

Automatic Nucleic Acid Extractor S-48 User Manual



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Preface

Thank you for using the S-48 Automatic Nucleic Acid Extractor.

Please read this manual carefully before operating the instrument, especially the precautions, warnings, and informative content. For convenient reference, please keep this manual in an easily accessible location.

In this manual, "user" refers to operators who have received systematic training. Any operations beyond the scope of this manual are strictly prohibited.

Basic Information

- Product Name: Automatic Nucleic Acid Extractor
- Model Specification: S-48
Software Name: Human-Machine Interface Control System
- Software Version: V3
- Software Name: Automatic Nucleic Acid Extraction Operation Software
- Software Version: V3
- Product Dimensions: Length 50cm, Width 46cm, Height 54cm
- Manufacturing Date: See product label
- Design Service Life: 5 years
- Registrant/Manufacturer: SHT technology GmbH
- Address: Schultheißenweg 109, 60489 Frankfurt am Main
- Telephone: +49 017634989414
- Website: <https://sht-medino.de>
- Email: info@sht-medino.de
- After-sales Service Provider: SHT technology GmbH
- Contact: +49 017634989414

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Chapter 1 Overview

1. Instrument Introduction

The S-48 is an integrated automated nucleic acid extraction workstation capable of purifying nucleic acids from various biological specimens including whole blood, viruses, tissues, plants, bacteria, and cultured cells. Featuring intelligent pre-loaded extraction protocols, compatible with magnetic bead-based extraction kits and consumables, this system provides laboratories with efficient, automated, high-quality nucleic acid purification solutions for downstream genetic analysis and molecular diagnostics.

2. Instrument Structure

The automatic nucleic acid extractor consists of mechanical and electrical components. Specifically, it comprises housing, top cover, sample mixing mechanism, magnetic bead transfer mechanism, heating and cooling module (optional), HEPA filtration system, UV sterilization device, color touch screen, automatic nucleic acid extraction operation software, and human-machine interface control software.

3. Intended Use

For extraction and purification of nucleic acids from clinical specimens.

Chapter 2 Instrument Working Principle

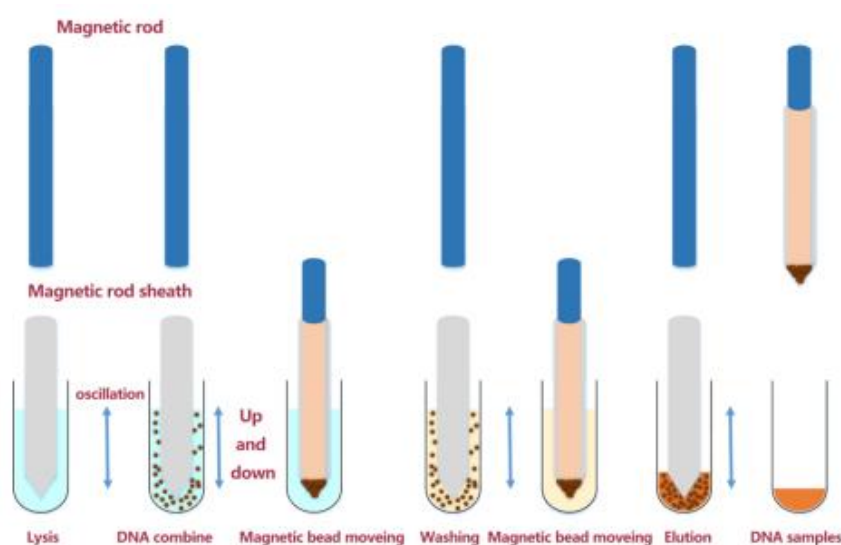


Figure 1: Working Principle Diagram of Automatic Nucleic Acid Extractor

This product operates on the principle of magnetic bead adsorption: The automatic nucleic acid extractor can simultaneously process up to 48 samples. Using magnetic rods on the experimental chamber's magnetic rod rack, magnetic beads with adsorbed nucleic acids are transferred to different reagent wells. The sheaths covering the magnetic rods rapidly move up and down repeatedly to mix the liquid, ensuring uniform mixing of liquid and magnetic beads. Through the processes of cell lysis, nucleic acid adsorption, washing, and elution, high-purity nucleic acids are ultimately extracted.

Chapter 3 Performance Parameters

1. Performance Specifications

1.1. Operational Performance

- 1.1.1. Processing capacity: 1 to 48 samples
- 1.1.2. Working volume: 20 μ L – 1 000 μ L
- 1.1.3. Magnetic bead recovery rate: > 98%;
- 1.1.4. Permanent-magnet rods: 4000 – 6000 Gs
- 1.1.5. Temperature-control range: 4 – 120 °C (with optional heating/cooling module).

1.2. Appearance

- 1.2.1. The automatic nucleic acid extractor housing consists of two parts: a plastic front shell and a sheet metal chassis. The plastic front shell is manufactured from ABS material with a black alcohol-resistant paint finish. It must be free of sharp edges, and the outer surface should be smooth and flat without defects such as impacts or scratches. The sheet metal chassis is constructed of metal with a white matte powder coating that is alcohol-resistant and must not exhibit discoloration. The surface should be smooth and flat with soft, uniform coloration, without defects such as exposed substrate, bubbles, peeling, cracking, whitening, sagging, scratches, pinholes, or orange peel texture;
- 1.2.2. Screen printing must be free of ghosting, ink overflow, missing corners, omissions, misalignment, or insufficient ink. The printed graphics and text must adhere strongly and be alcohol-resistant

without discoloration;

1.2.3. Fastener connections must be secure and reliable, without looseness, and all fixing holes must have screws installed;

1.2.4. The door and chassis must fit tightly, and the door must operate without interference or jamming.

1.3. Software Application Functions

Through the software interface, users can control the device's horizontal and vertical movement modules, the temperature of the heating module, as well as the UV sterilization device and LED illumination device:

1.3.1. Users can configure workstations, set waiting times, mixing modes, mixing durations, pause options, magnetic adsorption times, volumes, temperatures, 4°C preservation times, and motor parameters. The system settings include 10 different mixing speeds that can be freely combined with mixing modes. The workstation settings allow fine adjustments to each individual workstation. Motor parameter settings enable adjustments to the position and speed of each motor during operation/mixing/magnetic adsorption. During program execution, preset workstations can be heated while adjacent workstations can be actively cooled to prevent temperature transfer that might compromise experimental results. After program completion, preset workstations can be maintained at 4°C;

1.3.2. For horizontal movement, the mechanical arm moves from workstation 1 to workstation 6. Users can input corresponding position and speed parameters through the human-machine interface on the color touch screen. During operation, the sequence and timing of each action should be consistent with the set parameters. The mechanical arm should move without interference, abnormal noise, or sudden jumps;

1.3.3. For vertical movement, sample mixing, and magnetic adsorption, users can input corresponding position and speed parameters

through the human-machine interface on the color touch screen.

During operation, the sequence and timing of each action should be consistent with the set parameters. When the magnetic rods and sheaths descend into the deep-well plate, they should be centered without interference or abnormal noise;

1.3.4. In the UV lamp setting interface, users can set UV irradiation time and press the run or stop button to turn the UV lamp on or off;

1.3.5. During machine operation, users can turn the LED illumination lamp on or off at any time by clicking the virtual button on the screen;

1.3.6. The air filter membrane switch functions normally during program execution/completion.

1.4. Electrical Safety

Must comply with GB 4793.1-2007 "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements", GB 4793.6-2008 "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 6: Special Requirements for Laboratory Material Heating Equipment", GB 4793.9-2013 "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 9: Special Requirements for Automatic and Semi-automatic Equipment for Laboratory Analysis and Other Purposes", and YY 0648-2008 "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-101: Special Requirements for In Vitro Diagnostic (IVD) Medical Equipment".

1.5. Electromagnetic Compatibility

Must comply with GB/T 18268.1-2010 "Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements" and GB/T 18268.26-2010 "Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 26: Special Requirements - In Vitro Diagnostic (IVD) Medical Equipment".

1.6. Environmental Testing

Must comply with GB/T 14710-2009 "Environmental Requirements and Test Methods for Medical Electrical Equipment" standard for Climate Environment Group I, Mechanical Environment Group I, and the requirements in Table 1.

Table 1: Environmental Test Requirements and Inspection Items

Test Item	Test Requirements				Test Requirements				
	Duration (h)	Recovery Time (h)	Powered State	Test Conditions	Initial Inspection	Intermediate Inspection	Final Inspection	Power Supply Voltage V	
								Rated value -10%	Rated value +10%
Operational low-temperature test	1	—	Power on in the test	10℃	All project	—	2.3	√	—
Low temperature storage test	4	4	Power on in the test	-40℃	—	—	2.3	220V	
Operational high-temperature test	1	—	Power on in the test	30℃	—	—	2.3	—	√
Operation test	4	—	Power on in the test	10-30℃	—	—	2.3	—	√
High temperature storage test	4	4	Power on after the test	55℃	—	—	2.3	220V	
Humid heat test	4	—	Power on after the test	Temperature: 30° C Humidity: 70% ± 3%	—	—	2.3	220V	
Humid heat test	48	24	Power on after the test	Temperature: 40° C Humidity: 93% ± 3%	—	—	2.3	220V	
Vibration test	—	—	Power on after the test	Reference test conditions Frequency cycle range: 5-20-5Hz Amplitude: 0.15mm Scanning cycle count: 10 times Scanning speed: ≤1 octave/min Working state: Non-working state	—	—	2.3	220V	
Transport test	—	—	Power on after the test	Reference test conditions	—	—	All project	220V	

			Road surface: Level 3 highway Driving distance: 200km Driving speed: 30km/h- 40km/h				
Note: Reference test conditions, environmental temperature 23°C±2°C, humidity 45%-75%.							

Chapter 4 Installation Instructions

1. Installation Environment Requirements

The S-48 Automatic Nucleic Acid Extractor must be installed and operated indoors under the following environmental conditions:

- Environmental temperature: 10°C-40°C
- Relative humidity: 30%-80%
- Altitude: Below 2000 meters
- Power requirements: 200-240V~/3.4A 50/60Hz
- Good ventilation, avoid direct sunlight

Installation surface requires at least 80cm×70cm×80cm (L×W×H) of space, flat, stable, and able to support weight exceeding 100KG.

2. Instrument Unpacking

The S-48 Automatic Nucleic Acid Extractor is stored and transported in an aviation box. The packing list is as follows:

No.	Item	Quantity
1	Automatic Nucleic Acid Extractor	1
2	Power Cord	1
3	Fuse	2
4	Manual	1
5	Warranty Card	1
6	Certificate of Conformity	1

3. Power Connection

The rear interfaces are as follows:

1. Reserved interface;

2. USB interface;
3. Program update interface;
4. Power cord interface.

Insert one end of the power cord into interface 4 and the other end into the mains power supply.

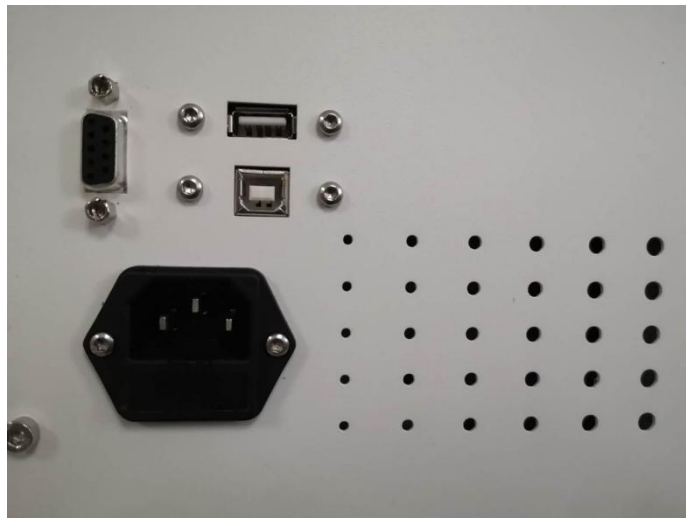


Figure 2: Rear Interface



Figure 3: Experimental Chamber

The power button is located on the right side of the instrument. Before powering on, please ensure there are no foreign objects in the experimental chamber, then press firmly to turn on.



Figure 4: Right Side Power Button

After normal power connection, the instrument will perform a self-test. If the self-test is normal, it will enter the home page. If there are abnormal sounds or error pop-ups during the self-test, please immediately disconnect the power and contact the distributor or manufacturer. Do not disassemble the machine.

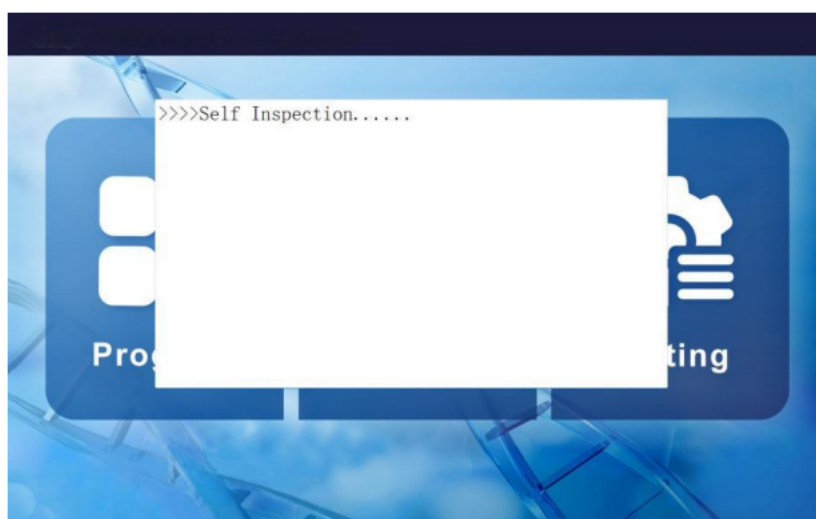


Figure 5 Self-check Incomplete After a Long Time

Chapter 5 Nucleic Acid Extraction Operating Instructions

1. Home Screen Icons

The home screen icons are: [Program List], [UV Lamp], [System Settings].

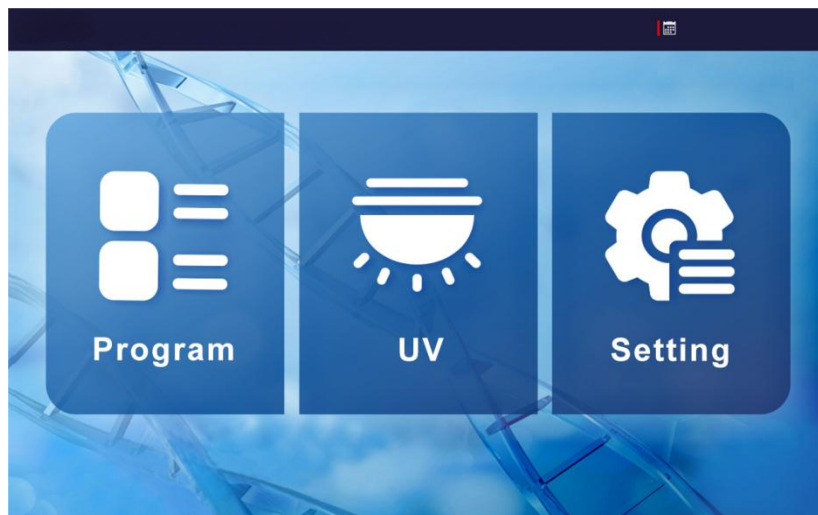


Figure 6: Home Page Interface

2. How to Run Pre-set Extraction Programs

Click the "Program List" button on the main interface to enter the program list interface.

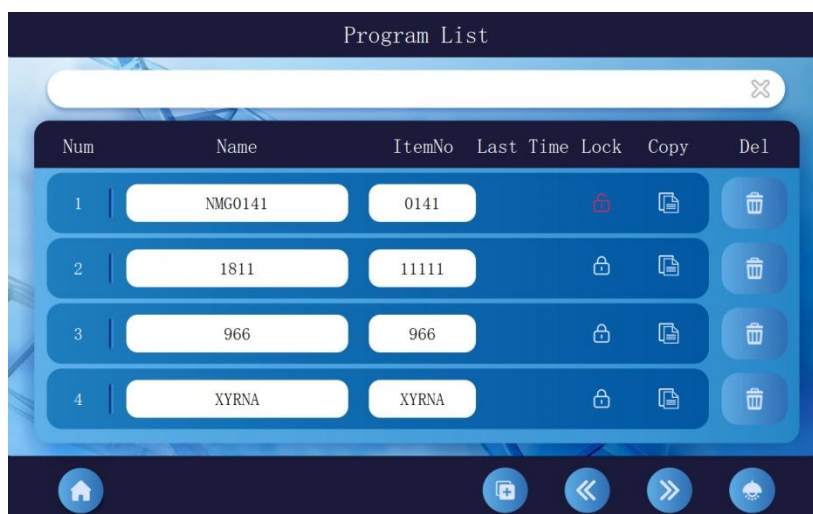


Figure 7: Program List

The buttons at the bottom from left to right are: Home button, Add New Program button, Page Left button, Page Right button, Illumination Lamp.

Click the "Number-Name-Item Number" area to enter the program editing interface.



Figure 8: Program Editing 1

The buttons at the bottom from left to right are: Home button, Return to Program List button, Page Left button, Page Right button, Run button, Illumination Lamp.

Click the "Run button", and a "Magnetic Sheath Installation Prompt" pop-up will appear. Please be sure to check if the magnetic sheath is installed!! If the magnetic sheath is installed, click "✓" and the instrument will start running. If you wish to exit due to incorrect operation, click "×".



Figure 9: Magnetic Sheath Installation Prompt

The instrument running interface will display the total countdown, current action, remaining time for the current action, etc.

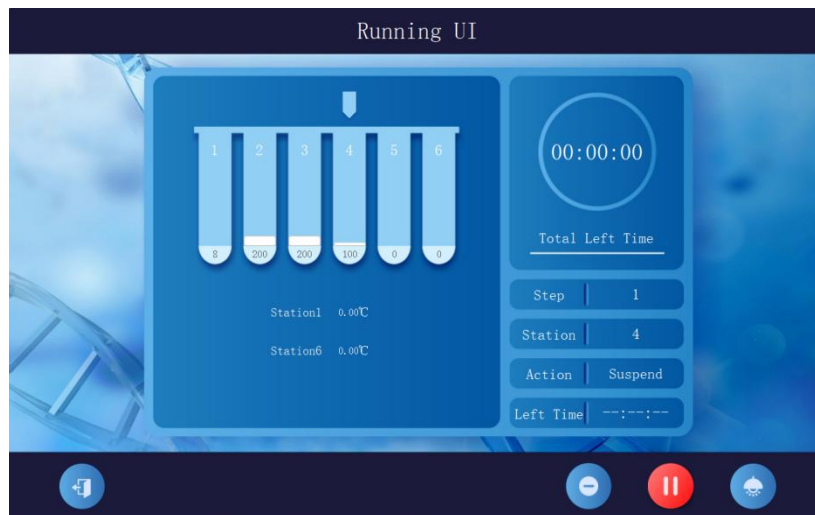


Figure 10: Running Interface

The buttons at the bottom from left to right are: Return to Program Editing Interface button, Stop button, Pause button, Illumination Lamp.

During program execution, users can click the "Pause button" to pause the currently running program, or click the "Stop button" to terminate the current program.

Note: After pressing the pause button, the mechanical arm stops moving, but the workstation does not change, and the program can continue to run subsequently. After pressing the stop button, the program will terminate, and the mechanical arm will automatically return to the initial workstation.

3. Program Search Function

If there are many programs in the program list, making it difficult to find a specific one, you can click the "Search area" to bring up a keyboard. Entering keywords will search for corresponding names or item numbers, allowing you to quickly find the program you need.

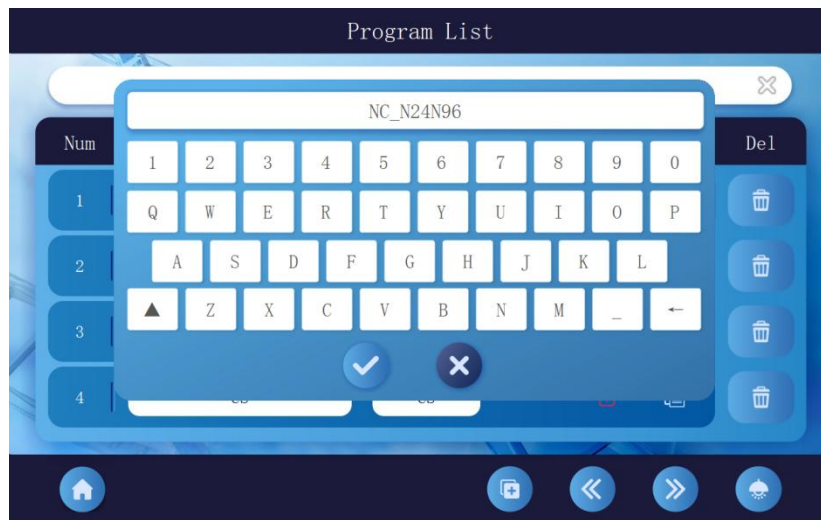


Figure 11: Program Search

4. Program Deletion Function

If the "Encryption" area of a program shows a red lock icon, it means the program is encrypted, and deleting the program or modifying parameters requires a password. If the "Encryption" area shows a white lock icon, it means the program is not encrypted, and you can freely delete the program or modify parameters.

Clicking the delete button for an unencrypted program will immediately bring up a confirmation pop-up. Clicking "✓" will delete the program, and clicking "×" will cancel the deletion.

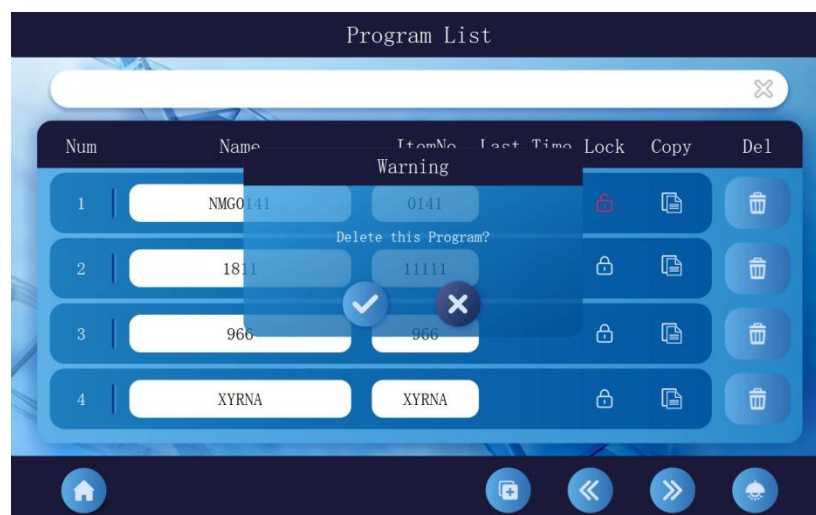


Figure 12: Program Deletion

Clicking the delete button for an encrypted program will bring up a password box. After entering the correct password, clicking "✓" will delete the program, and clicking "×" will cancel the deletion.

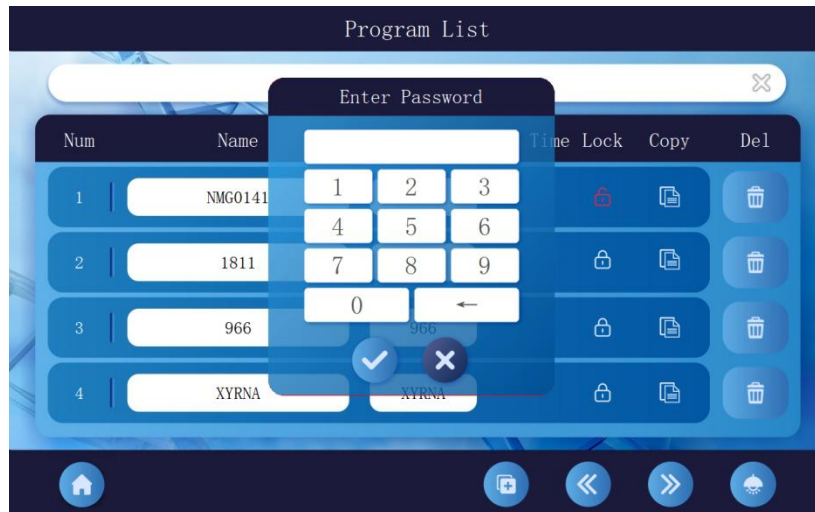


Figure 13: Program Deletion Password Confirmation

5. Power Failure Protection

If a power failure occurs during instrument operation, the instrument will memorize the program's running state at the time of power failure. After power is restored and the instrument is turned on again, it will prompt the operator whether to continue running the program from before the power failure. If the user clicks the "✓" button, the unfinished program will continue. If the "✕" button is clicked, the instrument will return to the home page.

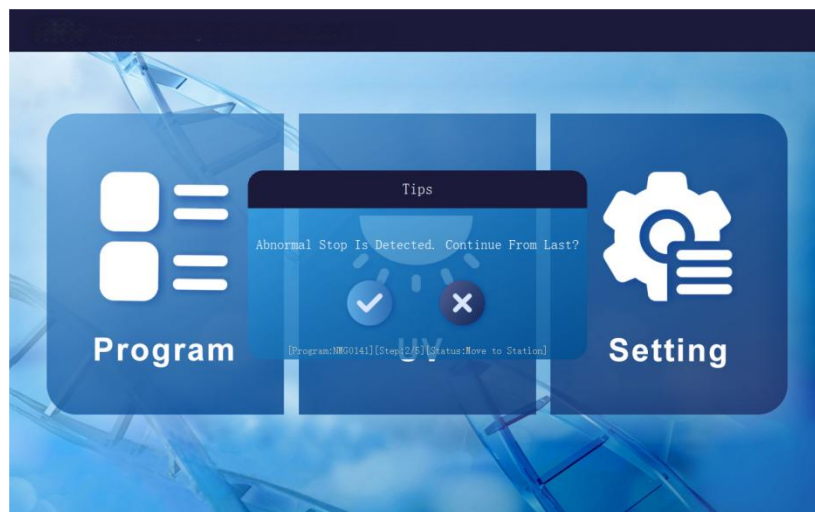


Figure 14: Power Failure Protection

6. UV Lamp Disinfection Function

Click the "UV Lamp" button on the home page to enter the UV lamp setting interface. A 15-minute UV irradiation time is pre-set. Click the "Run button" to turn

on the UV lamp, and click the "Stop button" to turn off the UV lamp. If you need to change the irradiation time, click the numbers to bring up the time keyboard.

"00:00:00" represents hours, minutes, and seconds.

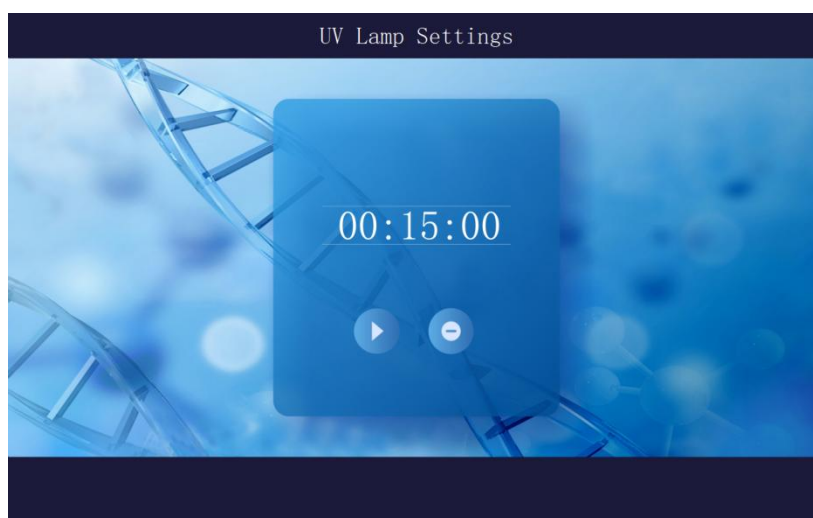


Figure 15: UV Irradiation

Chapter 6 Precautions

1. Instrument Maintenance and Operational Safety

- 1) Before using the instrument, please carefully read the manual and participate in the training organized by engineers;
- 2) Regularly clean the instrument with 75% ethanol and activate the UV lamp for more than 30 minutes for disinfection. Avoid contact between the instrument and strongly corrosive liquids, and avoid mechanical impact;
- 3) Ensure a relatively stable operating environment for the instrument, provide stable voltage, and ensure that the operating environment temperature and humidity meet requirements. The surface on which the instrument is placed should be stable;
- 4) Always install the magnetic sheaths before each operation to prevent the magnetic rods from directly contacting the solution, which could cause contamination of the magnetic rods. If contamination occurs, carefully wipe with 75% alcohol or distilled water and a clean cotton cloth;
- 5) Non-professional after-sales personnel should not open the instrument to replace components or make internal adjustments. Such operations must be performed by professional maintenance personnel approved by our company;
- 6) Pay attention to electrical safety, and strictly prohibit operation with wet hands;

- 7) During program execution, do not touch the heating block with bare hands to avoid burns;
- 8) A bell will ring when the program ends. After the bell rings, press the return button to go back to the program settings home page.

2. Common Faults and Troubleshooting

No Display on Screen

- Check if the machine switch is turned on
- Check if the power cord is properly plugged in
- Check if the power outlet has electricity
- If still unable to turn on, please contact after-sales service

Machine Cannot Complete Self-test or Cannot Continue Running During Operation, Making Abnormal Noises

- Check if there are foreign objects on the track blocking the mechanical arm's movement
- Check if there are foreign objects on the magnetic rod sheath rack
- Check if the magnetic rod sheaths are properly inserted
- Check if the deep-well plate is correctly placed in the workstation
- If still unable to operate normally, please contact after-sales service

Instrument System Crash

- Use the power switch at the back of the instrument to restart
- If there is still no response after several restarts, please contact after-sales service

UV Lamp Does Not Light Up

- Restart the instrument and turn it on again to check if it was caused by a system crash
- Check if the UV lamp tube contact is good
- Replace with a new lamp tube

Incomplete Magnetic Adsorption in a Few Wells

- Check for contamination or damage
- Use a magnet to check for demagnetization

Heating Block Does Not Heat or Cool

- Check if heating temperature and time are correctly set
- Restart the instrument to check if it was caused by a system crash
- If still no response, it should be a hardware problem, please contact after-sales service

When liquid enters the interior of the instrument or the instrument suffers major mechanical impact, immediately disconnect the power and contact after-sales service as

soon as possible.

Chapter 7 After-sales Service

We provide comprehensive equipment service, including pre-sales guidance, after-sales installation, debugging, usage, maintenance, and other services. The instrument is warranted for one year.