RT-9600
Chemistry Analyzer
Service Manual

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1. Introduction to the Analyzer

1.1 Overview of the analyzer

- Windows OS.
- Single- and double-wavelength test modes.
- Rotary plane grating system, continuously adjustable wavelength within measuring range.
- With the following test methods:

  End Point

  Kinetics

  Two Points

  Dichromatic

  Absorbance

  Multi-Calibration
- Reagent open or close system is selectable according to the customer.
- Printing forms include comprehensive report, test parameter, reaction curve, calibration curve, QC chart, etc.
- External incubator (optional).

1.2 Analyzer structure and compositions

The analyzer is composed of optical system, pipeline, computer control system and software, etc.

1.3 Applications

The analyzer can be used for clinical measurement of various common biochemical indexes of human blood and other body fluids.

1.4 Specifications

Resolution:	0.001Abs (Display), 0.0001 Abs (Internal calculation)
Light source:	Tungsten halogen lamp
Wavelength:	Continuously adjustable within 330-800nm
Temperature control:	Room temperature, 25, 30, and 37℃
Cell:	Flowcell
Interface:	RS-232 bidirectional communication interface, USB interface, etc.
Display:	LCD
Printer:	Built-in printer or external printer
Operating environment:	0℃～40℃;≤85%RH
Storing environment:	-10℃～40℃; ≤85%RH
Weight:	10kg
Dimensions:	370mm(L)×284mm(W)×318mm(H)
Power supply:	a.c.220V±22V, 50±1Hz
Input power:	120VA
Fuse type:	Φ5×20
Fuse rating:	3.15AL250V

2. Installation

2.1 Unpacking the analyzer

Unpack and remove materials for transportation. Keep the package box and materials for repackaging.

1） Take out the analyzer from the package box.

2） Remove the packing materials and take out the analyzer from the plastic bag.

3） Check the articles in the package box and the following article should be included:

- RT-9600 semi-auto chemistry analyzer
- User's manual
- Packing list
- Acceptance certificate
- Power cable
- Serial port cable
- Accessories (fuse, spare tube, and spare pump tube)

2.2 Suitable installation place

For ensuring the normal operation of the analyzer, please select a suitable place for installation of RT-9600 Semi-auto Chemistry Analyzer according to the following conditions:

- Worktable without direct sunlight;
- The worktable should be flat and with sufficient space and without strong shock (if a centrifuge has been installed);
- Places not in the vicinity of electromagnetic equipment that generates magnetic field.
- Places where the temperature doesn't change extremely;
- Places
- Where large amount of dust doesn't exists.

Note: The operating temperature of the analyzer should be 0℃～40℃, relative humidity should be less than 85%.

For ensuring the normal operation of the analyzer, please do not install the analyzer at the following places:

- Places where the temperature changes extremely.
- Extremely hot or cold places.
- Places where large amount of dust exists.
- Places in the vicinity of electromagnetic equipment that generates magnetic field.

2.3 Power supply

- a.c.220V±22V
- 50Hz±1Hz
- 120VA

2.4 Structure

Front view

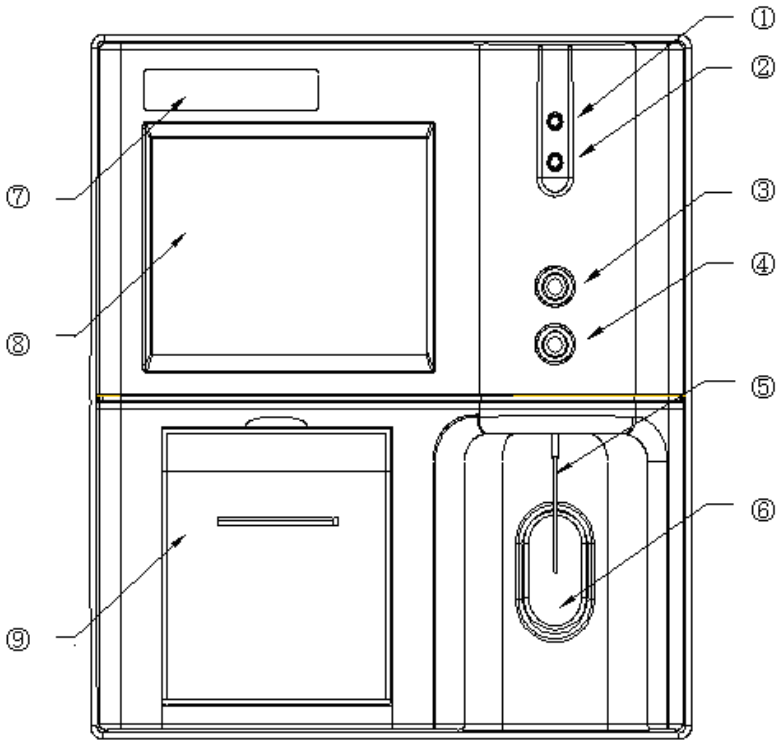


Fig. 2-1 Front view

① Indicator 1: The indicator is lit when the analyzer is on.

② Indicator 2: The indicator is lit when the peristaltic pump is running.

③ Paper feed key: The built-in printer feeds paper outwards.

④ Rinse key: Start or stop rinsing to the pipeline of the analyzer.

⑤ Aspiration tube: Sample will be sucked into the flowcell through aspiration tube by pressing SUCTION key when the analyzer are working in flowcell mode.

⑥ SUCTION key: The analyzer will suck the sample into flowcell automatically by pressing SUCTION key when suction is indicated on screen.

⑦ Analyzer label

⑧ LCD: Display interface.

⑨ Printer cover: Built-in installation position for printer paper.

Rear view

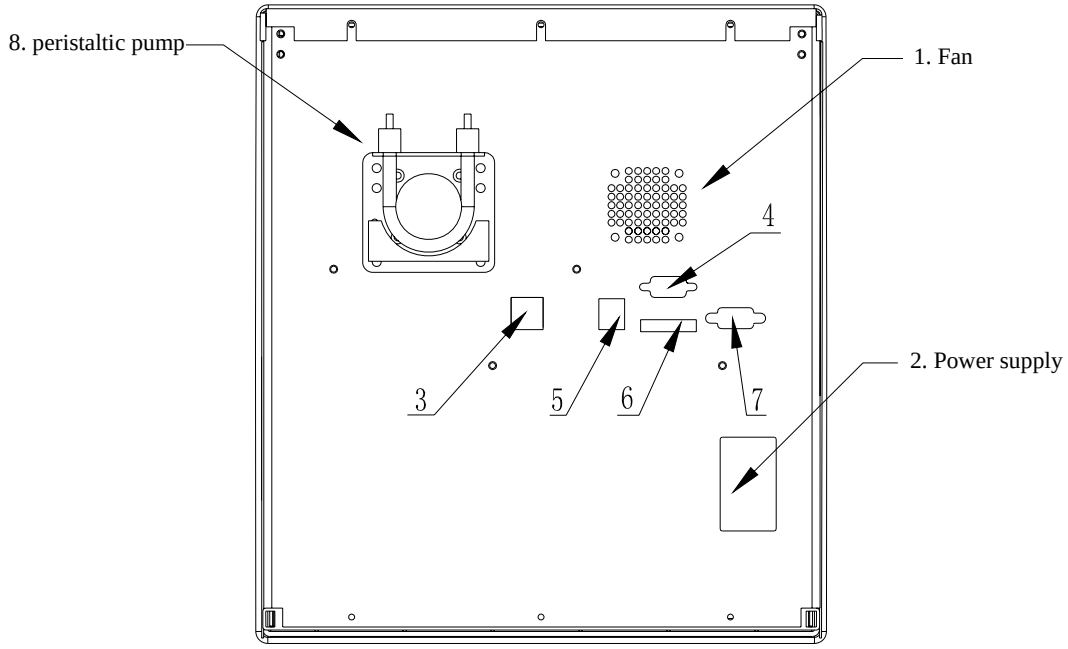


Fig.2-2 Rear view

① Fan

② Power switch

③ Ethernet interface

④ CRT interface

⑤ USB interface

⑥ SD card interface

⑦ COM interface

⑧ Peristaltic pump

2.5 Connecting the analyzer to the power supply

1） Insert one end of the power cable into the power socket of the analyzer.

2） Insert the other end of the power cable into an AC power socket.

Cautions:

- **The AC power supply should be securely grounded (N-to-G voltage should be <5V).**
- **The AC power supply should be stable, and should not be used together with a high-power electric apparatus. It'd better be provided with a power stabilizer.**
- **If smoke, peculiar smell or strange sound is found on the analyzer, you should switch off the analyzer and contact to the maintenance centre.**
- **When unplugging the power cable, grasp the plug instead of the cord.**

2.6 Connecting to PC

1) Ensure the analyzer is power off.

2) Insert one end of the serial port cable into the serial port on the rear of the analyzer.

3) Insert the other end of the serial port cable into a serial port of PC that can be used.

2.7 Installation of the flowcell

Open the top cover, you can find the flowcell system includes:

- Thermostatic bath
- Flowcell bracket
- Flowcell

Fig. 2-3 Colorimetric system

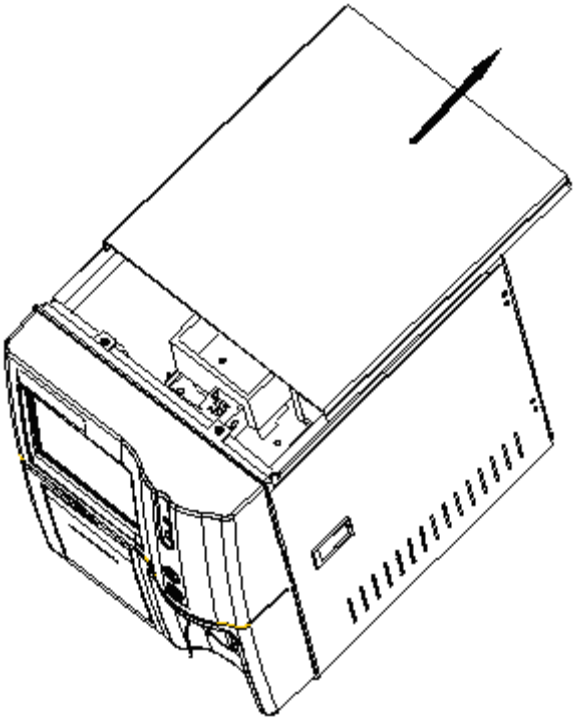


Fig. 2-4 Remove the flowcell cover

As shown in figure, push away the top cover after removing the hand screw of the analyzer.

1) Remove the sticky tape for fixing the flowcell and remove the packing material;

2) Put the flowcell into the thermostatic bath. However, the light opening direction should be consistent with that of the light path;

3) Let the aspiration tube go through the fixing hole and make it stretch forwards;

4) Recover the analyzer and tighten the screw.

Cautions: Do not touch the light opening of the flowcell for not affecting the transmittance of the flowcell by oil on your hand.

Please ensure that the aspiration tube is not pinched, otherwise bubbles will be produced easily by the flow, and that may affect the measured result.

3. Functions

3.1 Front CPU board

Front CPU board is the control center of the whole machine; it can be connected to the mainboard achieving the back end control command; for controlling filter wheel motor, peristaltic pump motor, temperature sensor, and Peltier Effect; and for collecting the data of analog signal.

3.2 Indicator panel

Front indicator panel is connected to front CPU board directly, provides 4-LED display; and flush and sucking can be performed through it.

4. Replacement of Accessories

4.1 Disassembling

RT-9600 is a complicated high-precision analyzer, and the components in it can't be repaired by the customer. When the analyzer can’t be back to normal, a professional engineer should be called for repairing it;

RT-9600 adopts tool-free 3-side opening design which is convenient for testing or maintenance of the analyzer. Remove the upper cover of the analyzer according to the figure below.

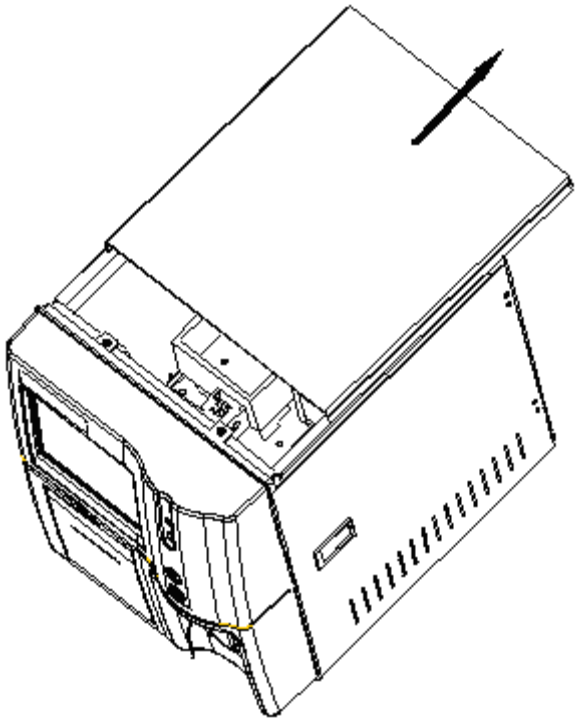


Fig. 3-1 Removing the cover

4.2 Replacement of fuse

Fuse should be installed in the fuse holder beside power switch on the rear of the analyzer. Open the holder cover, and replace the fuse conveniently.

Fuse specification: 250V, 3.15A. It is recommended that a power stabilizer should be used.

Cautions: The fuse of the rating above should be used. Do NOT replace the fuse when the power is ON!

4.3 Adjustment of peristaltic pump tube

After a long use of peristaltic pump tube, the tube should be adjusted. The method is:

- Turn the hasp of the peristaltic pump tube clockwise, and open the protective plate of the tube.
- Remove the peristaltic pump tube.
- Loose the fixing steel wire on the pump tube joint, turn the tube 180^{o}, and then fix the tube with the steel wire again.
- Secure the pump tube and lock it (turn the peristaltic pump tube hasp counterclockwise).

Caution: If the pump tube is not installed correctly, the analyzer might not suck liquid.

4.4 Replacement of aspiration tube

If the aspiration tube (or flowcell) is blocked by foreign substance, it can be cleared out by using a syringe. If the aspiration tube is damaged or blocked seriously, it should be replaced. The method is:

- Pull out the flowcell.
- Remove the aspiration tube on the inlet, replace the aspiration tube with a new one. Put a positioning tube (the thicker one) in one end of the new aspiration tube first, and then put in the fixing tube (the thickest one). Note that 1cm of the aspiration tube should be left outside of the positioning tube (as shown in Fig. 3-1).
- Fix the fixing tube at the inlet of the flowcell.

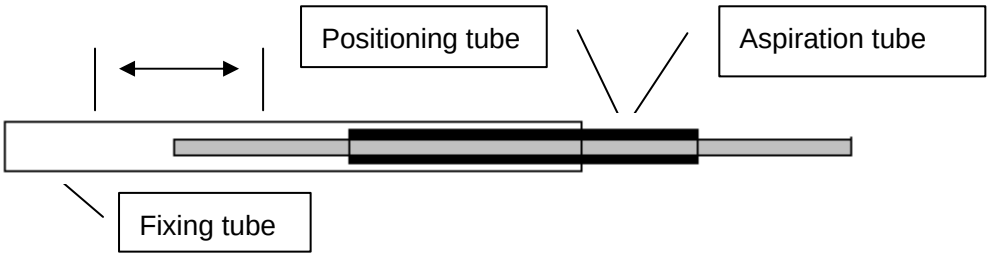
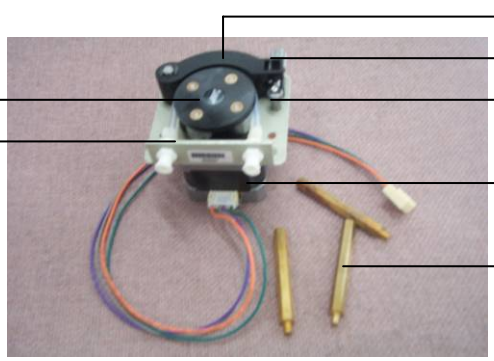


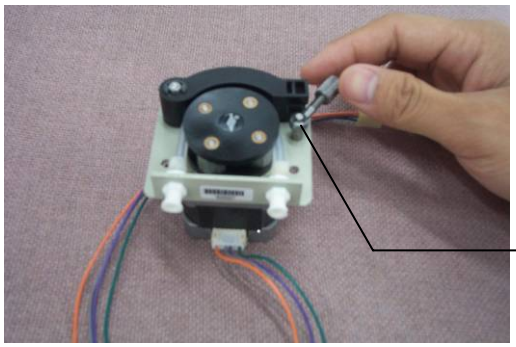
Fig. 3-2 Aspiration tube joint at the inlet of flowcell

4.5 Replacement of pump tube

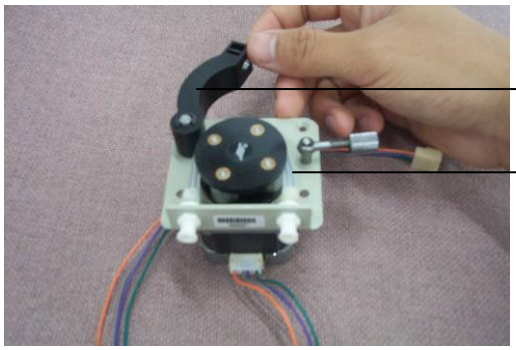
The overall view of peristaltic pump:



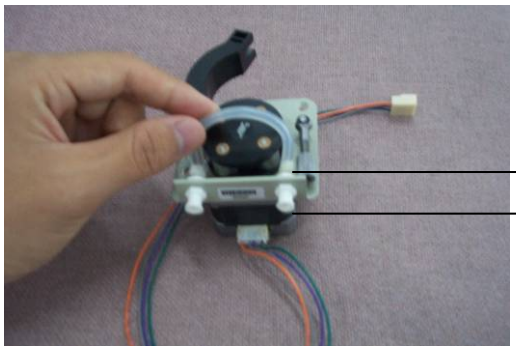
1. Loose the adjusting screw, open the fixing bar.



2. Open the fixing block, the pump tube can be seen.



3. Remove the pump tube, shear off the bandage, you can separate the pump tube from the white cuff.



4. Replace the pump tube with a new one, bandage, and do the operation procedures above reversely, and adjust tightness through adjusting screw finally.

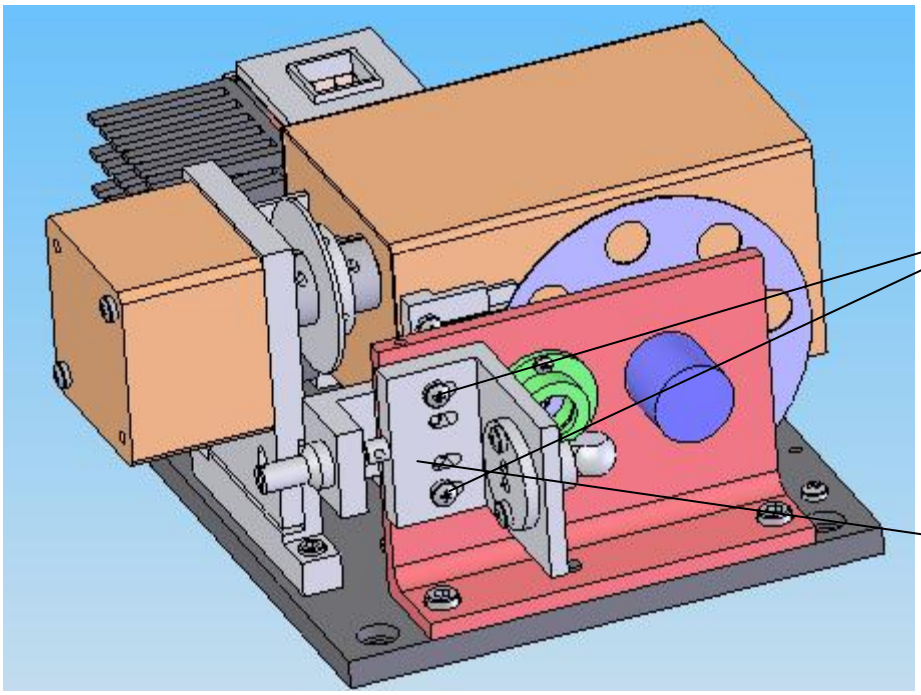
Note: You can replace it directly according to the procedures above, it isn't necessary to disassemble the pump body.

4.6 Replacement of lamp

A complete lamp component is as shown in figure.

Fig. Lamp component

1. The same as above, remove the top, left and right covers of the analyzer.
2. Remove the light path cover.
3. Remove the lamp that needs to be replaced as shown in figure.
4. Replace the lamp component with a new one, and then tighten the screw.
5. Adjust the position of the lamp. Adjust the grating to wavelength 340nm, click AD real-time monitoring function. Loose the adjusting holder of the lamp holder, adjust the position of adjusting holder of the lamp holder, and observe the Value AD at the grating rear simultaneously. The Value AD should be as small as possible during the adjustment. If Value AD is 0, you should adjust the potentiometer PR10 for reducing the multiplication factor, i.e. increasing Value AD. Then adjust the adjusting screw of the lamp holder again, and observe the Value AD at the grating rear again. Until the smallest Value AD exists. At this moment, tighten the support frame of light source.


Adjusting screw of adjusting holder of the lamp holder
Adjusting holder of the lamp holder

5. Maintenance

RT-9600 is a precision clinical analyzer. For ensuring its good conditions, daily maintenance should be done. Maintenance of RT-9600 is very simple, but it should be carried out carefully.

5.1 Cleaning the analyzer

5.1.1 Cleaning the surface of the analyzer

- Keep the operating environment of the analyzer clean.
- Neutral detergent and wet cloth can be used for cleaning the surface of analyzer.
- Please use a soft cloth to clean the LCD.

Caution: Do not let the analyzer be exposed to any solvent, oil, and other corrosive substances.

5.1.2 Cleaning the flowcell

The flowcell should be kept clean for ensuring the accuracy of the measured result.

Cleaning the outside of the flowcell.

a. The flowcell should be installed according to the requirements.

b. If the outside of the flowcell is dirty, a piece of soft cloth with absolute alcohol can be used for cleaning.

Cleaning the inside of the flowcell

a. Put a container full of distilled water under the aspiration tube, press RINSE key to start continuous rinsing function. Then pres RINSE key again to stop rinsing. Normally it takes half a minute for continuous rinsing.

b. Detergent for glass container, dilute hydrochloric acid (0.1N), and Tween 20 diluent (2-3 drops/L) can be used for clean the flowcell. Press RINSE key to suck the detergent, press RINSE key again to stop the running of the peristaltic pump to let the detergent remain in the flowcell for 5min., and rinse the flowcell with distilled water for 1min. finally. If it isn‘t clean enough, rinse the flowcell with detergent again.

The flowcell should be cleaned under the following conditions:

- Water blank difference is too large
- Change the testing item
- Before shut-down

Caution: Do not leave the reaction liquid or other pollutants in the flowcell for a long time.

5.2 System maintenance

Click “System Maintain” in “System Settings” interface to enter the System Maintain window. This module offers the following functions:

- Temperature Settings: 25, 30 and 37℃ can be selected.
- Real-time temperature: Display the current real-time temperature.
- Temperature factor: If the actual temperature of system and objective temperature is not the same, you can correct it.

  Correcting method: If the actual temperature is lower than the objective temperature, you can increase the temperature correction; otherwise, reduce the temperature correction. Input range of temperature correction: -2.0℃ to 2.0℃.
- Peristaltic pump coefficient: When the suction amount is different from the desired value, you can compensate this deviation by modifying the peristaltic pump designated factor.

  Correcting method: When the suction amount is less than the desired suction amount, you can increase the peristaltic pump designated factor; otherwise, reduce the peristaltic pump designated factor.
- Peristaltic pump revolution: When there is a large fluctuation in measured result, you can reduce bubble amount of flowcell for changing the pump velocity.
- Evacuation amount: After the test of each sample during testing, the system will suck into air for evacuating the test liquid. More air is sucked, more waste liquid can be evacuated. The air amount sucked can be set from 1 to 2000. Default evacuation amount is 800.
- Blank scanning: The system will carry out wavelength scanning. “10 normal wavelengths” or Custom can be selected.

Note: Only the Administrator has the authority to use System Maintenance functions.

6. Simple Troubleshooting

Situations	Solutions
1) The analyzer can't be started	——Check whether the analyzer power is on. ——Is the power plug loosen. ——Check the fuse. ——Check the voltage. ——Is the On-Off time interval too short?
2) The lamp can't be lit	——Switch off the analyzer before replacing the lamp. ——If the lamp is damaged, you should replace the lamp with a new one.
3) The software indicates that the initialization of serial port is failed	——Is the analyzer On? ——Is the serial port cable loosen?
4) "Check the analyzer" is indicated during testing	——Is the analyzer On? ——Is the serial port cable is loosen?
5) No liquid in the flowcell	——Does the peristaltic pump run normally? ——Check the connection between aspiration tube and flowcell interface. ——Is the aspiration tube too long or too short? ——If the aspiration tube is blocked, you should clear off it. ——Is the flowcell too dirty?
6) No reading of the photometer	——Is the photometer lamp lit? ——Try to read by another wavelength. ——The flowcell isn't inserted completely.
7) Too large water blank value	——Clean the flowcell. ——Replace the distilled water. ——Check the photometer lamp. ——Check the electromagnet whether it is switched to the right position.
8) Too low result repeatability	——There is some bubbles in the flowcell, you should clean the flowcell.

——Check the suction in the flowcell.

Situations	*Solutions*
	——Too little reagent amount, you should increase the amount. ——Replace the photometer lamp. ——The reaction liquid is polluted. ——The aspiration tube is inserted too deep, you should pull it out slightly. ——Is the coupling or synchronizing wheel loosen?
9) The suction amount of flowcell is not stable	——Is the aspiration tube blocked? ——The peristaltic pump tube might be replaced.
10) The QC is not in the target value range	——Check the period of use. ——Check whether the settings are correct. If not, please correct the parameter. ——Check whether the QC is polluted. ——Try another test method. ——Check the flowcell, or use another reagent and QC to test again. ——Check the accuracy of the monochromator wavelength.

Note: If a fault you can't solve by yourself, or a fault that appears repeatedly occurs during use, please contact to the distributor.

Note:

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