



Microplate Washer

LMRW-B101

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1. Safety Measures

1.1 Warning

The equipment should only be operated by trained and qualified medical inspection professionals, trained medical personnel, or experimentalists. All users must receive proper training before using or performing maintenance on the equipment.

Improper use of electrical equipment can lead to serious risks, including electrical shocks, burns, fires, and other hazards.

Always adhere to basic safety precautions, including the following guidelines:

1.2 Guidelines

- 1) Ensure that the voltage configuration matches the supply voltage.
- 2) When connecting to the power grid, make sure to plug the instrument into a power socket with a ground connection.
- 3) Always unplug the instrument immediately after use.
- 4) Do not place the instrument in or near liquids and avoid situations where it could fall into liquid. If the instrument becomes wet, unplug it before handling.
- 5) Never leave the instrument unattended when it is plugged into the power supply.
- 6) Use the instrument only for the purposes outlined in the instruction manual.
- 7) Do not use accessories that are not provided or recommended by the manufacturer.
- 8) Do not use the instrument if it is malfunctioning or damaged.
- 9) Avoid exposing the instrument or its cord to surfaces that are too hot to touch.

2. Introduction

Microplate Washer LMRW-B101 has liquid volume range of 10-9999 μL , adjustable with 1 μL as step. It supports adjustable washing parameters for various assay requirements. Equipped with an automatic liquid detection system for safe operation. Integrated 8 or 12 channel manifold ensures efficient and uniform washing. Our Microplate Washer is ideal for ELISA assays and other microplate-based procedures.

3. Features

- 4.3" touch screen
- Adjustable plate and strip wash
- Low residual volume
- Complete bottom washing
- Shaking and dipping function
- Can be paused during washing
- Adjustable wash pressure
- Pipe washing function
- Blockage prevention system
- Flat, V, U-bottom compatibility
- Large memory to store

4. Specifications

Model	LMRW-B101
Residual Liquid	< 1 µL
Plate Types	Flat, Round and V-bottom strips and plates
Plate Mode	96 / 48 well plate or strip
Washing Volume	50 – 3000 µL for 8-way manifold; 50 – 20000 µL for 12-way manifold
Bottle Capacity	2 Litres each
Washing Cycle	Maximum 99 cycles
Strip Washing	1 to 12 strips programmable
Washing Channels	3 (Maximum)
Soaking Time	0 – 24 hours
Display	LCD
Storage	50 washing protocol
Interface	RS - 232
Power Supply	AC 220 V ± 10 %, 50 - 60 Hz
Dimension	390 x 340 x 180 mm
Weight	8 Kg

5. Applications

Microplate Washer LMRW-B101 is ideal for ELISA, cell culture, and immunoassay washing processes. It supports various microplate formats, ensuring efficient and consistent washing for laboratory diagnostics and research.

6. Instrument Introduction

The Microplate washer is composed of three units:

- 1) **Wash unit:** It is composed of a micropump, solenoid valve, liquid bottle, waste liquid bottle, buffer bottle, distillation bottle, and cleaning head.
- 2) **Control unit:** It is composed of a single-chip microcomputer, liquid crystal display, touch screen, and driving circuit.
- 3) **Kinematic unit:** It is composed of two parts: horizontal motion mechanism and vertical motion mechanism.

6.1 Schematic Diagram

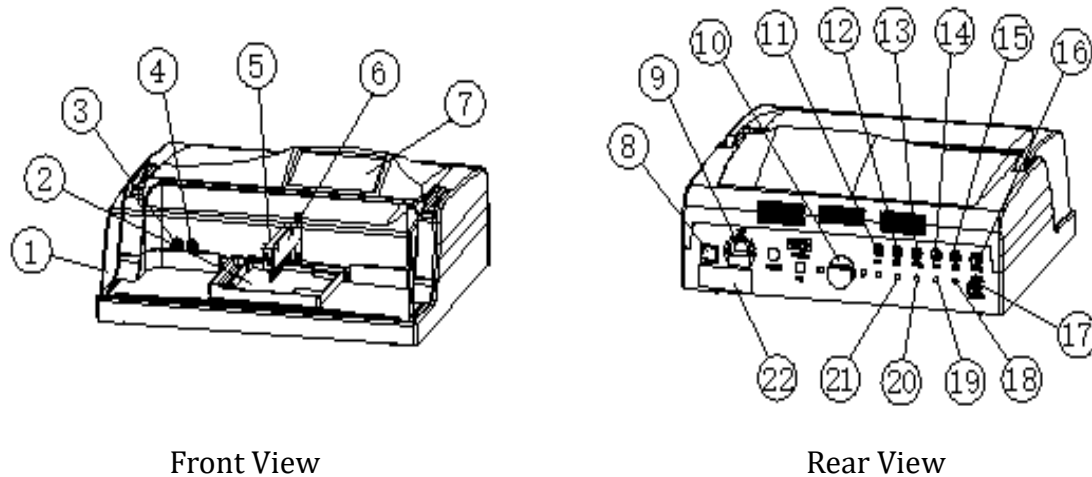


Figure-1 Appearance Diagram

- | | |
|-------------------------|-------------------|
| 1) Lid | 10) Pinch Valve |
| 2) Plate rack | 11) P.Pressure |
| 3) Liquid outlet (Wash) | 12) N.Pressure |
| 4) Liquid inlet (Waste) | 13) Rinse inlet |
| 5) Wash manifold | 14) Liquid Outlet |
| 6) Manifold Bracket | 15) Liquid Inlet |
| 7) Screen | 16) Safety Valve |
| 8) Power Switch | 17) Liquid Sensor |
| 9) Power Socket | 18) Nameplate |

Microplate Washer LMRW-B101

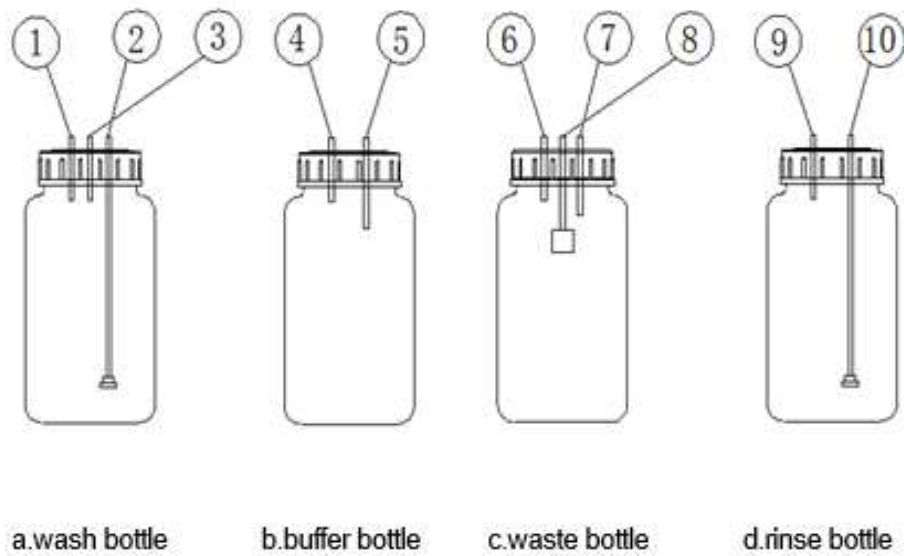


Figure-2 Scheme of Using Bottle

- 1) P.P. (red)
- 2) L.I. (white)
- 3) Air outlet (brown)
- 4) N.P. (black)
- 5) Air inlet (grey)
- 6) Air outlet (grey)
- 7) L.O. (green-yellow)
- 8) Liquid sensor
- 9) Air inlet (brown)

7. Installation

7.1 Unpacking

- Open the outer packing box and take out the accessories and instrument. Place the instrument on a stable horizontal workbench along with all accessories. Check whether all accessories are complete and damaged or not according to the Packing List in the file bag.
- Prepare the main accessories such as power cord, bottles, silicone hoses, and manifolds to connect the pipe.

7.2 Pipe Connection

- Single channel connection
- Connect the pipe with 9 silicone hoses. Each interface of the instrument, bottle cap, and ends of silicone hoses are color-coded. Connect the instrument and bottle with silicone hoses according to the color code and **Figure 3** below.

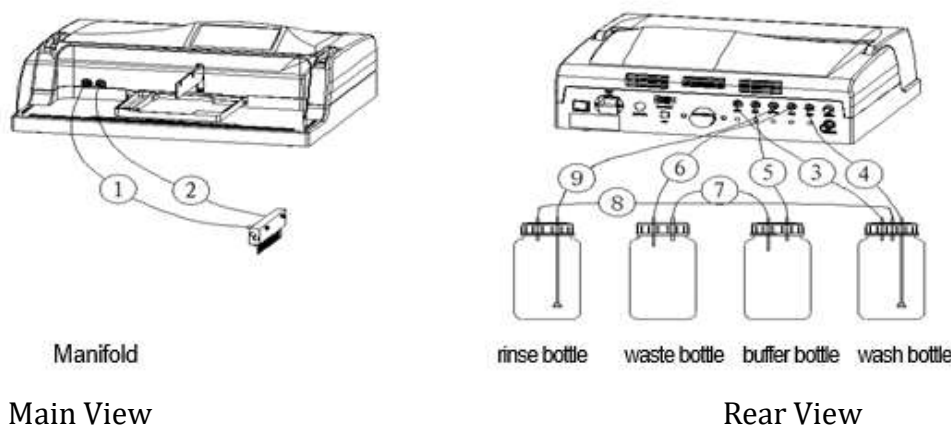


Figure-3 Scheme of Connecting of the Outer Pipe1

Liquid outlet(green)	Manifold(green)
Liquid inlet(yellow)	Manifold(yellow)
Instrument back-P.pressure (red)	Wash bottle-P.P. (red)
Instrument back-Liquid inlet(white)	Wash bottle-L.I. (white)
Instrument back-N. pressure(black)	Buffer bottle-N.P. (black)
Instrument back-Liquid outlet (green, yellow)	Waste bottle-L.O. (green yellow)
Buffer bottle-Air inlet(grey)	Waste bottle-Air outlet(grey)
Rinse bottle-Air inlet(brown)	Wash bottle-Air outlet(brown)
Instrument back-Rinse inlet	Rinse bottle-R.I. (orange)

After connecting all the pipes, put the manifold on the bracket.

7.3 Boot

After connecting all the pipes, Power on after connecting the power cord. The instrument will start self-checking.

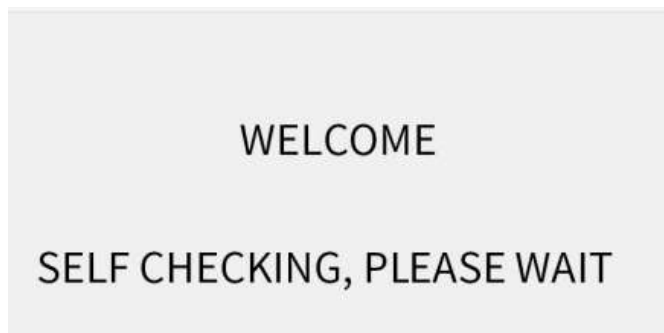


Figure-4 Boot Interface
LCD screen displays the main interface in a few seconds.



Figure-5 Main Interface

These two interfaces indicate that the instrument can be used normally.

Note: During the self-checking, the mechanical parts of the instrument begin to move. Do not touch any moving parts during the process.

8. Software Operations

8.1 Parameter Settings

Figure-6 Parameter Settings Interface

Adjust each parameter according to the experimental requirements.

“Channel select” is only available for multi-channel models, not for single-channel models.

Note1: When you select **“SOAK”** in the combo box of **“SOAK/SHAKE”**, **“TIME”** means soak time. **“SHAKE”** is the same as **“SOAK”**.

Note 2: After selecting the number of strips to be washed, only a few numbers can be displayed, the rest are displayed as “...”

- 1) **“LAST PRO” KEY**
Return to the last program interface.
- 2) **“NEXT PRO” KEY**
Displays the next program interface, up to 120 programs can be stored.
- 3) **“SAVE” KEY**
After editing each program, click” SAVE” first, and then go to the next program.
- 4) **“BACK” KEY**
Exit to the main interface.

8.2 System Settings

Figure-7 System Setting Interface

Modify the operation mode of the instrument on this page. When **"STAND-ALONE OPER"** is selected, the instrument can operate independently. When **"ON-LINE OPER"** is selected, the instrument does not respond to any touch operation itself and can only be operated through the connected computer.

1) **"SAVE" KEY**

After operation mode is selected, click "SAVE".

2) **"BAKE" KEY**

Exit to the main interface

8.3 Wash

WASH		SHAKE	
PRO NO.:	WASH STRIPS:	TIME:	MIN
WELL TYPE:	WASH TIMES:	TIME:	S
SIP MODE:	LIQUID VOL.:	uL	BOTTOMWASH:
SIPTIME:	S SOAK/SHAKE:	RINSE TIME:	S
WASH MODE:	SHAKE SPEED:	CHANNEL SELECT:	
LAST PRO	NEXT PRO	START	PAUSE/RECOVE
			END/BACK

Figure-8 Wash Interface

This interface shows the parameters of a certain wash program you set.

1) **"LAST PRO" KEY**

Return to the last program interface.

2) **"NEXT PRO" KEY**

Displays the next program interface.

3) **"START" KEY**

After selecting the wash program, click "START" to execute the program. During washing, the mark "●" will flash alternately on the interface.

4) **"PAUSE/RECOVE" KEY**

When you need to pause or remove the wash program during washing, click "PAUSE/RECOVE", and the mark "●" will stop flashing.

5) **"END/BACK" KEY**

Finish washing and exit to the main interface.

8.4 Shake

A screenshot of the 'SHAKE' interface. At the top, there are two tabs: 'WASH' and 'SHAKE', with 'SHAKE' being the active tab. Below the tabs, there are two input fields: 'SHAKE SPEED:' followed by a text box, and 'SHAKE TIME:' followed by a text box, the word 'MIN', another text box, and the letter 'S'. At the bottom, there are two blue buttons: 'SHAKE' and 'END/BACK'.

Figure-9 Shake Interface

Edit the shake speed and time, then click "Shake" 'to Start.
SHAKE TIME: 0-1440 min 0-59 s can be edited.

- 1) **"SHAKE" KEY**
Start shake by clicking "START".
- 2) **"END/BACK" KEY**
End shaking and exit to the main interface.

8.5 Line Wash

A screenshot of the 'LINE WASH' interface. At the top, there are two tabs: 'LINE WASH' and another tab, with 'LINE WASH' being the active tab. Below the tabs, there are two input fields: 'WASH TIME:' followed by a text box, the word 'MIN', another text box, and the letter 'S'. At the bottom, there are two blue buttons: 'START' and 'END/BACK'.

Figure-10 Line Wash Interface

Edit the wash time (0-10 min, 0-59 s), Then click "START".

- 1) **"START" KEY**
Click to start line wash
- 2) **"END/BACK" KEY**
End line washing and exit to the main interface.

8.6 Adjust

Five positions can be adjusted, we have adjusted all positions according to the 96-well plate before leaving the factory. But you may fine-tune the positions with the microplate you will use before installing it, especially when using microplates of different sizes, such as 48-well plates.

8.6.1 Adjustment of Position 1

This position is the first sip(aspirate) position when selecting the **“two-point”** function.



Figure-11 Adjust

Click "+", and the microplate moves to the left by 0.2mm each time, and click "-", and the microplate moves to the right by 0.2mm. Observe while adjusting until the microplate moves to the proper position. According to the diagram below Fig.12, Then click "SAVE" first before entering the next position. Enter the next position by clicking "NEXT" "and return to the main interface by clicking" "BACK".

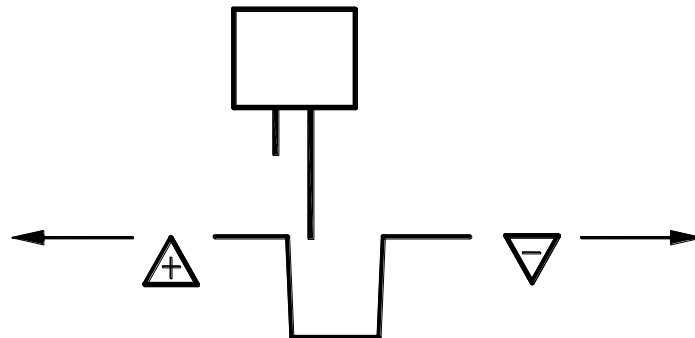


Figure-12 Adjustment diagram of Position 2

8.6.2 Adjustment of Position 2

This position is the default sip(aspirate) position when **“v-bottom or U-bottom”** microplate is used.



Figure-13

Use “+” and “-” to move the long needle of the manifold just above the middle of the wells of the first strip. According to the diagram below **Figure 14**, Then click” SAVE” and enter the next position or return to the main interface by clicking “NEXT” or “BACK”.

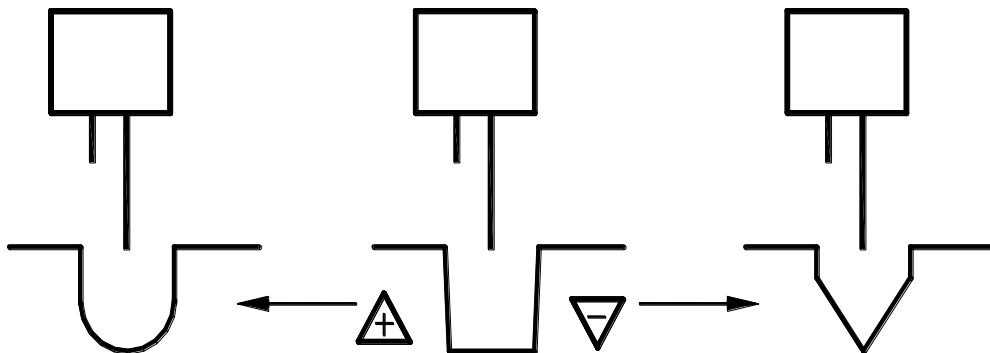


Figure-14 Adjustment diagram of position 2

8.6.3 Adjustment of Position 3

This position is the default sip(aspirate) position when selecting the” one point” function, and also the second sip(aspirate) position of “two-point”.



Figure-15

” Use “+” and “-” to move the long needle of the manifold to the right side of the wells. According to the diagram below **Figure 16**, Then click” SAVE” and enter the next position or return to the main interface by clicking “NEXT” or “BACK”

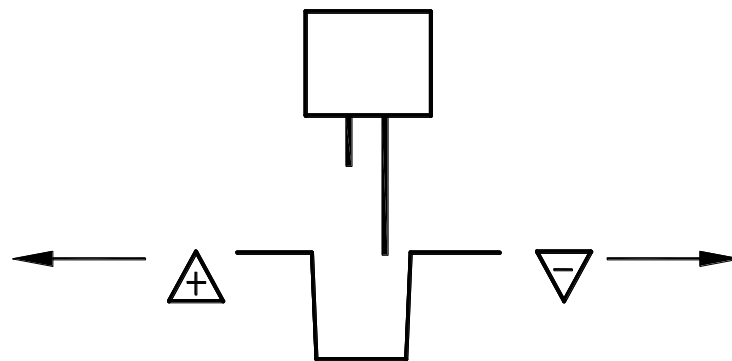


Figure-16 Adjustment diagram of Position

8.6.4 Position 4 (adjust the lowest position of the manifold)

This position is where the long needle of the manifold touches the bottom of the wells of the microplate.



Figure-17

Use “+” and “-” to move the long needle of manifold touches the bottom of the wells. According to the diagram below **Figure18**, then click” SAVE” and enter the next position or return to the main interface by clicking “NEXT” or “BACK”.

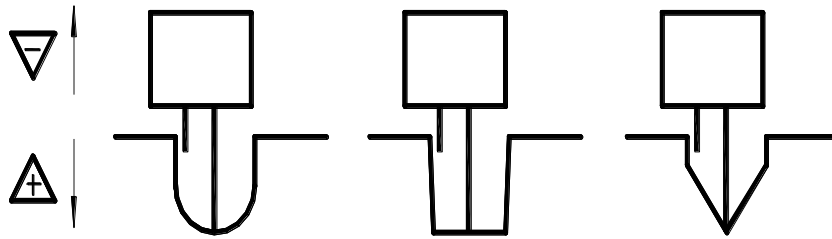


Figure-18 Adjustment diagram of position 4

8.6.5 Position 5 (adjust the higher position of the manifold)

This position is the highest position of the manifold from the liquid surface when injecting liquid, and liquid beyond this position will be sucked away.



Figure-19

Use “+” and “-” to align the long needle of the manifold to the center of the wells and the strips. According to the diagram below **Figure 20**, Then click” SAVE” and enter the next position or return to the main interface by clicking “NEXT” or “BACK”.

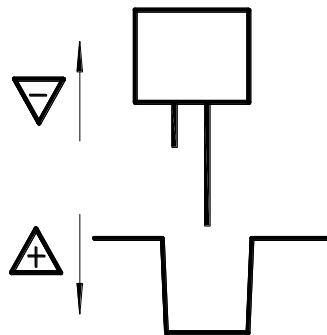


Figure-20 Adjustment diagram of Position 5

8.7 Fine-Tuning the Injection Volume

- There is a safety valve at the rear of the instrument, which can control the amount of injection volume by adjusting it, which we have adjusted before leaving the factory. But you may fine-tune it according to actual condition before using the instrument.
- Loosen the nut on the valve needle first, while observing the liquid flow of the manifold's needle, Turn the valve needle until it fits, and then tighten the nut. The safety valve can only adjust the injection volume (liquid speed) in a small range.

9. Operations

Operation Steps

- 1) Place the instrument on a stable, horizontal workbench. Verify that the pipeline connections are correct and secure. Keep the waste bottle empty and fill the wash bottle with cleaning solution before starting the instrument.
- 2) Turn on the power switch. The instrument will enter the main interface after performing a self-check.
- 3) Follow the experimental requirements and refer to [Section 8.6](#) to adjust the position of the microplate.
- 4) Refer to [Section 8.2](#), click "**PARAM SET**" on the main interface, then click "SYSTEM SET." Select the operation mode; the default is "STAND-ALONE" mode.
- 5) Click "SHAKE" to verify that the parameter settings are correct, then click "START" to begin the program.
- 6) **LINE WASH**: After completing the wash program, click "**LINE WASH**" to flush each pipe with liquid from the rinse bottle.
- 7) Power off the instrument, clean the workbench, and cover the instrument.

10. Maintenance

- Clean the instrument according to the following steps after each use, turn off the power switch, and unplug the power cord of the instrument to ensure that the instrument is disconnected from the power supply of the network.
- Ensure that the waste bottle is empty. Discard the waste liquid in the waste bottle within a few hours of using it to prevent waste liquid from entering the pump.
- Clean the manifold needles. Use the stylus, which is included in the accessories, to insert into each needle to keep it clean.
- Clean the surface of the instrument with a neutral detergent, and wipe the LCD screen with a soft, dry cloth.
- If there are dangerous and infectious substances during use, Wipe the plate rack with 75% ethanol. Make sure to wear disposable gloves when cleaning.

Note: Keep the instrument away from all kinds of Solvent grease, corrosive substances.

11. Troubleshooting

The following checklist may help resolve problems in the operation of this instrument.

Symptom	Problem Cause	Remedy
The instrument does not work, no message is displayed on the LCD.	AC power is not getting to the unit. check the AC line cord Blown fuse.	Connect to AC line and replace fuse with proper type.
The needle of the manifold cannot extend into the micro-well.	- The position of the first strip of the microplate is not correct. - Something may be put on the working platform or plate rack.	Adjust the position of the first strip of micro-well remove things put them on the plate rack and try again.
The needle of the manifold cannot aspirate waste liquid.	- The aspirating liquid nozzle of the manifold has not been well connected with the inlet nozzle of the waste bottle. - The cover of the waste bottle is not tightly closed. - Extracting the air nozzle of waste bottles has not been well connected with the vacuum nozzle of the unit. - Silicone hoses are broken or raised. - The aspirating needle of the manifold has been blocked - The vacuum nozzle of the main unit does not aspirate air.	- Check and well-connect the silicone hoses. - Tight the cover of the waste bottle. - Check and well-connect the silicone hoses. - Replace the silicone hoses. - Take the needle and insert it into each hole of the manifold to clean the blockages.
Cannot add liquid	- The inlet nozzle of the wash bottle has not been well connected with the pressure air outlet. - The outlet nozzle of the wash bottle has not been well connected with the inlet nozzle of the main unit. - The cover of the wash bottle has not been tightly closed.	- Check and well connect the silicone hoses. - Check and well connect the silicone hoses tight the cover of waste bottle. - Replace the silicone hoses. - Take the needle and insert it into each individual hole of

	• Silicone hoses are broken or crushed. • Injecting needles of manifold has been blocked. • The wash bottle has been emptied. • No air output from the pressure nozzle of the main unit.	manifold to clean the blockages.
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11.1 Other Faults and Operating Method

11.1.1 The instrument does not start after turning on the power

1) The power supply has no voltage, or the power socket may be loose.

Check whether the power socket has voltage and whether the connection between the plug and the socket is firm.

2) The fuse is disconnected.

There is a fuse holder on the back of the instrument. Use a flat-head screwdriver to remove the fuse holder and check if the fuse is disconnected. If yes, replace it with a new one.

3) The plugs and sockets on the electrical Mainboard are loose.

Disconnect the power supply, Lift the transparent cover, there are two fixing screws on the left and right sides of the upper part of the instrument, then open the front cover of the instrument gently. Check one by one whether the plugs and sockets on the electrical Mainboard are loose, If yes, Re-insert.

11.1.2 Turn on the Power, the screen is displayed normally, but does not self-check, and the keys do not respond.

1) The program may be stuck, Reboot.

2) The electrical motherboard may break, Replace it.

11.1.3 During working, No or less wash fluid sprayed out of the short needle of manifold.

1) Loose Bottle Cap

The cap of the wash bottle may be loose, or the seal between the cap and the silicone hoses may not be tight. Re-tighten the cap to ensure a proper seal.

2) Cracks or Wrinkles in Silicone Hoses

Cracks or wrinkles in the silicone hoses may cause blockages. Check and straighten the silicone hoses or cut off the cracked part and replace it with new silicone hoses.

3) Adhesive on Silicone Hoses at the Solenoid Valve (Pinch Valve)

The silicone hoses at the solenoid valve (pinch valve) may be stuck. Gently pull out the hoses and remove any adhesive or blockage.

4) Blocked Filter Vessel in the Wash Bottle

The filter vessel in the wash bottle may be blocked by impurities. Open the wash bottle, locate the filter vessel at the bottom of the silicone hoses connecting the cap and liquid outlet, and use a brush to clean the blockage.

5) **Blockage in Silicone Hoses of the Pressure and Wash Piping System**

The silicone hoses in the pressure and wash piping system may be blocked by impurities, preventing liquid from entering the manifold. Check for blockages in the wash system's pipeline. If there is a blockage, remove the silicone hoses, clean the inner walls with a long, thin brush, and reinstall them.

6) **Blocked Liquid Inlet Nozzle of the Manifold and Short Needle**

The liquid inlet nozzle of the manifold or the short needle may be blocked. Check for blockages and clear the short needle if necessary. Use the needle from the spare parts box to unblock it. Then, cross-connect the silicone hoses of the liquid inlet and outlet, place the manifold in the wash liquid tank, and press the "WASH" key. Flush the manifold in the reverse direction for a few seconds to aspirate the impurities into the waste bottle, then reconnect the silicone hoses.

7) **The Long Needle of the Manifold is Below the Liquid Level**

During washing, the long needle should be positioned 1–2 mm above the microplate. If the long needle is below the microplate, press the "ADJUST" key to enter "POSITION 1" mode. Then, press the "SELECT" key until the instrument reaches "POSITION 4." Use the "+" or "-" keys to adjust the long needle to be 1–2 mm above the microplate. Finally, press the "STOP" key to return to the home page.

8) **Solenoid Valve (Pinch Valve) Malfunction**

During operation, observe the movement of the spool in the circular solenoid valve (pinch valve) at the back of the instrument. When the manifold is injecting liquid, the spool should move inward with a "click" sound, then bounce back to clamp the silicone hoses once the injection is completed. If the spool does not move, the solenoid valve (pinch valve) is malfunctioning. Follow the instructions in **Section 11.1.3-3** to open the upper cover of the instrument and check if the solenoid valve plug is securely inserted. Use a multimeter to check the power board for a 24V reading. If there is no power, replace the solenoid valve (pinch valve) and mainboard.

9) **Pump Does Not Start, Resulting in No Pressure in the Wash Bottle**

Follow the instructions in **Section 11.1.3-3** to open the upper cover of the instrument. Turn on the switch and check if the pump is vibrating. If it is not, check whether the pump's plug is loose and reconnect it. If the pump still does not work, either the pump or the mainboard needs to be replaced.

11.1.4 After Washing, the residual volume in the wells of the microplate exceeds the standard.

1) **Loose Caps or Damaged Silicone Hoses**

If the caps of the buffer bottle or waste bottle are not tightened, or if the silicone hoses connected to the caps are broken, wrinkled, or not properly connected, retighten the caps. Straighten the silicone hoses, reconnect the pipeline, and if necessary, cut off the damaged part or replace the silicone hoses.

2) **Blocked Suction Nozzle of the Manifold and Long Needle**

If the suction nozzle or long needle of the manifold is blocked, clear the blockage. Use the needle from the spare parts box to clear the long needle. Then, place the manifold in the wash liquid tank, press the "WASH" button, and wash for a few seconds to aspirate the impurities into the waste bottle.

3) **Blocked Pipeline in the Liquid Suction System**

If the pipeline of the liquid suction system is blocked, remove the silicone hoses and clean their inner walls using a long, thin brush. After cleaning, reinstall the hoses.

4) **Long Needle of the Manifold Not Touching the Bottom of the Microwell**

If the long needle does not touch the bottom of the microwell, press the "ADJUST" key to enter "**POSITION 1**" mode. Then press the "**SELECT**" key until the instrument reaches "**POSITION 4**." Use the "+" or "-" keys to adjust the position until the long needle touches the bottom of the microwell. Finally, press the "**STOP**" key to return to the home page.

11.1.5 The volume of washing liquid injected into the wells through the short needle overflows.

1) First, follow the troubleshooting steps outlined in **Section 11.1.1, Tips 1-3**.

2) **The Long Needle of the Manifold is Too High Above the Microplate**

If the long needle is positioned too high above the microplate during operation, loosen the lock nut (located on the back of the instrument) on the "safety valve." While adjusting, observe the liquid output from the short needle of the manifold until the liquid flow returns to normal.

3) **The Distance Between the Long Needle and the Microplate Well is Too Large**

Press the "**ADJUST**" key to set the manifold to "**POSITION 1**." Then press the "**SELECT**" key until the instrument reaches "**POSITION 4**." Use the "+" or "-" keys to adjust the long needle to be approximately 1–2 mm above the microplate well. Finally, press the "**STOP**" key to reset.

4) **The Pump Does Not Start, Preventing Waste Liquid from Being Aspirated into the Waste Bottle**

Follow the instructions in **Section 11.1.1-3** to open the upper cover of the instrument. Turn on the power and observe or touch the pump to see if it vibrates. If it does not, check whether the plug connected to the pump is loose and reconnect it. If the pump still does not work, the pump or the mainboard may need to be replaced.

11.1.6 After turning on the power, the short needle keeps flowing out

1) **Impurities in the Solenoid Valve (Pinch Valve) Causing Improper Clamping**

If there are impurities in the Solenoid valve (Pinch valve) clamp hoses (at the back of the instrument), the valve core may not be in the correct position, preventing the silicone hoses from being clamped properly. Hold one end of the silicone hoses near the Solenoid valve (Pinch valve) with your hand, pull out the clamped silicone hoses, and clean out any impurities. Then, reinstall the hoses.

2) **Solenoid Valve (Pinch Valve) Malfunction**

Check if the Solenoid valve (Pinch valve) is damaged by following the troubleshooting steps outlined in **Section 11.1.3 -8**.

11.1.7 After turning on the power, Water sprays through the safety valve on the back of the instrument.

1) **Both the Waste Liquid Bottle and Buffer Bottle are Full, Causing Waste Liquid to be Aspirated into the Pump and Sprayed Along the Pressure Pipeline**

Press the "WASH/STOP" key to pause the instrument. Empty both the waste bottle and the buffer bottle. Then, unplug the silicone hoses connected to the back of the instrument. Find other silicone hoses and connect them to both the P. and N. pressure nozzles at the back of the instrument.

Turn on the power and run the instrument without load for 10 minutes to drain the waste liquid from the pump. (Do not allow waste liquid to remain in the pump for extended periods, as this may cause damage.)

2) Incorrect Connection of the P. and N. Pressure Pipelines, Causing Wash Liquid to be Aspirated into the Pump

Refer to the User Manual and check each pipeline connection carefully to ensure they are correctly connected.

11.1.8 The position of the manifold and microplate are not suitable, and the vertical step structure and horizontal step structure are stuck.

1) The Position of the Microplate is Inaccurate

Reposition the microplate to ensure that the bottom is completely aligned with the tray.

2) Debris on the Front and Back of the Tray Blocking the Horizontal Step Structure

Inspect and clean any debris from the front and back of the tray.

3) Re-adjust the Horizontal and Vertical Positions

Follow the instructions in the User Manual to readjust the horizontal and vertical positions as needed.

4) Objects on the Horizontal Guide Rail, Hindering Smooth Movement of the Slider

Lift the front end of the tray slightly and clean the horizontal slideway and slider. Be careful not to damage the slideway or the slider surface.

5) Object Jammed Between the Horizontal Axis of the Step Structure and the Horizontal Slider

Open the upper cover of the instrument and wipe the horizontal shaft with degreasing gauze soaked in kerosene. While wiping, gently push the horizontal shaft and tray. Apply grease evenly to the horizontal axis and move the tray repeatedly to ensure full lubrication of the horizontal axis.

6) Object Jammed Between the Lead Screw and Nut on the Vertical Step Structure

Open the upper cover of the instrument and clean the vertical lead screw, vertical shaft, and guide rail using degreasing gauze soaked in kerosene. Use a screwdriver to rotate the top of the screw, or manually move the synchronous belt of the vertical step structure to move the nut up and down, ensuring all parts are fully lubricated.

7) Loosened Synchronous Belt and Gear, Causing the Motor to Rotate but the Step Structures to Remain Still

Open the upper cover of the instrument, loosen the screws on the vertical motor bracket with a screwdriver, and move the vertical motor to an appropriate position before tightening the screws (ensure the synchronous belt is neither too tight nor too loose). Then, loosen the two screws on the driven wheel of the horizontal step structure, move the driven wheel bracket left until the horizontal synchronous belt is tight, and fix the screws.

8) **Malfunctioning Horizontal or Vertical Motor**

Open the upper cover of the instrument and use a multimeter to check for a 24V output on the board. If there is no voltage, replace the motherboard or components. If there is 24V output but the motor does not start, replace the motor or associated components.

11.1.9 After the instrument is turned on, the vertical pallet and the horizontal workbench are in place, but the motor continuously emits noise, indicating that it cannot proceed to the next program.

1) The Optocoupler Connection is Disconnected, Rendering the Optocoupler Inoperative

Open the upper cover of the instrument and check if the horizontal and vertical optocoupler connections are disconnected. Reinsert the plug securely. If the issue persists, replace the optocoupler connection.

2) The Light Barrier of the Vertical or Horizontal Step Structure is Not Entering or Not Fully Entering the Optocoupler Groove

Open the upper cover of the instrument and use a screwdriver to adjust the light barrier so that it enters the groove by 3–4 mm.

3) The Optocoupler is Broken

If the optocoupler is damaged, replace it or the mainboard as needed.



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