device starts to extract. Click "Cancel" button to return to the pre-set program interface.

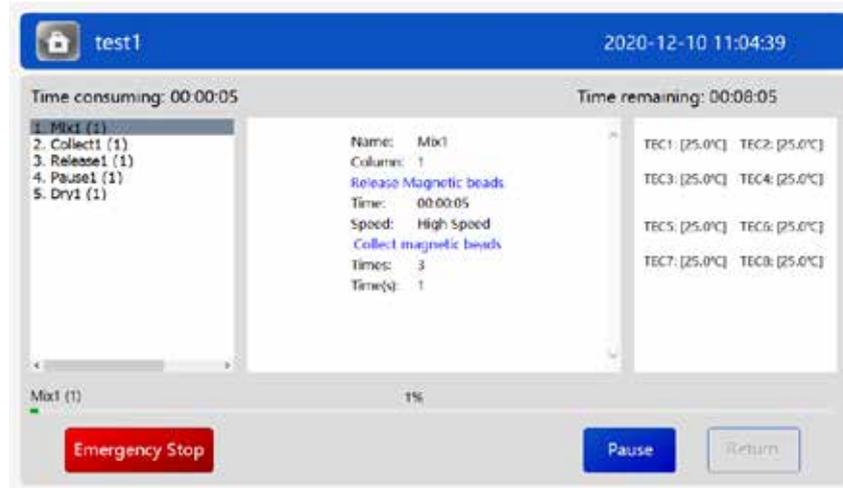


Fig.4-19 Extraction Progress Display

In case of an emergency, the user can press the "Emergency Stop" button to realize the emergency stop of the device, and then click "Return" button to return back. In this case, you need to enter the Maintenance Test and solve the problem before proceeding to the next extraction.

During the execution of the program, user can also click the "Pause" to pause the program and make a beep sound. At this time, the "Pause" button becomes the "Continue" button. Click the "Continue" button, the extraction program continues to operate.

When the nucleic acid extraction process is completed, the device will pop up a prompt window with a beep sound. At this time, user can click the "OK" button on the screen to close the message, door and take out the kit. After the nucleic acid extraction process is completed, the "Return" button is automatically enabled with lights on. The user can click the "Return" button to return to the main interface.

On the extraction process display interface, the user can observe the currently executed nucleic acid extraction program, the currently executed steps in the program and the elapsed time.

#### 4.4 UV Lamp

The user can set to turn on the UV lamp and enter the UV Lamp interface to disinfect the inside of the device.

Select "UV Lamp On" on the main interface to enter the UV Lamp interface, as shown in Figure 4-21 which shows "Set the lamp-on duration" window and "OK" and "Cancel" buttons.

The user can set the duration of the UV lamp to be turned by adjusting + and - buttons at the position of hour, minute or second.

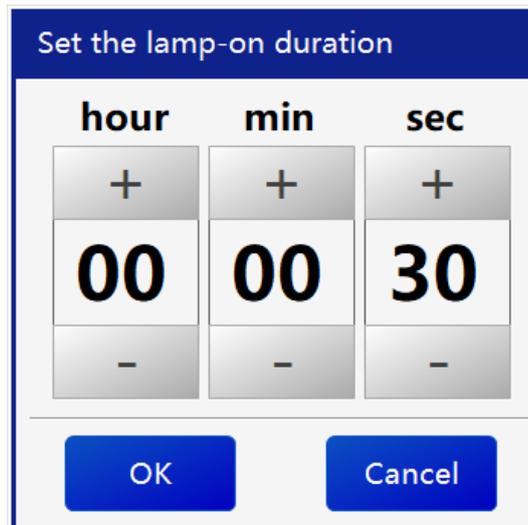


Figure 4-20 UV Lamp Settings

After setting the duration of UV lamp for disinfection, click the "OK" button and return to the main interface. In the meanwhile, the UV lamp is on with the "Remaining Time" and "Turn Off the UV Lamp" displayed on the interface, as shown in Figure 4-22.



Figure 4-21 UV Lamp Display

To turn off the UV lamp, click "Turn Off" button to turn off the UV lamp and at the same time the interface displays "Turn On" button.

On the UV lamp setting interface, if click the "Cancel" button, it will directly return to the main interface without turning on the UV lamp.

If the UV lamp is on and the hatch door is opened at this time, the UV lamp will automatically pause. When the door is closed, the UV lamp will continue to turn on till the countdown ends.

 **Warning:** When the UV lamp is on, please do not look up the UV lamp from outside.

## 4.5 User Management

Click "User Management" on the main interface to enter the user management interface. The interface displays "Add", "Edit", "Delete", "Reset Password", and "Return" buttons, as well as admin user

information displayed, as shown in Figure 4-23.

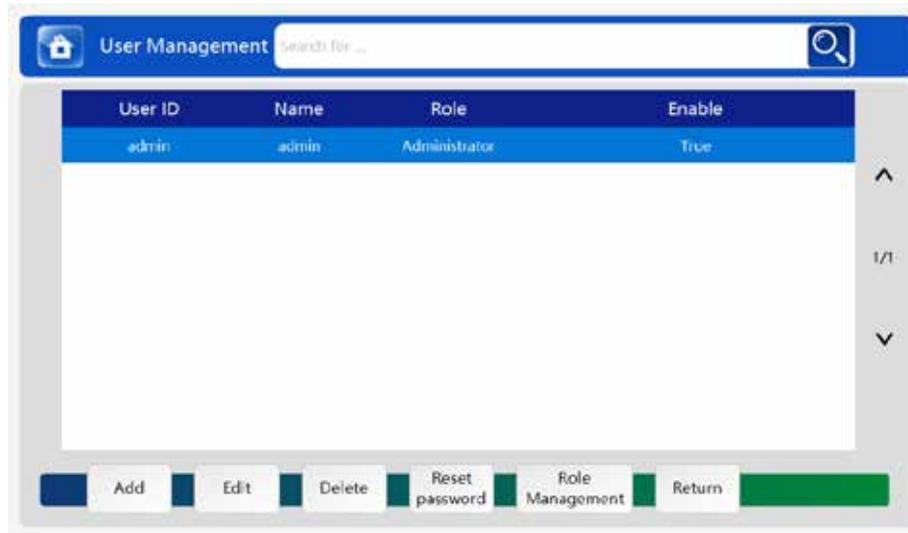
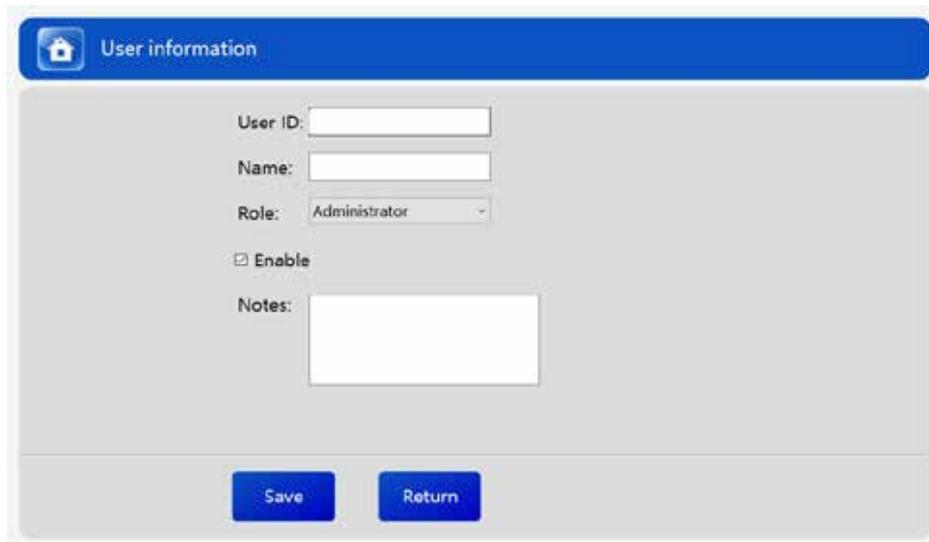


Figure 4-23 User Management

**Add:** Click the "Add" button to display the user information editing interface as shown in Figure 4-24, with "User ID", "Name", "Role", "Enable", "Notes" options and "Save" and "Return" buttons displayed.



User information

User ID:

Name:

Role: Administrator

Enable

Notes:

Save Return

Fig.4-24 User Management-Add

**User ID:** Fill in the user's User ID;

**Name:** Fill in the user's name;

**Role:** Select the user's role, such as "Administrator" , "Operator", "Maintenance Engineer" to be selected;

**Enable:** Select whether this user is enabled, it is not enabled by default. Tick to enable it otherwise the user is not authorized to log in;

**Notes:** Fill in other user information;

After editing the user information, click the "Save" button to save the edited information, and click "Return" to return directly to the User Management interface.

**Edit:** Select one of the users to edit or modify. Operation process is the same as "Add". This function cannot modify the user's User ID.

**Delete:** Click "Delete" to delete the selected user.

**Reset Password:** This function enabled to reset the password of the selected user. If this step is executed, the password is forced to reset to 000000.

**Role Management:** This function is to set the user rights; Administrator can set the rights of operators and maintenance engineers.

**Return:** When all other operations completed, click "Return" button to return to the main interface.

#### **4.6 Maintenance Test (Quality Control)**

This function is to test the function of the device from the outside and to check the parameters of the devices for product quality control.

Click the "Maintenance Test" button on the main interface to enter the maintenance test interface. This interface is composed of five modules: "Routine", "Magnetic Rod", "Magnetic Sleeve", "Horizontal motor ", and "Temperature ".

##### **Maintenance Test—Routine Test**

Figure 4-25 below is the Maintenance Test-routine test, which has two functions of "Replace the magnetic rod" and "Reset".

Replace the magnetic rod: The magnetic rod moved to the appropriate position for replacement;

Reset: Each moving part performs the initialization function, and returns to the original position;

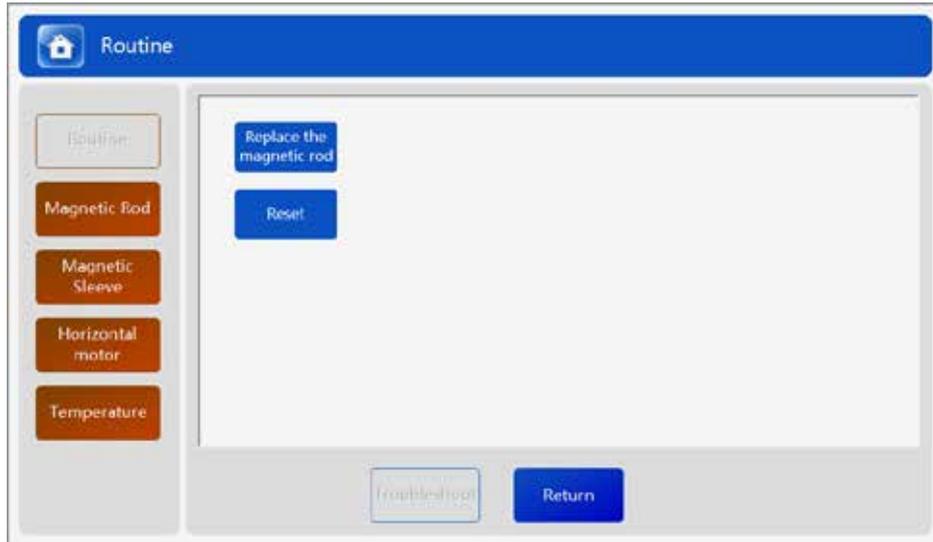


Fig.4-25 Maintenance Test- Routine

### Maintenance Test—Magnetic Rod Test

Fig. 4-25 below is the Maintenance -magnetic rod test, which is to test the function of the magnetic rod motor.

Up: The magnetic rod rises up to the top;

Down: The magnetic rod falls at the bottom;

Rotation Speed: the moving speed of the magnetic rod, the bigger the set value, the slower the speed;

Rotation Pulse: the number of pulses of a single movement of the magnetic rod;

Upward Rotation: the magnetic rod performs the upward movement according to the set rotation speed and rotation pulse, the top position is the upper photoelectric position of the magnetic rod;

Downward Rotation: the magnetic rod performs the downward movement according to the set rotation speed and rotation pulse, the bottom position is the lower photoelectric position of the magnetic rod;

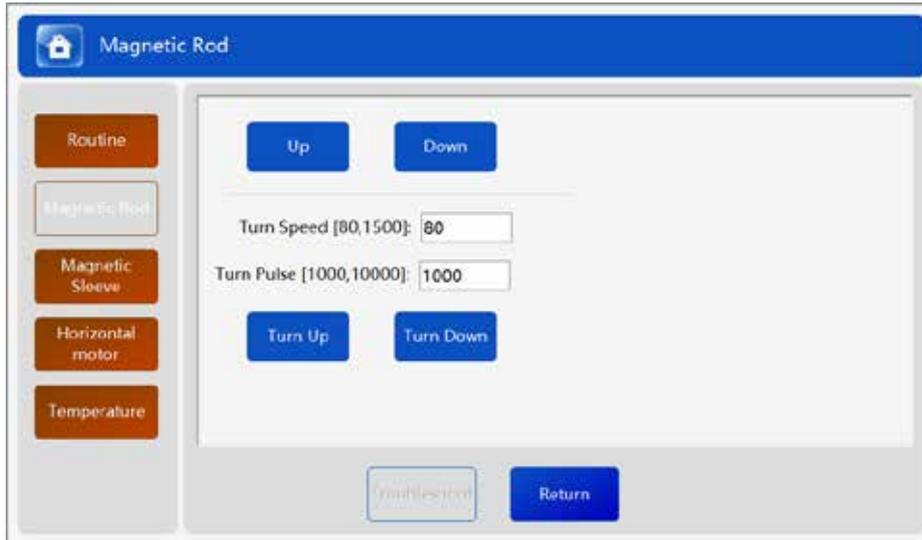


Figure 4-26 Maintenance Test-Magnetic Rod Test

### Maintenance Test -Magnetic Sleeve

The following Figure 4-27 is the Maintenance Test -Magnetic Sleeve interface, which is mainly to test the function of the magnetic sleeve motor.

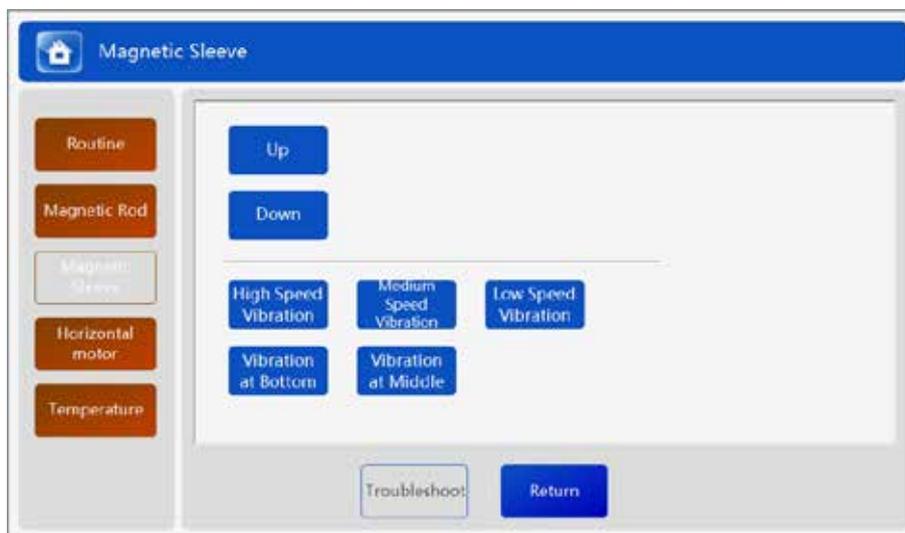


Figure 4-27 Maintenance Test-Magnetic Sleeve Test

Up &Down: The magnetic sleeve moves up to the top or moves down to the bottom position;

High/Medium/Low Speed Vibration: the magnetic sleeve descends to the bottom position and stops after vibrating at different speeds;

Middle/Bottom Vibration: the magnetic sleeve descends to the bottom or middle position and stops after vibration;

### Maintenance Test -Horizontal Motor

The following Figure 4-28 is the Maintenance Test - horizontal motor interface, which is mainly to test the function of the horizontal motor.

Horizontal Reset: the horizontal motor moves to the rightmost zero position;

Align the well position of the kit: random select the well position among 1-6, click the corresponding number, and the moving part will find the selected well position and remain on top of it;



Fig. 4-28 Maintenance Test -Horizontal Motor

### **Maintenance Test -Temperature Test**

The following figure 4-29 is the Maintenance Test -Temperature Test interface, which is to check the heating module temperature value, as well as the control of temperature and fan.

TEC1-TEC8 above shows the current temperature value of each heating block.

Temperature Setting: select a temperature value between 20-120 degree centigrade, and select the corresponding column to be temperature controlled, click the "Temperature Control ON" button, the device will control the heating module to heat or cool down from the current temperature to the set temperature value and display the current temperature value on the top of the screen; click the "Temperature Control OFF" button to stop the current action of the temperature control module;

Note: Select up to 4 columns of heating blocks to heat.

Fan ON: When fan is turned off, click "ON" button to turn on the fan;

Fan OFF: When the fan is turned on, click "OFF" button to turn off the fan;

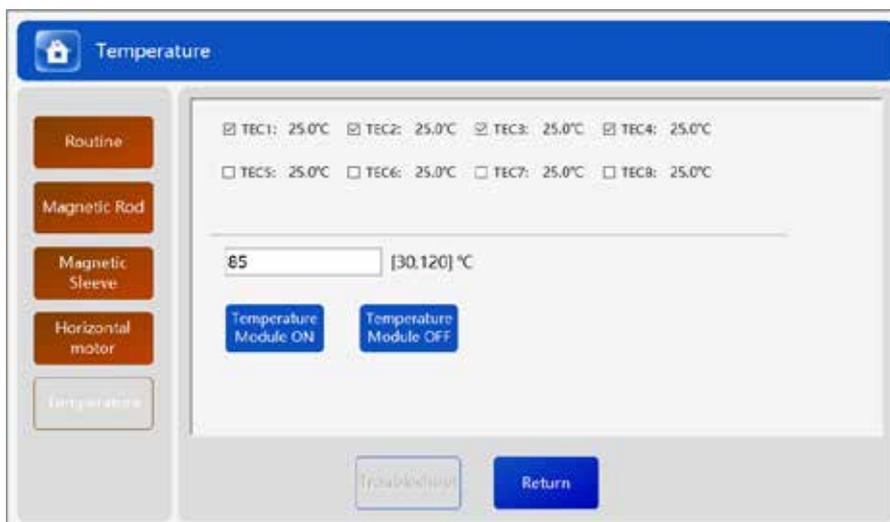


Fig.4-29 Maintenance Test -Temperature Test

In case of a malfunction of the device, the red light flashes, and the "Troubleshoot" button will light up. Click the button to remove the malfunction and perform other operations. Especially when the "Emergency Stop" is executed during the extraction, it is necessary to return to this interface for troubleshooting.

-  Warning: Do not touch moving parts during operation.
-  Warning: Do not touch the heating block during heating.
-  Warning: Operators shall be trained to perform the above operations.

## 4.7 System Settings

The function is to set some operating parameters of the device.

Click "System Settings" on the main interface to enter the system setting interface. This interface is divided into six modules including "General Settings", "Magnetic Sleeve Speed", "Horizontal Position", "Magnetic Rod Position", "Magnetic Sleeve Position" and "System Update".

There are five options of the System Settings-General Settings interface, including "Specifications", "Capacity" "Network", "System Disk locked" and "Language".

Specifications: currently applicable for 96-well deep well plates by default;

Capacity: the default is 32 flux, which cannot be changed;

Network: shows the status of the network connection; the "Shows network connected" and "Offline" shows the network is disconnected;

System disk locked: shows the system disk is locked, tick when system disk is locked, and untick when system disk is not locked; Change of the tick status will take effect after saving and restarting the device;

Language: Chinese by default. English language can also be selected to execute the device.

The other six options can only be set by the manufacturer; the operator is not allowed to change the parameters.

When the above operation is completed, click the "Save" button, the device saves the previous settings and returns to the main interface; if click "Return", it will directly return without saving.

#### 4.8 Extraction Records

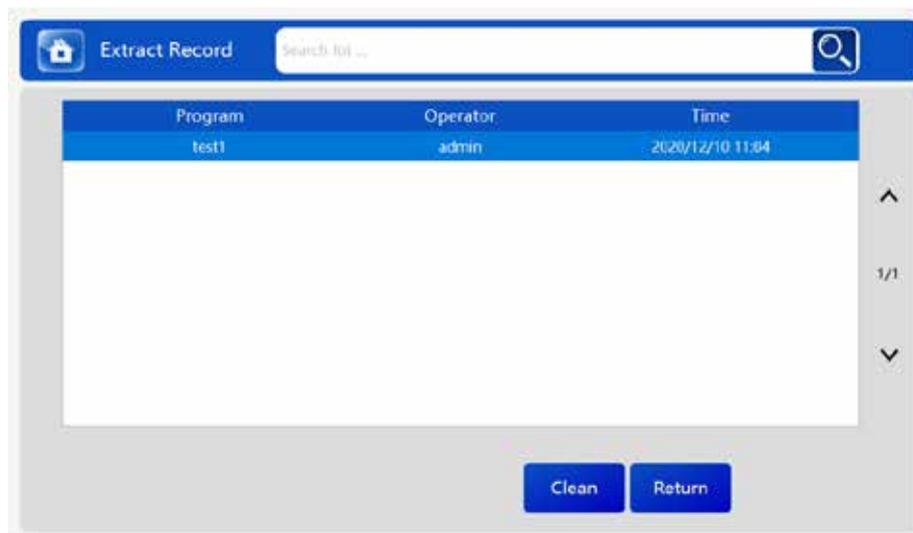


Figure 4-30 Extraction Records

This function mainly checks the previous extraction records, including "program name", "operator", and "time", as shown in Figure 4-30.

Users can select the corresponding keyword in the search box and click the search button to retrieve the extraction records relating to the keyword.

Administrator can delete extraction records according to their needs, and operators and maintenance engineers have no authority to delete extraction records.

## 4.9 Change Password



The image shows a 'Change Password' dialog box with a blue header. It contains five input fields: 'User ID' (pre-filled with 'admin'), 'Name' (pre-filled with 'admin'), 'Old password', 'New password', and 'Confirm new password'. At the bottom, there are two blue buttons: 'Save' and 'Close'.

Figure 4-31 Change Password

This function is to modify the current user's password. Click "Change Password" button on the main interface, and the change password interface appears, as shown in Figure 4-31.

User ID: Shows the current logged in User ID. Only the current User ID is allowed to be modified.

Name: the name of the operator corresponding to the User ID;

Original Password: Enter the original password of the current user;

New Password: Enter the modified password;

Confirm New Password: Confirm the modified password;

When the above operations are completed, click "Save" button to complete the modification of the password; click "Close" button, the password will not be modified and will directly return to the main interface.

## V Repair and Maintenance

### 5.1 Maintenance Guidelines

- ❗ The device shall be placed in a ventilated and dry place;
- ❗ Handle the device with care;
- ❗ The device shall avoid contact with corrosive gas or liquid;
- ❗ The device can be cleaned with a clean soft cloth dipped in a small amount of 75% alcoholic solution;
- ❗ The LCD screen shall be kept clean for clear display;
- ❗ Keep away from heavy objects hitting or scratching by sharp objects;
- ❗ Turn off the power if the machine is not running.

### 5.2 Periodic Check

The device must be inspected regularly to maintain safety, function, performance and reliability. Please perform periodic check according to the "Periodic Checklist". If any item in the periodic check fails to meet the standard, you should not continue to use the device. During periodic check, visual and functional check shall be adopted in sequence. Corrective measures shall be taken if items fail to meet the requirement. TS-32 Automated Nucleic Acid Extractor can only be used after all items meet the requirements. The following checks must be performed at least once a year.

Table 5-1 Periodic Checklist

Type	Check Item	Check Procedure	Requirement
Appearance Check	LCD display	After the instrument starts, observe the interface display.	Normal display, no black screen / white screen / blurred screen
Functional Check	Magnetic rod sleeve left and right movement function	Enter the "Maintenance Test" module in the main interface, click the corresponding column in the horizontal motor check tab	The magnetic rod sleeve moves to the corresponding column

	Magnetic rod up and down movement function	Enter the "Maintenance Test" module in the main interface, select the first column of the horizontal position in the horizontal motor test tab, and click the "Up" and "Down" buttons in the magnetic rod test tab.	The magnetic rod moves up or down respectively
	Magnetic rod sleeve up and down movement function	Enter the "Maintenance Test" module in the main interface, select the first column of the horizontal position in the horizontal motor test tab, and click the "Up" and "Down" buttons in the magnetic rod sleeve test tab.	The magnetic rod sleeve moves up or down respectively
	Temperature control function	Enter the "maintenance Test" module in the main interface, set the temperature value in the temperature tab, and open the temperature control.	The heating module heats up or cools down to the set temperature. (Note: please turn off the temperature control after the test is completed)
	UV disinfection function	Enter the "Ultraviolet Lamp On" module in the main interface, set the operation time for 5 sec, and click the "OK" button.	The UV lamp is turned on and turned off after 5s.
Note: Please install the magnetic rod sleeves and the matched well-plate before check.			

 Note: In case of any malfunction of the device, shut down the device and cut off the power supply immediately, and contact the manufacturer for maintenance.

 Note: The protection system provided by the device may be damaged if the device is not used as instructed.

 Warning: The device shall not be used if it operates abnormally. It can be reused after repair and maintenance is conducted by the manufacturer's technician. Replacement parts shall only be provided or checked by the manufacturer.

 Warning: If the device is ceased of use, or during transportation or under treatment, make sure that the experimental consumables are removed from the device, and close the hatch door if necessary.

### 5.3 Common Fault Analysis

This section provides reference suggestions and basic solutions for the problems that the TS-32 Automated Nucleic Acid Extractor may occur. If these methods cannot solve your problem, please contact our company in time.

#### 1. Fail to start up.

- Check power supply system, including Power socket, power cord and power outlet and see if it's disconnected.
- Disconnect the power supply and check the fuse of the extractor. In case of fuse failure, replace fuse after checking and troubleshooting.

#### 2. Fail to pass the self-test.

- Restart the device and check whether it can pass the self-test.

#### 3. The motor moves left and right abnormally during operation.

- Enter maintenance test—Horizontal motor test interface, click the corresponding column to check whether the horizontal motor can move to the corresponding position.

#### 4. The UV lamp does not turn on.

- Disconnect the power supply and remove the UV lamp to check if the filament is fused;
- Reinstall the UV lamp, turn it on, and check if it lights up.

#### 5. The motor moves up and down abnormally during operation.

- Enter maintenance test--magnetic rod sleeve check interface, click magnetic rod sleeve up, magnetic rod sleeve down, rapid vibration respectively to check if the magnetic rod sleeve motor operates normally;
- Enter the maintenance test-magnetic rod check interface, click the magnetic bar up, magnetic bar down respectively to check if the magnetic rod motor operates normally.

#### 6. Abnormal temperature display during operation.

- Enter the maintenance test--temperature control test interface whether the temperature is displayed normally;
- Turn on the temperature control and check whether the temperature rises normally.

## **5.4 Main Components Replacement Method**

### **5.4.1 Fuse Replacement Method**

The fuse protector of the nucleic acid extractor is in the fuse box at the back of the device. Unplug the power cord, pull out the fuse box from the notch of the power port, take out the fuse for replacement. Fuse model: F4AL250V,  $\Phi 5 \times 20\text{mm}$ . After replacing the fuse, push the fuse box back to its original position.

### **5.4.2 Connection Cable Replacement Method**

This device is only allowed to use the matched connecting cable. If the matched cable is damaged or lost, please contact the manufacturer for replacement.

## VI Electromagnetic Compatibility

### Notes on electromagnetic compatibility:

- a) This device complies with the radiation and anti-electromagnetic interference requirements specified in GB/T 18268.1 and GB/T 18268.26.
- b) This device is designed and tested according to Class A device in GB 4824. In a home environment, it may cause radio interference, and protective measures are required.
- c) It is recommended to evaluate the electromagnetic environment before using.
- d) It is forbidden to operate this device near strong radiation sources (such as unshielded RF sources), otherwise it may interfere with the normal operation of the device.

Note 1: The manufacturer is responsible for providing electromagnetic compatibility information of the device to the customers or users.

Note 2: The user is responsible for ensuring the electromagnetic compatibility environment of the device to ensure the device works normally.

## **VII After-sales Service**

### **7.1 Warranty**

The warranty period of the device is one year. The manufacturer is responsible for the lifetime maintenance of the device. The warranty period begins on the date of delivery of the device. Do not repair the internal the device or conduct dangerous charged operation unless the engineer is trained or authorized by the manufacturer (Note: The warranty period does not include damage caused by human causes, such as collision, improper operation and unqualified working environment).

### **7.2 Maintenance Service**

This device is guaranteed for one year, and the manufacturer charges appropriate maintenance fees for maintenance activities beyond the warranty period.

Within the warranty period, necessary maintenance fee shall also be charged by the manufacturer if the device is damaged by the following misconducts, such as improper use of man-made damage, the voltage of the power grid exceeds the specified range, irresistible natural disasters, replacement of accessories not permitted by the manufacturer, and improper operation by non-authorized personnel, etc.

### **7.3 After-sales Service Company Information**

After-sales service company: TransGen Biotech Co., Ltd.

Address: Building No.4, Zhongguancun Dongsheng International Science Park, No. 1 North Yongtaizhuang Road, Haidian District, Beijing, China

Postal Code: 100192

Contact: +86-400 898 0321