



Automatic Nucleic Acid Extraction System

LB-10NAE

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1. Safety Measures

Users may see these signs, labels, and symbols used with text on the LB-10NAE to remind operators of the warnings and potential dangers, kindly understand the meaning of the symbols before use.

Symbols	Description
	Biological risk: This mark appears on the instrument as a warning of the risk of contamination associated with biological or chemical materials.
	Heat warning label: When this mark appears on the instrument, it is a warning for high-temperature parts, be careful of hot hands.
	Anti-squeeze sign: When this mark appears on the instrument, it is a warning for moving parts. Be careful of squeezing your hands.
	Safety warning label: When this mark appears on the instrument, attention should be paid to safety to prevent collision or entrapment!
	Fuse specification label.
	Interface and switch identification on the rear of the instrument.

Text Description in Manual

Text	Description
Notice	Used to illustrate important information in the action steps or other things that need to be brought to the user's attention.
Warning	Remind the user to follow the instructions, otherwise it may result in personal injury.

1.1 Security Precautions

To use the system safely and effectively, kindly read the following safety precautions carefully. Any operation that violates the following safety precautions may result in system damage or personal injury. If the instrument is without following the instructions, the protective measures provided by the system may fail.

1.1.1 Electrical Safety

To use electricity safely and prevent electric shock and damage to the instrument, kindly observe the following precautions.

Warning:

- This instrument is only suitable for non-domestic use and cannot be directly connected to the residential low-voltage power supply network.
- If there are external switches or fuses or protection devices for overcurrent, these switches or circuit breakers should be installed near the equipment.
- Do not place the instrument where it is difficult to operate the disconnected device. If the plug of the power supply cannot be disconnected immediately in an emergency, make sure that the wall socket connected to the instrument's power supply can be always touched by hand.
- After the installation is completed, users are not allowed to move the instrument without authorization. This system is connected to the ground via ground wire. The power ground wire must be grounded to avoid electric shock.
- The AC power supply must be stable. It is forbidden to share the power supply with high-power appliances.
- When the user runs or maintains the instrument, do not touch the power connector on the back of the system, otherwise, there may be danger of electric shock.
- When the main power of the instrument is turned on, non-authorized maintenance personnel must not disassemble the cover of the instrument.
- Spilling the solution into the instrument may cause the instrument to malfunction and cause electric shock. Do not place objects on the instrument. In the event of a spill, immediately turn off the power.
- Do not plug or unplug the power supply with wet hands.
- Disconnect it from all power sources before opening the instrument for any maintenance or repair which should only be performed by a person who is skilled and understands the hazards.

- Make sure that the replaced power supply meets the requirements of this instrument.
- If the instrument may be damaged, disconnect it from the power outlet and do not operate it again.

1.1.2 Electrical Danger

To prevent electrical hazards, kindly observe the following precautions.

Warning:

The operator must always observe the electrical safety operation regulations. Only professional personnel can perform electrical repairs. Kindly wear static-free wrist straps or gloves during maintenance to protect the sensitive components on the instrument from electrostatic damage.

1.1.3 Mechanical Danger

To prevent mechanical hazards, kindly observe the following precautions.

Warning:

The moving parts of the system may cause injury to personnel during operation. During the experiment, the door of the instrument compartment must be closed. It is strictly prohibited to extend body parts into the working area of the machine, otherwise it may cause injury to operators and damage to the instrument.

1.1.4 Electromagnetic Interference Prevention

To prevent electromagnetic interference, kindly observe the following precautions.

Warning:

- To ensure the normal operation, the user has the responsibility to ensure that the instrument operates in an environment of electromagnetic compatibility
- Electromagnetic interference may affect the normal operation of the device. Do not install the device in an environment with strong electromagnetic field interference.
- Do not use other medical devices that may generate electromagnetic interference around the instrument, otherwise it may affect the normal operation of the instrument.

1.1.5 Biological Risk Protection

To prevent biohazards effectively, kindly observe the following precautions.

Biological risk:

- All liquids and solids in the laboratory are considered to be biological hazards and the user must take general laboratory precautions.
- All clinical samples are potentially infectious. Improper use may result in infection. Do not touch the samples directly with your hands. Always wear gloves and overalls to prevent infection during the operation. Wear protective glasses when necessary.
- If the sample accidentally meets the skin, kindly immediately follow the work standards for users to handle it and consult a doctor.

1.1.6 Other Precautions

To use the instrument correctly, kindly observe the following precautions

Warning:

- Do not smoke or eat near the instrument.
- Avoid direct sunlight when the instrument is in operation.
- Kindly use the software installation package provided by our company when installing the user software
- During the start-up or running, it is prohibited to change the date and time of the host. Do not run other applications while the user software is running.

2. Introduction

Automatic Nucleic Acid Extraction System LB-10NAE facilitates purification and isolation of nucleic acid from variety of sample sources and volumes using magnetic beads extraction system. Features integrated shaking and heating module station with concave design heating belt to fits deep hole tube and saves extraction time. Compact design with HEPA filter and UV sterilization lamp, offers high efficient sterilize environment. With LCD touch screen display having windows operating system offers friendly user interface to provide optimum user experience.

3. Features

1. An automatic nucleic acid extraction system to facilitate and fasten user experience
2. Offers purification and isolation of nucleic acid from variety of sample sources
3. Magnetic bead extraction method for efficient and precise extraction of nucleic acid
4. Integrated shaking and heating module station with concave design heating belt
5. High efficient HEPA filter and UV sterilization lamp for effective sterilization
6. Auto safety door protection function to ensure zero aerosol contamination
7. Smart and intelligent LCD touch screen display with Win operation system
8. User friendly interface and automatic processing for reliable operation

4. Specifications

Model	LB-10NAE
Sample capacity	32 samples
Extraction method	Magnetic beads
Processing volume	20 to 1000 µl
Extraction time	15 to 60 min
Temperature range	RT to 100°C, Adjustable heating function
Magnetic bead recovery	≥98%
Wells extraction difference	<3%
Modules station	2
Magnetic rod flux	4500 Gs
Oscillation mode	Vertical mixing: High, medium, low; 3 gears adjustable
HEPA filter	Class II HEPA filter
Sterilization lamp	8W UV lamp
Illumination	3.4W LED lamp
Display	10.1-inch color LCD touchscreen
Storage	>1000 project
Power supply	AC 100 to 240 V, 50/60 Hz
External dimension (W×D×H)	450×440×532 mm
Packaging dimension (W×D×H)	538×538×750 mm
Gross weight	37 kg

5. Applications

Automatic Nucleic Acid Extraction System is used for automatic extraction of nucleic acids from serum, body fluids, plasma cells etc. across research, R&D departments, forensics, medical etc.

6. Instrument Introduction

6.1 Model Structure and Function

6.1.1 Structure of Magnetic Rod and Rod Sleeve



Figure-1

The magnetic rod module and the rod sleeve module are independent and independently controlled by the dual Z-axis motors. The rod sleeve module can run independently during the shake and lysis process, and the magnetic rod module and the rod sleeve module also can run during the adsorption process. The motors do not interfere with each other during running.

6.1.2 Function of Plate Position



Figure-2

There are two positions In the instrument where you can put the deep hole plate, a total of 24 columns of hole positions, of which Columns 1-8 identified in **Figure 2** (the actual hole positions are columns 1, 6, 7, 12, 13, 18, 19, 24) are heating modules, and the temperature control range is from room temperature to 100°C. Four leaf springs are placed on both plate positions to fasten the deep hole plate.

6.1.3 Function of Floodlight

This instrument is equipped with LED floodlights to observe the operating conditions in the cabin during running.

Light on/off method: After the instrument is turned on, there is a "Light" button in the upper right corner of the software interface (the position of the button will not be changed in any interface). Click the "**Light**" button to turn on or turn off the light in any state.

6.1.4 Function of HEPA

This instrument uses the filter without partitions, which is made of fine glass fiber paper and hot melt glue and is used for air purification under normal temperature, normal pressure, and normal humidity. The HEPA filter can filter the aerosol generated when the instrument is heating or shaking and the dust in daily work.

HEPA open/close method: After the instrument is turned on, there is a "Filter" button in the upper right corner of the software interface (the position of the button will not be changed in any interface). Click the "**Filter**" button to open or close the filter in any state.

7. Operations

7.1 Boot

Turn on the power switch of the automatic nucleic acid extractor, turn on the instrument, and perform a system reset. After the reset is successful, it will enter the main menu interface.

The main interface contains 5 sub-menus such as "Run", "Program Manage", "Instrument Manage", "UV Operator", and "About", as shown in **Figure 3**.



Figure-3

7.2 Program Running

The program running interface contains three function buttons: "Run", "Scan code to run" and "Select". Users can view all the programs that have been entered in the list on the left.

Run: Click to select the program to be run, and then click the "**Run**" button to directly run the selected program.

Scan code to run: Automatically enter the barcode in the identification kit through the external scan code gun and refer to **chapter 7.3.3** for the introduction of the System default program.

Select: Click the corresponding program, and then click "Select" to see the details of the selected program.

Automatic Nucleic Acid Extraction System LB-10NAE

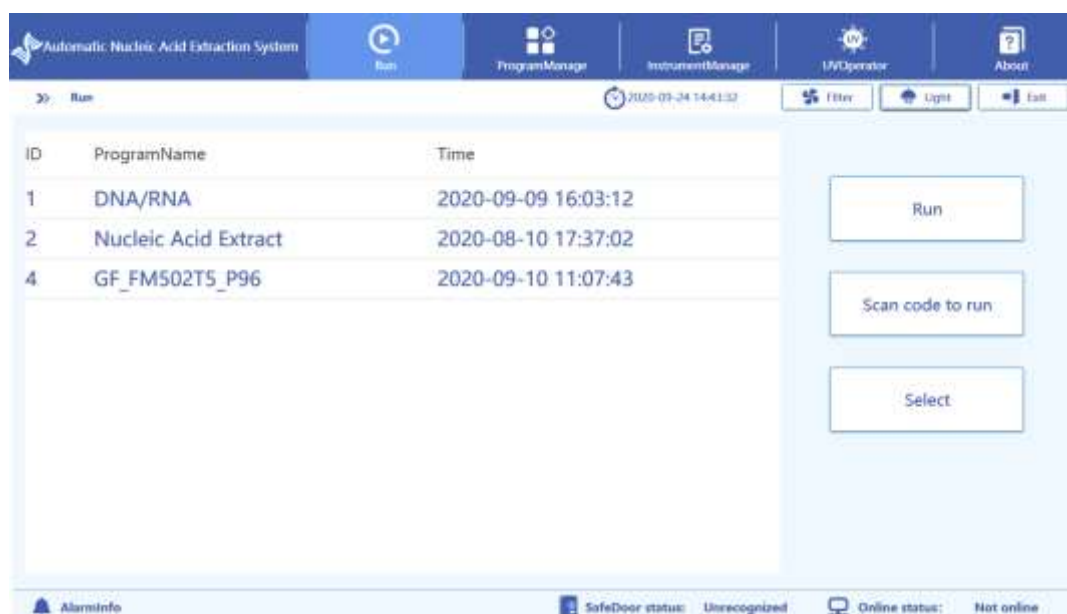


Figure-4

7.2.1 Program Viewing

Choose a program and click [Select] in the “Run” interface to enter the interface as **Figure 5**, which displays the detailed steps of the program, including the step name and the time of each step.

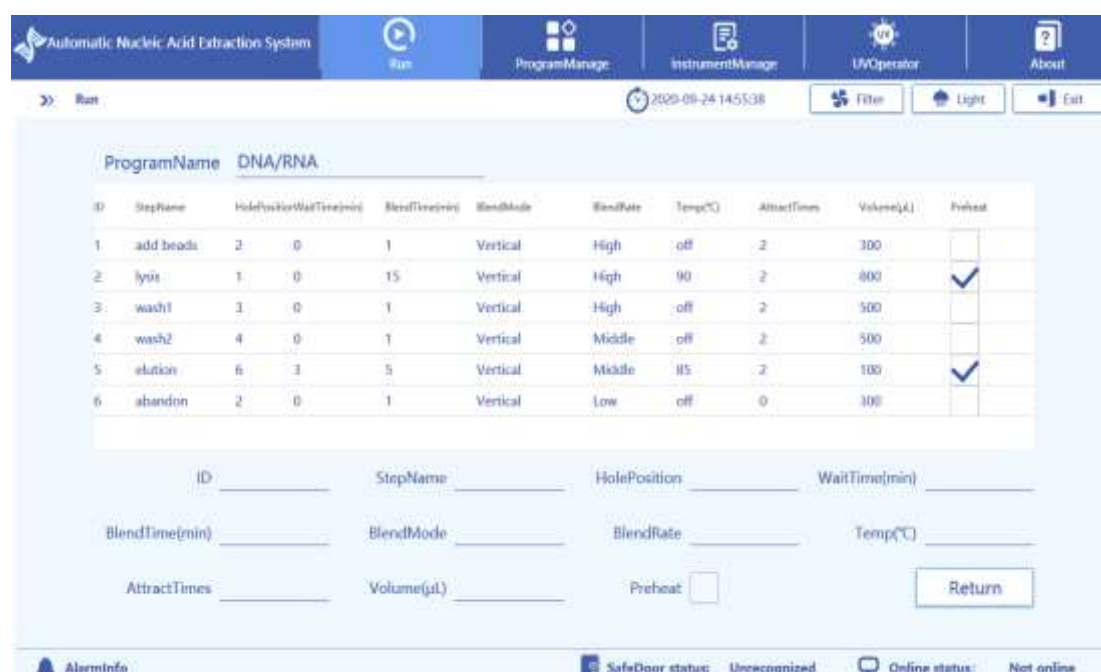


Figure-5

7.2.2 Program Running

Choose a program and click [Run] in the “Run” interface to run the interface as **Figure 6**



Figure-6

After clicking [**Start**], the program starts to run, [Step Remaining Time] is displayed as the remaining running time of the current step, and [Total Remaining Time] is displayed as the overall remaining running time of the program.

After the program starts running, the [Pause] and [Stop] keys will change from gray to clickable. Click [**Pause**] to pause the program operation, and the [Pause] button to switch to [Continue], click [**Stop**], and the instrument stops the program operation and automatically resets.

Click [**Return**] to return to the upper interface.

Note:

- Do not open the front safety door while the program is running or during the test. If the safety door is opened, the operation will be immediately suspended until the safety door is closed and the running program can continue.
- When the program is not running, the [Pause] and [Stop] buttons are grayed out.
- When the program is running, except for the [Pause] button and the [Stop] button, other buttons are grayed out and cannot be operated until the program is finished.
- When the running program is in the paused state, all buttons except the [Continue] and [Stop] buttons are grayed out and cannot be operated.

7.2.3 Alarming

If an abnormal operation or abnormal reset occurs during operation, the instrument will emit a short alarm sound, and at the same time, the alarm information will be displayed after [Alarm Info] in the lower left corner of the main interface of the operation, as shown in **Figure 7**.

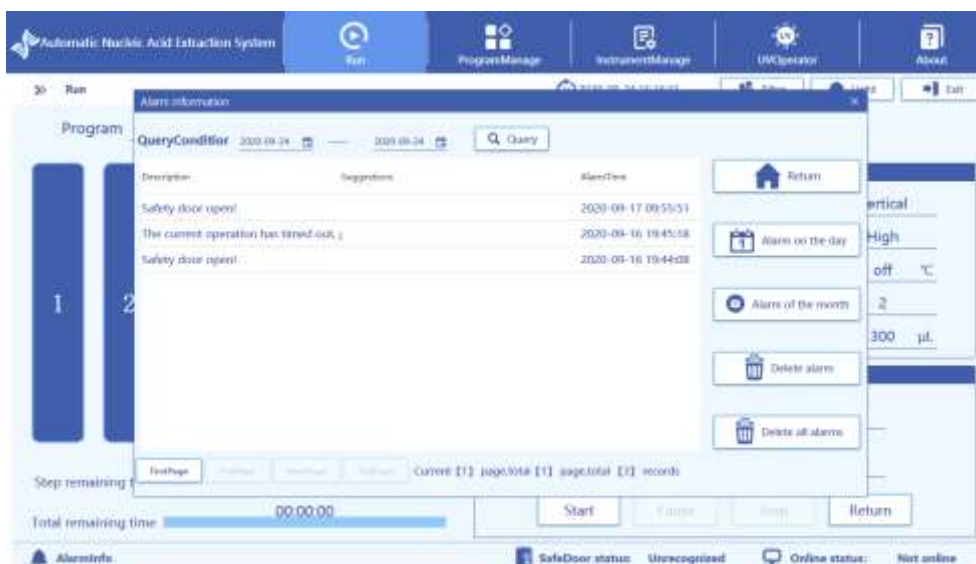


Figure-7

Common types of alarm information are as follows:

- Reset failure of magnetic rod and magnetic sleeve X.
- Magnetic sleeve Z reset abnormally.
- The magnet Z is reset abnormally.
- Cleavage temperature sensor abnormality.
- Elution temperature sensor abnormality bit.
- The cracking position oscillates abnormally.
- Elution bit abnormal oscillation.
- Safety door open.

7.3 Program Management

Click [**Program Manage**] to enter the program management interface as shown in **Figure 8**. All the programs that have been entered will be displayed in this interface, and the programs can be edited, deleted, or added.

Add: Create a new program.

Edit: Select a program and click [**Edit**] to edit the parameters of the program.

Delete: Select a program and click [**Delete**] to delete this program.

Return: Return to the upper interface.



Figure-8

7.3.1 Add

Click **[Add]** to enter the interface as shown in **Figure 9** to create a new program. Click **[Add]** after "Program Name" to set the program name, and the **[Add]** button is replaced with **[Cancel]**. After entering the program name, the following **[Save]** button changes from gray to clickable, click **[Save]** to save the program name settings.

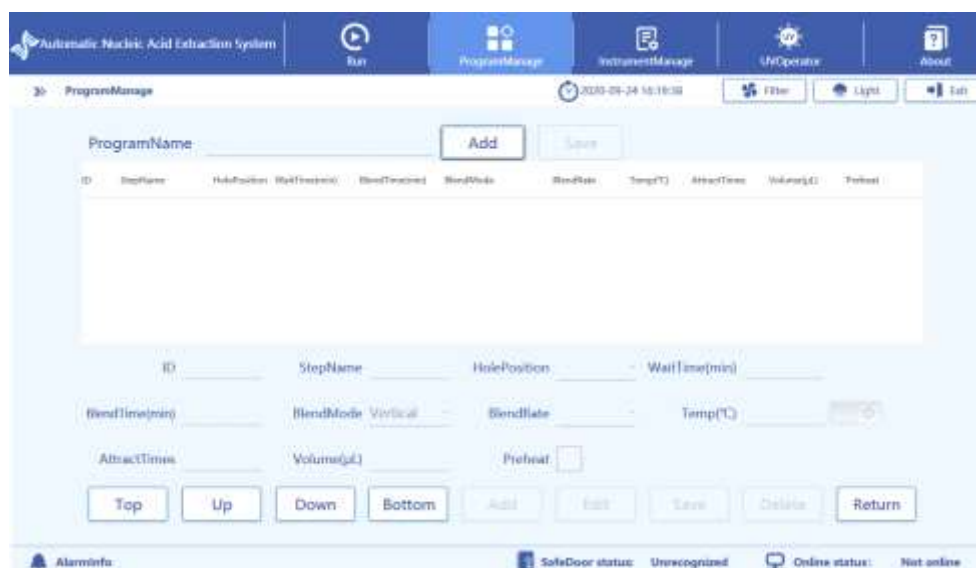


Figure-9

7.3.2 Edit

Select the program you want to modify in the "Program Manage" interface, and then click **[Edit]** to enter the "Program Edit" interface, as shown in **Figure 10** where you can see each step of the program. Select a step to edit the parameters of that step.

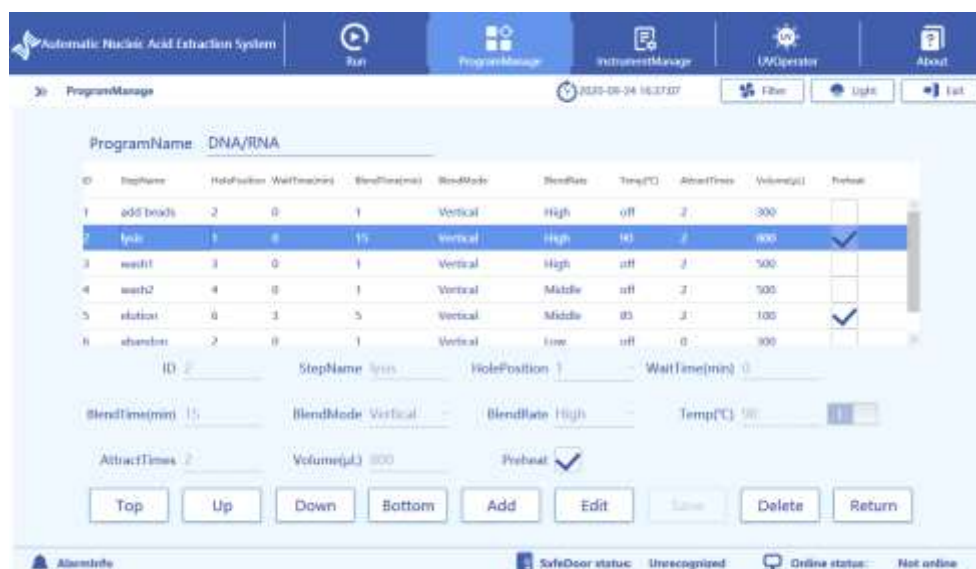


Figure-10

ID: The sequence of steps in the program. (Automatic generated)

Step Name: It is recommended to set the name of the step according to the requirements of the reagent instructions, which can be set freely.

Hole Position: The operation position of this step, columns 1-6, is optional. (The positions in columns 1.6.7.12.13.18.19.24 have a heating function, and the temperature control range is from room temperature to 100°C, that is, positions 1-8 in the instrument marked by numbers).

Wait Time: The standing time of this step is minute, and the upper limit is set to 99.

Blend Time: The shake time of this step is in minutes, and the upper limit is set to 99.

Blend Mode: Only vertical mode is available.

Blend Rate: Low, medium, and high are available.

Temp: You can freely set whether this step needs heating and the heating temperature.

Attract Times: The times that the magnetic rod attracts the beads which can be up to 99 times.

Volume: This volume corresponds to the volume of the solution in the well of the 96-well deep well plate. The rod sleeve will adjust the shaking distance in lysis and adsorption steps according to the volume and calculate the time for one magnetization at this position.

Preheat: Preheat to ensure that the preset temperature is reached when performing this step.

Top: Set the selected step as the first step of the program.

Automatic Nucleic Acid Extraction System LB-10NAE

Up: Run the selected step one step ahead.

Down: Delay the selected step by one step.

Bottom: Move the selected step to the last step of the procedure.

Add: Add a new step below the selected step.

Edit: Turn the above steps into an editable state.

Save: It is usually grayed out. Click to modify and make changes to the steps to become clickable and click it to save the changes.

Delete: Delete the selected step.

Return: Return to the upper interface.

7.3.3 System Default Program

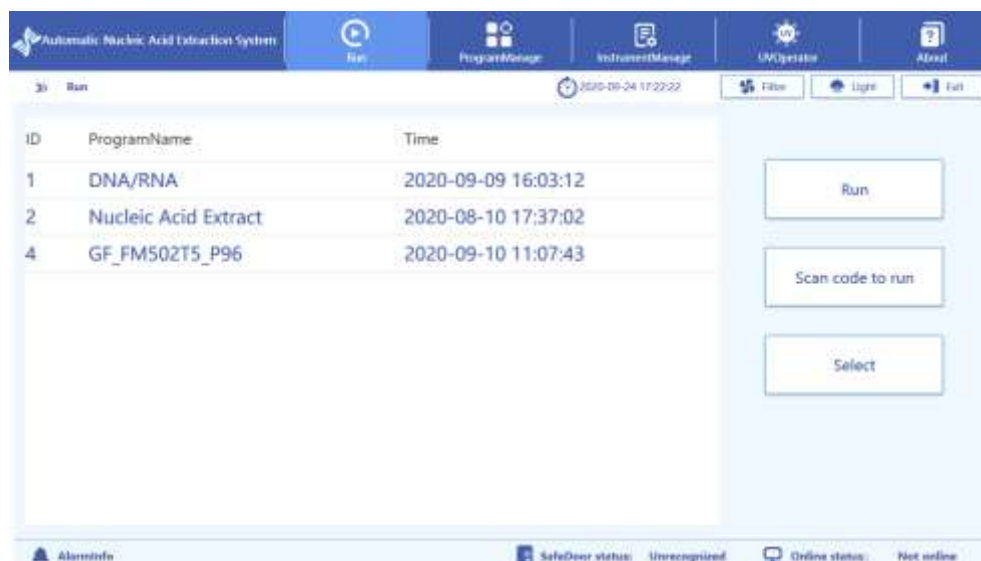


Figure-11

For example, select the "DNA/RNA" program, and click [Select] to enter the interface as shown in Figure 12.



Figure-12

ID	Step Name	Description
1	Add beads	The operating position is in column 2 of the deep-well plate. There is no waiting time during the operation. The mixing time is 1 minute. The mixing mode is vertical oscillation, and the mixing rate is high. There is no heating demand. The number of magnetizations is 2 times. In this step processing volume is 300 μ L.
2	Lysis	The operating position is in column 1 of the deep-well plate. There is no waiting time during the operation. The mixing time is 15 min. The mixing mode is vertical oscillation, and the mixing rate is high. There is a need to be heated to 90°C before operation. The number of magnetizations is 2 times. In this step the processing volume of 800 μ L.
3	Wash 1	The operating position is in column 3 of the deep-well plate. There is no waiting time during the operation. The mixing time is 1 minute. The mixing mode is vertical oscillation, and the mixing rate is middle. There is no heating demand. The number of magnetizations is 2 times. In This step, the processing volume is 500 μ L.
4	Wash 2	The operating position is in column 4 of the deep-well plate. There is no waiting time during the operation. The mixing time is 1 minute. The mixing mode is vertical oscillation, and the mixing rate is middle. There is no heating demand. The number of magnetizations is 2 times. In this step, the processing volume is 500 μ L.
5	Elution	The operating position is in column 6 of the deep-well plate. The waiting time during operation is 3min. The mixing time is 5 min. The mixing mode is vertical oscillation, and the mixing rate is middle. There is a need to be heated to 85°C before operation. The number of magnetizations is 2 times. In this step, the processing volume is 100 μ L.
6	Abandon	The operating position is in column 2 of the deep-well plate. The waiting time during operation is 3min. The mixing time is 1 minute. The mixing mode is vertical oscillation, and the mixing rate is low. There is no heating demand. No magnetization. In this step, the processing volume is 300 μ L.

7.4 Program Management

As shown in **Figure 13**, the instrument management interface has four functions: [Instrument Debug], [Import/Export], [Software Upgrade], and [Language Setting].

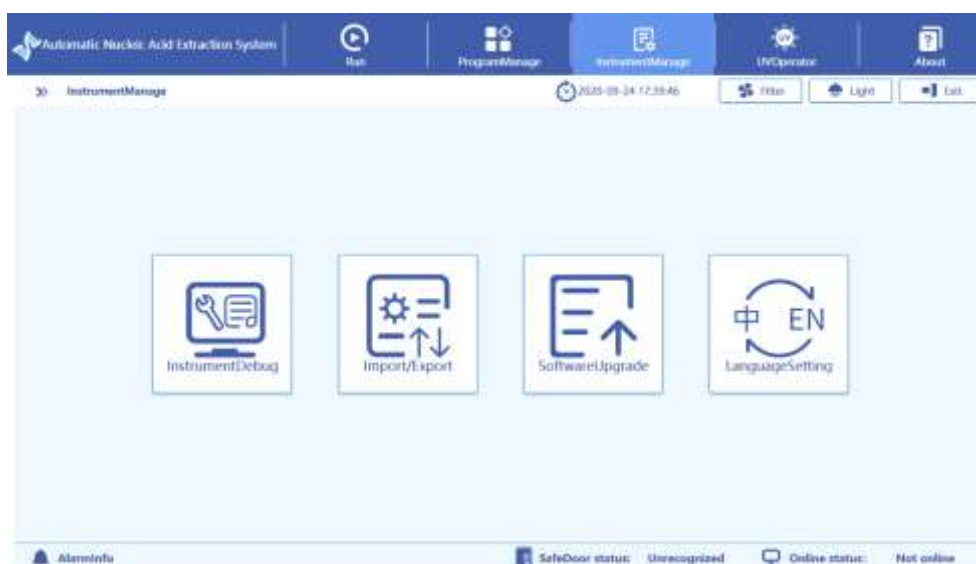


Figure-13

7.4.1 Language Settings

Click [Language Settings] to switch the software between Chinese and English, as shown in **Figure 14**. (Need a password).

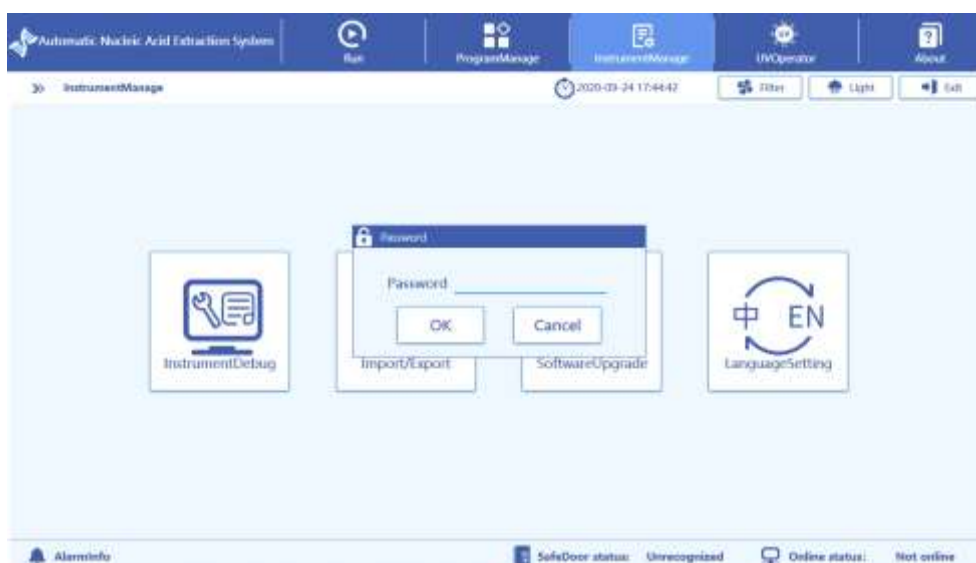


Figure-14

7.4.2 Instrument Debug

The “Instrument debugging” interface can set the instrument motion parameters and position parameters, which have been set before leaving the factory and usually not need to be modified.

7.4.3 Import/Export

Plug the U disk into the USB interface of the instrument to export the existing programs of the system to the U disk for storage. Similarly, after editing the program on the computer, you can import the program into the instrument via a USB flash drive. The interface is shown in **Figure 15**.

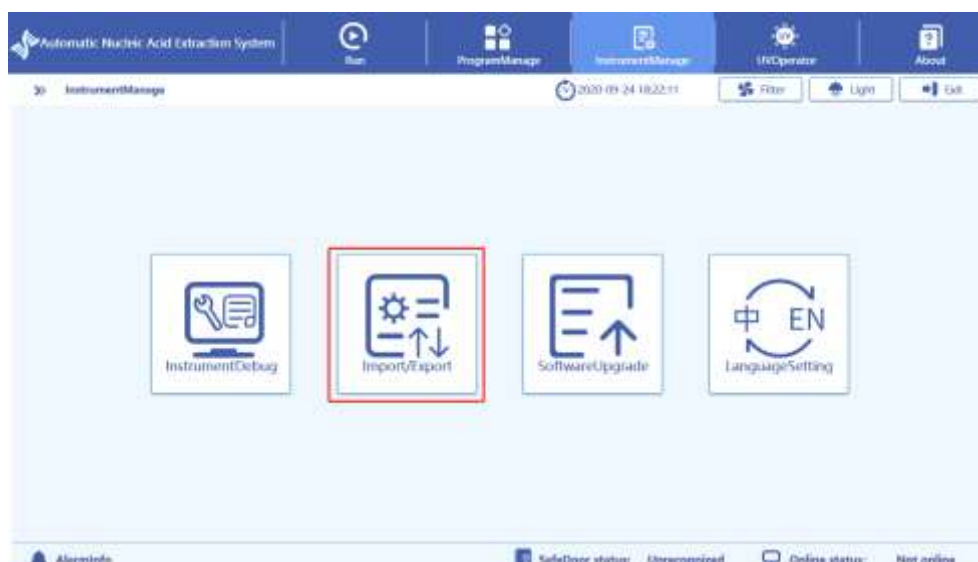


Figure-15

7.4.4 Software Upgrade

Plug the U disk into the USB interface of the instrument, and click [**Software Upgrade**], the interface is shown in **Figure 16**. Click the circuit board module that needs to be upgraded, then select the .bin file that needs to be upgraded, and then click [**Upgrade**] to complete the module upgrade. As shown in **Figure 17**.



Figure-16

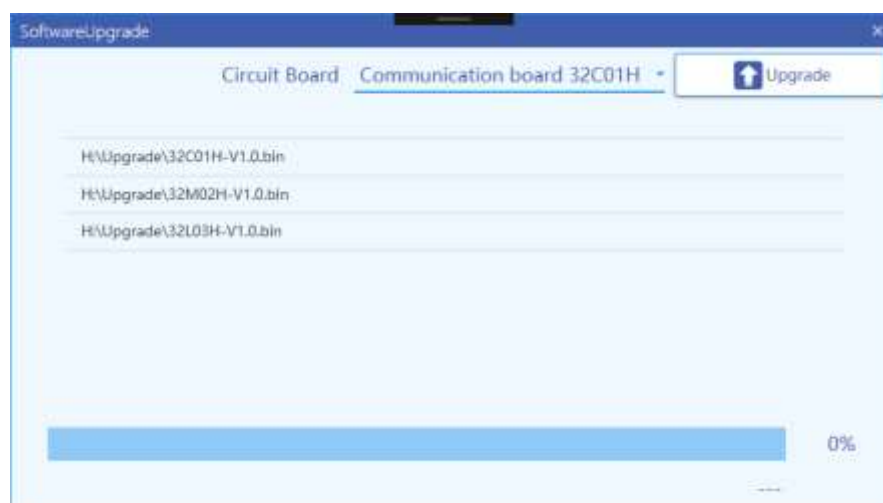


Figure-17

7.5 UV Disinfection

Click [**UV Operator**] to enter the interface shown in **Figure 18**. You can set the UV disinfection time on the left, click [**Open**] to start disinfection and the time count down. After the countdown is over, the UV lamp is automatically turned off. You can also click [**Stop**] to stop the disinfection and turn off the UV lamp during the disinfection process.

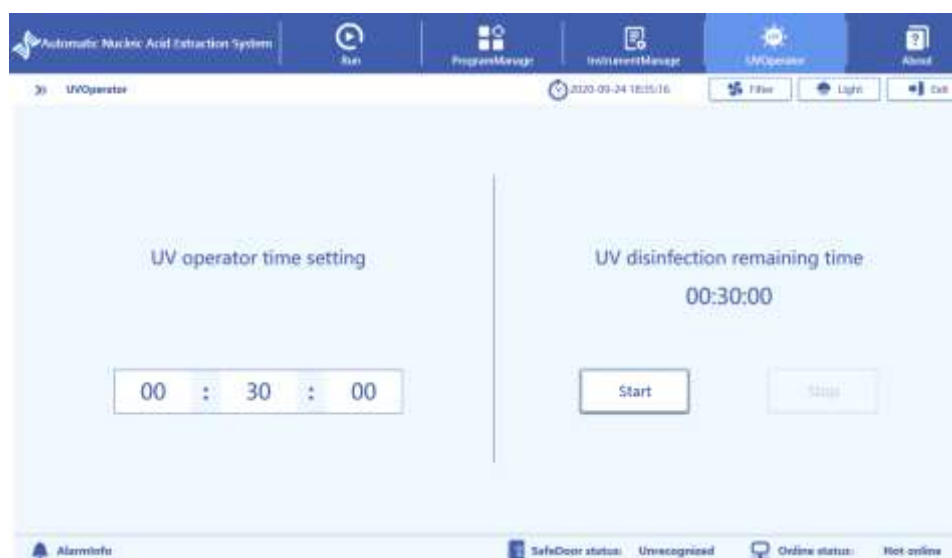


Figure-18

Note:

- 1) At the end of the disinfection time, the system will automatically turn off the UV lamp, or the operator can turn off the UV lamp according to the actual situation.
- 2) During the UV disinfection process, no icons except the UV disinfection function can be used. Other icons can be used only when the UV lamp is off.

Warning: Do not look directly at the UV lamp when it is turned on to avoid accidents.

7.6 About

As shown in **Figure 19**, the "About" interface displays the current software version, machine code, motor driver board version, program version of the communication module and the temperature control oscillation module.



Figure-19

Run log: The operation record of the nucleic acid extractor, users generally do not need to check it.

Instruction: Built-in electronic version of the operating instructions of the nucleic acid extractor, click to view.



Figure-20

7.7 Exit

After clicking the [**Exit**] button in the upper right corner, a prompt box as shown in **Figure 21** is displayed.

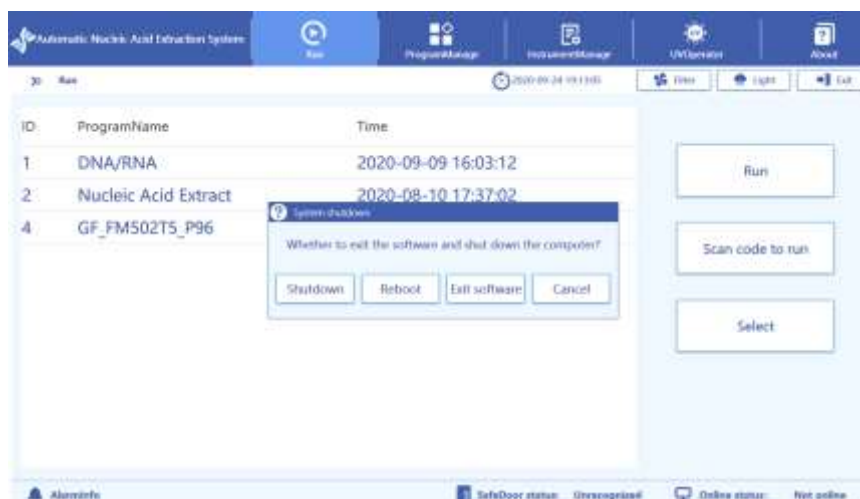


Figure-21

Shut down: Turn off the industrial computer.

Reboot: Reboot the industrial computer.

Exit software: Only the software, the interface returns to the main interface of the industrial computer.

Cancel: Cancel the operation of the previous step.

8. Maintenance

- 1) Kindly read the operating instructions carefully before using the instrument.
- 2) After the testing, turn off the power supply of the instrument. Kindly use absorbent cotton dipped in 75% ethanol for wiping the cabin instead of pouring ethanol into the cabin directly. After the ethanol is dry, turn on the UV lamp to disinfect for more than 30 minutes.
- 3) Regularly clean the surface and cabin of the instrument, and be careful not to use strong alkali, concentrated alcohol, and organic solvent solutions.
- 4) Keep the environment in the cabin dry and free of water stains.
- 5) Do not use the instrument in a dusty environment.
- 6) During the use of the instrument, kindly ensure that there is good ventilation around the instrument.
- 7) Kindly do not use the instrument when the voltage is unstable, too high, or too low.
- 8) When the instrument is not in use for a long time, kindly unplug the plug and cover the instrument with a soft cloth or plastic bag to prevent dust.
- 9) When the instrument is not in use, to ensure the stable performance of the instrument, it is recommended to run the instrument on empty every 30 days.
- 10) If the rod cover is worn out during use and the magnetic rod is contaminated, use absorbent cotton dipped in absolute ethanol to wipe it in time. After the absolute ethanol evaporates, turn on the UV operator for 30 minutes.

Warning: It is forbidden to clean the cabin or surface during instrument running.

9. Accessories

Standard Accessories

- Heating component
- Magnetic rod assembly

Optional Accessories

- 96 deep well plates
- Handheld scanning device



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