HERA
Chemistry Analyzer
Service Manual

Version:June 29, 2004

CONTENTS

Chapter 1. Instrument Overview

- **HERA** is an internet-oriented chemistry analyzer, it can be used in the measurement of the following matters:
    - Electrolytes
    - Substrates
    - Enzymes
    - Plasma proteins
    - Hormones
    - TDA‘S
- It can program 130 test items. User can revise all the original program setting of tested items.
- It has double coloring system: One is flow cell system and the other is cuvette system.
- Following test methods can be provided:

  Endpoint
  Two point
  Kinetics
  Bichromatic
  Absorbency
  Multi- Calibration

- It can analyze samples of blood serum, blood plasma, whole blood and urine etc.
- It can connect to the internal network of hospital, quality supervision center and Rayto user service center, and bring great convenience to the work.
- Either built-in printer or external printer can be selected.
- The external standard keyboard, CRT display, mouse and bar code scanners can be choose to equip.

1.1 Installation

1.1.1 Unpacking of the instrument

Unpack the instrument and remove the materials used for delivery. Keep the packing boxes and materials for repacking the instrument in the future.

1)Take the instrument out from the boxes.
2)Take away the packing materials, take out the instrument from the plastic packing bags.
3)Check the articles in the packing box and confirm that the following articles are contained:

- **HERA** mainframe
- User’s manual

- Packing list
- Repair guarantee certificate of the agent
- Power source line

1.1.2 Select proper mounting location.

The instrument should not be directly exposed to the sun. The working table selected shall be smooth in surface and has enough space to mount **HERA. T**he front edge of instrument shall be close to the edge of working table. The working table is prevented to have great vibration (e.g. centrifuge is placed on the table).

Note： **The working environment of the instrument:**

The temperature shall be 15℃-32℃
The related humidity shall be20%-85%。

To ensure the normal operation of the instrument, it is forbidden to mount the instrument in the following places：

- A place with extreme change of temperatures.
- A place too hot or too cold
- A place with many dust
- Close to electromagnetic equipment that can produce magnetic field.

1.1.3 Power source requirement

- AC110V ~AC250V
- 50~60 Hz
- 80W

1.1.4 Connect the instrument to the power source

1） Insert one end of power source line to the power source socket of the instrument.
2） Insert the other end of power source line to the alternating current power source socket.

Warning

- **The alternating current shall have fine grounding（zero voltage<5V).**
- **The alternating current shall be stable. It is forbidden to use power source together with appliance with great voltage. It is better to equip stable-voltage power source.**
- **If smoke, peculiar smell, or strange sound is found in the instrument , turn off the power immediately and contact with repair service center.**
- **When pulling out power source line, hold the connector plugs , do not hold power source line.**

1.1.5 Connect to the external printer.

1) Confirm the printer and instrument are closed.
2) Insert the printing cable to the output port at back of the printer.
3) Fix the plug with the wire button that is used for fix up.
4) Insert the other end of printing cable into the RS-232 port of the instrument.
5) Connect the printer with alternating current power source with power source line equipped in printer.

Note: HERA can also use special built-in heat sensitive printer.

1.1.7 Place flowcell.

As indicated in the following drawing, take away the cover of flowcell (**beware proper strength is used)**

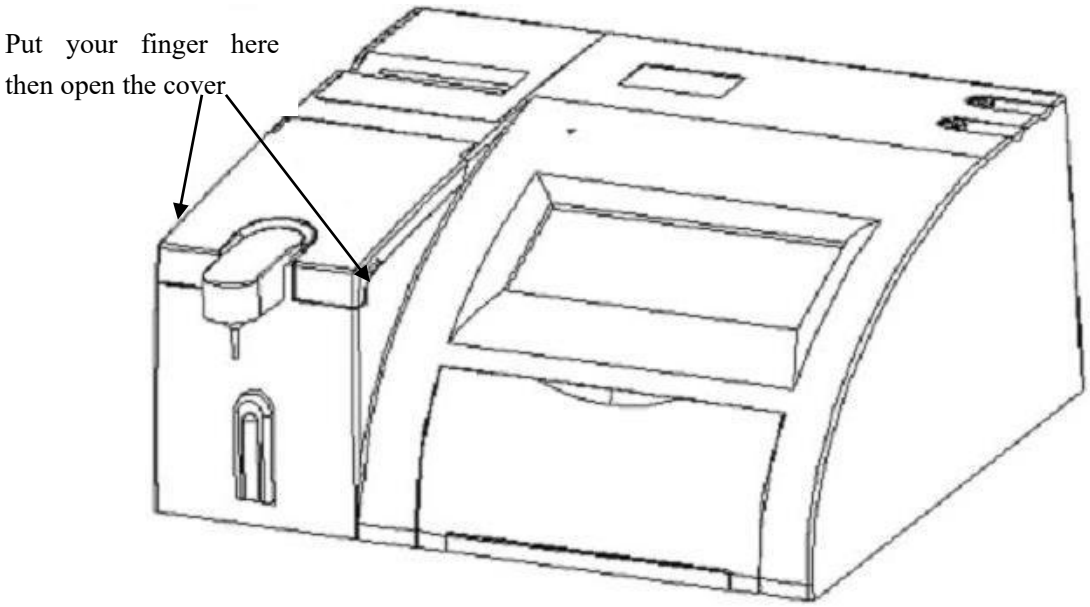


Diagram 1-2 Open the cover of flowcell

1) Tear the adhesive tape use in fixing flowcell.
2) Remove packing materials
3) Place the flowcell into incubation carefully and make the aspirate tube in front。

Warning： Do not touch the surface of transmit window of flowcell to avoid befouling of the transmit window with grease of hand and effect the absorbency.

1.2 Structure

1.2.1 Front view

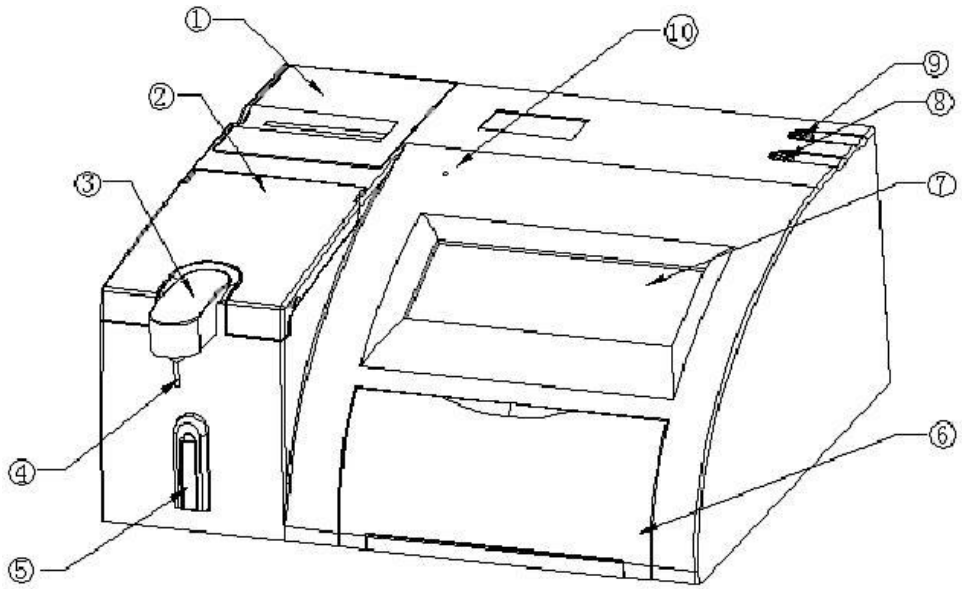


Diagram 1-3 Front view

①Printer cover	Open the cover you can install the printer paper.
②Lamp and flowcell cover:	Open the cover, user could change the lamp or maintain the flowcell.
③Aspirate tube bracket	Protect the aspirate tube
④Aspirate tube	Aspirate the reactant into the flowcell for testing
⑤Aspirate button	Press the button to aspirate the solution
⑥Keyboard cover	Open the cover you can see the keyboard
⑦LCD Screen	To display the results and curves
⑧Rinse button	Press the button to rinse the flowcell
⑨Paper feeding button	Press the button to feed the paper
⑩Power-on indicator lamp	When it light, it means power supply work.

1.2.2 Key Board

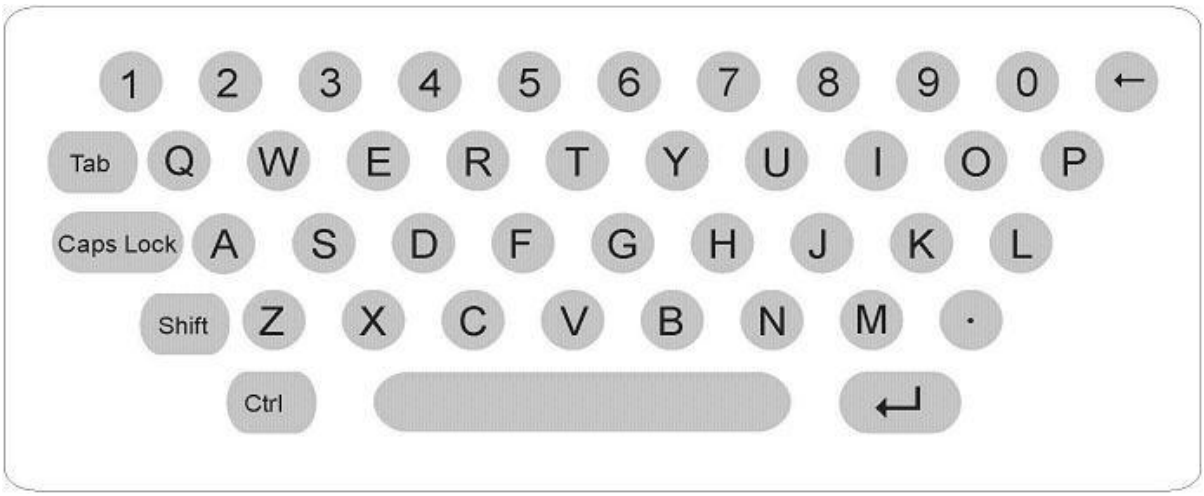


Diagram 1-4 Key Board

1.2.3 Back view

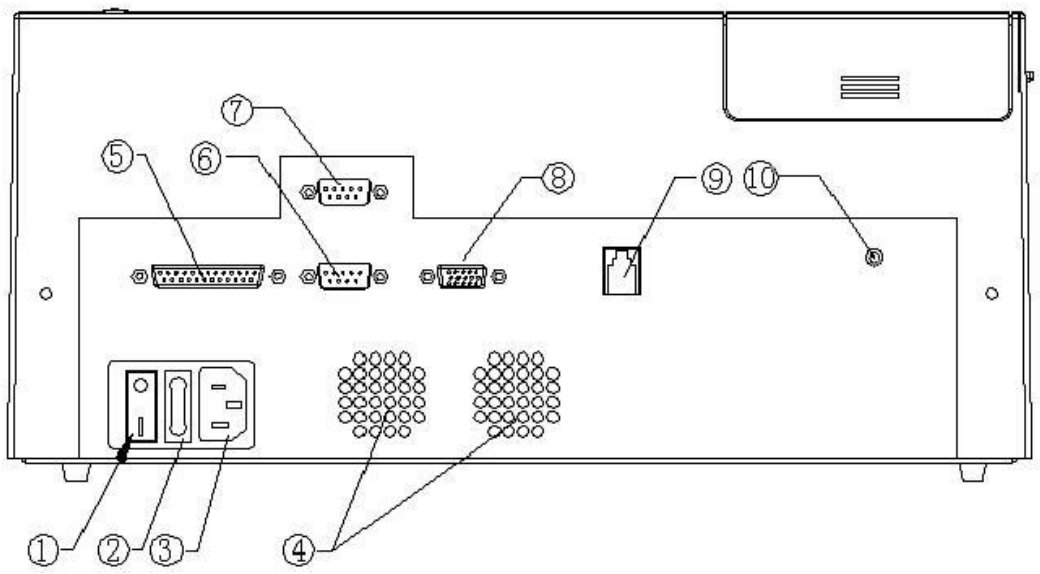


图 1-5 Back view

① Power switch: To switch on or off the power source of the analyzer
② Fuse: Check fuse of instrument if there is no power supply after switch on the power switch.
③ AC INPUT: Power source line socket.
④ Fan: It is used in the cooling of instrument.
⑤ Printer port: It is used to connect external printer.
⑥ Mouse port: It is used to connect external mouse.
⑦ RS-232 port: Communicate with PC.
⑧ CRT port: It is used for connecting the external CRT display.

⑨ Telephone line port： Connect telephone line for remote networking

⑩ DRAIN PORT: Waste out here.

1.2.Flowcell

Open the cover of flowcell as indicated in the following drawing.

Note: ***When opening the cover of flowcell or inner cover of light lamp, press the two sides of cover so that it deform innerward, and then open it according to the direction of the following drawing.***

Inside the colorimetry system there are：

- Incubation
- Colorimetry bracket
- Inner cover of light source
- Flowcell

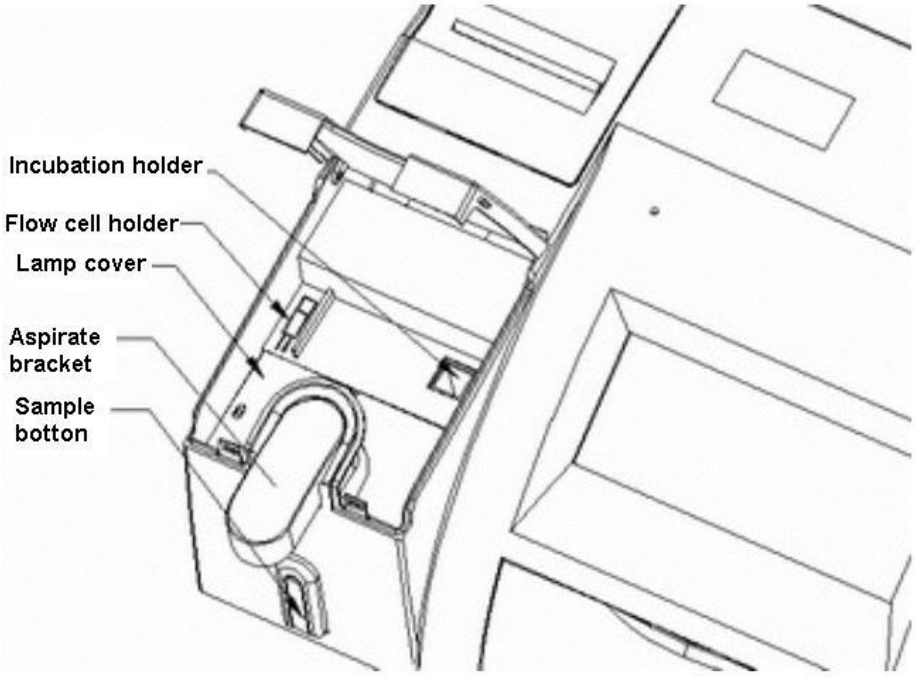


Diagram 1-7 Inside of colorimetry system

1.3 Instrument parameter

Linearity range	0.000-2.500A
Resolution	0.001Abs(display),0.0001 Abs(inner calculation)
Light source	halogen tungsten lamp,6V/10W,service life about 1000 hours
Wavelength	340,405,500,546,578,620,670nm ,One blank for optional filter
Excursion	0.003A/30min
Semi-bandwidth	<10nm
Temperature control	Room temperature,25,30,37℃ (Peltier component),precision±0.1℃
Flowcell	30μl quartz flowcell
Sample feeding volume	200-3000μl (add 50μl)
Cuvette	12.5mm×12.5mm square test tube
Cross pollution	≤1%(500μl) ,≤1.5%(300μl)
Storage	143test items, 500 test results
Port	Mouse,RS232,CRT,RSTN,Keyboard,Printer
Display	7″ color LCD display(640×240line),256color
Print	Built in or external universal printer
Computer	Embedded high speed processor
Working environment	15℃-32℃;Maximum humidity85%R.H.(below30℃)
Storage environment	-20℃-50℃; maximum 85%R.H.(below 30℃)
Weight	10kg
Dimension	450mm(L)×330mm(W)×140mm(H)
Fuse	250V, 3.15A
Power supply	110VAC-250VAC±10%,50-60Hz

Chapter 2 Function Description

2.1 **HERA function frame**

Refer to the following.

2.2 Description of power source function

The power used by the **HERA** machine is provided by electric source module. The high frequency PWM conversion technology is adopted so that the electric power has the advantage of small size, light weight, high efficiency, high reliability, high load adjustment ratio and power adjustment ratio etc. Two stage conversion is adopted in the power structure. One stage is single reverse current AC/DC conversion , the other is DC/DC Buck converter, so that the direct power exported from 4 passages had high voltage precision and adjustment rate.

The power source module exports 4 direct current , the power usage situation is as the following：

CH1：	+12V/3.3A	It is used in light filter generator; pump generator, Peltier temperature rise/fall and fan generator.
CH2：	+5V/2.6A	It is used in the main board and front board logic control
CH3：	+5V/2A	It is used in tungsten halogen lamp
CH4：	+5V/3A	It is used in embedded printer.
Ch5:	+6V/0.8A	It is used in peltier temperature rise/fall.

2.3 Main board Function Description

2.3.1Main board function illustration

1. It acts as system platform and provide operating environment for system software and application software.
2. It provides connection port with front end system, perform the control of front end system and data collection and processing；

It provides I/O port of the system. Component that supports the I/O ports are as the follows: four RS232 port that used respectively in the embedded serial port mouse, embedded serial printer, embedded modem and outer RS232 port.1 parallel printer port ; one key board panel port; one external XT compatible key board port; one embedded speaker port; one simulation telephone line port; one 640×480 CRT display port, one 640×240 LCD display port.

2.3.2Main board function diagram

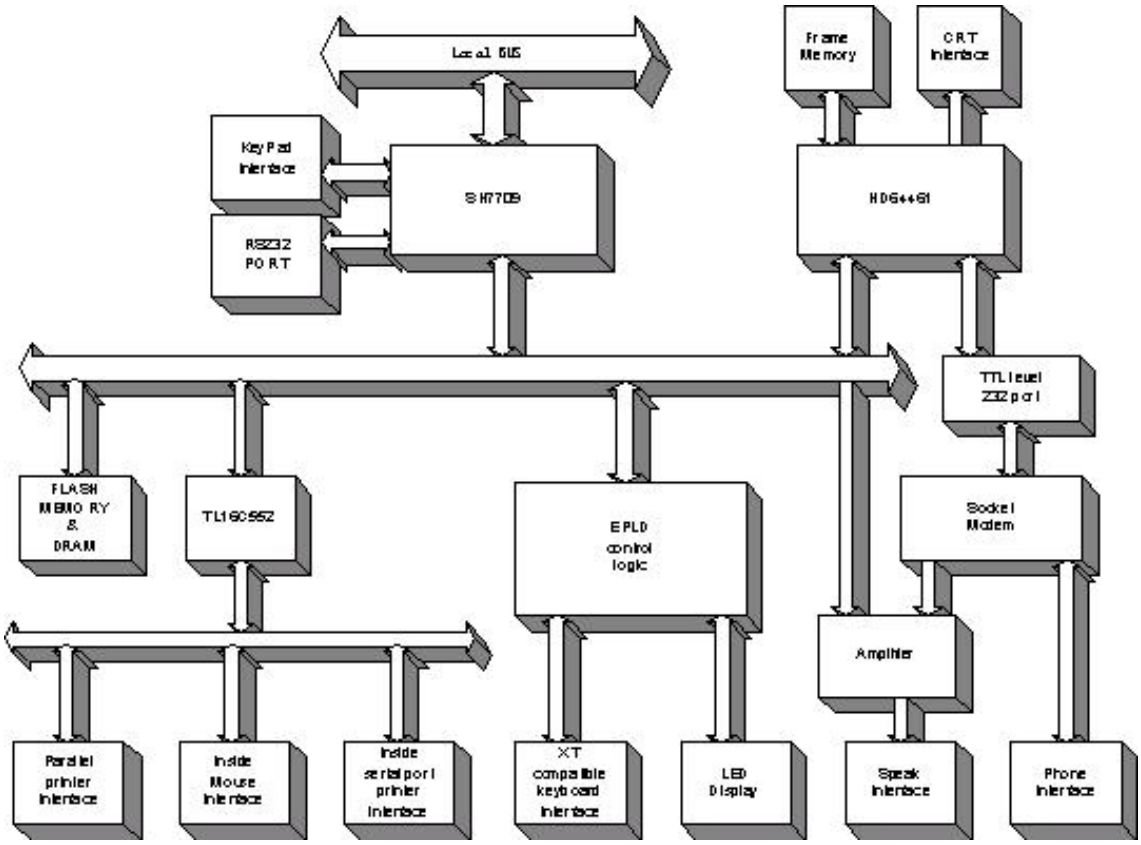


Diagram 2-1 Main board function diagram

2.3.3 Main board principle description.

As indicated in the above diagram, the main board is consists of the following major part:

1. SH7709、Flash Memory and DRAM constitute the basic platform of system operation; the system software and application software is fixed in the Flash Memory. The address space of Flash Memory is distributed in the 0 district of system storage area. The address space of DRAM is distributed in the lower 32M space of 3 district of system storage area. The outer frequency of CPU is 20MHz. When the system starts, the program is directly executed on Flash Memory; the start area program on Flash Memory can complete upgrading of software.
2. HD64461、Frame Memory constitute the outer controller of the system, that mainly used in support CRT and LCD display. The address space of Frame Memory is distributed in the high 32M 3 district of system storage area, and connects directly with HD64461. HD64461 supports the port with SH7709, color/single color STN-LCD port, CRT（VESA VGA）port and UART that is compatible with standard 16550. In the system the display port of HD64461 is connected with LCD or CRT display, through UART it constitute one serial port of TTL electric level and connected with serial port of Socket Modem so as to provide remote maintenance ability for the system.
3. Serial communication port and parallel ports
   There is 4 serial communication ports and one parallel port on main board: the serial port 2 on SH7709 constitute RS232 for outer use; the PB port on HD64461 constitute TTL electric level

serial ports to connect with modem; through the expansion of TL16C55 chip, another two serial ports and one parallel ports is provided by the system; one serial port is used in connecting embedded mouse, the other serial port is used in connecting of embedded printer; the expanded parallel port is used in connecting external parallel printer.

4. The transmission rate of Socket Modem module data is14.4K bits, it support At command bank, connect with TTL serial port on HD64461, it connected outer simulation telephone line for use in support the remote diagnosis, maintenance and upgrading of the system.
5. Programmable logic equipment
   The programmable logic part can complete logic control of various part of the system. Through the equipment the XT compatible key board port and the LED indicator light port are expanded, it provided transmission control of disconnected signal and control of local bus that connected on the front end. And it produces the M signal for use in the STN-LCD display screen.
6. Key board scanning and voice signal amplifying
   Key board scanning logic is constituted by low 4 area ofSH7709 PTC port, and low 4 area of PTF ports to form a 4×4 key board scanning. SH7709 regularly give out from PTC ports the signal to scan keyboard. The PTF port inspects the key push action, it is delivered by LM386 and amplify and export the voice signal given out by SH7709 and Socket Modem to speaker port.
7. Power conversion circuit
   The system power provides +5V power for main board. The main board need mixed power supply of +5V and +3.3V. Therefore +5V to +3.3V power conversion of main board is needed.

2.4 Front board Function Description

2.4.1 Front board function illustration

The front board is under the control of main board of computer. The plate execute and complete all the unique functions of the semi-automatic biochemical analyzer, it is the control execution center of the semi-automatic biochemical analyzer. In the **HERA** product of semi-automatic biochemical analyze, the front board mainly complete the following functions:

- Selection of light filter
- Pump rotation to absorb certain amount of liquid
- Control of tungsten halogen lamp (switch on/off)
- Transfer, amplify and sampling of light and electric signals
- Temperature test and control

2.4.2 Front board principle frame

The front board principle frame is as follows：

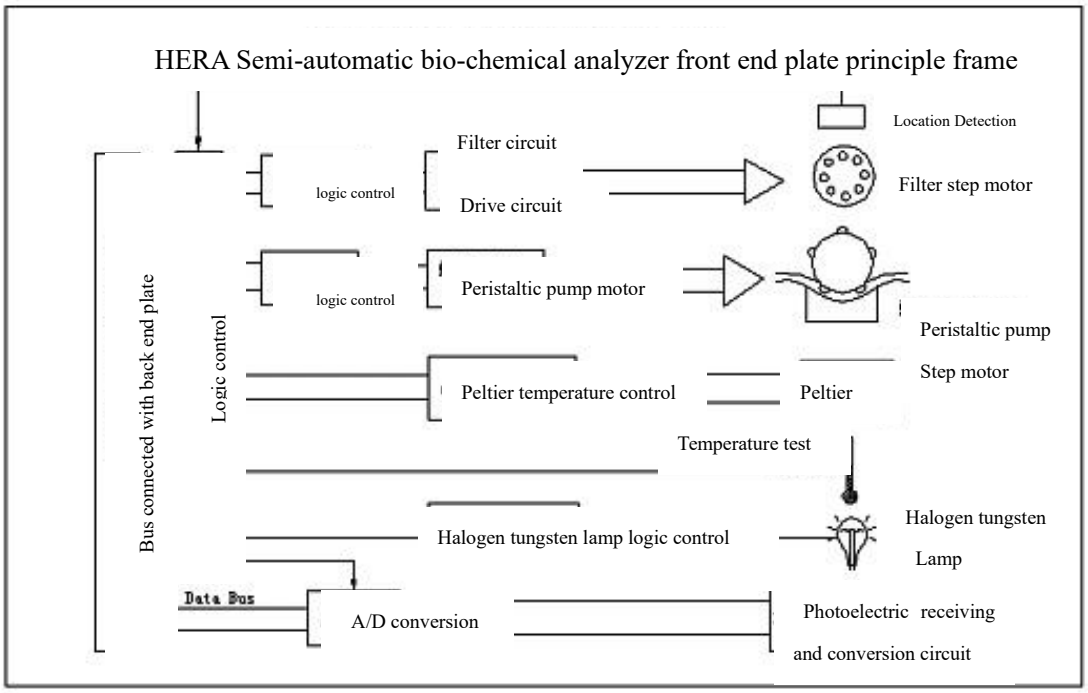


Fig 2-2 Front board function diagram

2.4.3 Light filter selection and control

In the semi-automatic biochemical analyzer **HERA** product, the categories of selected light filter is as follows: 340nm、405nm、500nm、546nm、578nm、620nm、670nm totaled 7 kinds. Different wavelength of light filter is needed for different test method. Place the entire filters evenly on circumference of 8 hole round disk. The angle of neighboring two hole is 360/8=45° . The remaining hole is preserved for adding unique wavelength filter in the future. The round disk is rotated by step motor. When step motor rotates on different angles, different wavelength filters is selected by the system. The model of step motor is UBD6N07D04AKNC. The reduction gear is equipped in the motor to increase the rotation moment. The reduction gear is equipped together with step motor 8254 OUT. After exporting filter and pulse, related filter is selected.

2.4.4 Liquid absorbing control of pump

In the semi-automatic biochemical analyzer **HERA**，the instrument automatically absorbs related amount of reagent according to the amount of liquid set by the test item. Similar with the filter, the step motor is adopted to control precision amount of liquid absorbing. The control method is similar to that of the filter step motor. When the step motor rotates different angel, the instrument absorbs different amount of reagent. Since the moment is large when pump is absorbing and rotating, the double stages step motor is selected. The model is 17HS1022. The double stage drive of L297 and L298 control/drive chip are adopted in related circuit drive.

Since the test sample is different and have different density, it can offer different absorbing rate

to users. 1～8 rates are set on pump. Different frequency division is written on Timer/Count of 82C54. OUT_0 exports different frequency, the pump rotates in different rates.

2.4.5 Temperature test and control

Temperature control can be divided into temperature test and temperature rise/fall. The bus all digital temperature sensors DS1820 produced by DALLAS that can decrease peripheral conversion circuit is adopted in temperature test.

2.4.6 Light energy sampling and conversion

The sampling test of light energy is the core of semi-automatic biochemical analyzer. All the test and calculation of semi-automatic biochemical analyzer are performed through test on light intensity. Therefore the light energy sampling shall be precise and stable so that the requirement of instruments on sampling test speed can be satisfied. The photoelectric sensor OPT301M of B-B Company is adopted. The component integrates the silicon photovoltaic cell and embedded calculation amplifier. The silicon photovoltaic cell transfers the photocurrent signal into low voltage signal. The embedded calculation amplifier amplifies the low voltage so as to satisfy the measurement requirement of voltage. OPT301M has the strong point of high integration and fine performance. at the same time only by transferring the voltage signal into digital amount to CPU can it start processing. So A/D transfer circuit shall be added. ADS774 of B-B company is adopted as A/D converter, its main indexes are: 12Bit. All can satisfy requirements of instrument on measuring range, precision and speed. The voltage range of input A/D is 0-10V.

2.4.7 Halogen tungsten lamp control

To lengthen the service life of the lamp, the instrument shall automatically shut the lamp if instrument does not measure after being on for a long time. The lamp used by the instrument is halogen tungsten lamp. Its specification is 6V/10W. Both the current passes and voltage are high .If voltage MOS tube is adopted to control on/off of halogen tungsten lamp, voltage drop of the voltage MOS tube is great, the voltage consumption is also great, many disadvantages such as heat emission will be brought along. So the small relay is adopted to control. The voltage drop of relay contact is almost zero. And the voltage of relay line package is small. Control signal is put out by $P_{B.6}$ of 8255. Audion is used to drive on/off of line package that control relay.

2.5 Pipeline Function Description

2.5.1Function illustration

In instrument measurement, aspirate key is pushed, system control drive the rotation of pump generator. The pinch wheel of pump presses the pipeline and enable the tested liquid in pipeline extrude to liquid drainage port. The tested liquid is absorbed into the flowcell. When sample volume set by measuring item is absorbed, the system control stops the pump generator. Liquid to be tested is in the flowcell for measurement. After measurement, the system control drive the rotation of pump generator, emptying the tested liquid in flowcell to decrease cross pollution and ready for the next measurement.

2.5.2 Pipeline structure

Diagram 2-3 Pipeline Structure

2.6 Light Path Function Description

2.6.1 Function illustration

The optical structure of **HERA** is, as the above diagram, spectrums structure after going through light filter. After lightening tungsten halogen lamp, radiate light with filament as center is given out. The radiate light is converted to parallel ray after going through convex. The protection glass plays the role of protecting convex. After the parallel ray shoots the flowcell with sample liquid to be tested, a part of light energy is absorbed by liquid. Light that shoot up is called shoot-up light. The shoot-up light is changed to single color light after going through single color filter. The single color ray shoots on the photoelectric receiver. The photoelectric receiver transfer the light signal into electric signal and input it to front board for processing. The color of filter and color of tested liquid shall be additive complementary colors.

2.6.2 Light path structure

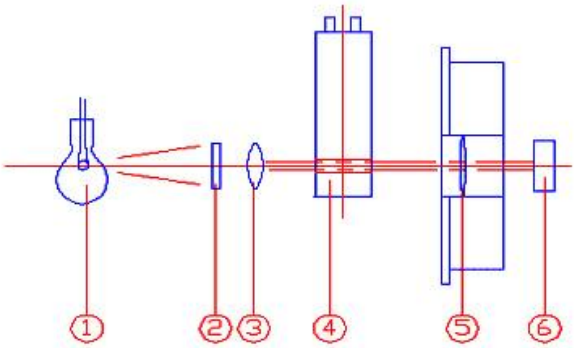


Diagram 2-4 Light path sketch map

①. Lamp
②. Protection glass
③. Convex
④. flowcell
⑤. Filter
⑥. Signal receiving assembly

Chapter 3 Fittings Replacement

3.1 Instrument Dismantling Method

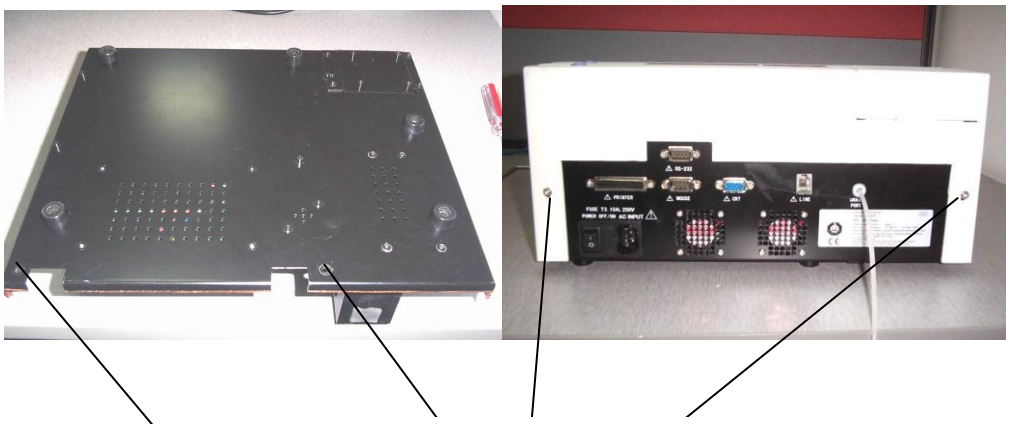
HERA is a high precision and complicated instrument. There is no component inside that can be repaired by users. In case the instrument fails and cannot be solved on above method, specialists will be sent for to repair. When it is determined that inner parts of instrument has broken down and repair is needed, please dismantle the instrument according to the following procedures:

1）Thoroughly drain out the remaining liquids in pipeline of the instrument, fix the flowcell.

2）Turn off the power switches of instrument and printer respectively, pull out electric source line.

3）Dismantle external printer cable with screwdriver.

Pull out external mouse, connection line of modem, and other cables connected to the Analyzer.



Remove these four screws which upper cover

Diagram 3-1 The location of screw used for connecting upper and lower covers.

4）Place silk on a clean and smooth table, reverse the instrument on the silk to prevent damage to outer surface of plastic cover of the instrument.。

5）Use screwdriver to unscrew four screws used in connecting metal base and plastic upper cover according to the above diagram.

6）Carefully place the instrument on the table, open the light source cover, take out the aspirate tube from the bracket on upper plastic cover, take out the flowcell also, and place them in a safe place.

7）Dismantle the embedded printer cover,. Hold the front side of upper plastic cover with both hands; carefully lift the upper plastic cover. Notice that the upper and lower covers are connected with many groups of cable. Prevent excessive force that damages plug and sockets for cable connection. If separation of upper and lower covers is needed, the connection cable shall be pulled out from the socket. The sketch map after separation of upper and lower covers is as the following:

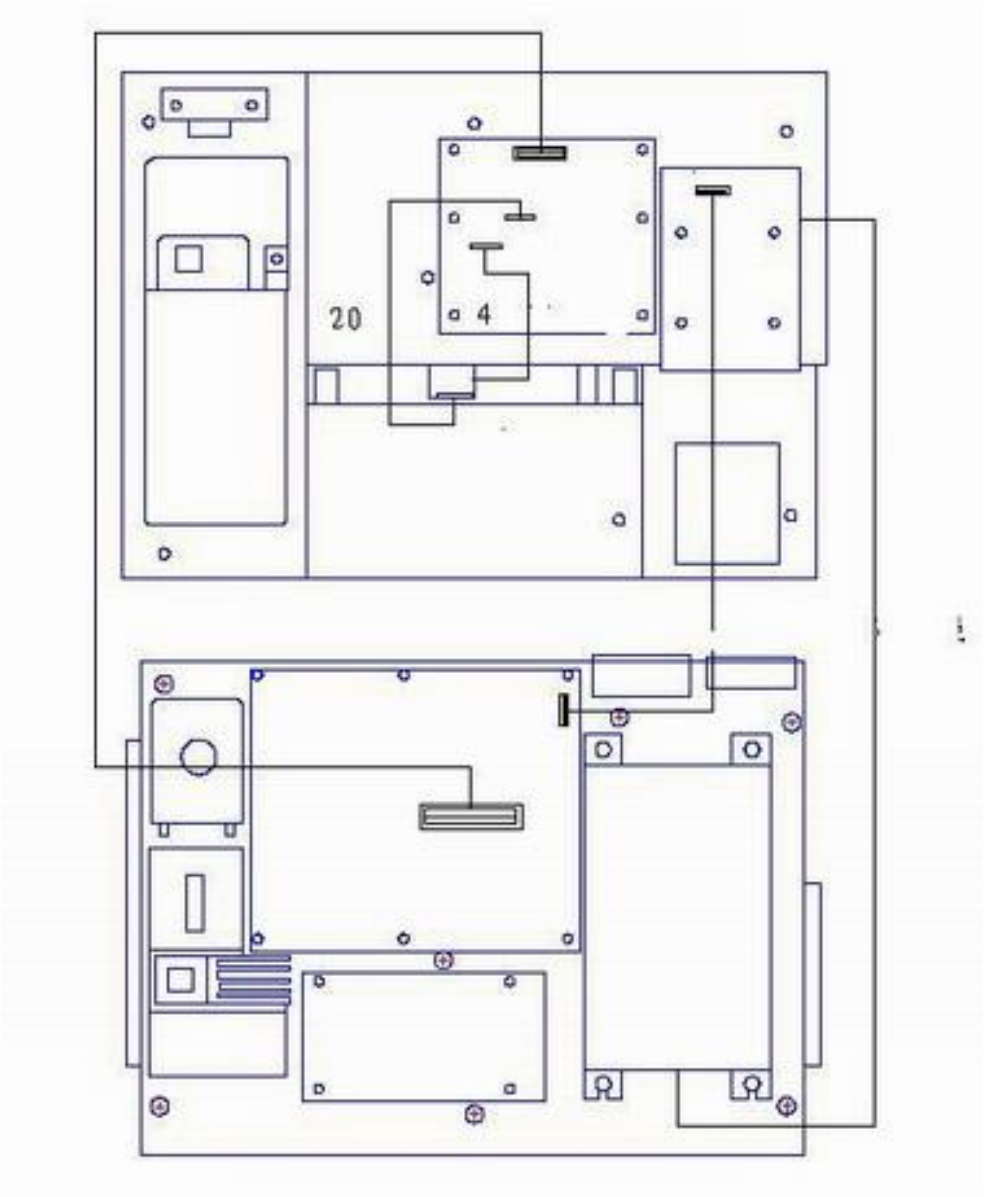
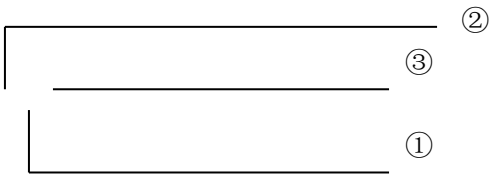


Diagram 2-2 Sketch map after the upper and lower covers is separated.

3.2 Lamp Replacement

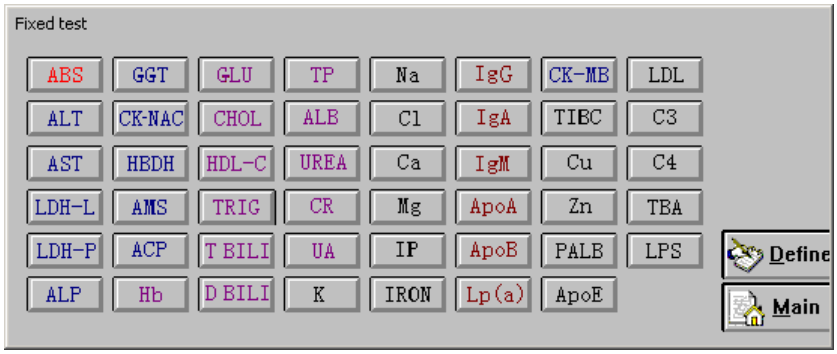
The structure of light source lamp is showing below：



①． fix screw. Its function is to fix the lamp on light path..
②、③．adjustment screws. Its function is to micro adjust the location of lamp in order to adjust the intensity of light.。
④． power source line for lamp. It can supply power for the lamp.

1. Turn off the machine, open the inner cover, pull out power source line of lamp, loose ② or ③ then unscrew the bolt①，take out the light source lamp.

2. Place a new lamp on the light source seat, screw the bolt①，but do not screw it too firm, connect the lamp power source line.
3. Screw the bolts ②、③ ，but do not screw it too firm
4. Open the machine and enter the main menu, select“ABS”option; after entry, set wavelength as 340nm and num of point as240，absorb distilled water to test.



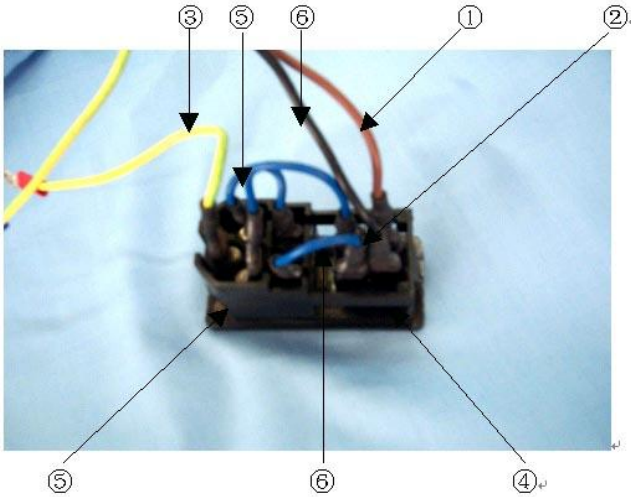
5. Move frontwards and backwards the location of the lamp to maximize the tested AD value.(value in the small bracket.e.g.3000)
6. Adjust bolts②、③，notice that the movement of ②、③ will lead to reverse effect to the AD value. Find out the right bolt which enable the tested AD value to about 3000（1600—3000 also permissible ），and then fasten it.

7. Fasten bolt①，and place the cover of the lamp.

3.3 Power Switch Replacement

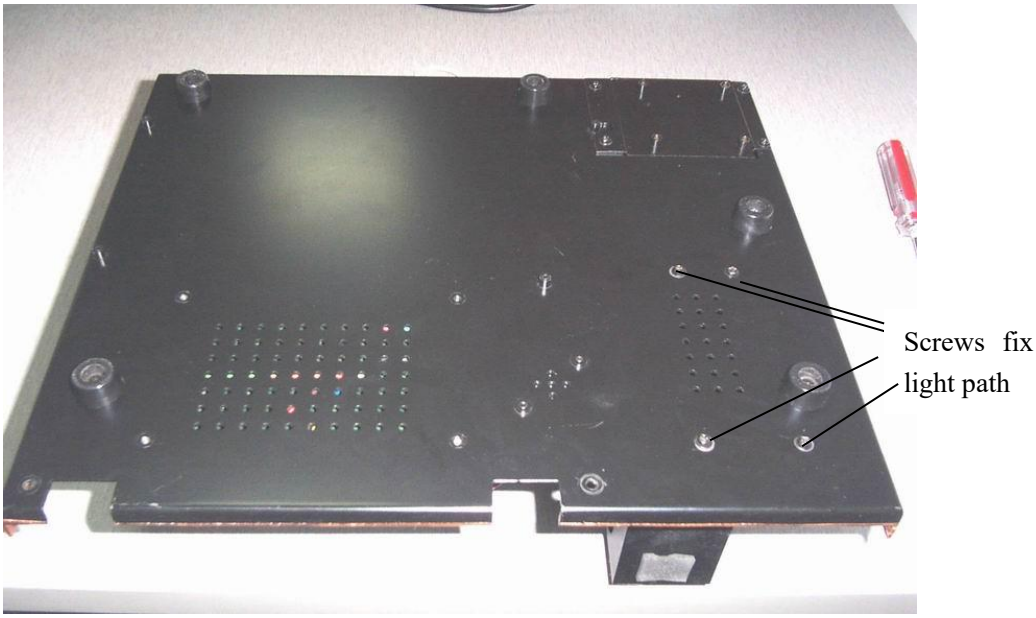
1. Turn off the machine, unscrew the bolts on base of instrument; take out the upper cover of instrument.
2. Pull out plugs①、②、③（diagram -1）。
3. Press firmly the flip plate④ on both end of switch, push outwards the entire switch seat and remove the switch seat（diagram-1）
4. Pull out tie-in of power source line⑤、⑥ with switch. Press firmly the flip plate and push outwards the switch.（diagram-1）。
5. Take a fine quality switch，the Ⅰon the switch faces the power source line socket, press in the switch.
6. Connect the tie-in of power source line⑤、⑥and switch.(diagram-1)。
7. Press the switch socket outwards into the base of instrument(diagrram-2)，the power source line socket shall face the fan.(diagram-2)。
8. Connected power source line①、②、③（diagram-1）。
9. Place the upper cover, firmly screw bolts. Open the machine (note that various connection line do not press on the bolt port to prevent damage of connection line.)。

Diagram-1

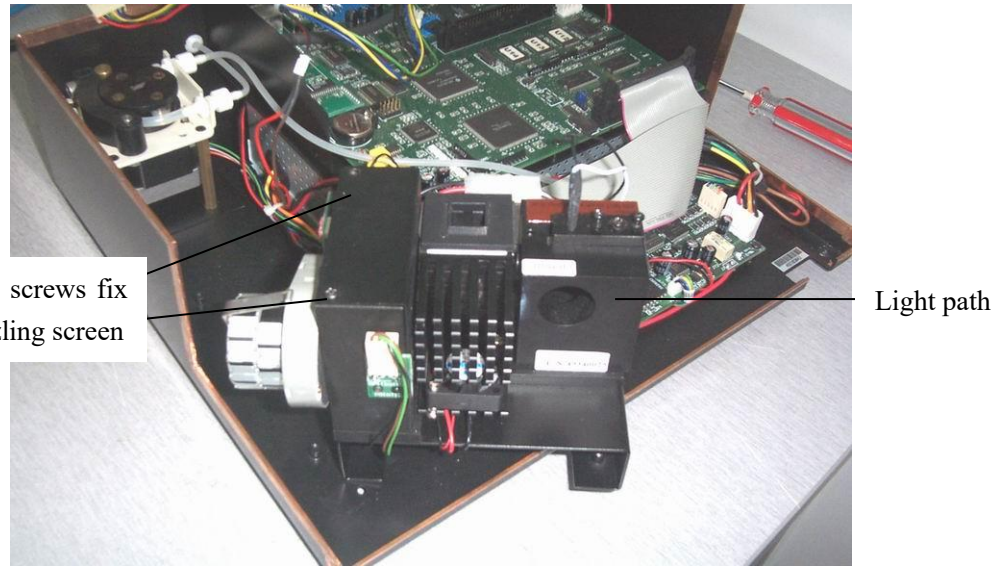


3.4 Light Filter Replacement

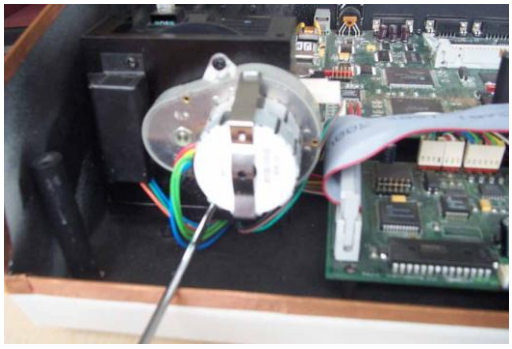
1、 Open the upper cover of **HERA**，beware of the connection lines between upper cover and main board. Loose the four screws in the base bottom, which fix the light path.



2、 Take off the light path, loose the two screws fix the anti dazzling screen, draw out anti dazzling screen, at the same time unscrew3 screws on the filter wheel inside..

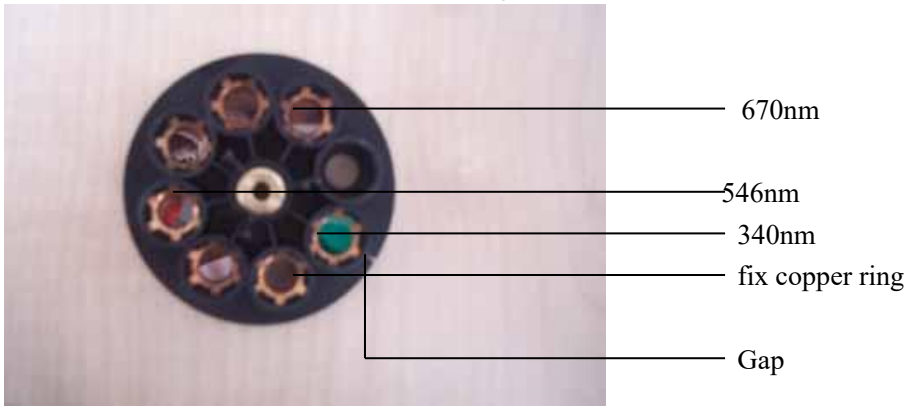


4、Unscrew the fix screw and dismantle the step motor.



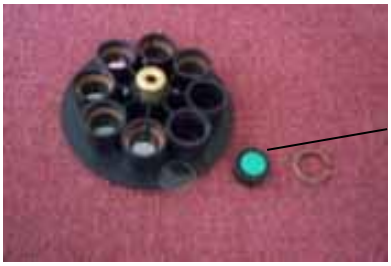
5、First draw out step motor and take out filter wheel as indicated in the drawing.

6 The taken out filter wheel is as the drawings：



7、 Filter with various wavelengths is show in the drawing. The gap related wavelength is 340nm,the wavelength 340nm～670n mare arranged clockwise.

8. Carefully take out fixing copper ring, take out used light filter.



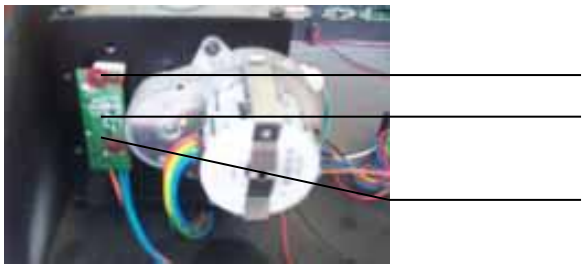
9、Replace new filter with related wavelength, fix it with cooper ring. And the replacement is completed.

10、Reverse the above dismantling procedure, then the filter can be place in the anti dazzling screen cassette .

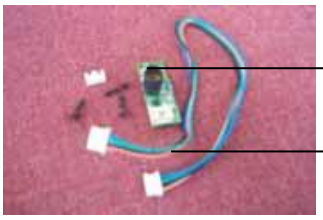
3.5 Change Signal Receiver assembly

The function of signal receiver is to change the varying light signal into the electric signal and then calculated and process. It is the most important component in the light path system .The change method is as follows.

1、Unscrew screws, remove the cassette, the signal receiver plate can be seen.



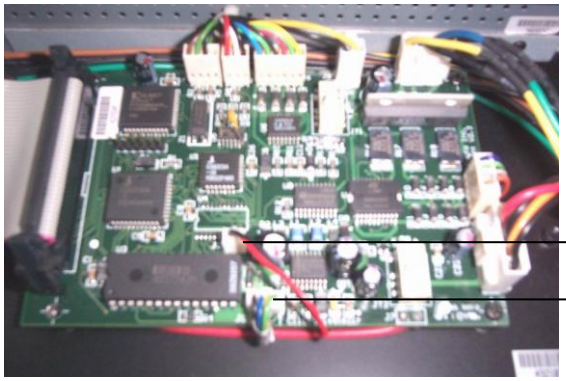
2、Unscrew 3 screws with red mat, draw outwards the receiver board and the whole assembly can be seen.



3. Replace new signal receiving assembly, connects power source line, screw the screws, add mat and equip. Thus the replacement is finished.

4、Connect the other end of power source line in the 4pin and 2pin plugs of front board. The signal

receiver can work normally.



3.6 Pipeline Change

1、Change of aspirate tube.

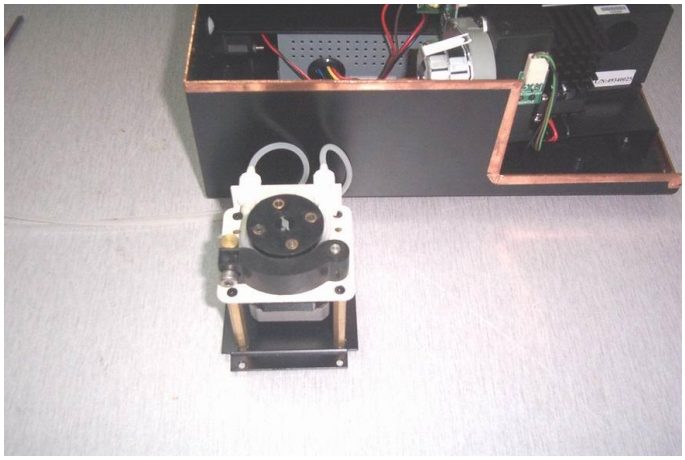
Hold the coarse side of flowcell. Carefully pull out the aspirate tube from the sample feeding port of flowcell. And replace it with a new one.

2、Change of transfer tube：

Hold the coarse surface of flowcell, pull out the transfer tube from the liquid draining port, screw out another end from pump tube, and equip with new transfer tube.

Note：Carefully perform the above operations, do not let water drop on main board..

3、Pump replacement：Loose the pump assembly fixing screws, and then take the pump assembly carefully.



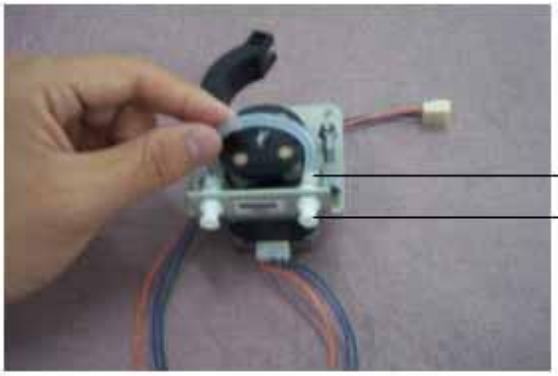
The whole view of pump is as following:

The copper column is used to fix the pump

1、 Unscrew the adjustment screw and break off the clip button and clip bar.

2、Open clip button, the pump tube can be seen.

3、Take out the pump tube, tear the belt, then the pump tube can be removed from the white cuff.



4、Replace a new pump tube, tie the belt, operate reservedly so that the replacement can be completed. At last adjustment firmness with adjustment screw.

Chapter 4 Daily Maintenance

4.1 General Introduction

HERA is a clinic precision analyzer. To keep the instrument in a fine state, daily maintenance shall be performed. The maintenance of **HERA** is very simple, but it shall be done earnestly and carefully.

4.2 Clean instrument

4.2.1 Clean outer surface of instrument.

- Keep clean the working environment of instrument.
- Neutral detergent and wet cloth wiping are needed in cleaning the surface of equipment.
- Use soft cloth to clean the liquid crystal display.

Warning：Do not let any solvent, grease or eroded matter to contact the instrument.

4.2.2 Clean flowcell

The clean of flowcell shall be kept so as to ensure the accuracy and reliability of test results.

1. Outer flowcell clean

a、According to the requirement to place flowcell.（refer to1.1.7）。

b、If the outer flowcell is polluted, take a soft cloth soaked with water to clean it softly.

2. Inside flowcell clean

a. Put vessel with distilled water under the aspirate tube, push **RINSE** key to start continuous cleaning function. Push **RINSE** key again to stop cleaning. Generally the cleaning takes half a minute.

b. The detergent of glass vessel or NACLO, （0.1N）、tween-20 diluted liquid （2-3drop/L） are used to clean flowcell. Push **RINSE**key to absorb the detergent, again push **RINSE**key to stop the rotation of pump. Let the detergent to settle in flowcell for 5 minutes. At last continuous clean it for 1 minute by distilled water. If it cannot be cleaned with once cleaning, detergent can be used to clean for a second time.

The flowcell shall be cleaned in the following circumstances.：

- The water blank difference is too large when open the machine.

- Transfer test items.
- Before closing the machine.

Warning：Do not let reaction liquid or other pollutant in the flowcell for a long time.

Chapter 5 Common Malfunction List

Malfunction	Settlement
time pop up randomly, date can not be stored after change.	Battery used out，replace another battery. Check whether the D2、D3 beside battery is damaged, replace it.
Water blank value is not stable, it is high and negative value	Bubble is liable to be absorbed in the flowcell. The flowcell is dirty ,clean the flowcell with 5%NaClO for several times and clean it with distilled water. Sample feeding tube is break; replace it. Signal receiving assembly is damaged, replace it. Air is absorbed in the first machine opening, switch off the machine and absorbed again the distilled water.
Great absorbency differences	It is because that air is absorbed, absorb again distilled water. Change for new distilled water There is air in the pipelines, re-connect or change pipeline. The light intensity of lamp is low, change lamp. The flowcell is damaged, change the flowcell ， The flowcell has not been insert to the bottom.
No test results	There are no factors; factor does not been input in the kinetic method. Standard has not been set in end-point method and two points method, or the standard was set but haven't get the factor in the calibration..
The test is not accurate, there is great deviations in results.	The parameter is not right, re-input is needed. There is bubble or defilement in flowcell. Do it again after cleaning. The light filter is aging, replace light filter Check whether the front board, Signal receiver are damaged,. The aspirate volume is too low, increase the volume . The reaction liquid is polluted.
Low light intensity	There is dirt in light path, blow with ear absorb ball or dismantle light path to clean(use lens wiping paper) The lamp is in the wrong location, make re –adjustment Check whether the lamp and light filter are aging, change if there is any.
Blank screen and break down when start the machine	The switch fails, change the switch. Power source fails（import to J3 must be 5V，J10 must be 5V、6V、0V，J11must be 12V、5V、0V）replace it. The software is damaged, upgrade the software.

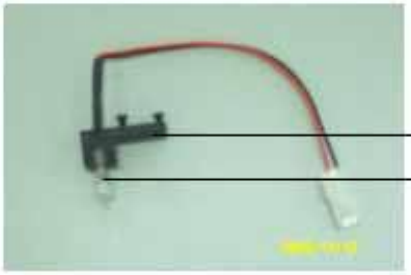
	The small drop-out line (old machine) is damaged, replace it. Check chip of main board (7709)，FLASH chip，9735chip。Replace the damaged ones.
Disorder screen	Check whether the FLASH chip on the main board is damaged, replace it if there is any LCD display line is in poor contact, pull out or re-plug in or use glue. (old machine)
Historical data item cannot be entered.	Check whether the FLASH ROM chip on mainboard is damage. Change it if there is any.
Temperature control fails	In front board J11，J8plug has poor contact , pull out and replace it. U10 is invalid welding or damaged, re-welding or replace it. The peltier is damaged（it shall be 4 ohm in empty load）change it.
The pump do not rotate, give out noise, and do not absorb liquid.	The pump value and receiver plate value doesn't adjusted after upgrading. Re-enter the pump value and receiver plate value Check the 4M crystal vibration on front board is damaged, change it if there is any damage.
It is reported that "please check whether the filter wheel is in normal operation."	The sleeve of light sensor of receiver end newly replace is too long, use scissors to shear it . Check if the positioning light coupling is damaged, replace the positioning light coupling. Check whether the L297，L298，5804LB on the front board is damaged or not，change it if there is any.
Appear 4095	Newly replaced filter, add attenuation plate or adjust position of lamp. The filter wheel does not rotate in place, use driver to fix the filter wheel, check the fix light coupling, adjust position of light coupling or replace it
The report cannot be printed.	Reset related printer in system configuration, pull out plug or replace it. Print cable and change printer.
The analyzer cannot starts.	Check whether the instrument is power on. Check whether the power source plug is loosened. Check the fuse Check the voltage
The printer cannot start.	Check whether the power source plug is loosened. Check ON/OFF button Check fuse

The printer can not print	Switch on Analyzer first and then switch on printer. Check whether the connection is in normal state.
There is no liquid in flowcell.	Check whether the pump is in normal operation. Check the connections of aspirate tube and flowcell port etc. The aspirate tube is too long or too short. The aspirate tube may be blocked and must be clean and unblock it. The flowcell is very dirty.
The results has low repeat performance.	There is bubble in flowcell, and cleaning is needed. Check the liquid absorbing of flowcell. Aspirate tube inserts too deep into the flowcell, pull it out a little.
The absorbing volume of flowcell is not constant.	Check whether the aspirate tube is blocked or not The pump tube may need to replace.
The quality control is not in the range of targeted value.	Check the valid period of the reagent. Check whether the setting is right or not and whether parameter revision is needed Ensure the quality control cannot be polluted. Re-measure with another method. Check the flowcell; use another reagent and re-measure.
When break line and set standard in end-point method，it is suggested that “standard set error”	Check whether standard material is absorbed correctly. Please exit the standard setting procedure and enter, reset the standard.
Temperature control time is too long.	The normal work temperature range is 15℃-32℃

Note：If unsolvable error is found during the operation process or re-appear of certain error, please contact the supplier.

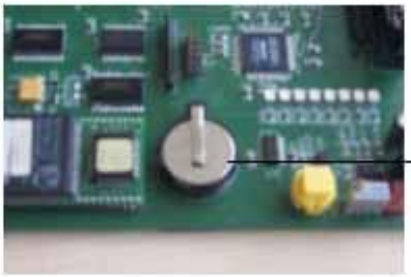
Chapter 6 Common Fittings List

Common Fittings	Fitting Number		
Light filter 340nm	1212	001	0
Light filter 405nm	1212	002	0
Light filter 500nm	1212	003	0
Light filter 546nm	1212	004	0
Light filter 578nm	1212	005	0
Light filter 620nm	1212	006	0
Light filter 670nm	1212	007	0
6V 10W halogen tungsten lamp	1212	009	0
Main board battery	1222	018	0
Signal receiving assembly	2100	003	1
Power upper cover	1211	040	0
Power base	1211	041	0
Power PCBA	2100	006	0
Front board	2100	001	0
Main board	2100	005	0
Key board plate	2100	004	0
Power switch (with socket)	1212	012	0
FLASH Rom	1110	072	0
LCD display	1212	015	0
LCD display cable	1213	003	0
Voltage inverter	1212	013	0
Peltier	1212	019	0
Trough light coupling	1190	004	0
Flowcell(two tube diameters)	1212	010	2



Lamp holder

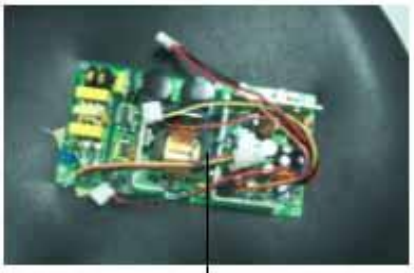
lamp



Main board battery

Signal receiver

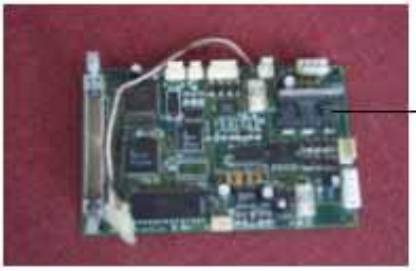
Power lower cover



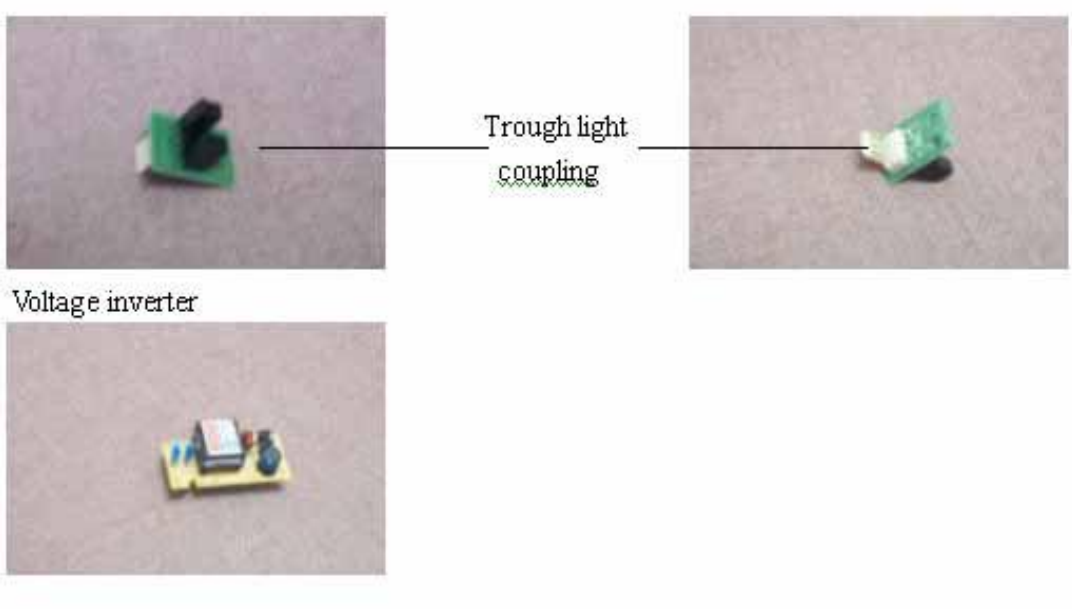
Power PCBA plate

Power complete machine

Power upper cover



Front board



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