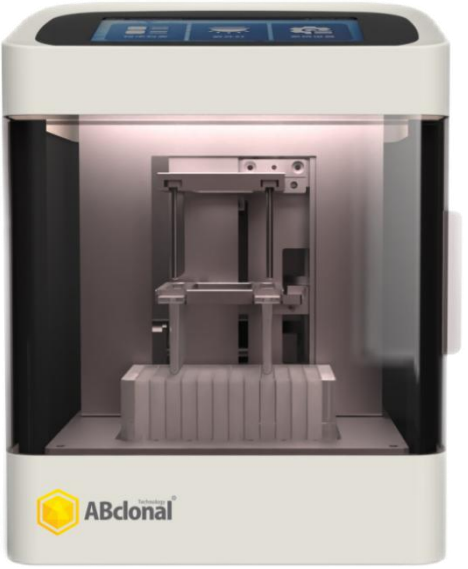
S-16 Fully Automated Nucleic Acid Extraction System

User Manual



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Preface

Please read this manual carefully before using the instrument, especially the cautionary, warning, and informative content. For future reference, please keep this manual in an easily accessible location.

In this manual, the term "user" refers to the operator who has undergone systematic training. Any operations outside the instructions in this manual are strictly prohibited.

Basic Information

Product Name: S-16 Fully Automated Nucleic Acid Extraction System

Software Name: Human-Machine Interface Control Software

Software Name: Fully Automated Nucleic Acid Extraction Operation Software

Product Dimensions: Length 30 cm, Width 24 cm, Height 32 cm

Production Date: See product label

Precautions

1. Important Safety Information

Please read the user manual thoroughly before using the instrument.

Do not operate the instrument without reading this manual. Failure to follow the instructions may lead to burns from heat generated during operation or even electric shock. Carefully read the safety tips and implement all protective measures.

2. Safety Guidelines

Comply with the following basic safety measures during the operation, maintenance, and repair of this instrument. Failure to do so or disregarding warnings in this manual may compromise the protection and intended use of the device.

This device complies with GB4793.1, GB4793.6, GB4793.9, and YY 0648 standards. This instrument is intended for indoor use only.

Users should not attempt to disassemble or replace any parts or accessories of the instrument. If repairs or replacements are needed, please contact our after-sales service or the authorized distributor where the instrument was purchased. Only trained service engineers or designated personnel should perform these operations.

Before operating the instrument, thoroughly read this manual to avoid personal injury. Only qualified personnel who have been trained in the installation and use of electrical equipment should operate this instrument.

Operators must not attempt to open or repair the instrument themselves, as this may void the warranty and could result in electric shock. If repairs are needed, our company should be contacted to handle the repairs.

Before connecting the instrument to the power supply, ensure that the voltage matches the instrument's requirements. The power outlet should also have a rated load that meets or exceeds the instrument's power needs.

If the power cord is damaged, it must be replaced with a cord of the same type and specification. During operation, do not place anything on the power cord, and do not place the power cord in an area where people walk.

When plugging or unplugging the power cord, always hold the plug itself. Ensure that the plug is fully inserted into the socket. Do not pull on the cord to unplug it.

The heating module inside the instrument may reach very high surface temperatures during normal operation, which could cause burns. Therefore, do not touch it with any part of your body to avoid injury.

Warning! This biohazard symbol (yellow background, black symbol and outline) indicates that when handling potentially contaminated samples or reagents, tip collection boxes, and waste liquids from washing, you should treat them as potential infection sources. Please take appropriate protective measures, such as

wearing protective gloves and masks.

Warning! Be cautious of pinch points when the instrument is in motion. Do not place your hands in the movement areas of the instrument.

Warning! Be careful of UV radiation. Do not look directly at the UV light.

I Power On

O Power Off

Research Use Only: This instrument is intended for research purposes only.

Protective Conductor Terminal

Note: This terminal is connected to the conductive parts of the device for safety purposes and is intended to be connected to an external protective grounding system.

Recycling and Waste Disposal. This product must be disposed of according to the regulations for electrical and electronic equipment waste. Proper disposal of your old equipment helps protect the environment and reduces health risks.

The instrument should be placed in an environment with low humidity, minimal dust, and away from water sources. It should also be kept out of direct sunlight and intense light sources. The room should be well-ventilated, free from corrosive gases or strong magnetic interference, and away from heating elements such as radiators, stoves, or other heat sources. Do not place the instrument in damp or dusty areas.

The openings on the instrument are for ventilation purposes. To prevent overheating, do not block or cover these ventilation slots.

When not in use, the power should be turned off. If the instrument will not be used for an extended period, unplug the power cord, allow the instrument to cool to room temperature, and cover it with a soft cloth or plastic sheet to prevent dust from entering.

In the following situations, immediately unplug the instrument from the power outlet and contact the supplier or a professional technician for further assistance:

- If liquid spills inside the instrument.
- If the instrument has been exposed to rain or water.
- If the instrument is not functioning normally, particularly if there are any unusual sounds or smells.
- If the instrument has been dropped or the casing is damaged.
- If there are significant changes in the instrument's performance.

3. Operation of the Instrument

(1) Waste must be disposed of in accordance with regulations for electrical and electronic equipment waste.

(2) If dealing with potentially infectious materials (such as human samples or reagents), protective gloves must be worn.

(3) If there is a risk of releasing hazardous aerosols during normal use, necessary protection for the mouth, nose, or eyes must be employed, such as wearing a mask.

(4) RADIATION PROTECTION NOTE: When using UV disinfection, do not open the chamber door.

4. Instrument Maintenance and Care

Except where otherwise specified, all maintenance should be performed when the instrument is not in use.

The instrument should be regularly cleaned with a soft cloth moistened with a small amount of ethanol to clean the chamber.

If the surface of the instrument becomes stained, it can be cleaned with a soft cloth and a cleaning paste.

4.1. Cleaning and Disinfection

The user must ensure the following:

(1) If hazardous substances spill on the equipment or its surface, appropriate disinfection is required.

(2) Do not use disinfectants or cleaners that chemically react with any parts or materials of the equipment.

(3) If there are concerns about the compatibility of disinfectants or cleaners with the equipment's components or materials, consult the manufacturer or supplier.

(4) Only use the disinfectants or cleaners specified in the manual. If you wish to use other types of disinfectants or cleaners, please confirm with the manufacturer whether they are safe to use.

4.2. Routine Maintenance

After each use, daily maintenance should be carried out as follows:

(1) Keep the platform clean and ensure no liquid residue or stains are left on the plate positions.

(2) Activate UV disinfection to ensure sufficient disinfection and waste removal.

(3) Turn off the instrument's operation switch, and then turn off the main power switch of the instrument.

4.3. Periodic Maintenance

In addition to daily maintenance, after six months of continuous operation or after long-term storage, the instrument requires periodic maintenance.

(1) Check the transmission mechanism for any issues. If any screws are loose, tighten them immediately.

(2) Run the test program. If the instrument operates smoothly and quietly, it is functioning normally.

(3) Inspect the instrument's electrical circuits, ensuring proper grounding, good condition of fuses, and no signs of aging in the wiring.

4.4. Long-Term Storage Maintenance

Although this instrument is designed for continuous operation in laboratories, situations may arise where it is not used for an extended period. If the instrument is not going to be used for a long time, these steps must be taken: thoroughly disinfect the instrument, power off the

instrument, and follow relevant regulations for the proper disposal of any waste materials.

5. After-Sales Service

5.1. Warranty Coverage

Within one month from the date of delivery, our company will be responsible for replacement in the event of any faults caused by material or manufacturing defects.

Within 12 months from the date of delivery, our company provides warranty service for any faults caused by material or manufacturing defects. During the warranty period, our company will either repair or replace the instrument at its discretion, based on the nature of the defect.

Warranty claims must be made by returning the instrument to the designated service department of our company. The shipping costs for sending the instrument to the service department are the responsibility of the customer. Our company will cover the shipping costs when returning the instrument to the customer.

For repairs outside the warranty period, our company will charge a reasonable fee to cover the cost of repairs.

5.2. Warranty Exclusions

The above warranty does not apply to damage resulting from improper use or maintenance by the customer, usage under non-compliant conditions, unauthorized repairs or modifications, or other forms of misuse.

Table of Contents

I. Overview

1. Introduction to the Instrument

The S-16 is an integrated nucleic acid automatic preparation system that can purify nucleic acids from various biological samples, including whole blood, viruses, tissues, plants, bacteria, and cultured cells. Equipped with intelligent pre-installed extraction programs and corresponding nucleic acid extraction kits and consumables based on magnetic beads, this system provides laboratories with efficient, automated, and high-quality nucleic acid purification solutions, serving downstream gene analysis and molecular diagnostics.

2. Structure of the Instrument

The fully automated nucleic acid extractor consists of mechanical and electrical components. Specifically, it includes a casing, a cover, a sample mixing mechanism, a magnetic bead transfer mechanism, a heating module, a HEPA filtration system (optional), a UV sterilization system, a color touchscreen, fully automated nucleic acid extraction operation software, and human-machine interaction control software.

3. Intended Use

The instrument is intended for the extraction and purification of nucleic acids from various biological samples.

II. Operating Principle of the Instrument

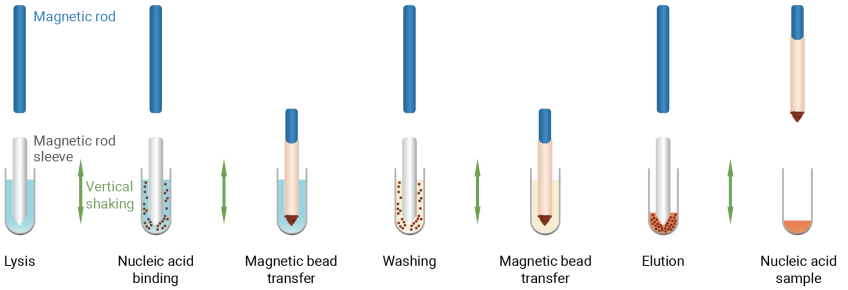

Figure 1. Schematic diagram of the working principle of the fully automated nucleic acid extraction system

The principle of this product is the magnetic bead adsorption method.

The Fully Automated Nucleic Acid Extraction System can simultaneously process up to 16 samples. Using the magnetic rods on the magnetic rod holder in the laboratory chamber, the magnetic beads adsorbed with nucleic acids are transferred to different reagent wells. Then, using the magnetic rod sleeves on the outside of the magnetic rods, the liquid is rapidly mixed up and down so that the liquid and magnetic beads are uniformly combined. Through this process, cell lysis, nucleic acid adsorption, washing, and elution occur, and finally, high-purity nucleic acids are extracted.

III. Performance Parameters

1. Operating Performance

(1) Processing capacity: 1 to 16 samples;

(2) Working volume: 20 μL to 1000 μL, with an absolute elution volume of 20 μL;

(3) Magnetic bead recovery rate: >99%;

(4) Permanent magnet column: >4600 Gs;

(5) Temperature control range: Room temperature ~ 120℃.

(6) Temperature display resolution: 0.1℃.

2. Exterior Condition

(1) The fully automated nucleic acid extractor consists of a plastic front shell and a metal box. The plastic front shell is made of ABS material with a colored alcohol-resistant coating. It must have no sharp edges, and the surface must be smooth, without bumps, scratches, or other defects. The metal box is made of metal with a matte black alcohol-resistant finish, which must not fade or show defects like bubbles, peeling, or cracks. The surface must be smooth, soft in color, and free from defects such as exposure, bubbles, peeling, cracks, whitening, sagging, scuffs, needle holes, or orange-peel texture.

(2) The silk screen printing must not have double images, ink overflow, missing corners, misprints, or deviations in position. The ink must be securely attached and alcohol-resistant, with no fading after wiping.

(3) Fasteners must be securely connected, with no looseness, and all screws must be properly installed.

(4) The door and machine box must fit tightly without interference or jams when opened or closed.

3. Software Application Features

Through the software interface, the system can control the horizontal and vertical movement of the machine modules, adjust the temperature of the heating module, and control the UV sterilization system and LED lighting system:

(1) It is possible to set the workstation, waiting time, mixing mode, mixing time, whether to pause, magnetic adsorption time, volume, temperature, and motor parameters. The mixing

speed can be set to 10 different levels, with the option to mix freely. Each individual workstation's position can be finely adjusted, and the motor parameters for each process (mixing, magnetic adsorption, etc.) can be set, ensuring precise positioning and speed adjustments.

(2) Horizontal Movement: The robotic arm moves between workstations 1 and 6. The input position and speed must match the parameters on the color touch screen, and the robotic arm should move without interference, abnormal noise, or jumping.

(3) Vertical Movement: During sample mixing and magnetic adsorption, the position and speed input on the color touch screen must match the movement parameters. The robot arm must enter the deep-well plate centered, without interference or abnormal noise.

(4) You can set the time for the UV lamp to turn on, and control whether it is on or off using the virtual button on the screen.

(5) The LED lighting can be turned on or off at any time by clicking the virtual button on the screen during the machine operation.

(6) The air filter switch functions normally when the program is running or completed (optional).

4. Electrical Safety

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, and YY 0648-2008 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use Part 2-101: Special Requirements for Medical Equipment for In Vitro Diagnosis (IVD). Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use Part 2-101: Special Requirements for In Vitro Diagnostic (IVD) Medical Equipment".

5. Electromagnetic Compatibility

GB/T 18268.1-2010 Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control and Laboratory Purposes Part 1: General Requirements and GB/T 18268.26-2010 Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control and Laboratory Purposes Part 26: Special Requirements In Vitro Diagnostic (IVD) Medical Devices should be conformed to the requirements of the GB/T

18268.1-2010 Electromagnetic Compatibility Requirements for Electrical Equipment for Measurement, Control and Laboratory Purposes Part 1: General Requirements.

6. Environmental Testing

It should meet the requirements of GB/T 14710-2009 in the climatic environment test group II and mechanical environment test group II. The transportation test and power supply voltage adaptability test of the product shall meet the requirements of Chapter 3 and Chapter 4 of GB/T 14710-2009 respectively. Table I Environmental test requirements and test items.

IV. Installation Instructions

1. Transportation and Storage Environment

Storage ambient temperature: -20℃ ~ 50℃;

Storage environment humidity: ≤93%.

2. Installation Environmental Requirements

(1) Ambient temperature: 10℃ ~ 40℃

(2) Relative humidity: 30% to 80%

(3) Altitude: below 2000 meters

(4) Power supply: 220-240 V~/160 W 50 Hz/60 Hz

(5) Weight of the whole machine: 8.9 KG

(6) Keep away from sources of strong electromagnetic field interference

(7) Good grounding environment

(8) Well-ventilated and out of direct sunlight

(9) The installation desktop requires a space of no less than 40cm x 40cm x 50cm (L x W x H), is flat, stable, and able to support a weight of 15 KG or more.

(10) Allow at least 15 cm of space on both sides of the equipment and 20 cm of space at the rear of the equipment; ensure that the equipment is not placed in a position where it is difficult to disconnect it from the operation.

3. Unpacking the Instrument

The packing list of S-16 Automated Nucleic Acid Extraction System is as follows:

Serial number	Element	Quantities
1	Automated Nucleic Acid Extractor	1
2	Factory Inspection Report	1
3	Power Adapter	1
4	Synopsis (of a play or film)	1
5	Product Quality Inspection Certificate	1
6	Warranty Card	1

4. Powering On

The back ports are as follows: power cord port.

Plug one end of the power cord into the device connector and connect the other end to a power cord box that has a good ground to provide the required power; improper grounding can result in electrical shock and system damage.

Figure 2. Back ports

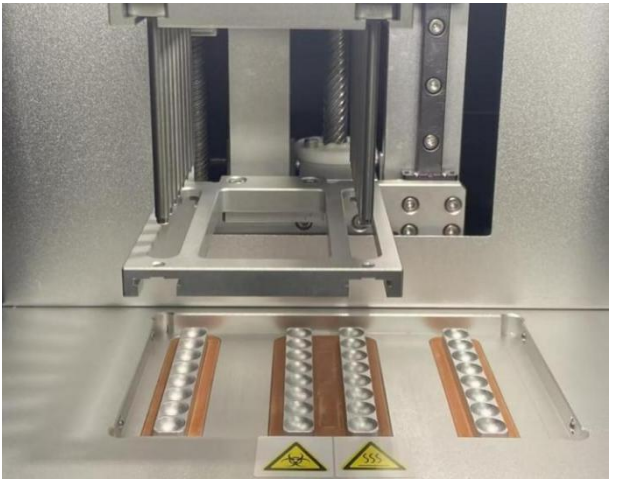

Figure 3. Experimental chamber

The power button is located on the right side of the instrument. Before turning on the instrument, ensure that there is no foreign matter in the experimental chamber. Press the

power button to turn it on.

Once powered on, the instrument will initiate a self-test. If the self-test completes successfully, it will proceed to the homepage. **If there are any abnormal noises, error messages, or if the self-test takes too long to complete, promptly disconnect the power and contact the dealer or manufacturer. Do not attempt to disassemble the instrument.**

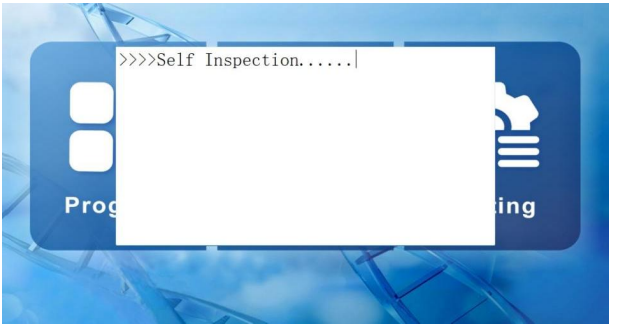

Figure 4. Self-test did not complete after a long time

V. Nucleic Acid Extraction Instructions

The homepage icons are: 〈Program List〉, 〈Ultraviolet Lamp〉, and 〈System Settings〉.

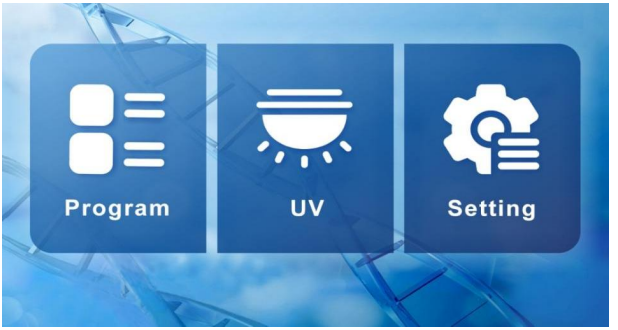

Figure 5. Home Screen

1. The instrument has a preset extraction program, how do I start the operation?

(1) Click the "Program List" button on the main interface to access the program list screen.

Figure 6. List of Programs

The buttons at the bottom, from left to right, are: Home, Add Program, Previous Page, Next Page, and Lighting.

(2) Clicking on the "No. - Name - Item No." area will take you to the program editing screen.

Figure 7. Program Editing

The buttons at the bottom, from left to right, are: Home, Program List, Previous Page, Next Page, Save or Run, and Lighting.

(3) When you click "Run", a pop-up window will appear with message "Tips for Magnetic Rod Sleeve Installation". **Please ensure that the magnetic rod sleeve is properly installed!** If it is, click "√" to start the instrument. If you need to exit due to an error, click "×".

Figure 8. Sleeve Installation Tip

(4) The instrument's operation interface displays the total countdown, the current action, the remaining time for the current action, and more. The graphical area shows the current workstation and the module temperature.

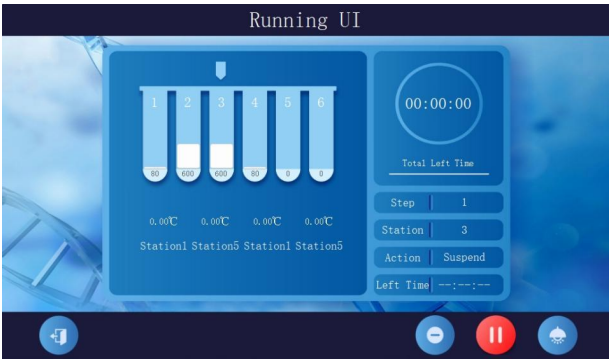

Figure 9. Running Interface

The buttons at the bottom, from left to right, are: Return to Program Editing Interface, Stop, Pause/Continue, and Lighting.

During the program's operation, the user can click the "Pause" button to temporarily stop the running program, or click the "Stop" button to terminate it.

Note: After pressing the Pause button, the robotic arm will stop, but the workstation will remain unchanged, allowing the program to resume later. Pressing the Stop button will terminate the program, and the robotic arm will automatically return to the initial workstation.

2. Program Search Function

If there are many programs in the program list and it is difficult to find one, you can click on the "Search Area". A keyboard will pop up - enter the keyword, and the corresponding name or item number will be retrieved, allowing you to quickly find the program you need.

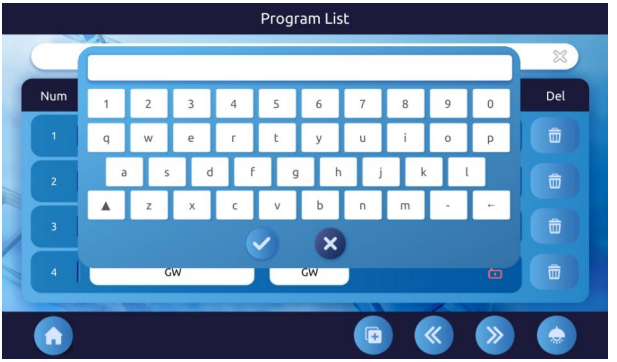

Figure 10. Program Search

3. Program Deletion Function

If the "Encryption" area of the program displays a red lock icon, it means the program is encrypted, and you will need to enter a password to delete the program or modify it parameters. If the "Encryption" area shows a white lock icon, the program is not encrypted, and you can freely delete or modify the parameters.

Clicking the Delete button for an unencrypted program will trigger a confirmation pop-up. Click "√" to delete the program, or click "×" to cancel the deletion.

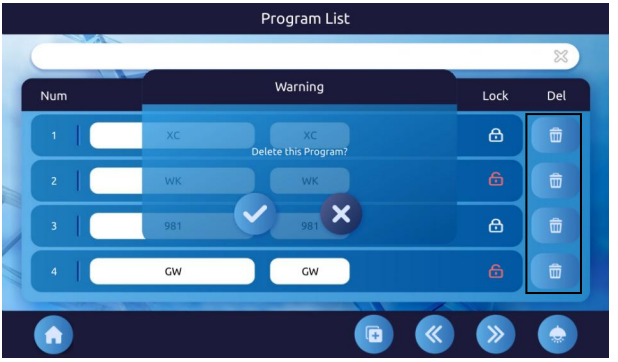

Figure 11. Program Deletion

Clicking the Delete button for an encrypted program will trigger a password box. Enter the correct password and click "√" to delete the program, or click "×" to cancel the deletion.

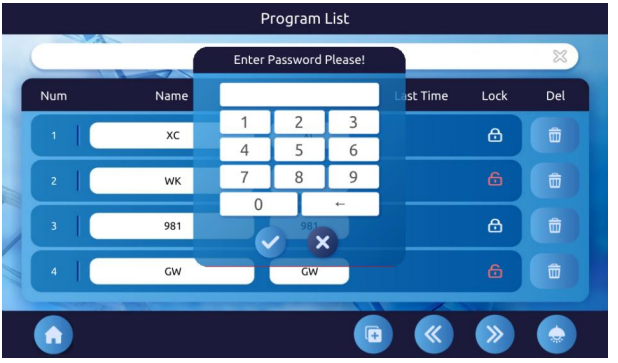

Figure 12. Program Deletion Password Confirmation

4. Power Failure Protection Function

If a power failure occurs during the operation of the instrument, it will remember the

program's running status at the time of the outage. When the power is restored, the instrument will prompt the operator to continue the program. By clicking the "√" button, the user can resume the unfinished program, while clicking the "×" button will return the instrument to the homepage. If the user clicks the "√" button, the program will continue; if "×" button is clicked, the instrument will return to the homepage.

Figure 13. Power Failure Protection

5. UV Sterilization Function

Click the "UV Lamp" button on the homepage to enter the UV lamp settings interface. The UV irradiation time is preset for 15 minutes. Click the "Run" button to turn on the UV lamp and the "Stop" button to turn it off. If you need to change the time, click the number to bring up the time keypad, where "00:00:00" represents hours, minutes, and seconds.

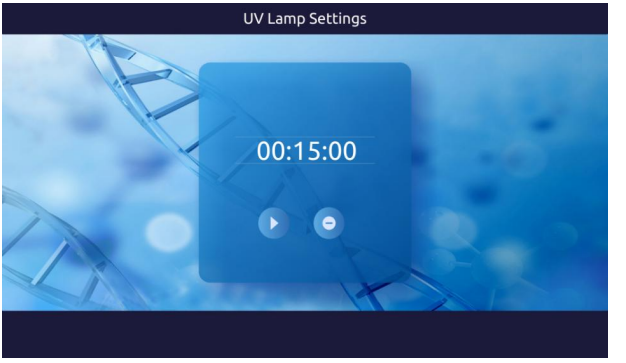

Figure 14. Ultraviolet Irradiation

VI. Precautions

(1) Before using the instrument, carefully review the manual and attend the online training organized by the engineer.

(2) Regularly clean the instrument with 75% ethanol and turn on the UV lamp for more than 30 minutes to disinfect. Avoid contact with strong corrosive liquids and mechanical impacts.

(3) Ensure that the instrument operates in a stable environment, with consistent voltage, temperature, and humidity levels that meet the requirements. Place the instrument on a smooth, stable table.

(4) Always attach the magnetic rod sleeve during operation to prevent the magnetic rod from directly contacting the solution, which could cause contamination. If contamination occurs, carefully wipe the rod with 75% alcohol or distilled water and a clean cotton cloth.

(5) Only authorized professionals may open the instrument to replace components or make internal adjustments. Non-professional after-sales personnel must not attempt such operations without approval from our company.

(6) Pay attention to electrical safety, and never operate the instrument with wet hands.

(7) Do not touch the heating block with bare hands during program operation to avoid burns.

(8) A bell will ring at the end of the program. Pressing the Back button after the bell will return you to the program settings homepage.

(9) If the instrument needs to be transported, first secure the stirring sleeve and handle the instrument with care.

VII.Common Faults and Troubleshooting

(1) No display on the screen

a. Check if the machine's power switch is turned on

b. Ensure the power cord is properly plugged in

c. Verify that the power outlet has power

d. If the issue persists, please contact after-sales service

(2) The machine cannot complete the self-test, or it makes strange noises and cannot continue running during operation

a. Check if there are any foreign objects on the track preventing the arm from moving

b. Inspect the magnet rod holder for any foreign matter

c. Ensure that the magnetic rod sleeve is properly inserted

d. Confirm that the deep-well plates are correctly placed in the workstation

e. If the problem persists, please contact after-sales service

(3) Instrument downtime

a. Restart the instrument using the power on/off button on the back of the instrument.

b. If there is no response after several restarts, please contact after-sales service

(4) UV lamp does not light up

a. Restart the instrument and check if the issue is due to downtime

b. Ensure the UV lamp is making good contact

c. Replace the lamp if necessary

(5) Small wells are not properly magnetized

a. Check for dirt or damage

b. Test for demagnetization using a magnet

(6) Heating block does not heat up

a. Verify that the heating temperature and time are set correctly

b. Restart the instrument to check if the issue is due to downtime

c. If there is still no response, it could be a hardware issue – please contact after-sales service

(7) If liquid enters the instrument or the instrument experiences a major mechanical impact, immediately cut off the power supply and contact after-sales service as soon as possible.

ABclonal Technology

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