

RT-3500

Auto Microplate Washer

User's Manual



Manufacturer: Rayto Life and Analytical Sciences Co., Ltd.

Address: Rayto Industrial Building, Shuangming Blvd South, East Hi-Tech Park, Guangming New District, 518107 Shenzhen, P.R.China

Tel: 0755-26670255 Fax: 0755-26670256

EC Representation: Shanghai International Holding Corp. GmbH (Europe)

Address: Eiffestrasse 80, 20537, Hamburg, Germany

Tel: 0049-40-2513175 Fax: 0049-40-255726

Rev 1.0e

Prepared or Revised on: Sep. 06 2018

How to use the Manual

Thank you for using the Microplate Washer.

Before operating the instrument, be sure to read the Manual carefully

To get the best results, you must be aware of our instrument and its performance before clinical use. Untrained or unauthorized persons must not use or install the Microplate Washer. This is the User's Manual for Rayto Microplate Washer. It describes the installation, daily use and maintenance, etc. of the instrument.

The functions may vary depending on the version or configuration of the instrument. The contents of the Manual may be changed slightly due to version upgrade without prior notice. If you have any questions, contact your dealer.

Please keep all packing materials for future storage, transportation or return to the manufacturer for repair. The product must be protected by the complete original package during transportation.

Note *Cautions, tips, advice and suggestions are printed in italics.*

Warning Warnings must be strictly followed to ensure the normal operation of the instrument. They are printed in bold type.

Representation

Rayto reserves the right for the final explanation of the User's Manual.

The illustrations in the Manual give typical examples only and may not be completely consistent with the actual displaying on the product. Take practicality as standard. Never use the illustrations for other purposes. No individual or organization may duplicate, modify or translate the contents of the Manual without written consent of Rayto.

Rayto will be responsible for the safety, reliability and performance of the product only when all the following requirements are met:

- Assembly, re-debugging, expansion, improvement and repair should be conducted by persons recognized by Rayto;
- The product is operated according to the Manual;
- The related electrical equipment complies with the national standards.

Caution

- The instrument must be used by medical examination professionals or trained doctors, nurses or laboratory technicians.

Warning

- If no satisfying maintenance/repair plan is achieved, the instrument may fail abnormally and may endanger personal health.
- Be sure to use the instrument in the conditions specified in the Manual. Otherwise, it may cause the instrument's failure to function normally and unreliable measurement results, damage the components of the instrument, and endanger personal safety.

Major Icons Used in the Instrument



Temperature Limit
The temperature range of the transport package.



Fragile
The transport package contains fragile objects. Be careful in handling.



Upward
The transport package should be straight up during transportation.



Keep Away From Rain
Protect the transport package against rain.



Layers Limit
The maximum number of layers stacked for the same kind of transport package. 3 indicates the total number of layers from bottom to top.



Biological risks



Warning
The user should check the important warning information in the User's Manual.



Device for in vitro diagnosis
The medical device is an in vitro diagnostic medical device.



Warning
Motion area. Watch out for pinching.



CE Mark

Warning and Safety Instruction

For in vitro diagnosis only. Carefully read the following warning before use and strictly follow it.

- If the equipment is not used in accordance with the Manual, the protection provided by the equipment may be destroyed.
- The items and materials used in some test items may have biohazards. Be sure to wear protective clothing and glasses and put down the protective cover when operating the instrument.
- Do not expose your hand or body to the reagents or patient samples. In case a wound is in contact with patient samples carelessly, immediately wash it and receive medical examinations.
- If the waste liquid container overturns when the instrument is operating, immediately turn off the power switch. Here, the instrument may also discharge a small amount of waste liquid. The waste liquid must be disposed as a biohazard.
- Wear rubber gloves during repair or maintenance. Wash hands after each operation to avoid virus infection.
- The steel needles on the dispensing head are sharp. If case you touch them carelessly, they may cause personal injuries. Do not put your hands or fingers in the area of the workstation when the instrument is operating. Before replacing the dispensing head, be sure to turn off the power supply. Touching the dispensing head when the instrument is operating is prohibited.
- The blockage of the dispensing head may cause uneven liquid adding. Firstly, use the cleanser for intensive cleaning and clean the dispensing head line by line; then consider using a fine needle to clear the blocked holes. If this cannot solve the problem, consider replacing the dispensing head.
- The instrument is an in vitro diagnostic medical device, so it does not have the issue of contraindication.
- The electric cable of the instrument has a ground conductor and is grounded. To avoid electric shock, the ground conductor must be connected to the ground.
- The AC power supply must be stable. Sharing a power supply with high power electrical appliances is prohibited.
- At the time of installation, the electric cable supplied with the instrument must be used. The instrument should be put in a place for easy power off operation.
- To unplug the electric cable, grasp the plug, rather than the wire.
- In case of smog, peculiar smell or abnormal noise from the instrument, any operator must immediately turn off the power and contact the retailer.
- Before transportation or handling, perfuse the tubes with distilled water and

then empty the tubes; clean and disinfect the washing bin to prevent biological contamination.

- **Before removing the shell for repair or other reasons, be sure to turn off the instrument and cut off the power supply.**
 - **In accordance with the Pharmaceutical Affairs Law, modification of medical instruments is prohibited.**
-

Table of Contents

Chapter 1	Introduction	8
1.1	Introduction	8
1.1.1	Product Name	8
1.1.2	Model	8
1.2	Scope	8
1.3	Technical Parameters of Instrument	8
1.4	Performance Indexes	8
1.5	Structure and Composition	9
1.6	Working Principle of Instrument	11
Chapter 2	Installation	12
2.1	Environmental Requirements	12
2.1.1	Work Environment	12
2.1.2	Transportation and Storage Environment	12
2.2	Safety Classification	12
2.3	EMC Requirements	12
2.4	Requirement of Power Supply	14
2.5	Unpacking	14
2.6	Installation of Cleanser Bottle and Waste Liquid Container	14
2.7	Power-on	15
Chapter 3	Operation of Instrument	16
3.1	Plate Washing	17
3.1.1	Mode Setup	17
3.1.2	Cleanser Type	18
3.1.3	Washing Bin Position and Number of Plates Selection	18
3.1.4	Plate Washing Operation	18
3.2	System Setup	21
3.3	Maintenance	22
3.3.1	Daily Washing	22
3.3.2	Intensive Washing	23
3.3.3	Dewatering	25
3.3.4	Reset	26
3.3.5	Perfusion	26
3.3.6	Empty	28
3.4	Power-off and Sleep	28
3.4.1	Power-off	28
3.4.2	Sleep	30
3.5	Software Security	31
Chapter 4	Preservation and Maintenance	32

4.1	Daily Maintenance of Workstation	32
4.2	Daily Maintenance of Dispensing Head	32
4.3	Disinfection of Centrifugal Module	32
4.4	Fuse Change	32
4.5	Treatment of Lock Nut.	32
4.6	Treatment of Waste Liquid Container	33

Chapter 5 System Errors and Countermeasures34

Appendix: Names and Contents of Toxic/Hazardous	
Substances or Elements in Product.....	35

Chapter 1 Introduction

1.1 Introduction

1.1.1 Product Name

Microplate Washer

1.1.2 Model

RT-3500

1.2 Scope

For automatic washing of flat-bottomed porous ELISA plates.

1.3 Technical Parameters of Instrument

- 1) Table-top vertical microplate washer;
- 2) Plate Washing Bin Position: 4 EA;
- 3) Number of Pores per Bin: 96 (8*12);
- 4) Dispensing Head: 96-needle dispensing head (8*12);
- 5) Inlet Channel: 3 EA;
- 6) Cleaning Channel: 1 EA;
- 7) Waste Liquid Discharge Channel: 1 EA;
- 8) Voltage: 100V-240V~, 50Hz/60Hz;
- 9) Input Power: 200VA;
- 10) Tightness of Connectors: The tubes and connectors of the Microplate Washer do not have liquid leakage under the pressure of 200kPa;
- 11) Weight: 23kg;
- 12) Dimension: 498mm(L)×389mm(W)×386mm(H).
- 13) Operating System: (4:3) 8" touch screen, Chinese system;
- 14) Programmable Plate Washing Procedure: 99 EA;
- 15) Adjustable Number of ELISA Plates to be Washed: 1~8 EA;
- 16) Cleanser Type Selection: 3 types of cleanser can be switched freely;
- 17) Auto Sleep: 1 min. ~ 999 min.;
- 18) Automatic Stop in Case of Cover Opening during Dewatering: Emergency stop in case of cover opening;
- 19) Tip of High-speed Operation: Raise the level of safety.

1.4 Performance Indexes

- 1) Maximum Residual Volume: After an ELISA plate is washed, the maximum residual volume of each pore should be $\leq 0.5\mu\text{L}$ averagely;
- 2) Normal Working Condition: The Microplate Washer is connected to the corresponding

cleanser through the tube and, after powered on, should be able to complete the washing of ELISA plates.

- 3) Type of Plate That Can be Washed: Flat-bottomed ELISA plates;
- 4) Washing Times: Adjustable Range: 0~9 times. Default Parameter: 5 times;
- 5) Washing Time: Adjustable Range: 0~60.0s. Adjusting Step: 0.1s. Default Parameter: 2.0s;
- 6) Soaking Time: Adjustable Range: 0~999.9s. Adjusting Step: 0.1s. Default Parameter: 10.0s;
- 7) Dewatering Time: Adjustable Range: 10.0~60.0s. Adjusting Step: 0.1s. Default Parameter: 15.0s;
- 8) Rate of Cross Contamination between ELISA Plates: $\leq 0.5\%$;
- 9) Relative Centrifugal Force: $\leq 2000g$;
- 10) Noise of Whole Machine: Under Working Condition: $\leq 70dB$. In Standby Mode: $\leq 60dB$;
- 11) Liquid Level Alarm: The low liquid level alarm of Cleanser A\B\C bottle and deionized water bottle is provided to check whether Cleanser A\B\C bottle and deionized water bottle are empty. The high liquid level alarm of waste liquid container is provided to check whether the waste liquid container is full;
- 12) Tube Cleaning Function: The Microplate Washer cleans and maintains the tubes automatically when the Microplate Washer is turned off or in sleep mode. The Microplate Washer provides the intensive cleaning and daily cleaning of tubes.

1.5 Structure and Composition

The Microplate Washer is composed of the instrument, cleanser bottle and waste liquid container, in which, the instrument is composed of the control circuit, liquid pump system, solenoid valve control section, dispensing head, centrifugal module, and LCD.

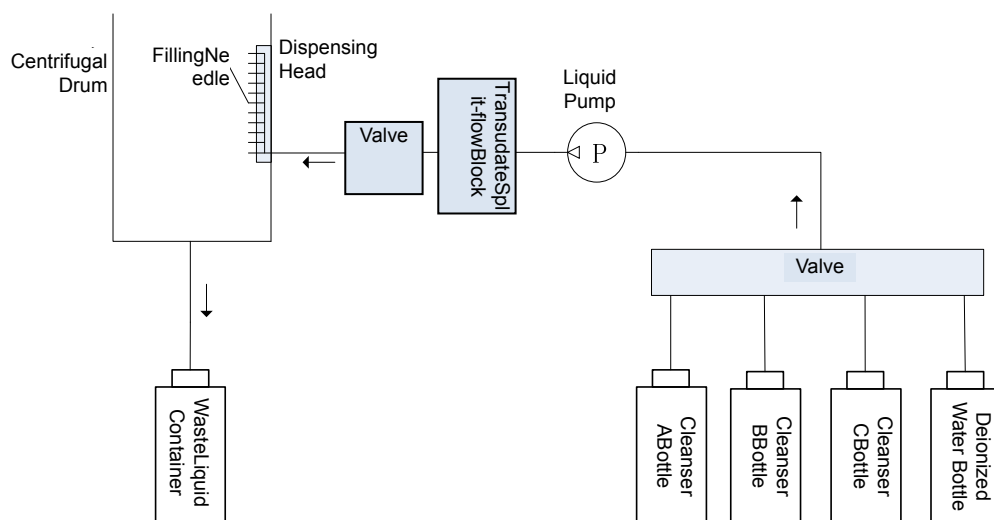


Figure 1-1 Schematic Diagram of Internal Structure

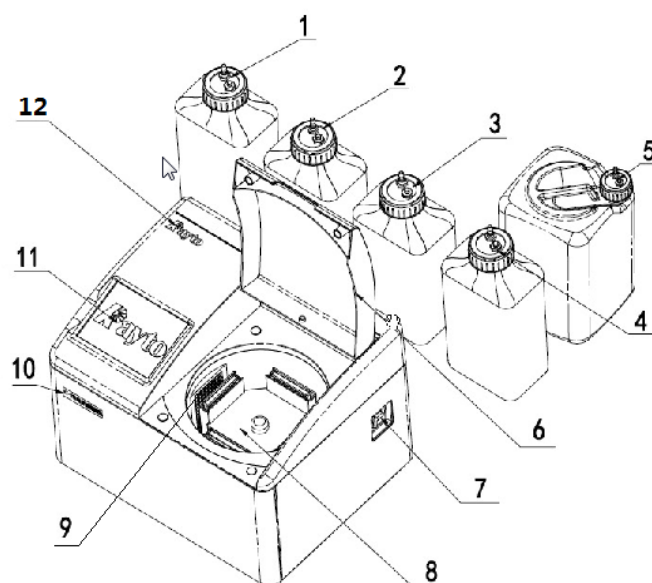


Figure 1-2 Overall Structure of Appearance

1	Deionized Water Bottle	7	Power Switch
2	Cleanser C Bottle	8	Centrifugal Module
3	Cleanser B Bottle	9	Dispensing Head
4	Cleanser A Bottle	10	Model Label
5	Waste Liquid Container	11	Display
6	Flip	12	Logo Label

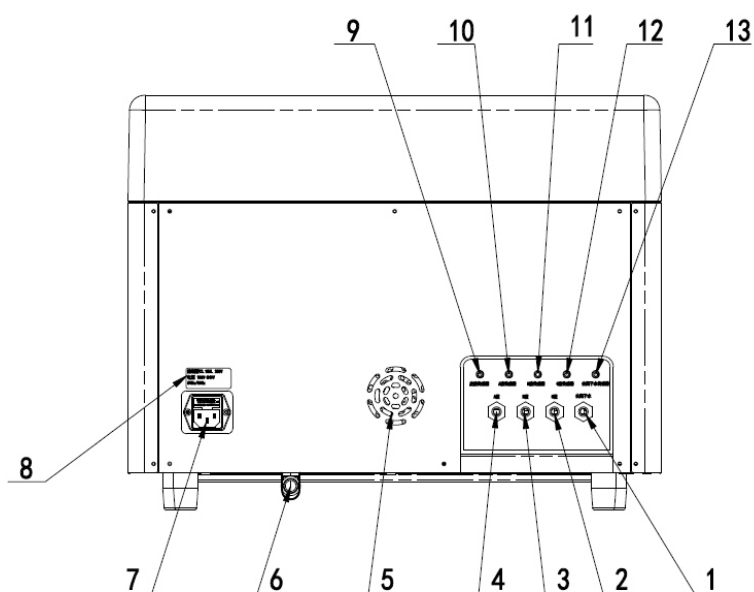


Figure 1-3 Diagrammatic Sketch of Rear Side of Instrument

1	Deionized Water Connector	8	Parameter Label
2	Cleanser C Connector	9	Waste Liquid Sensor

3	Cleanser B Connector	10	Cleanser A Sensor
4	Cleanser A Connector	11	Cleanser B Sensor
5	Air Vent	12	Cleanser C Sensor
6	Waste Liquid Connector	13	Deionized Water Sensor
7	Electrical Socket		

1.6 Working Principle of Instrument

The Microplate Washer mainly realizes the dynamic positioning, liquid dispensing and waste liquid discharge functions. Basic Principle of Liquid Dispensing: The positive pressure of the pump is utilized to press the liquid to the dispensing head; the liquid path of cleanser and the tubes for dispensing are controlled by the solenoid valve; the liquid is evenly dispensed by the dispensing head to the microplate according to the parameters set. With respect to waste liquid discharge, the waste liquid is discharged to the waste liquid container mainly by utilizing the action of gravity after the high-speed rotation of the centrifugal module.

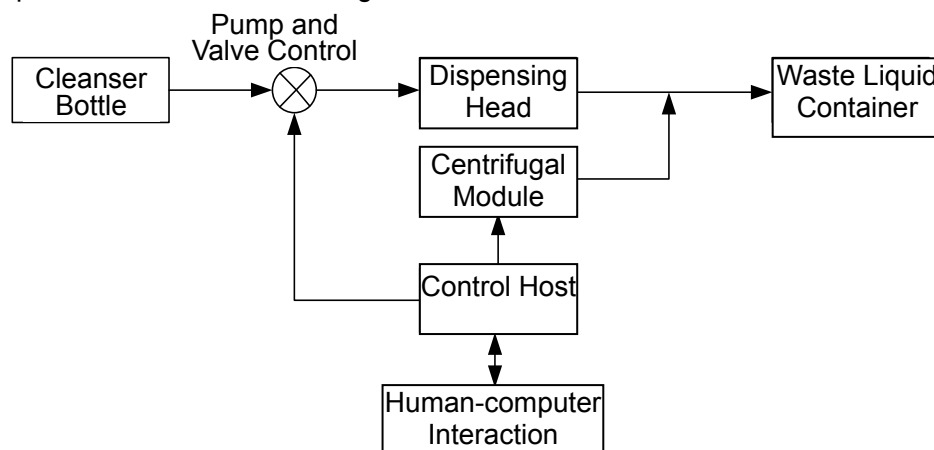


Figure1-4 Diagrammatic Sketch of Working Principle

Chapter 2 Installation

Caution: After installation, try to avoid frequent movement. To move the instrument, it should be handled by adults by hand and transported with a stable cart. The instrument should be moved stably, with the angle of inclination not greater than 15°.

2.1 Environmental Requirements

2.1.1 Work Environment

Firstly, prepare an operational site meeting the following requirements for the Microplate Washer:

- Ambient Temperature: 10°C~35°C;
- Relative Humidity: 40%~80%;
- Atmospheric Pressure: 70.0kPa~106.0kPa;
- Altitude: ≤ 3000m;
- No direct sunshine;
- No large amounts of dust;
- No strong electromagnetic radiation;
- With good ventilation;
- A level, firm desk that is big enough.

2.1.2 Transportation and Storage Environment

In addition, the transportation and storage of the Microplate Washer should meet the following conditions:

- Storage Temperature: 0°C~40°C;
- Storage Humidity: ≤93%;
- Altitude: (-400~5500)m;
- Atmospheric Pressure: 50.0kPa~106.0kPa.

2.2 Safety Classification

- Transient Overvoltage Facility Category (Over Voltage Category): Category II;
- Class of Pollution: Class 2.

2.3 EMC Requirements



Caution:

- Auto Microplate Washer complies with the requirements of emission and immunity requirements described in EN 61326-1:2013 and EN 61326-2-6:2013.
- You are obliged to ensure the electromagnetic compatibility environment for the equipment to make the equipment work normally.

- We suggest that you assess the electromagnetic environment before using the equipment.



Warning:

- Auto Microplate Washer is designed and tested to CISPR 11 Class A. In a domestic environment it may cause radio interference, in which case, you may need to take measures to mitigate the interference.
- Do not use this device in close proximity to sources of strong electromagnetic radiation (e.g. unshielded intentional RF sources), as these can interfere with the proper operation.

2.4 Requirement of Power Supply

- 100V-240V~;
 - 50Hz/60Hz;
 - 200VA.
-

Warning: (1) The AC power supply must be grounded properly.

(2) The AC power supply must be stable. Sharing a power supply with high power electrical appliances is prohibited. It is better to be equipped with a regulated power supply.

(3) In case of smog, peculiar smell or abnormal noise from the instrument, immediately turn off the power and contact the retailer.

(4) To unplug the cable, grasp the plug, rather than the wire.

2.5 Unpacking

Unpack the instrument and remove the materials for transport. Keep the packing case and packing materials properly for future repacking.

- Take out the packing list and check the accessories;
 - Take out the instrument.
-

Caution: If the accessories are inconsistent with those specified in the packing list, contact the dealer.

2.6 Installation of Cleanser Bottle and Waste Liquid Container

Take out the cleanser bottle, waste liquid container, tubes, alarm signal cable, etc. from the packing case.

- **Installation of Cleanser Bottle:** As shown in Figures 1-2 and 1-3, when you face the back of the instrument, put Cleanser A bottle, Cleanser B bottle, Cleanser C bottle and deionized water bottle in turn from left to right.

- **Connection of Cleanser Tube:** As shown in Figure 1-3, when you face the back of the instrument, connect the tubes of Cleanser A bottle, Cleanser B bottle, Cleanser C bottle and deionized water bottle in turn from left to right.

- **Installation of Waste Liquid Container:** As shown in Figures 1-2 and 1-3, put the waste liquid container on the ground, install the lid of the waste liquid container onto the waste liquid container, and arrange the waste liquid tube. There should be no folding, tilting, U shape, etc. that cause poor drainage of the waste liquid tube from the bottom of the instrument to the waste liquid container. After the waste liquid container is installed, pour 500mL deionized water into the centrifugal module and check that the waste liquid can be smoothly discharged to the waste liquid container.

- **Connection of Signal Cables:** As shown in Figure 1-3, when you face the back of the instrument, connect the signal cables of the waste liquid container, Cleanser A bottle, Cleanser B bottle, Cleanser C bottle and deionized water bottle in the order of the bottles from left to right.

Caution: When the waste liquid container is not installed properly, the waste liquid cannot be smoothly discharged, which causes large amounts of liquid to splash at the time of centrifugal dewatering of the instrument, thus the plates cannot be washed effectively and biological risks may be caused.

2.7 Power-on

- Fill the cleanser bottle and deionized water bottle with cleanser and deionized water respectively.
- Take the electric cable out of the accessories bag. Connect one end to the electric socket on the rear side and the other end to a 220V power supply.
- Press the switch on the side panel of the instrument to turn on the instrument.

Chapter 3 Operation of Instrument

The Microplate Washer provides the related parameter menus, such as System, Liquid Path, etc., for the user to conduct setup, which setup is necessary for the normal work of the Microplate Washer.

- Caution:**
1. When use the instrument for the first time, be sure to conduct automatic cleanser bottleswitching and waste liquid level sensor selection on the System Setup interface according to the different needs of users. For details, see 3.2 System Setup.
 2. If the system setup is incorrect, the liquid may overflow, the plates cannot be washed effectively, the dispensing head may be damaged, etc.
 3. When the instrument is turned on, it uses the cleanser to perfuse the tubes; when it is turned off, it cleans the tubes through the power-off maintenance process.

After the instrument is turned on, it conducts parameter initialization and fault check of mechanical components, then uses the cleanser to perfuse the tubes, and enters the main interface of the system automatically, as shown in Figure 3-1. In the "Washing Bin Position and Number of Plates Selection" column, select the washing bin position and the number of plates to be washed through the touch screen. In the "Washing Setup" column, click Mode Setup to enter the Parameter Setup interface and set the parameters and plate washing mode. Click "Cleanser Type" to enter "Cleanser Selection and Bottle Liquid Level Check".

On the bottom left corner of the interface, the current state of the instrument is displayed. If its state is normal, "Ready" is displayed. Click the "Start" button on the bottom right corner to enter the plate washing process.

At the same time, on the main interface, click the "System Setup", "Maintenance" or "Power-off" button to enter the System Setup interface, System Maintenance Selection interface and Power-off Process interface respectively.

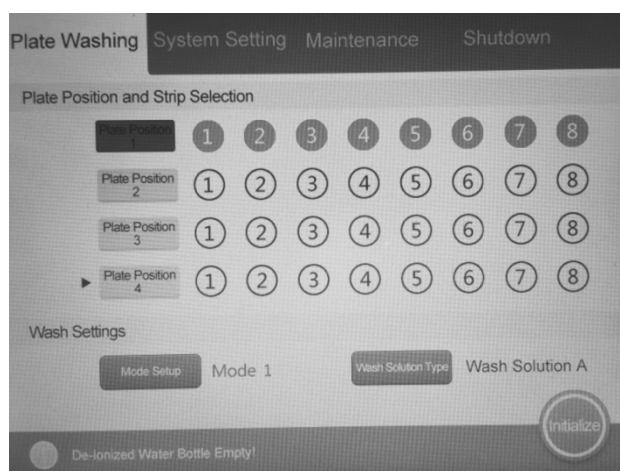


Figure 3-1 Main Interface of System

Plate Washing	To start plate washing; Bin position selection and number of plates selection;
---------------	---

	Plate washing mode selection, cleanser type selection (Cleanser A, Cleanser B or Cleanser C), etc.
System Setup	To display the serial number, software version and language of the instrument; Automatic cleanser bottle switching selection; Waste liquid level sensor selection; Sleep time setup.
Maintenance	Daily Washing; Intensive Washing; Dewatering; Reset; Perfusion; Empty.
Power-off	To execute the power-off maintenance procedure.

3.1 Plate Washing

3.1.1 Mode Setup

Before plate washing, it is necessary to select a mode. In the “Washing Setup” column on the main interface, click “Mode Setup” to enter the Parameter Setup and Mode Selection interface, as shown in Figure 3-2.

1. Default. Check the corresponding mode, then the current mode is selected as the plate washing mode.
2. Washing Time. The unit is second. It is the time of cleanser injection for each time of washing.
3. No. of Times. It is the number of times of continuous washing.
4. Soaking Time. The unit is second. It is the time for which the cleanser is in the pores of the ELISA plate after washing.
5. Dewatering Time. The unit is second. It is the time of high-speed rotation for dewatering of the revolving bin after the washing and rinse of all ELISA plates are finished.

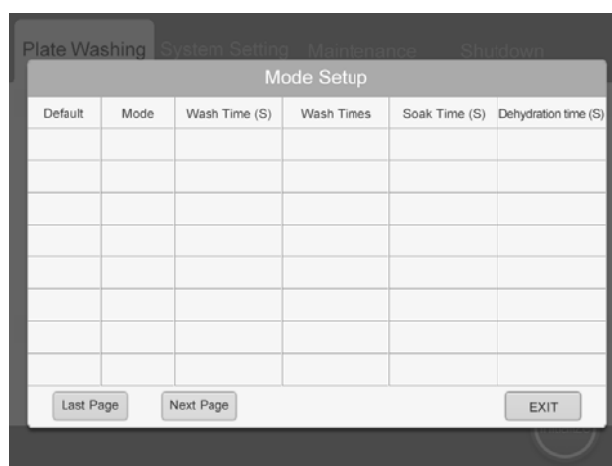


Figure 3-2 Mode Setup Interface

The default parameters of the modes of the instrument are as follows:

Washing Time (s): 2;

No. of Times: 5;

Soaking Time(s): 10;

Dewatering Time (s): 15.

The instrument supports 99 modes. Select a mode according to the needs and set the relating parameters, such as, Washing Time, No. of Times, Soaking Time, and Dewatering Time. After the setup, click the “Exit” button to return to the main interface.

3. 1. 2 Cleanser Type

In the “Washing Setup” column on the main interface, click “Cleanser Type” to enter the “Cleanser Bottle State Check and Setup” interface, as shown in Figure3-3.

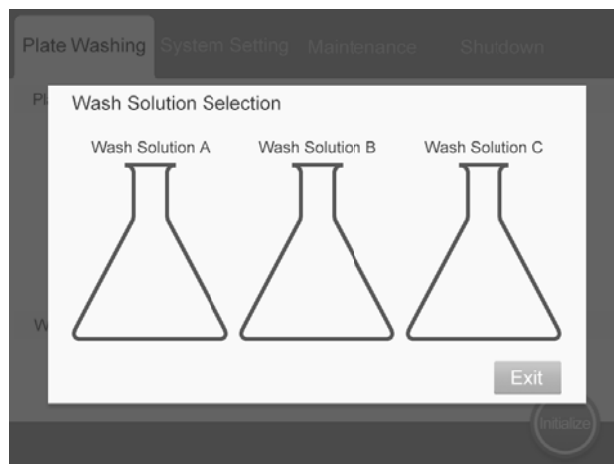


Figure 3-3 Cleanser Type Interface

The liquid level state of Cleanser A, Cleanser B and Cleanser C is displayed, including “With Cleanser” and “No Cleanser”. The selected bottle will be highlighted. Select a bottle with cleanser as the current cleanser bottle. Click the “Exit” button to return to the main interface.

3. 1. 3 Washing Bin Position and Number of Plates Selection

Before plate washing, it is necessary to select a bin position and the number of plates. As shown in Figure 3-1, click Bin Position1, Bin Position2, Bin Position3, and Bin Position4. You may select “Whole Plate Washing” or “Cancel Whole Plate Washing”. Independently click Circles 1 to 8 after each bin position to select or cancel the washing of the corresponding plate(s).

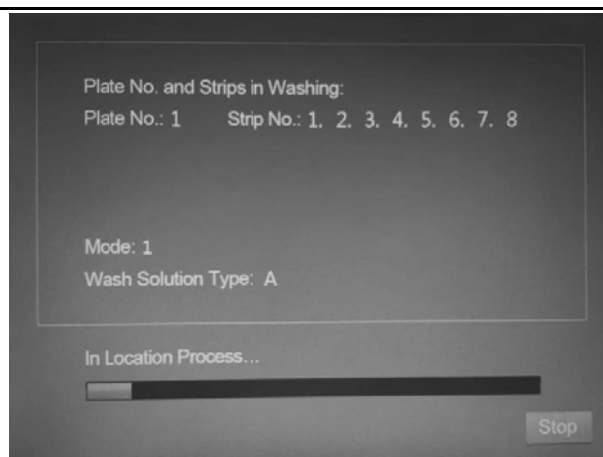
With respect to the bin position and number of plates to be washed, according to the selected circles, if a circle is selected, the corresponding plate will be washed; otherwise, it will not be washed.

3. 1. 4 Plate Washing Operation

After determining the selection mode, cleanser type, washing bin position and number of plates, click the “Start” button on the bottom right corner of the main interface to enter the plate washing process, as shown in Figure 3-4. Under “Bin position and number of plates being washed”, the bin position where the current washing is conducted is displayed; the number after “Number of Plates” indicates the position of the plate being washed. “Mode” and “Cleanser Type” display the procedure code and cleanser type.

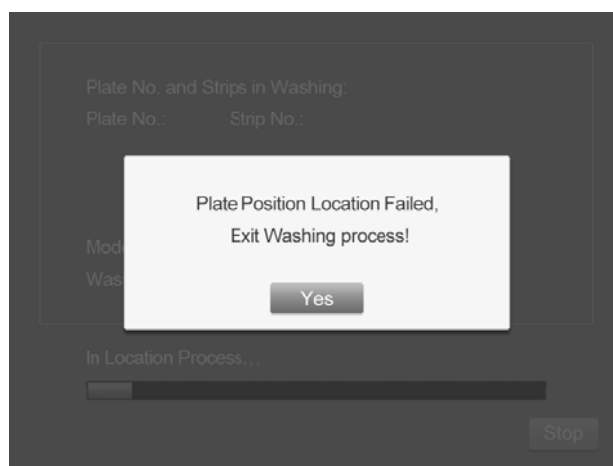
Caution: 1. In order to guarantee the balance of the instrument during high-speed centrifugal dewatering, for symmetrical bin positions, when there is an ELISA plate on one bin position, the other must have an ELISA plate, too. In this case, it is necessary to add a counterweight plate to the bin

- position without an ELISA plate.*
2. *When putting an ELISA plate before the test and taking out the ELISA plate at the end of the test, the operator shall wear protective equipment, such as gloves, a mask, etc., to prevent potential biosafety risks.*
 3. *During dewatering, the centrifugal assy is rotating at high speed, so never open or touch the flip to prevent injuries of hands.*
 4. *When plate washing, do not open the flip until the rotating support stops turning completely.*



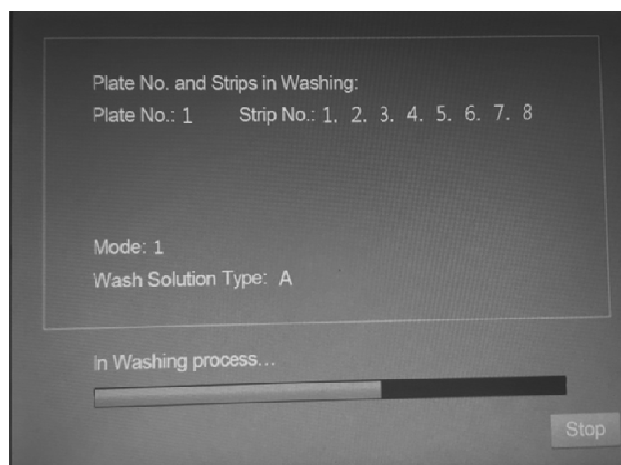
3-4 Plate Washing Process Interface 1

During washing, firstly, conduct bin position selection and positioning, as shown in Figure 3-4. The interface prompts that positioning is in progress. At the same time, the placement bin moves to the specified position; after it moves in place, the current bin position will be locked. If the instrument fails during positioning, it will give the positioning failure prompt, as shown in Figure 3-5. End the current plate washing process and troubleshoot the instrument.



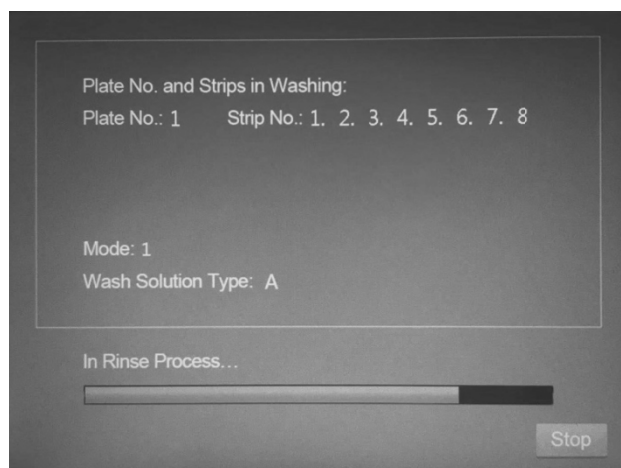
3-5 Positioning Failure Interface

According to the “No. of Times” and “Washing Time” set, dispense liquid to the ELISA plates according to the number of plates to be washed; according to the “Soaking Time” set, soak the ELISA plates with the liquid. In the process, the washing state will be displayed, as shown in Figure 3-6.



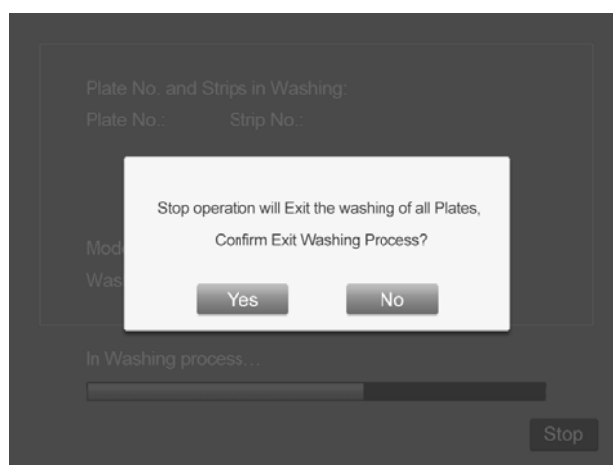
3-6Plate Washing Process Interface 2

After washed, the plates will be rinsed. The state displayed is as shown in Figure 3-7.



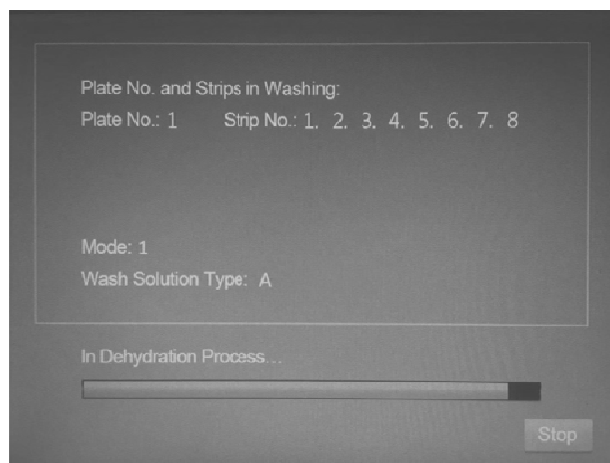
3-7Plate Washing Process Interface 3

During plate washing, click the “Stop” button on the bottom right corner, the instrument will pause and a dialogue will be popped up to prompt whether to stop plate washing. Click “OK” to stop this plate washing and return to the main interface; click “Cancel” to continue the remaining plate washing task. The prompt is as shown in Figure 3-8.



3-8Plate Washing Suspension Interface

After all plates in the bin are washed, the bin position will start high-speed rotation for centrifugal dewatering. The state displayed is as shown in Figure 3-9.



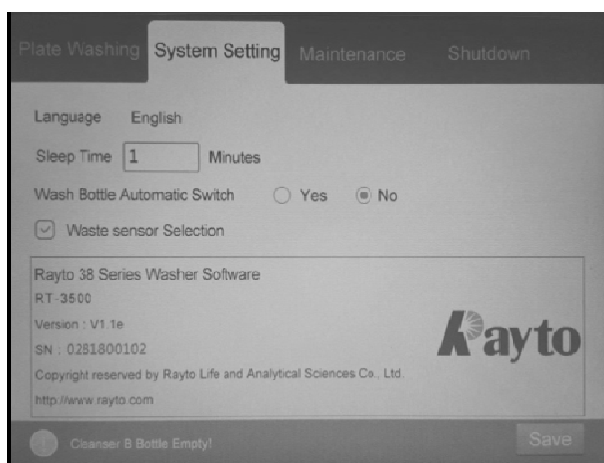
3-9 Plate Washing Process Interface 4

During dewatering, click the “Stop” button on the bottom right corner of the screen or open the dust cover, then a dialogue box will be popped up to prompt whether to stop plate washing. Click “OK” to stop this plate washing and return to the main interface; click “Cancel” to continue the dewatering task.

Caution: If, during washing, the “Stop” button is clicked, the dust cover is opened, the cleanser bottle is empty or the waste liquid container is full, the instrument will pause, pop up a prompt box, and wait for the user to handle the situation.

3.2 System Setup

Click the “System Setup” button on the main interface to pop up the System Setup interface, as shown in Figure 3-10.



3-10 System Setup Interface

Sleep Time. The unit is minute. After the instrument has been idle for the sleep time set, the system will enter Sleep mode automatically.

Automatic Cleanser Bottle Switching. You can select Yes or No. If you select Yes. During the plate washing, when the cleanser in the bottle is used up, the instrument will switch to the next bottle with sufficient cleanser automatically; if you select No, the instrument will pop up a dialogue box to wait for the user to add cleanser.

Waste Liquid Level Sensor Selection. It can be checked or unchecked. If it is checked, during use, the instrument chooses time to check whether the waste liquid container is full; if it is unchecked, the instrument will not inspect the condition of waste liquid during use.

***Caution:** The instrument has a waste liquid container. Be sure to check “Waste Liquid Level Sensor Selection”, otherwise the waste liquid may overflow.*

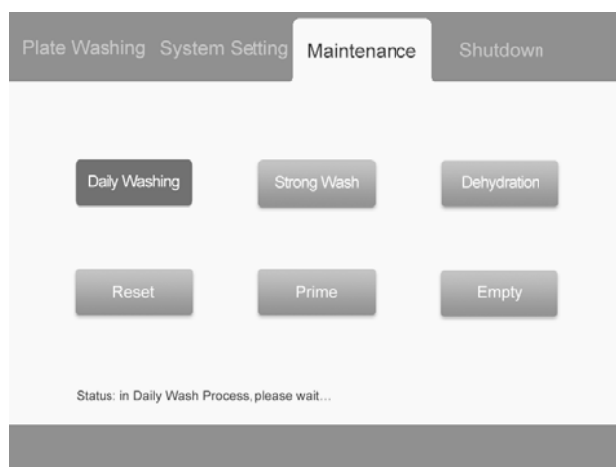
The information box displays the software version information, the information on the instrument, copyright information, etc.

Set the parameters and click the “Save” button on the bottom to save the current settings.

3.3 Maintenance

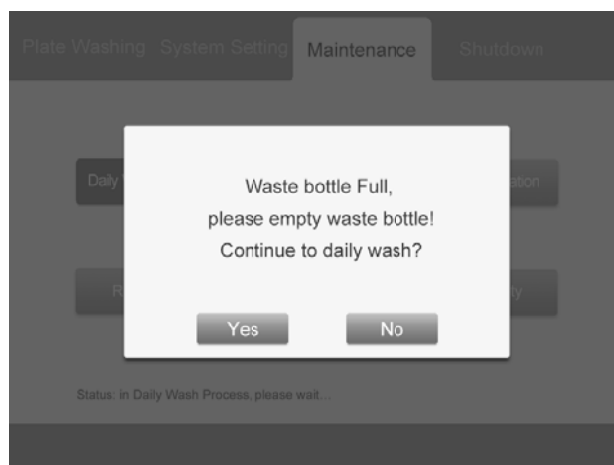
3.3.1 Daily Washing

Clean the tubes with deionized water to reduce contamination and reduce the risk of needle blockage of the dispensing head. As shown in Figure 3-11, on the Maintenance interface, click Daily Washing to enter the washing process.



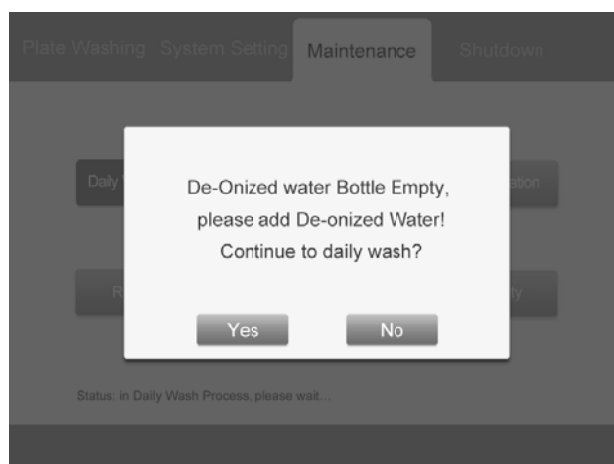
3-11 Daily Washing Interface

If, during washing, the waste liquid container is full, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-12. Click “Continue” to restart the washing maintenance; click “Cancel” to exit the daily washing process and return to the main interface of Maintenance.



3-12 Alarm of Full Waste Liquid Container in Daily Washing

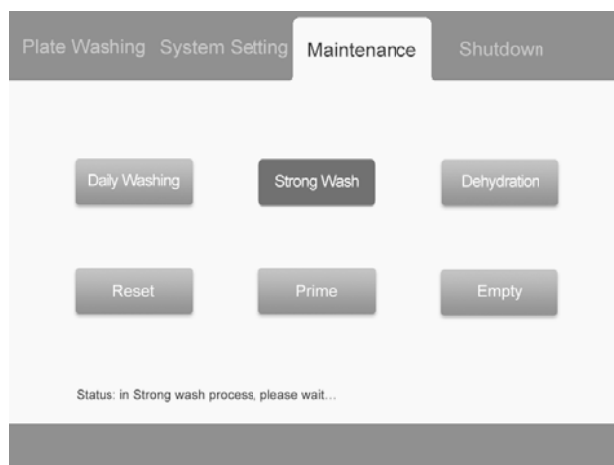
If, during washing, the deionized water bottle is empty, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-13. Click “Continue” to restart the washing maintenance; click “Cancel” to exit the daily washing process and return to the main interface of Maintenance.



3-13 Alarm of Empty Deionized Water Bottle in Daily Washing

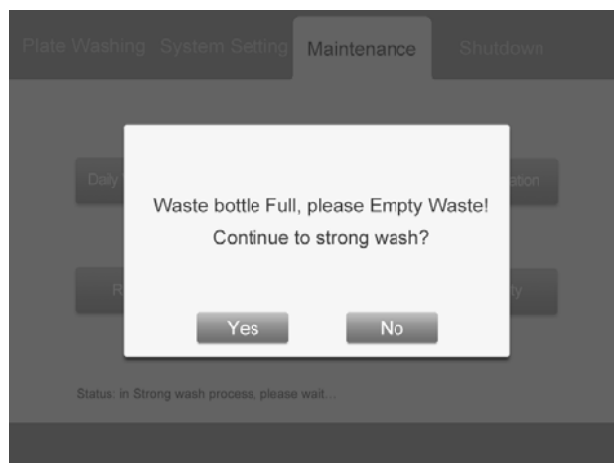
3. 3. 2 Intensive Washing

Clean the tubes line by line with the pressurized solution from the current cleanser bottle to reduce contamination and reduce the risk of needle blockage of the dispensing head. As shown in Figure 3-14, on the Maintenance interface, click Intensive Washing to enter the washing process.



3-14 Intensive Washing Interface

If, during washing, the waste liquid container is full, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-15. Click “Continue” to restart the washing maintenance; click “Cancel” to exit the intensive washing process and return to the main interface of Maintenance.



3-15 Alarm of Full Waste Liquid Container in Intensive Washing

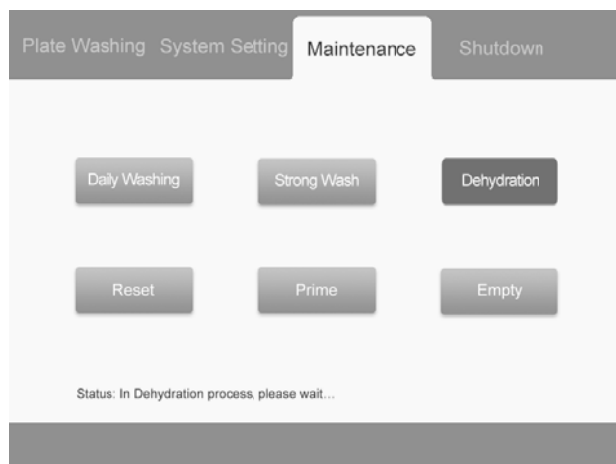
If, during washing, the cleanser bottle is empty, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-16. Click “Continue” to restart the washing maintenance; click “Cancel” to exit the intensive washing process and return to the main interface of Maintenance.



3-16 Alarm of Empty Cleanser Bottle in Intensive Washing

3.3.3 Dewatering

The instrument can directly conduct high-speed centrifugal dewatering, as shown in Figure 3-17.



3-17 Dewatering Interface

Click “Dewatering” on the Maintenance interface to pop up the setup box, as shown in Figure 3-18. Set the Dewatering Time and click “Start” to conduct dewatering; click “Cancel” to stop dewatering.



3-18 Dewatering Setup

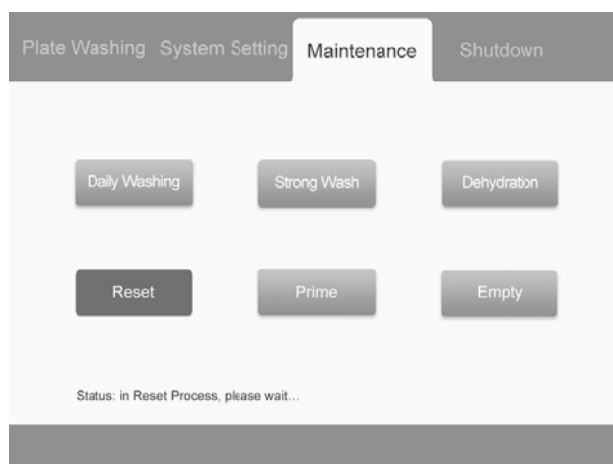
If, during dewatering, the waste liquid container is full, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-19. Click “Continue” to restart the dewatering; click “Cancel” to exit the dewatering process and return to the main interface of Maintenance.



3-19 Alarm of Full Waste Liquid Container in Dewatering

3.3.4 Reset

The instrument can directly detect the condition of mechanical reset. Click the “Maintenance” button to pop up the Maintenance interface, as shown in Figure 3-20.



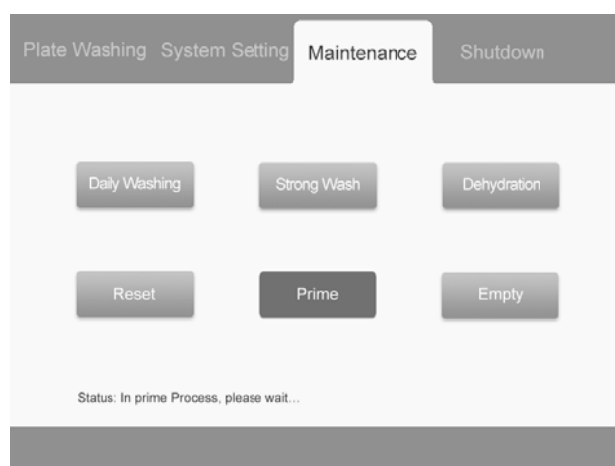
3-20Reset Detection Interface of Instrument

Click the “Reset” button and the instrument will automatically detect the running conditions of the revolving bin and lock cylinder. The revolving bin turns to Bin Position 1, Bin Position 2, Bin Position 3 and Bin Position 4 in turn. Each time it is in place, the lock cylinder will check whether the bin is locked or loose. In case of abnormality, an error prompt will be given on the bottom left corner.

In case of failure of mechanical testing when the instrument is being started, after troubleshooting, fault detection can be conducted here.

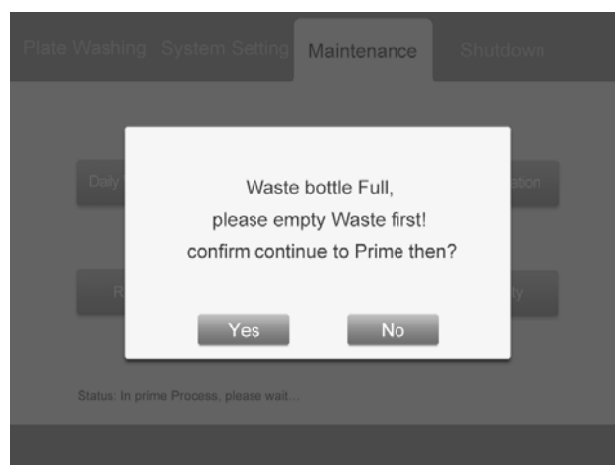
3.3.5 Perfusion

Perfuse the tubes with the current cleanser bottle to reduce air and enhance the effect of dispensing. As shown in Figure 3-21, on the Maintenance interface, click “Perfusion” to enter the perfusion process.



3-21Perfusion Interface

If, during perfusion, the waste liquid container is full, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-22. Click “Continue” to restart the perfusion; click “Cancel” to exit the perfusion process and return to the main interface of Maintenance.



3-22Alarm of Full Waste Liquid Container in Perfusion

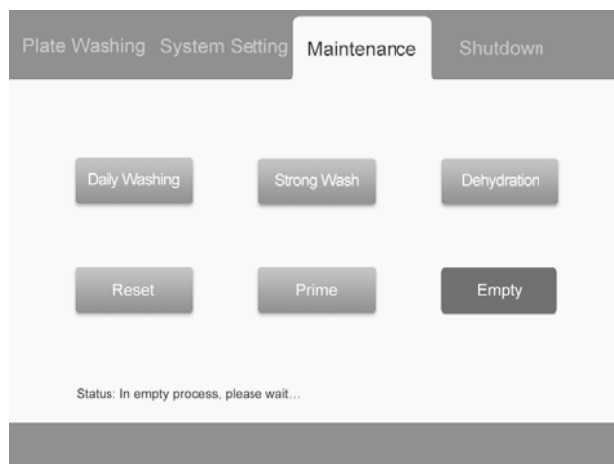
If, during perfusion, the cleanser bottle is empty, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-23. Click “Continue” to restart the perfusion; click “Cancel” to exit the perfusion process and return to the main interface of Maintenance.



3-23 Alarm of Empty Cleanser Bottle in Perfusion

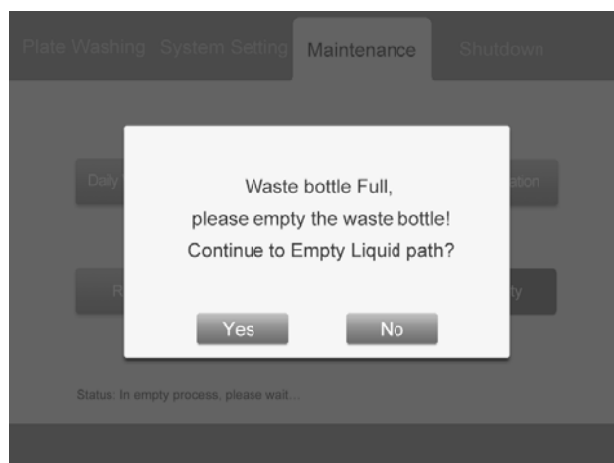
3.3.6 Empty

It is used to empty liquid accumulated in tubes. As shown in Figure 3-24, on the Maintenance interface, click “Empty” to enter the emptying process.



3-24 Emptying Interface

If, during emptying, the waste liquid container is full, the instrument will suspend motion and pop up a prompt box, as shown in Figure 3-25. Click “Continue” to restart the emptying; click “Cancel” to exit the emptying process and return to the main interface of Maintenance.



3-25 Alarm of Full Waste Liquid Container in Emptying

Caution: In emptying, the liquid in the deionized water bottle, Cleanser A bottle, Cleanser B bottle and Cleanser C bottle is all be drawn out to the waste liquid container. To recycle the cleanser, pour the cleanser from the cleanser bottle before emptying.

3.4 Power-off and Sleep

3.4.1 Power-off

After the plate washing operation is finished, the power-off maintenance should be conducted, which is favorable for keeping the needles and bin clean. Click the “Power-off” button on the main

interface to enter the Power-off Maintenance Selection interface, as shown in Figure 3-26. Click “OK” to enter the maintenance process; click “Cancel” to continue to operate the instrument.



Figure 3-26 Power-off Selection Interface

The instrument enters the power-off maintenance process. The revolving bin moves slowly. The deionized water inlet valve and 8 tubes are opened to clean the revolving bin. When this is finished, high-speed rotation for dewatering will be conducted to empty the revolving bin. The real-time process of maintenance is as shown in Figure 3-27.

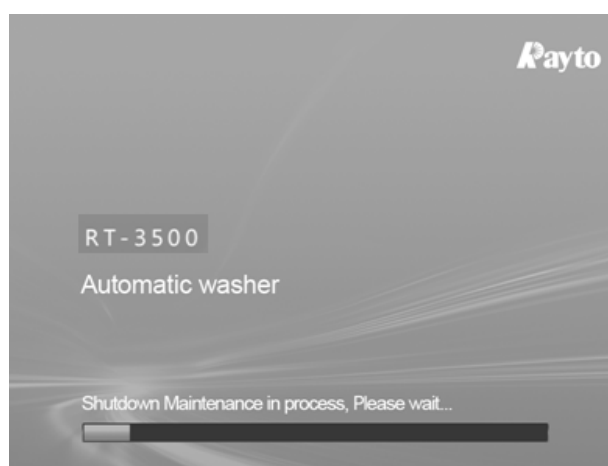


Figure 3-27 Power-off Process Interface

When the power-off maintenance process ends, the interface will display “Please turn off the power supply”, as shown in Figure 3-28.

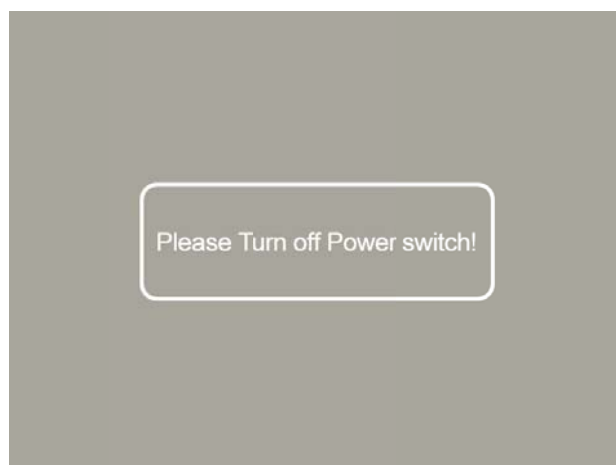
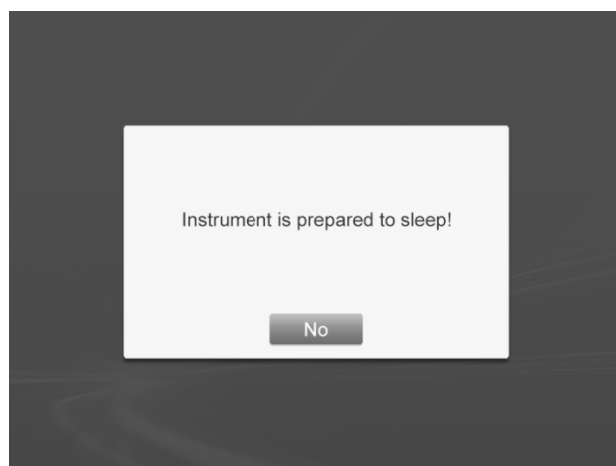


Figure 3-28 Turn off Power Interface

Caution: The power-off maintenance process conducted before the power supply is turned off is favorable for keeping the instrument clean and reducing the risk of hole blockage of the dispensing head.

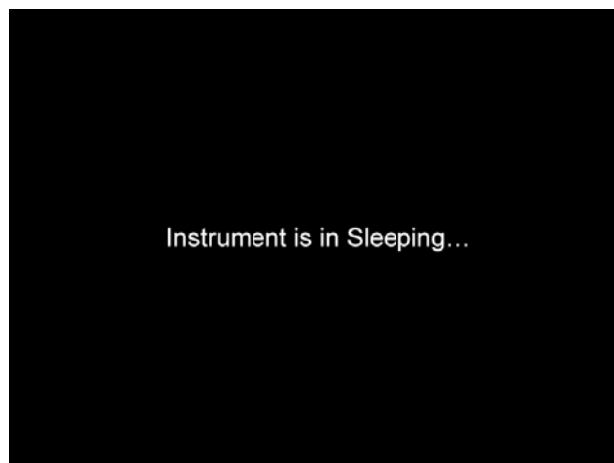
3. 4. 2 Sleep

If the instrument has not been operated or has not washed plates for the sleep time set, it will clean the tubes to avoid crystallization and enter Sleep mode. As shown in Figure 3-29, click "Cancel" to stop sleep and return to the original operation interface.



3-29Entering Sleep Interface

After the washing is finished, the instrument will enter Sleep mode, as shown in Figure 3-30. Click "The instrument is in Sleep mode..." to exit sleep.



3-30Sleep Interface

3.5 Software Security

Rayto 38 Series Microplate Washer software is used in the laboratory environment by inspectors trained by Rayto or its agents, including doctors or laboratory personnel, etc. According to the safety characteristic analysis involved in the *Risk Management Report* for Microplate Washer, RT-3500 Microplate Washer mainly washes ELISA plates and the users or operators shall be examination professionals, doctors or laboratory technicians trained by Rayto or its agents only. RT-3500 Microplate Washer is not used for life support or in direct contact with patients, etc. The software plays an auxiliary role only, does not output clinical test data, and replaces the traditional manual plate washing operation only. During the test, the software has the relating function of alarming you about possible accidental failure and foreseeable human misoperation. The facts that the cleanser bottle is empty, the waste liquid container is full, etc. are judged by the hardware sensor to ensure the whole test process is conducted under controllable conditions. In addition, the ELISA analyzer detects enzyme markers after plate washing. Through the confirmation of control material on ELISA plates, the effect of plate washing can be judged to monitor the running state and effectiveness of the Microplate Washer. Therefore, RT-3500 can guarantee the effectiveness of software output and ensure that the output will not cause clinical diagnosis errors even when the instrument is abnormal by monitoring the operators, use environment and operation process. Therefore, RT-3500 Microplate Washer will in no way create hazards to safety.

Chapter 4 Preservation and Maintenance

4.1 Daily Maintenance of Workstation

There is often liquid residue on the workstation. Excessive liquid may overflow the edge of the workstation and leak to the inside of the instrument, so it is necessary to often remove the residual liquid on the workstation. The specific method is to clamp a small piece of absorbent cotton with tweezers to wipe the workstation. Be careful! Don't let the tweezers head scratch the surface of the workstation.

Caution: Do not clean the surface of the workstation or instrument with any organic solvent, grease or corrosive liquid.

4.2 Daily Maintenance of Dispensing Head

The dispensing head for the instrument can be supplied by Rayto only.

There are strainers in the 3 cleanser bottles and one deionized water bottle for the instrument, which can prevent suspended particulate matters from entering the tubes. The suspended particulate matters in the cleansers may block the strainers, so please regularly check whether the strainers are blocked and timely clean the strainers. The dispensing tubes may be blocked due to the crystallization of cleanser. In order to prevent crystallization, when the work is finished, always remember to perform cleaning.

When the amount dispensed of one column is found to be obviously lower than that of other columns, it indicates that blockage occurs on the corresponding dispensing head. When the instrument is in the Standby mode, insert a fine needle into the problematic needle and dredge it more than ten times, and then enter the Maintenance interface for intensive washing. If the dispensing head is severely blocked, the above process should be conducted several times.

4.3 Disinfection of Centrifugal Module

In order to prevent potential biological risks, it is necessary to conduct spray disinfection of the centrifugal module, dispensing head and waste liquid bin with 70% alcohol (or disinfectant with a better effect) and wipe and disinfect the surface of the workstation and flip with 70% alcohol (or disinfectant with a better effect) after the tests are finished every day.

4.4 Fuse Change

The specification of the fuse is T3.15AL250V. The steps for changing the fuse are as follows:

- Open the safety cover on the rear side of the instrument with a screwdriver.
- Install the fuse in the safety cover and close the safety cover.

4.5 Treatment of Lock Nut

The lock nut on the centrifuge module should be tightened clockwise with the nut locking

piece, a special tool for microplate washers. Before using the instrument, check that the nut is locked. Otherwise, if the nut is loosened during high-speed operation, the instrument may be damaged severely. The structures of the lock nut and nut locking piece are as shown in Figure 4-1. After the nut is locked, remove the nut locking piece and store it properly.



4-1 Lock Nut

4.6 Treatment of Waste Liquid Container

The sensor in the waste liquid container can sense the level of liquid surface. When the waste liquid reaches a certain level, the software of the Microplate Washer will refuse any operation containing washing and drainage. Here, please timely dispose the waste liquid:

- Hold the waste liquid container with one hand.
- Hold the lid of the waste liquid container with the other hand and turn the lid counterclockwise till the lid is separated from the container.
- Place the lid properly. Please note that there may be small amounts of waste liquid in the waste liquid tube. Do not allow the waste liquid to flow out.
- Pour the waste liquid out and put the container in the original position.
- Hold the lid of the waste liquid container with one hand and put it on the container mouth.
- Hold the waste liquid container with the other hand and turn the lid clockwise till it is tightened.

Caution: 1. The Microplate Washer is a precision instrument. Please pay attention to daily preservation of it.

2. The dispensing head for the instrument is a precision component. During sample adding of ELISA plates, never add whole blood or foreign matters to avoid blocking the dispensing head.

3. The waste liquid generated in plate washing by the instrument must be disposed as a biological hazardous substance.

Chapter 5 System Errors and Countermeasures

When a system error is found, the software of the Microplate Washer will stop the actions of all mechanical components and give an alarm to the user. The error messages will be displayed on the LCD.

The most common error messages include "The cleanser bottle is empty", "The deionized water bottle is empty", and "The waste liquid container is full". The specific handling methods are:

1. "The deionized water bottle is empty": Fill the bottle with deionized water and install the bottle correctly.
 2. "The cleanser bottle is empty": Switch the cleanser bottle or fill the current empty bottle with cleanser.
 3. "The waste liquid container is full": One possible cause is the full waste liquid container. Just unscrew the lid of the waste liquid container, pour the waste liquid out, and tighten the lid. Another possible cause is the fact that the cable plug of the liquid level sensor of the waste liquid container has not been connected to the sensor connector on the rear side of the instrument.
 4. Mechanical Reset Failure: The stepper motor of the lock cylinder fails.
 5. Centrifugal Assy Reset Failure: The revolving bin fails.
- For other errors, please contact the technical support staff of the agent.

Caution: 1.If you encounter an error that cannot be solved or an error repeats during the use, please contact the retailer. For replacement of accessories, please contact the manufacturer or agent for supply of them.

2. The configuration of the instrument may be changed slightly depending on the version. Such changes have been made without impacting the performance or use of the instrument. Please rest assured when using the instrument.

Appendix: Names and Contents of Toxic/Hazardous Substances or Elements in Product

1. Names and Contents of Toxic/Hazardous Substances or Elements

Component	Toxic/Hazardous Substances or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Built-in circuit board	×	○	○	○	○	○
Shell	×	○	○	○	○	○
Display	×	○	○	○	○	○
Photoelectric components	×	○	○	○	○	○
Internal electronic wire	○	○	○	○	○	○
Accessories	×	○	○	○	○	○
○: Indicates the content of the toxic/hazardous substance in all homogeneous materials of the component is below the limit specified in the SJ/T11363 standard. ×: Indicates the content of the toxic/hazardous substance in at least one homogeneous material of the component exceeds the limit specified in the SJ/T11363 standard.						

2. Description of Mark

Environmental protection use period mark



Meaning of the mark: The electronic information product contains certain toxic/hazardous substances, with the environmental protection use period of 20 years. You can use it within this period. When this period expires, the product should enter the recycling system.