HumaCount 5D

| Service Manual

CE

Cat No. 16450/2

Human

Diagnostics Worldwide

REVISION LIST OF THE MANUAL

Rev. /DATE.	REVISION DESCRIPTION
01/2017-10	First Edition
02/2018-02	Isolation Chambers
03/2020-06	Maintenance Procedure

SYSTEM VERSION

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SERVICE AND SUPPORT

TABLE OF CONTENTS

1 SAFETY INSTRUCTIONS

1.1 Introduction

This manual is considered part of the instrument and must be available to the operator and the maintenance personnel. For accurate installation, use and maintenance, please read the following instructions carefully.
In order to avoid damage to the instrument or personal injury, carefully read the ”GENERAL SAFETY WARNINGS”, describing the appropriate operating procedures. Please contact your HUMAN authorised local Technical Service in the event of instrument failure or other difficulties with the instrument.

1.2 User Warranty

HUMAN warrants that instruments sold by one of its authorised representatives shall be free of any defect in material or workmanship, provided that this warranty shall apply only to defects which become apparent within one year from the date of delivery of the new instrument to the purchaser.
The HUMAN representative shall replace or repair any defective item within this warranty period at no charge, except for transportation expenses to the point of repair.
This warranty excludes the HUMAN representative from liability to replace any item considered as expendable in the course of normal usage, e.g.: lamps,valves, syringes, glassware, fuses, tubing etc.
The HUMAN representative shall be relieved of any liability under this warranty if the product is not used in accordance with the manufacturer‘s instructions, altered in any way not specified by HUMAN, not regularly maintained, used with equipment not approved by HUMAN or used for purposes for which it was not designed.

1.3 Intended Use of the Instrument

The instrument must be used for its intended purpose (see paragraph 2). It must be operated in perfect technical conditions, by qualified personnel, in such
working conditions and maintained as described in this manual, in the GENERAL SAFETY WARNINGS. This manual contains instructions for qualified professional operators.

IVD

1.4 General Safety Warnings

Use only chemical reagents and accessories specified and supplied by HUMAN and/or mentioned in this manual. Place the product so that it has proper ventilation.

The instrument should be installed on a flat, stationary working surface, that is free of vibrations.

Do not operate in area with excessive dust.

Operate at temperature and at a humidity level in accordance with the specifications listed in the user manual.

Do not operate this instrument with covers and panels removed.

Use only the power cord specified for this product, with the grounding conductor of the power cord connected to earth ground.

Use only the fuse type and rating specified by the manufacturer for this instrument.

The use of fuses with improper ratings may pose electrical and fire hazards.

To avoid fire or shock hazard, observe all ratings and markings on the instrument.

Do not power the instrument in environments that are potentially explosive or at risk of fire.

Prior to cleaning and/or performing maintenance on the instrument, switch off the instrument and remove the power cord.

Only cleaning materials described in this manual may be used, as other materials may damage parts. It is recommended to always wear protective clothing and eye protection while using this instrument.

All warning symbols that appear in this manual must be carefully observed.

1.5 Disposal Management Concept

The applicable local regulations governing disposal must be observed. It is the user's responsibility to arrange for proper disposal of the individual components.

All parts which may contain potentially infectious materials must be disinfected by suitable, validated procedures (autoclaving, chemical treatment) prior to disposal. Applicable local regulations for disposal must be carefully observed.

The instruments and electronic accessories (without batteries, power packs etc.) must be disposed of according to the applicable local regulations for the disposal of electronic components.

Batteries, power packs and similar power sources must be removed from electric/electronic parts and disposed of in accordance with applicable local regulations.

1.6 Biohazard Warning

Analytical instruments for in vitro diagnostic application involve the handling of human samples and controls which should be considered at least potentially infectious. Therefore every part and accessory of the respective instrument which may have come into contact with such samples must equally be considered as potentially infectious.
The „BIOHAZARD“ warning label must be affixed to the instrument prior to first use with biological material!

FIGURE 1
Biological Hazard Symbol

1.7 Instrument Disinfection

Before performing any servicing on the instrument it is very important to thoroughly disinfect all possibly contaminated parts. Before the instrument is removed from the laboratory for disposal or servicing, it must be decontaminated. Decontamination must be performed by authorised well-trained personnel, and in observance of all necessary safety precautions.

1.8 Who Should Read This Manual of HumaCount 5D

This service manual contains information written for clinical laboratory professionals to:

- Learn about the hardware and software of the analyzer.
- Customize system settings.
- Perform daily operations.
- Perform system maintenance and troubleshooting.

1.9 Special Symbols used in this Manual and on the Analyzer

When you see...	Then...
	Follow the instruction in the manual related to the the symbol to avoid potential biocontamination.
	Follow the instruction in the manual related to the symbol to avoid personnel injury.
	Follow the instruction in the manual related to the symbol to avoid analyzer damage and failure, or unreliable analysis results.
Note	Follow the instruction in the manual related to the symbol. The symbol highlight the important information in operating procedures that calls for special attention.
	Puncture Warning: The sampling probe is sharp and may contain biohazardous materials. Special care should be taken when working with it.
	Laser Warning: This sign serves as a reminder of laser radiation.

When you see...	It means...
	Caution
	Biohazard
	Excercise caution to prevent puncture
	Laser radiation warning: It is Class 3R laser product with 5.0 mW maximum power output at 635nm. Do not stare into the laser beam or view directly with optical instruments.
	Instruction for Moving
	Network interace

When you see ...	It means
	Protective grounding
	Alternating current (AC)
	For in vitro diagnosis only
	Lot No.
	Expiry date
	Serial No.
	European CE declaration of conformity
	Date of manufacture
	Manufacturer
	Storage temperature
	Humidity level for storage
	Atmospheric pressure level for storage
	Consult the operator's manual
	Avoid sunlight
	Keep dry
	No rolling
	No Stacking
	Let this side face upward
	Fragile, handle with care
	Recyclable materials
	The analyzer, after being scrapped, should not be disposed with other household garbage, instead, it should be collected and recycled following the disposal instructions for scrapped electronic and electrical equipment.

2 INSTRUMENT CONFIGURATION

2.1 Mechanical Components

The Auto Hematology Analyzer consists of the main unit and its accessories.

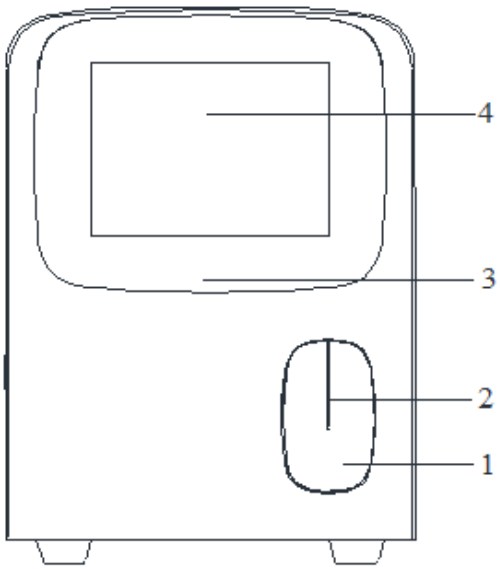


FIGURE 2
Front of the analyzer

1 **Aspirate key**
2 **Sample probe**
3 **Status indicator**
4 **Touch screen**

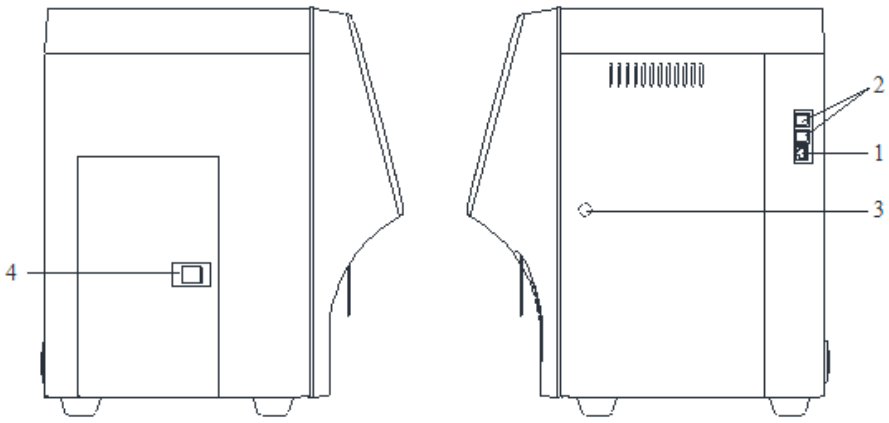


FIGURE 3
Side view of the analyzer

1 **LAN network interface**
2 **USB Interface**
3 **Right side door buckle**
4 **Left side small door buckle**

FIGURE 4

Back view of the analyzer (panel cover, rear shell removed

1 Power switch
2 Power supply input connector
3 Cooling fan
4 Waste outlet connector
5 Diluent inlet connector
6 BNC socket for the diluent sensor
7 BNC socket for the waste sensor
8 Ground studs

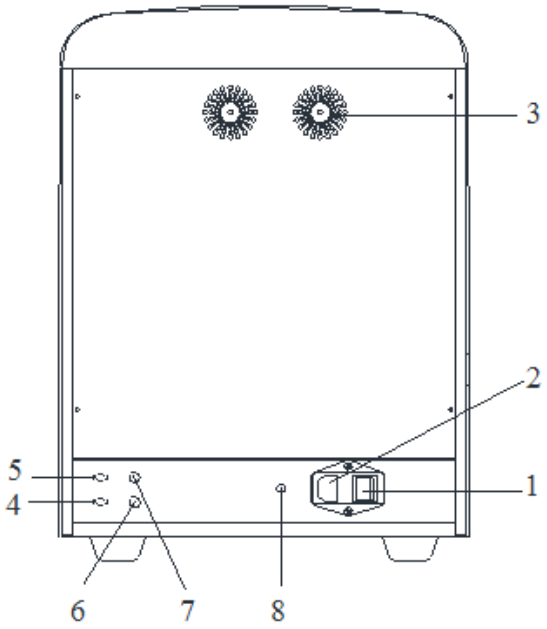
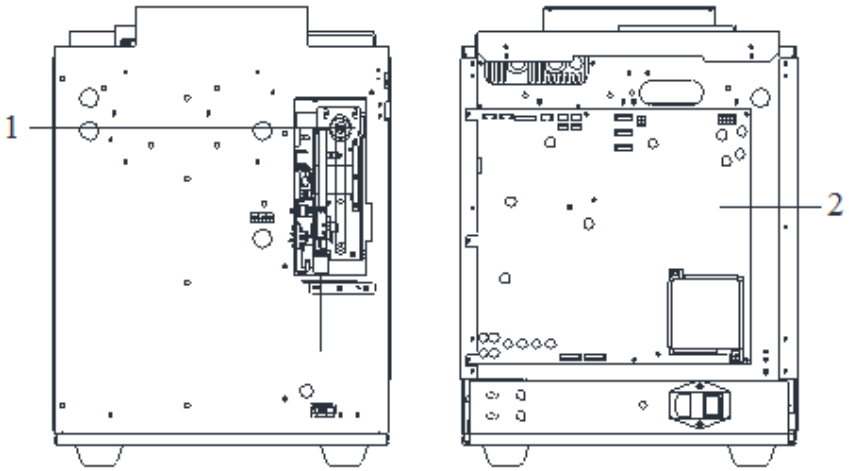


FIGURE 5

Back view of the analyzer (panel cover, rear shell removed

1 Sampling assembly
2 Main control panel



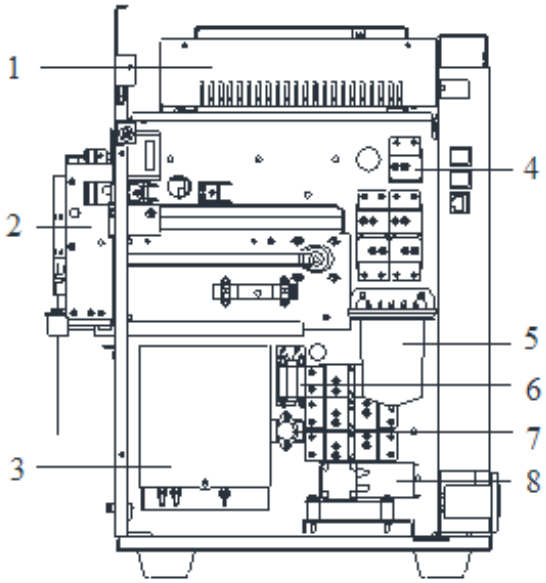


FIGURE 6
Right-side view of the analyzer (right-side door removed)

1 **Powersupply**
2 **Sampling assembly**
3 **Counting bath assembly**
4 **Electromagnetic valve assembly**
5 **Negative-pressure chamber**
6 **Preheating bath assembly**
7 **Pinch valve**
8 **Liquid pump assembly**

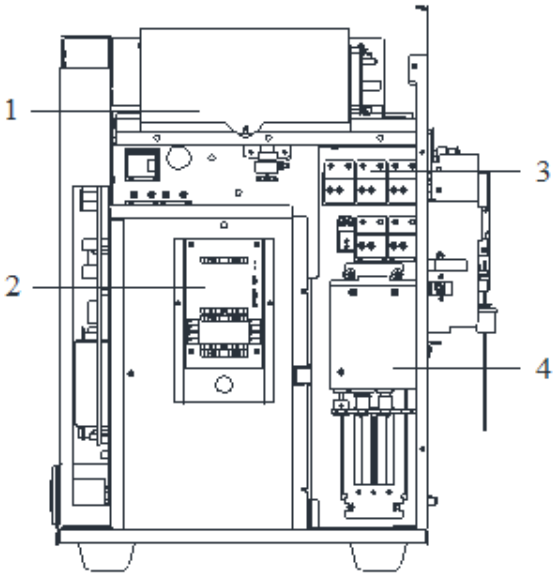


FIGURE 7
Left-side view of the analyzer (Left-side door removed)

1 **Optical assembly**
2 **Reagent testing panel**
3 **Electromagnetic valve assembly**
4 **Sample syringe**

2.2 Hydraulics System

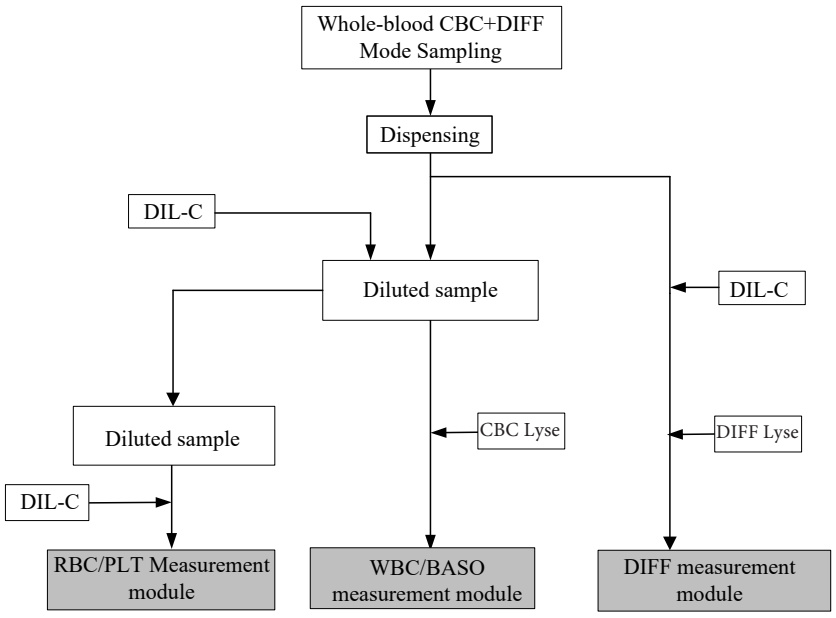
The hydraulics system consists of the DIFF/WBC measurement module, the HGB measurement module, the RBC/PLT measurement module, the sampling and blood dispensing module, the power supply and waste discharge module, and the status monitoring module. Detailed description:

- DIFF/WBC measurement module
- Consists of the dosing syringe, WBC reaction bath, flow chamber, tubing, and valve.
- HGB measurement module
- Consists of the dosing syringe, WBC reaction bath, tubing, valve, HGB emission light, and HGB receiving tube.
- RBC/PLT measurement module:
- Consists of the dosing syringe, RBC/PLT counting bath assembly, tubing, and valve.
- Sampling and blood dispensing module
- Consists of the sample probe, sample syringe, washhead, and sampling assembly.
- Power supply and waste discharge module
- Consists of the vacuum chamber, liquid pump, valve, and tubing.
- Status monitoring module

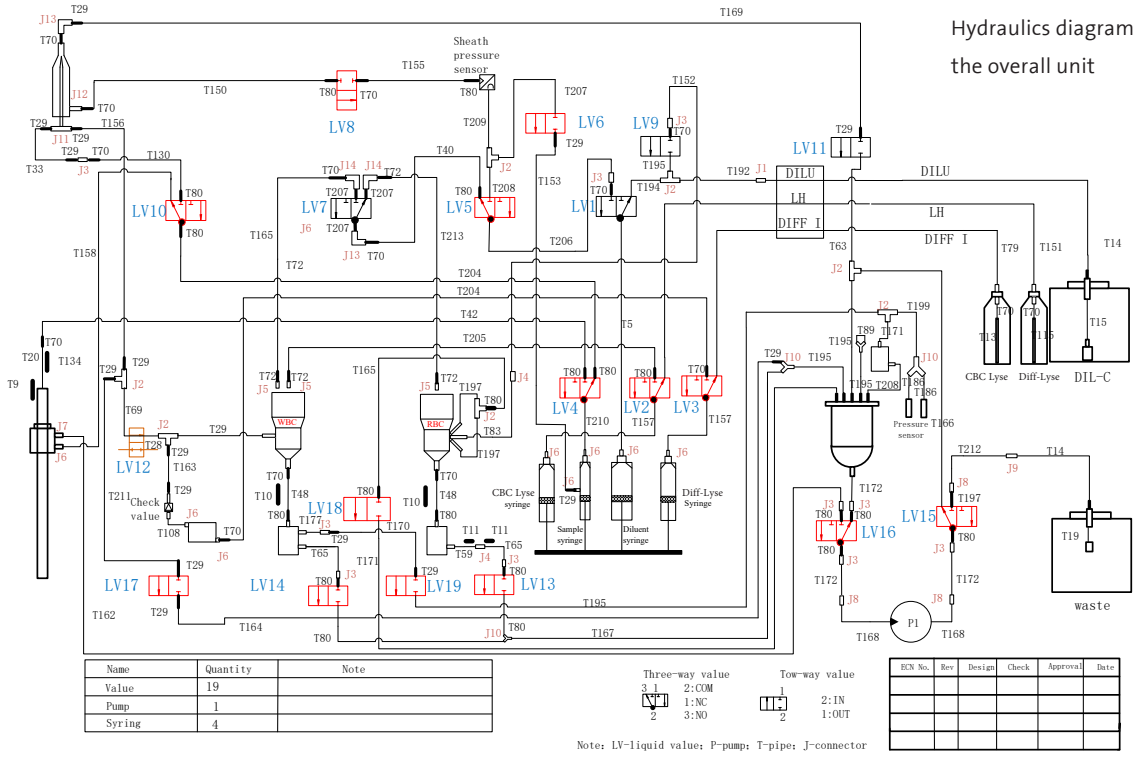
Consists of the optocoupler and sensor.

2.2.1 SCHEMATIC DIAGRAM OF THE HYDRAULIC SYSTEM

FIGURE 8
Schematic diagram of the hydraulic system



2.2.2 HYDRAULICS DIAGRAM FOR THE OVERALL UNIT



Name	Quantity	Note
Value	19	
Pump	1	
Syring	4	

ECN No.	Rev	Design	Check	Approval	Date

FIGURE 9
Hydraulics diagram for the overall unit

2.2.3 DIFF/WBC MEASUREMENT CHANNEL

2.2.3.1 Channel Principles and a Description of their Functions

- Measurement principles: Flow cytometry and scattering emission of the semiconductor laser
- Measurement parameters: WBC, Mon#, Mon%, Lym#, Lym%, Neu#, Neu%, Eos#, Eos%, Bas#, Bas%
- Graph information: DIFF 2D scattergram and BASO 2D scattergram.
- Reagents for use
- CBC Lyse: Lyses the RBC cells and WBC CBC count
- DIFF Lyse: For the optical differentiation of WBC cells
- DIL-C Diluent: This diluting and cleaning agent can provide an electrically conductive environment and is used as system liquid.
- Function description
  - DIFF parameters measurement

    The diluted sample is mixed well for a full reaction with DIFF Lyse in the WBC bath.Then the sample is placed between the flow chamber inlet and

the sample injection tube; meanwhile, the sheath flow is activated and kept steady so that it can hold the sample in motion until it reaches the measurement section of the flow chamber. The sample injection tube, at a constant speed and within a certain period of time, pushes the sample fluid wrapped in the sheath flow so that it travels steadily through the flow chamber for optical measurement.

- WBC parameters measurement
  After the first section sheath flow is measured, add the quantitative CBC-Lyse into WBC reaction bath to make it react fully. After that, place the sample between the inlet of the flow chamber and sample injection tube, and open the sheath flow and make it stable, then the sheath flow wrapping the sample reaches the measurement section of the flow chamber.
  The sample injection tube, at a constant speed and within a certain period of time, pushes the sample fluid wrapped in the sheath flow so that it travels steadily through the flow chamber for optical measurement.
  The measurement channels are cleaned after measurement to restore them to their pre-measurement status.

2.2.3.2 Measurement Process

The measurement process for the DIFF measurement module is as follows:

1. Dosing: The diluent syringe is first applied to add the diluent into the WBC bath, and then the sample probe is used to add the blood sample into the WBC bath, where they are mixed with Diff Lyse evenly for incubation.
2. Mixing: Open Valve LV19 to generate air bubbles through the intermittent valve opening to mix the sample well.
3. Measurement: Aspirate the incubated sample from the WBC bath using the sample syringe, then close LV12 and open LV01, LV05 and LV08 so that the sheath flow syringe can push the sheath fluid into the flow chamber, thereby forming a stable sheath flow. Then push the sample into the flow chamber using the sample syringe. This is how the sample, bundled in the sheath flow, enters the measurement section for measurement.

2.2.3.3 The measurement process for the WBC measurement module is as follows:

1. Dosing: The diluent syringe is first applied to add the diluent into the WBC bath, and then the sample probe is used to add the blood sample into the WBC bath, where they are mixed evenly. After aspirating the diluted sample for the RBC channel measurement, CBC Lyse is added into the WBC bath for mixing and incubation.

2. Mixing: Open Valve LV19 to generate air bubbles through the intermittent valve opening to mix the sample well.
3. Measurement: Aspirate the incubated sample from the DIFF bath using the sample syringe, then close LV12 and open LV01, LV05 and LV08 so that the sheath flow syringe can push the sheath fluid into the flow chamber, thereby forming a stable sheath flow. Then push the sample into the flow chamber using the sample syringe. This is how the sample, bundled in the sheath flow, enters the measurement section for measurement.
4. Cleaning: To clean, open LV01 and LV07, and add the diluent into the WBC bath using the dosing syringe.
5. Waste discharge: Waste is discharged by opening Valve LV14, LV15 and Pump P1.

2.2.4 HGB MEASUREMENT CHANNEL

2.2.4.1 Channel Principles and a Description of their Functions

- Measurement principles: Colorimetric method
- Measurement parameters: HGB
- Reagents for use
  - CBC Lyse: Lyses the RBC and combines with hemoglobin.
  - DIL-C Diluent: This diluting and cleaning agent can provide an electrically conductive environment and process cells and so on in bulk.
  - Function description

HGB is measured by colorimetry: Prior to the addition of the blood sample, the baseline voltage of the diluent is first measured. Then the blood sample and lyse are mixed well for a complete reaction so that the parameter voltage of the sample can be measured. HGB can then be calculated based on the local voltage and parameter voltage according to Lambert-Beer's Law.

2.2.4.2 Measurement Process

The measurement process for the HGB measurement module is as follows:

1. Dosing: The diluent syringe is first applied to add the diluent into the WBC bath, and then the sample probe is used to add the blood sample into the WBC bath, where they are mixed evenly. After aspirating the diluted sample for the first time, CBC Lyse is added into the WBC bath for incubation.
2. Mixing: Open Valve LV19 to generate air bubbles through the intermittent valve opening to mix the sample well.

3. Measurement: The blood sample and lyse are mixed well for a complete reaction so that the parameter voltage of the sample can be measured. HGB can then be calculated based on the local voltage and parameter voltage according to Lambert-Beer's Law.

2.2.5 RBC/PLT MEASUREMENT MODULE

2.2.5.1 Channel Principles and a Description of their Functions

- Measurement principles: Impedance method
- Measurement parameters: RBC and PLT
- Graph information: RBC histogram and PLT histogram
- Reagents for use
  DIL-C Diluent: This diluting and cleaning agent can provide an electrically conductive environment and is used as system liquid.
- Function description
  RBC and PLT measurement makes use of the impedance method: After the addition of CBC Lyse, the red blood cells are dissolved. Through the negative-pressure chamber (with a negative pressure of -30Kpa), the sample is aspirated out of the WBC bath through the aperture. The RBC and PLT particles generate electric pulses of various amplitudes when traveling through the aperture, allowing them to be counted according to the number of pulses emitted.

2.2.5.2 Measurement Process

The measurement process for the RBC/PLT measurement module is as follows:

1. Dosing: The diluent syringe is first applied to add the diluent into the RBC/PLT bath as the base liquid, before using the sample probe to aspirate the sample diluted for the first time from the WBC bath into the RBC/PLT bath.
2. Mixing: Open Valve LV13 to generate air bubbles through the intermittent valve opening to mix the sample well.
3. Measurement: Open Valve LV18 to aspirate the sample out of the RBC/PLT bath through the aperture by means of the negative-pressure chamber (with a negative pressure of -30Kpa). The RBC and PLT particles generate electric pulses of various amplitudes when traveling through the aperture, allowing the RBC and PLT cells to be counted according to the number of pulses emitted.
4. Cleaning: To clean, open Valve LV02 and add the diluent into the RBC/PLT bath using the diluent syringe.
5. Waste discharge: Waste is discharged by opening Valve LV13, LV15 and Pump P1.

2.2.6 SAMPLING AND BLOOD-DISPENSING MODULE

This module consists of the sample probe, the sample injection tube, the sampling tube, the washhead, the horizontal motor, and the vertical motor.

This is how the sampling and blood-dispensing module works:

Open LV04 and aspirate the sample from the testing tube using the sample syringe→Clean the outer wall of the sample probe→ ...until it reaches the WBC bath→Put aside a fixed amount of blood in the WBC bath→Clean the outer and inner wall of the sample probe→Aspirate out of the WBC bath a fixed amount of the sample that has been diluted once→Clean the outer wall of the sample probe and move the sample probe to the RBC bath→Add into the RBC bath the sample that has been diluted once→Clean the outer wall of the sample probe to complete the entire process of sampling and blood dispensing.

In summary, this module works by aspirating the sample and dispensing a fixed amount of the sample into the corresponding reaction baths, while cleaning the inner and outer walls of the sample probe to prevent cross-contamination.

2.2.7 POWER SUPPLY AND WASTE DISCHARGE MODULE

- Power supply module
- By opening LV15 and Pump P1 to establish a negative pressure of -30Kpa, this module provides propulsion for the counting of the impedance channel.
- Waste disposal module

  This module consists of the following five parts:
  - Discharge of waste resulting from washhead cleansing
  - LV15, LV16 and Pump 1 are opened to discharge any waste resulting from using the washhead to clean the sample probe.
  - Discharge of waste from the WBC bath
  - Valve LV14, LV15 and Pump P1 are opened to discharge any waste from the WBC bath.
  - Discharge of waste from the RBC/PLT bath
  - Valve LV13, LV15 and Pump P1 are opened to discharge any waste from the RBC/PLT bath.
  - Discharge of waste from the impedance counting bath

    After any waste from impedance counting (RBC/PLT counting) flows through the aperture, and after any waste that results from cleaning the rear section of the RBC/PLT bath flows into the negative-pressure chamber, Valve LV15 and Pump P1 are opened for waste discharge.

2.2.8 STATUS MONITORING MODULE

This module involves:

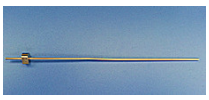
- Monitoring of DIL-C

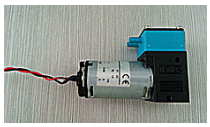
Detection is done by way of a floating sensor; the float moves downwards the diluent level falls, and an alarm is activated when it reaches empty.

- Monitoring of CBC Lyse
  An optocoupler is used to monitor the CBC Lyse level; as it gets lower, the optocoupler's status changes until an alarm is activated once there is no CBC Lyse left.
- Monitoring of DIFF Lyse
  An optocoupler is used to monitor the CBC Lyse level; as it gets lower, the optocoupler's status changes until an alarm is activated once there is no CBC Lyse left.
- Monitoring of waste overflow
  Waste overflow is done by way of a floating sensor; as waste levels rise, the float moves upward until it eventually activates an alarm indicating that it is full.

2.2.9 HYDRAULIC COMPONENTS

List of Hydraulic Components

No.	Component No.	Illustration	Function Description	Remarks
1	Sample probe		Collects blood samples in the testing tube and dispenses a certain portion of the sample to be placed in the corre-sponding counting bath	None
2	Washhead		Cleans the outer and inner walls of the sample probe	None
3	Two-way valve (L)		On-off switch for fluid control	None
4	Three-way valve (L)		Directional hydraulic valve	None
5	Two-way valve (S)		On-off switch for fluid control	None

6	Three-way valve (S)		Directional hydraulic valve	None
7	Liquid pump		Discharges waste and creates a vacuum	None
8	Syringes		Quantitatively divide the blood, and add with diluent and lyse	None
9	Isolation chambers		Isolation chamber for pressure chamber (Upper port blocked)	
			Isolation chamber with strainer for RBC chamber (Upper port blocked)	
			Isolation chamber with strainer for WBC chamber	

10	WBC/HGB bath		Sample incubation bath The counting bath is accompanied by a HGB emission light and a HGB signal receiving device for HGB measurement.	None
11	RBC/PLT bath		This consists of the front bath and the rear bath, with an aperture in between; the sample flows from the front bath through the aperture to generate electric pulses that facilitate RBC and PLT counting.	None
12	Negative-pressure chamber		- This chamber builds the negative pressure needed to drive impedance-channel counting - This chamber builds positive pressure needed to drive the mixing - This chamber builds negative pressure needed to flush the rear bath of the impedance counting bath and to discharge the waste liquid in the counting bath.	None
13	One-way valve		Separate the lyse and the diluent, to prevent the lyse from back flow	None

List of Tube Types

Tube No.	Human Cat. number	Tube No.	Human Cat. number
T80	16450/526	T162	16450/530
T152	16450/526	T172	16450/530
T64	16450/526	T63	16450/530
T33	16450/526	T69	16450/534
T177	16450/526	T72	16450/531
T197	16450/526	T70	16450/531
T166	16450/526	T59	16450/531
T89	16450/526	T10	16450/527
T171	16450/526	T60	16450/527
T186	16450/526	T11	16450/527
T199	16450/526	T9	16450/527
T65	16450/530	T134	16450/527
T105	16450/530	T153	16450/537
T192	16450/530	T170	16450/537
T195	16450/530	T211	16450/537
T194	16450/530	T156	16450/537

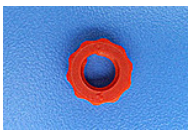
TABLE 1

Tube No.	Human Cat. number	Tube No.	Human Cat. number
T164	16450/537	T209	16450/539
T33	16450/537	T206	16450/539
T169	16450/537	T20	16450/539
T38	16450/537	T210	16450/539
T155	16450/538	T207	16450/536
T40	16450/538	T5	16450/536
T204	16450/538	T300	16450/528
T42	16450/538	T29	16450/528
T130	16450/538	T168	16450/532
T23	16450/538	T212	16450/532
T165	16450/538	T214	16450/535
T48	16450/538	T215	16450/535
T165	16450/538	T213	16450/535
T205	16450/538	T20	16450/533
T150	16450/538	T115	16450/622
T207	16450/539	T13	16450/622
T208	16450/539	T50	16450/529

TABLE 2
Digital power indicator light

List of Connector Types .

No.	Connector name	Illustration	Material	Features
1	T420-1 Connector		White nylon	T-type Connector for 1.6-2.4mm (i.d.) Tubing
2	K420-6005 Connector		PP	10-32 screw-thread connector for 1.6-2.4mm (i.d.) tubing
3	S220-6005 Connector		PP, natural color	1/4-28 screw-thread connector for 1.6-2.4mm (i.d.) tubing
4	L420-1 Connector		White nylon	L-type Connector for 1.6-2.4mm (i.d.) Tubing
5	Y230-1 Connector		White nylon	Y-type Connector for 2.4-3.2mm (i.d.) Tubing
6	Y420-1 Connector		White nylon	Y-type Connector for 1.6-2.4mm (i.d.) Tubing
7	N430/420-1 Connector		White nylon	Thick-to-thin tube connector for 1.6-2.4mm configuration
8	N420-6005 Connector		PP, natural color	Barrel connector for 1.6-2.4mm (i.d.) tubing
9	MTLL230-1 Integrated locking ring		White nylon	Integrated locking ring

10	MTLL013-3 Integrated locking ring		Red nylon	Integrated locking ring
11	LNS-1 Locking bolt for panel installation		White nylon	Locking bolt for white panel installation
12	LNS-3 Locking bolt for panel installation		Red nylon	Locking bolt for red panel installation
13	CCLR-1 Color-coded locking ring		White nylon	White-coded locking ring
14	CCLR-3 Color-coded locking ring		Red nylon	Red-coded locking ring

2.2.10 MAIN MEASUREMENT MODES

The measurement modes of the analyzer include:

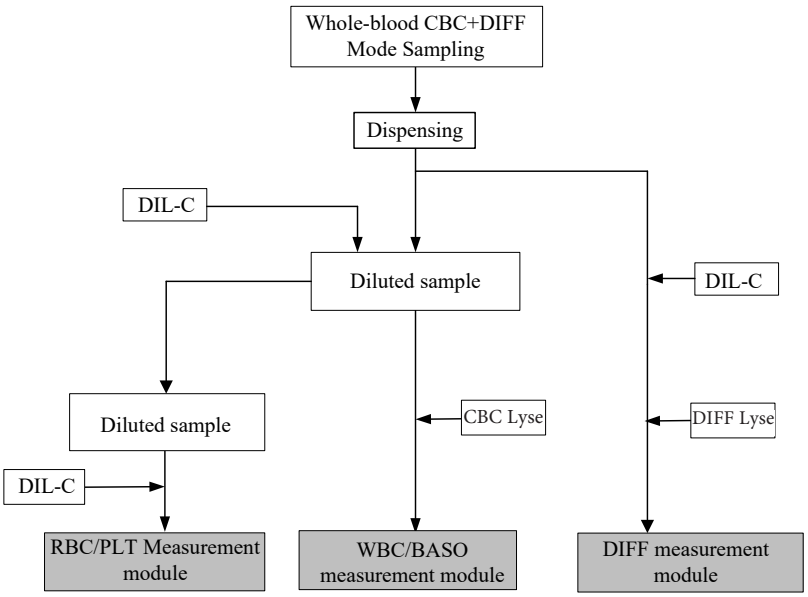
- Whole-blood CBC+DIFF Mode
- Whole-blood sample aspiration for CBC+DIFF measurement.
- Predilute CBC+DIFF Mode
- Dilution is performed in vitro, and the diluted sample is then aspirated for CBC+DIFF measurement.
- Whole-blood CBC Mode
- Whole-blood sample aspiration for CBC measurement.
- Predilute CBC Mode
  Dilution is performed in vitro, and the diluted sample is then aspirated for CBC measurement.

The dilution and measurement procedures of the sample in different measurement mode will be presented on the following pages.

2.2.10.1 Dilution Procedure in Whole-blood CBC+DIFF Mode

The dilution procedure in whole-blood CBC+DIFF mode is shown in Figure 10.

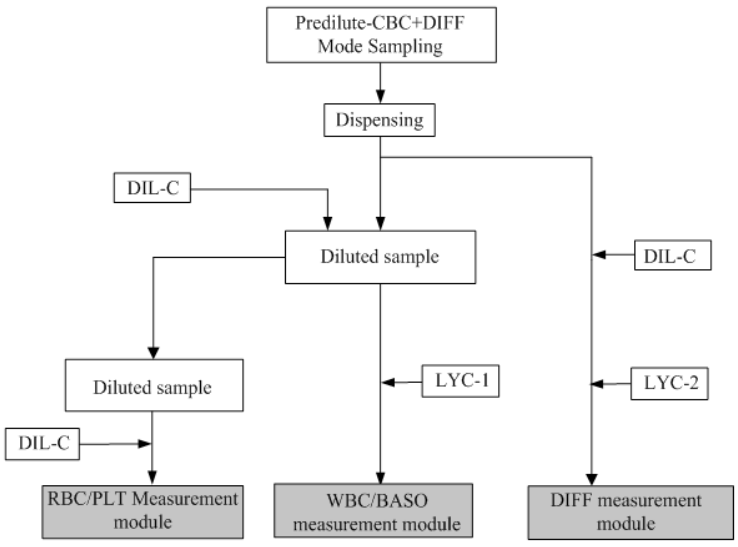
FIGURE 10
Dilution Procedure in Whole-blood CBC+DIFF Mode



2.2.10.2 Dilution Procedure in Predilute CBC+DIFF Mode

The dilution procedure in Predilute CBC+DIFF mode is shown in Figure 11.

FIGURE 11
Dilution Procedure in Predilute CBC+DIFF Mode



2.2.10.3 Dilution Procedure in Whole-blood CBC Mode

The dilution procedure in predilute CBC+DIFF mode is shown in Figure 12.

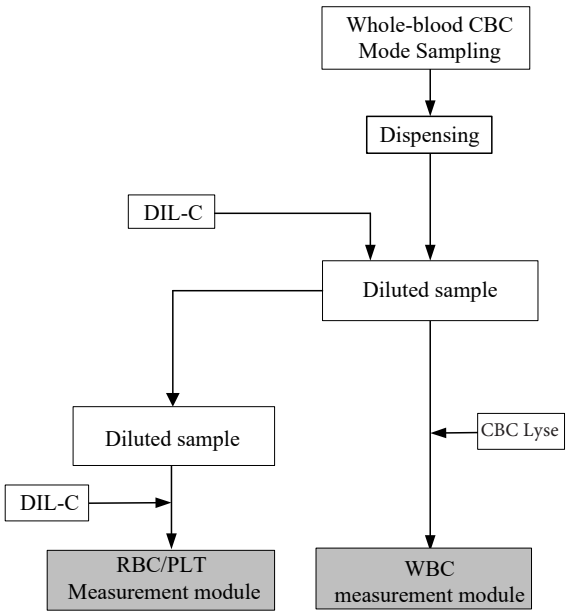


FIGURE 12
Dilution Procedure in Predilute CBC Mode

2.2.10.4 Dilution Procedure in Predilute CBC Mode

The dilution procedure in predilute CBC+DIFF mode is shown in Figure 13.

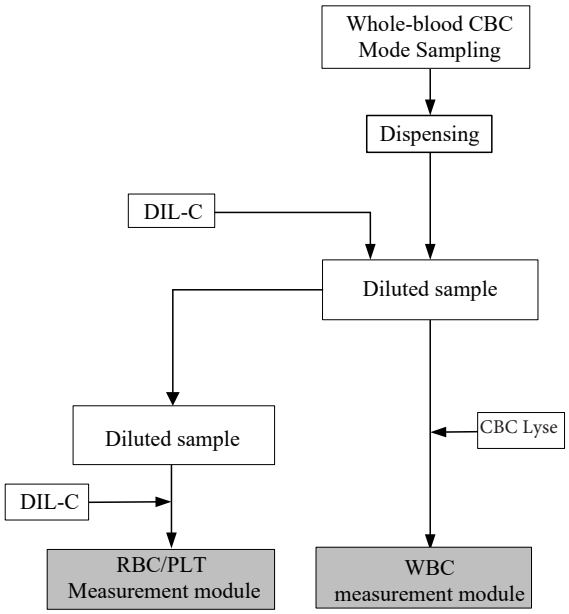


FIGURE 13
Dilution Procedure in Predilute CBC Mode

2.2.10.5 Measurement Procedure in Whole-blood CBC+DIFF Mode

In whole-blood mode, a total of 5 time slots for sample measurement are set at 0~4s, 5~10s, 11~25s, 26~52s, and 53~60s, respectively, during each of which different steps are taken. Detailed description:

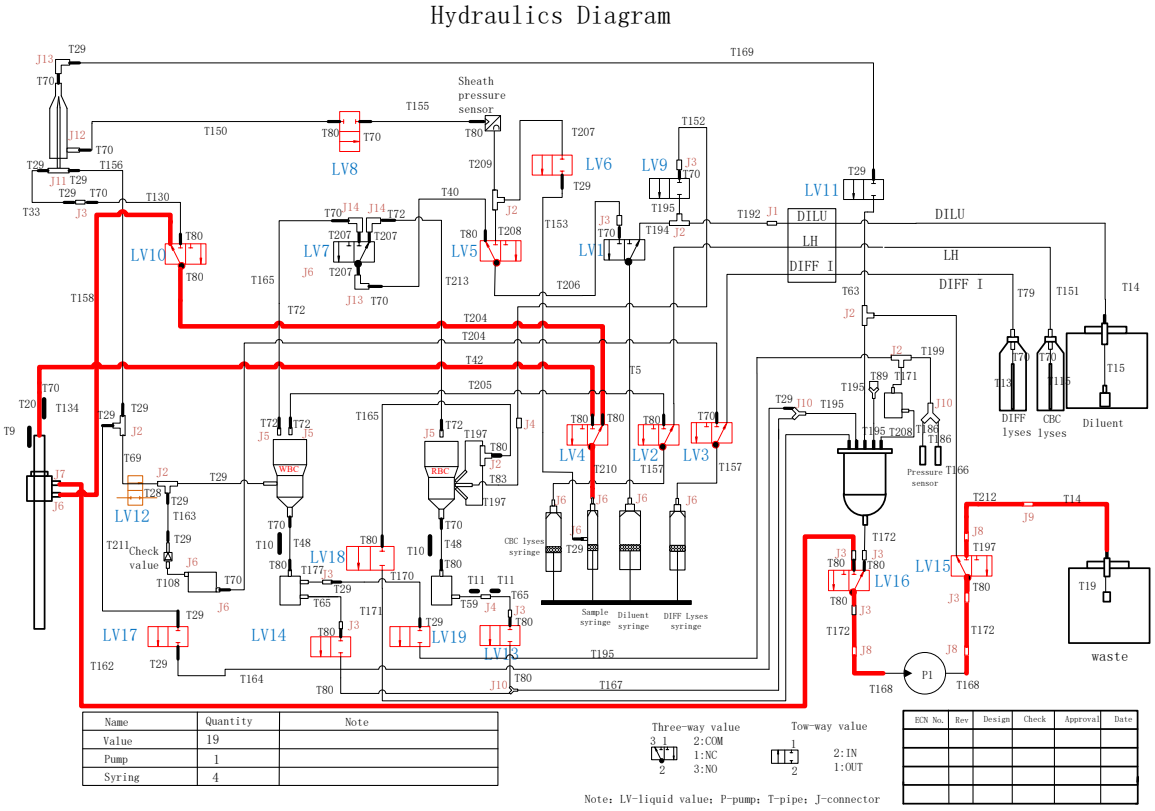
- Steps taken between 0~4s (Figure 14)

a. Aspirate the whole blood using the sample syringe.

b. Set the sample probe in the upper position for outer-wall cleaning.

FIGURE 14

Measurement Flowchart A



- Steps taken between 5~10s (Figure 15)

a. Insert the sample probe into the WBC bath.

b. The contaminated sample is removed from the tip of the sample probe from inserting it into the WBC bath.

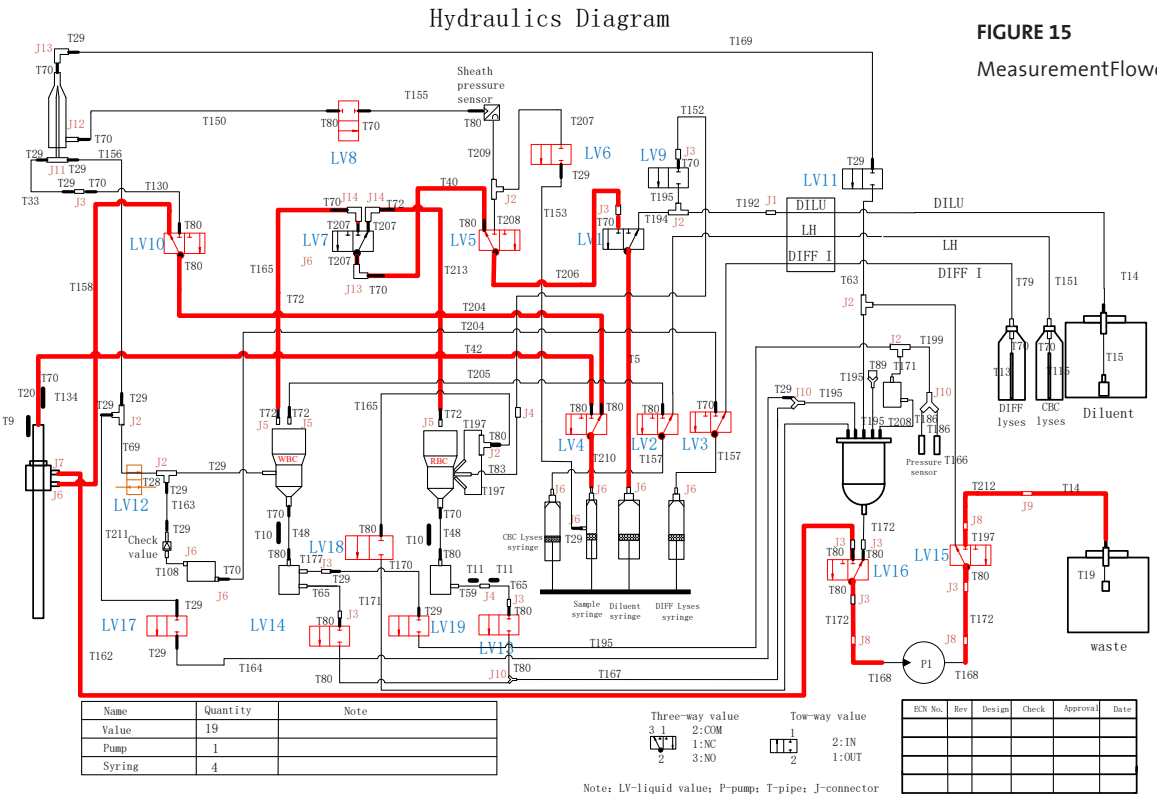
c. Drain the blood sample and diluent from the WBC/HGB bath.

d. Add the diluent into the WBC/HGB bath.

e. Add the blood sample into the WBC/HGB bath and mix it through with air bubbles.

f. Drain the RBC/PLT bath.

g. Add the base solution into the RBC/PLT bath.



Name	Quantity	Note
Value	19	
Pump	1	
Syring	4	

ECN No.	Rev	Design	Check	Approval	Date

FIGURE 15

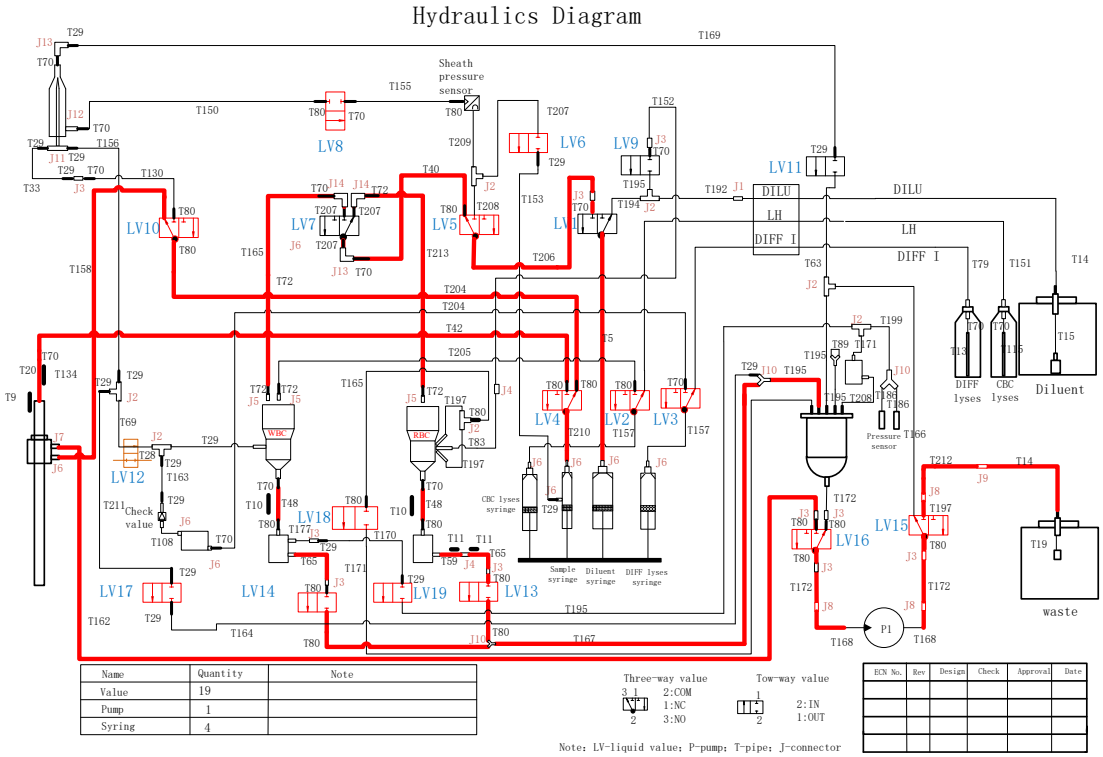
MeasurementFlowchart B

- Steps taken between 11~32s (Figure 16)

a. Move the sample probe to the upper position and clean its inner and outer walls.
b. Insert the sample probe into the WBC bath to aspirate the diluted sample.
c. Move the sample probe to the upper position and above the RBC/PLT bath, and then insert it into the RBC/PLT bath.
d. Add the diluted sample into the RBC/PLT bath once with the sample probe, and mix well using the air bubbles.
e. Add the Diff Lyse into the WBC bath and mix through with air bubbles.
f. Move the sample probe upward into the upper position and clean its outer wall.
g. A pressure of -30Kpa is created in the negative-pressure chamber.

FIGURE 16

Measurement Flowchart C



- Steps taken between 33~69s (Figure 17)

a. Push the diluent into the flow chamber with the diluents syringe, thereby forming a steady sheath flow; meanwhile, the sample syringe begins to push the sample into the flow chamber. DIFF channel data measurement is in progress.

b. After setting up negative pressure, open the count valve of RBC bath, then the RBC-channel data measurement is in progress.

c. After DIFF measurement is completed, clean the sample tube, push the remaining WBC reaction sample treated by CBC Lyse into the flow chamber to form the second section stable sheath flow, then WBC/BASO-channel data measurement is in progress.

d. Measurements on RBC-channel, HGB-channel and WBC-channel are completed.

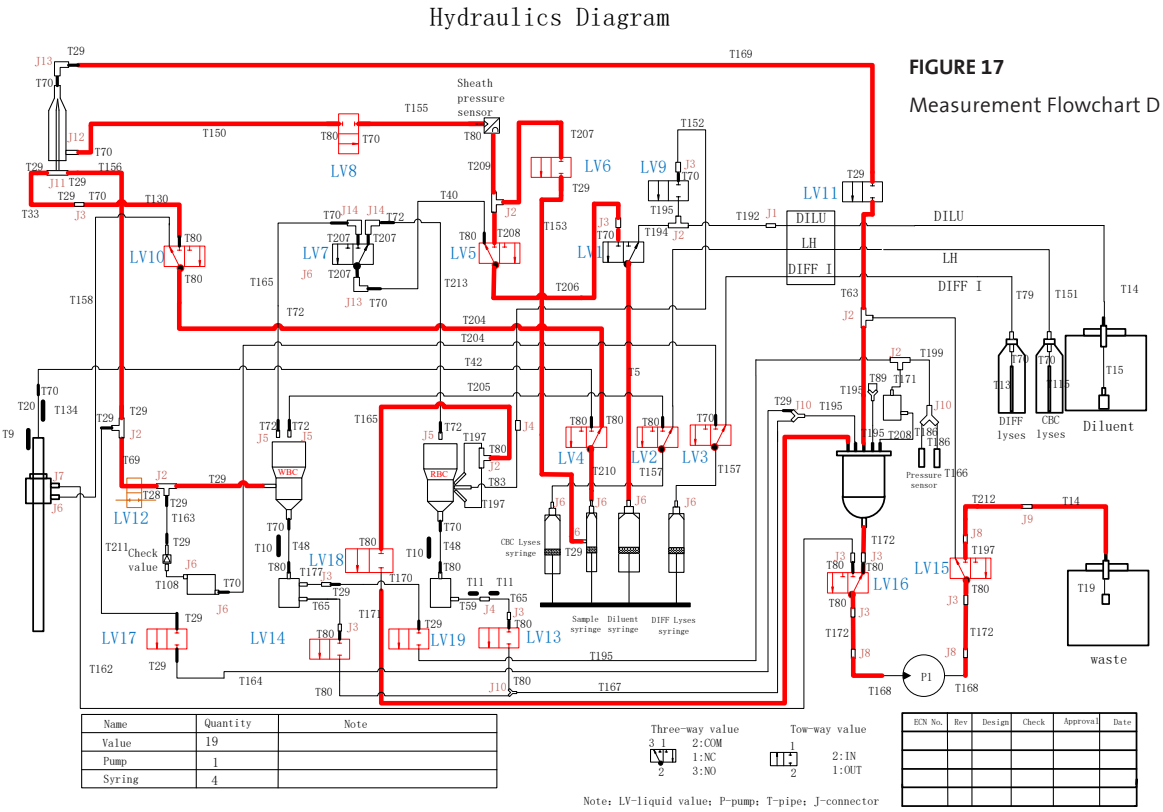


FIGURE 17

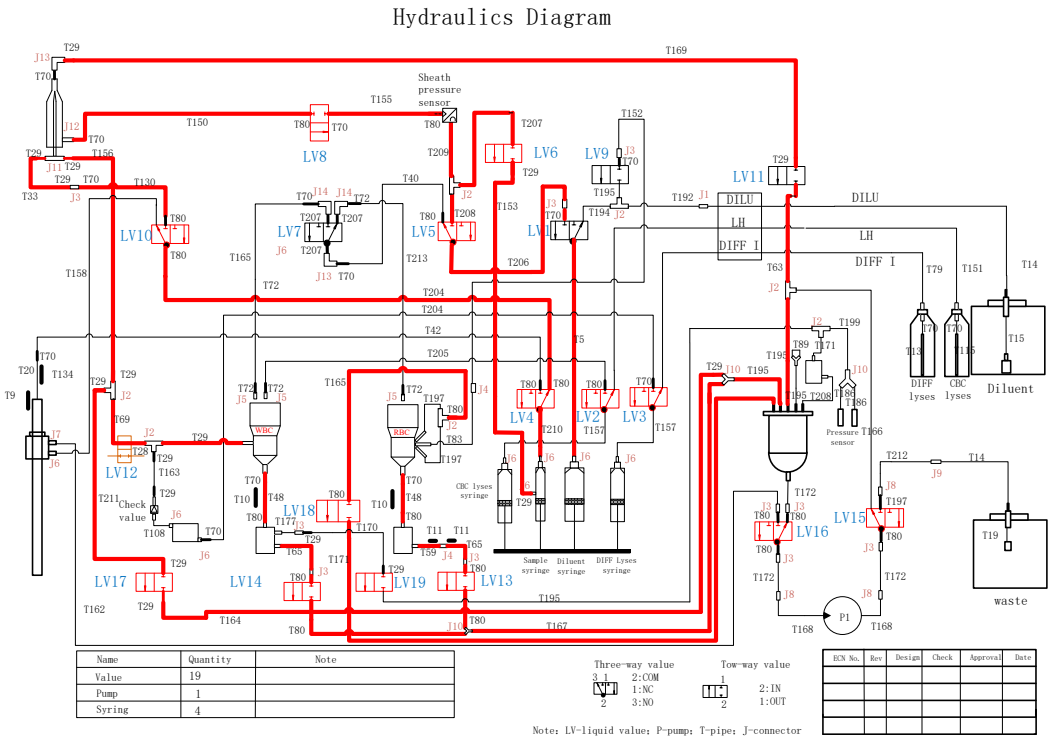
Measurement Flowchart D

- Steps taken between 70~80s (Figure 18)

a. Empty the WBC bath and RBC/PLT bath.
b. Add the diluent into the RBC/PLT bath for cleansing.
c. Zap the RBC/PLT bath.
d. Clean the sample tube of flow chamber and WBC bath, and add diluent as the base solution after emptying.
e. Drain the RBC/PLT bath before adding the diluent as the base solution.
f. Clean the rear bath of the RBC/PLT bath.
g. Restore the sample assembly to measurement preparation status.
h. At around the 72s mark, the screen will show the current counting results.
i. The next sample can be made as soon as 80s measurement is completed.

FIGURE 18

Measurement Flowchart E



Name	Quantity	Note
Value	19	
Pump	1	
Syring	4	

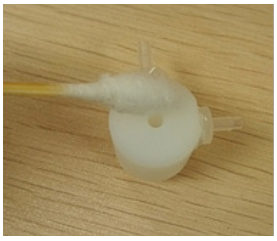
ECN No.	Rev	Design	Check	Approval	Date

2.2.10.6 Measurement Procedure in Predilute Mode

The measurement principle in predilute mode is generally the same with that in whole-blood mode, while, the difference lies in that the whole-blood measured shall be quantitatively prediluted prior to the measurement in predilute mode. Figure 19 Cleaning the washhead.

FIGURE 19

Cleaning the washhead



1. After cleaning and reassembling the washhead, check and make sure the inflow/outflow interface tubing is connected correctly.
2. Turn on the device.
3. Go to **Service > Maintenance > Clean.** Click the **Clean Sample Probe** icon to perform the operation before performing cleaning and maintenance on the washhead.

2.3 Hardware System

The hardware system of the Auto Hematology Analyzer consists of the main control panel, reagent testing panel, laser driver panel, optical preamplifier panel, front panel, reagent sealing panel, etc. and its block diagram is shown in Figure 20.

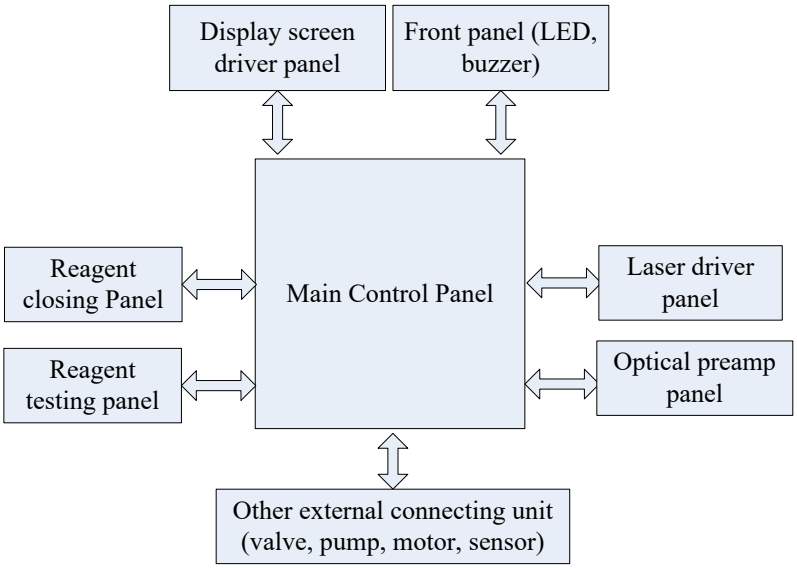


FIGURE 20
Block Diagram of Hardware System

2.3.1 MAIN CONTROL PANEL

The main control panel is the core panel of the Auto Hematology Analyzer. This section introduces the main control panel from the perspectives of composition, problem identification, and maintenance.

2.3.1.1 Composition of the Main Control Panel

The block diagram of main control panel functions is shown in Figure 21.

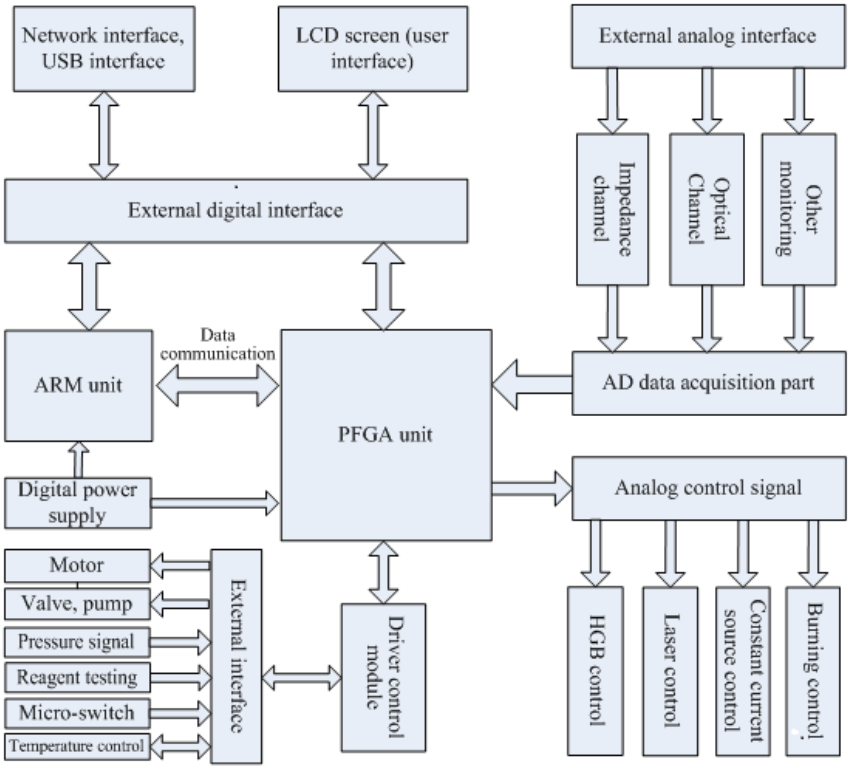


FIGURE 21
Block Diagram of Main Control Panel Functions

The block diagram above gives a brief overview of the composition of main control panel and the function of each module. Further description can be found below based on the pictures for each panel. Picture of main control panel is shown in Figure 22.

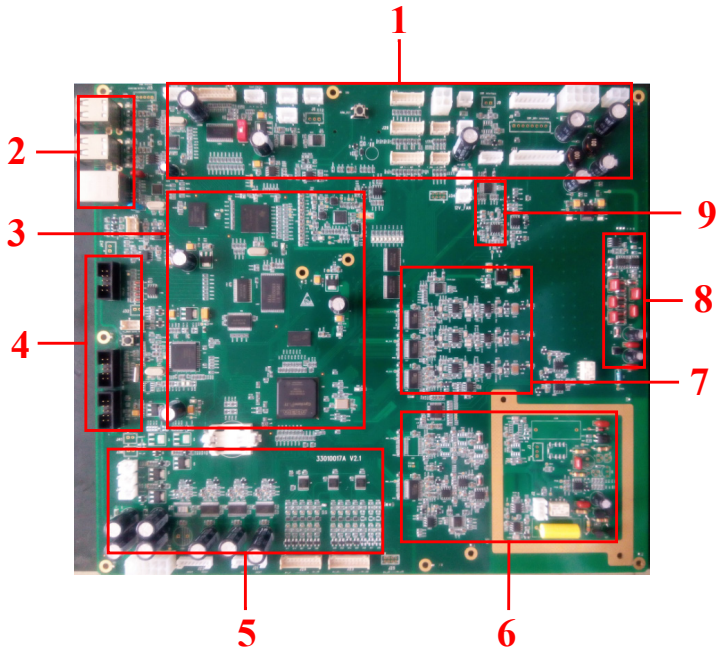


FIGURE 22
Main control panel

1 **External wiring interface**
2 **Network interface and USB interface**
3 **Digital circuit module**
4 **Debugging interface**
5 **Motor, pump valve and temperature-control module**
6 **Analog impedance channel module**
7 **Analog DIFF channel module**
8 **Voltage-multiplying circuit module**
9 **Analog HGB channel module**

The main control panel can be clearly divided into digital part, analog part and driver part. Among them:

- The left half of the panel is the digital part, including ARM unit, FPGA unit, external interface, debugging interface, power supply, etc.
- The right half of the panel is the analog part, including impedance channel, DIFF channel, hardware monitoring channel, external interface, power supply, etc.
- The lower left corner of the panel is the driver part, including motor driver, valve & pump driver, temperature control, etc.
- In the middle of the panel there are AD and interface chips, where AD is responsible for analog-to-digital conversion and the interface chip is responsible for on-off control for relevant functions of the analog part.

2.3.1.2 Peripheral Interface of the Main Control Panel

There are several interfaces on the main control panel, and the detailed interface description is shown in Table 3.

TABLE 3
Definition Table of External Interfaces on the Main Control Panel

No.	Tag No.	Description
1	J2	RBC analog signal interface
2	J21	Motor driver interface
3	J22	Motor driver interface
4	J23	Valve driver interface
5	J24	Valve driver interface
6	J17	Power supply input interface
7	J37	Pump driver interface
8	J39	Heating rod control interface
9	J40	Heating rod control interface
10	J7	MPU_JTAG interface
11	J12	FPGA_JTAG interface
12	J13	FPGA_AS interface
13	J31	Pressure sensor signal interface
14	J35	Front display panel interface
15	J43	Network interface
16	J46	USB interface
17	J47	USB interface
18	J14	Back-light panel interface
19	J44	Display screen data communication interface
20	J45	Touch screen data interface
21	J4	Serial port
22	J5	Serial port
23	J48	Printer interface
24	J26	Reagent testing signal interface
25	J27	Micro-switch signal interface
26	J28	Motor position optocoupler signal interface
27	J29	Motor position optocoupler signal interface
28	J30	Temperature sensor interface
29	J18	5V power inlet
30	J19	5V power inlet
31	J20	5V power outlet
32	J49	5V power outlet
33	J50	12V power outlet
34	J11	HGB signal interface
35	J36	Laser drive panel interface
36	J33	Preamplifier panel signal interface
37	J10	±12V power inlet
38	J16	110V burning power input interface

! The debugging Interfaces designated for the main control panel are serial interface J7 (RS232 signals), FPGA JTAG interface J3, FPGA AS interface J4, and SD interface for programming before shipping. Use of these debugging Interfaces is restricted to developers only.

2.3.1.3 Power input and indicator lights on the Main Control Panel

Digital power input and indicator lights

Power input of the digital part is 5V, and it can be tested via testing point TP15 (multimeter shall be adopted for testing, and during the testing, the red probe shall be connected to TP15, while the black probe shall be connected to the metal part on the housing). The 5V power input is accompanied by the fuse F2, Normally the fuse will not be blown since the power supply of the device is equipped with surge protection. If a short circuit occurs under the input of 5V of power, the power supply will fail to work properly and a buzzing sound can be heard.

All digital power supplies of the main control panel are equipped with an indicator light and testing point, and corresponding relationships between the digital power supply, indicator light, and testing point is shown in the Table 4.

Position Code of Indicator Light	Meaning	Normal Status
D21	5V digital power supply	On
D17	3.3V digital power supply	On
D16	2.5V digital power supply	On
D15	1.8V digital power supply	On
D14	TPS65910 3.3V working status[1]	On

TABLE 4
Digital power indicator light

! NOTE: 1- D14 usually indicates the working status of the ARM power management chip, TPS65910A31A1, but this indicator light only indicates the working status of one LDO signal channel in TPS65910; the multimeter can be used to test the corresponding testing points for other LDO and DC-DC channels. For details, see Digital Testing Points in the section of 2.3.1.4 Testing Points on the Main Control Panel.

Analog power input and indicator lights

The analog power input of +12V and -12V on the main control panel can be tested for actual voltage values via the testing points TP21 and TP22. The +12V power input is accompanied by the fuse F4, while -12V is accompanied by the fuse F5. Like the 5V digital power input, +12V and -12V derive power from the device's power supply; if both are subject to overload, they will receive surge protection from the power source and the corresponding indicator lights will not be activated. Table 2 3 lists the analog power indicator lights:

TABLE 5
Analog power indicator light

Position Code of Indicator Light	Meaning	Normal Status
D18	+12V power indicator light	On
D19	-12V power indicator light	On
D23	-5V power indicator light	On
D25	+5V power indicator light	On

! +5V and -5V originate from the linear stabilizer. The corresponding lights will not be activated by the +5V or -5V overload, and the linear stabilizer will be very hot. If either the +5V or the -5V power indicator light is not on, immediately power off the device. We recommend replacing the main control panel.

Other indicator lights on the main control panel

The ARM and FPGA units are each assigned a single indicator light to show their working status on the main control panel. In addition, a USB0 power indicator light is designated for the ARM unit. Table 6 lists the indicator lights.

TABLE 6
Other indicator lights on the main control panel

Position Code of Indicator Light	Meaning	Normal Status
D79	It indicates the ARM working status and flashes after proper system loading.	Flashing
D90	It indicates the FPGA working status and flashes after proper system loading.	Flashing
D52	It indicates the MPU working status and flashes after proper system loading.	Flashing

Indicator lights are very useful in practice; hardware problems can be identified by the status of the indicator lights. For details, see **2.3.1.5 Identification of Main Control Panel Problems**.

2.3.1.4 Testing Points on the Main Control Panel

There are two types of testing points on the main con trol panel: Digital and analog.

Digital testing points

The digital testing points on the main control panel listed here are commonly used ones, in particular for power supply and key signals.

Position Code of Testing Points	Description
TP15	The testing point for 5V digital input, with the expected voltage of 5V
TP9	TPS65910 VRTC output, with the expected voltage of 1.8V
TP61	DDR3 reference voltage, with the expected value of 0.75V
TP7	TPS65910 VDIG1 output, with the expected value of 1.8V
TP8	TPS65910 VDIG2 output, with the expected value of 1.8V
TP6	TPS65910 VAUX33 output, with the expected value of 3.3V
TP5	TPS65910 VMMC output, with the expected value of 3.3V
TP3	TPS65910 VAUX2 output, with the expected value of 3.3V
TP4	TPS65910 VAUX1 output, with the expected value of 1.8V
TP1	TPS65910 VDAC output, with the expected value of 1.8V
TP2	TPS65910 VPLL output, with the expected value of 1.8V
TP20	The testing point for 3.3V digital power supply, with the expected voltage of 3.3V
TP19	The testing point for 2.5V digital power supply, with the expected voltage of 2.5V
TP17	The testing point for 1.2V digital power supply, with the expected voltage of 1.2V
TP18	The testing point for 1.8V digital power supply, with the expected voltage of 1.8V
LS_CLK	DIFF low-angle AD clock,4MHz clock signal
MS_CLK	DIFF medium-angle AD clock, 4MHz clock signal
HS_CLK	DIFF high-angle AD clock, 4MHz clock signal
WBC_CLK	WBC-channel AD clock, 1MHz clock signal
RBC_CLK	RBC-channel AD clock, 1MHz clock signal

TABLE 7
Digital testing point on the main control panel

Analog testing points

The following table lists the analog testing points.

Position Code of Testing Points	Description
TP5	AVCC_+5V testing point, with the expected voltage of 5V
TP21	AVCC_+12V testing point, with the expected voltage of +12V
TP22	AVCC_-12V testing point, with the expected voltage of -12V
TP25	AVCC_-5V testing point, with the expected voltage of -5V
TP58	HGB_LED_CTL testing point, HGB light-driven control switch; 0 for on and 1 for off
TP47	WBC channel first-level OPAMP output testing point
TP46	WBC channel third-level OPAMP output testing point
TP43	WBC channel fourth-level OPAMP output testing point
TP44	WBC channel sixth-level OPAMP output testing point
TP45	WBC channel seventh-level OPAMP output testing point

TABLE 8
Analog testing point on the main control panel

WBC_AD	WBC-channel AD front-end testing point
TP39	RBC channel first-level OPAMP output testing point
TP40	RBC channel third-level OPAMP output testing point
TP38	RBC channel fourth-level OPAMP output testing point
TP41	RBC channel sixth-level OPAMP output testing point
TP42	RBC channel eighth-level OPAMP output testing point
RBC_AD	RBC-channel AD front-end testing point
TP31	SELECT_WBC_CTL testing point, the switch control signal for WBC bath zap and CC source; 0 for zap and 1 for CC source
TP29	SELECT_RBC_CTL testing point, the switch control signal for RBC bath zap and CC source; 0 for zap and 1 for CC source
TP53	VCONST_MON_AD testing point, 1.36V±0.2V
TP28	RH_MON testing point, 1.9V±0.2V
TP30	WH_MON testing point, 1.7±0.2V
TP33	VCONST_CTL testing point, the switch control signal for CC source; 0 for on and 1 for off
LSIN	the testing point for DIFF low-angle signal input
LS_AD	DIFF low-angle AD front-end testing point
MSIN	the testing point for DIFF medium-angle signal input
MS_AD	DIFF medium-angle AD front-end testing point
HSIN	the testing point for DIFF high-angle signal input
HS_AD	DIFF high-angle AD front-end testing point
HGB_AD	HGB-channel AD front-end testing point
TP37	LASER_MON_AD testing point, reflecting the laser current
TP36	AVCC_+12VMON_AD testing point, reflecting the voltage of AVCC_+12V power source
TP35	AVCC_-12VMON_AD testing point, reflecting the voltage of AVCC_+12V power source

2.3.1.5 Identification of Main Control Panel Problems

Problems with the main control panel can be categorized as power problems, connection problems, and functional problems. Power problems can be identified using the status of power indicator lights, and connection problems can identified by way of direct observation; however, functional problems are a little tricky, and can be indirectly shown using other indicators.

Power Problems of the Main Control Panel and their Indicators

The power supply of the main control panel is clearly divided between digital and analog. Where,

- A digital power input of 5V is realized by the upper middle J18, J19 interfaces on the main control panel, as shown in Figure 23.

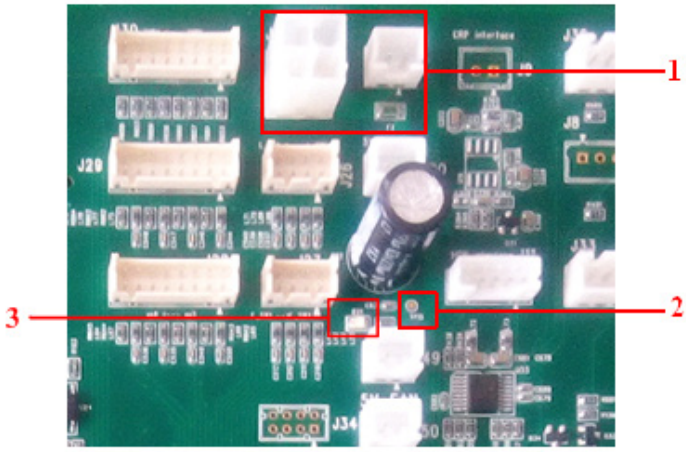


FIGURE 23
Digital power input, testing point and indicator light

1 **Power inlet**
2 **Testing point for 5V power supply**
3 **Power indicator light**

- An analog power input of +12V and -12V is enabled by the upper right J10 interface on the main control panel, as shown in Figure 2 24.

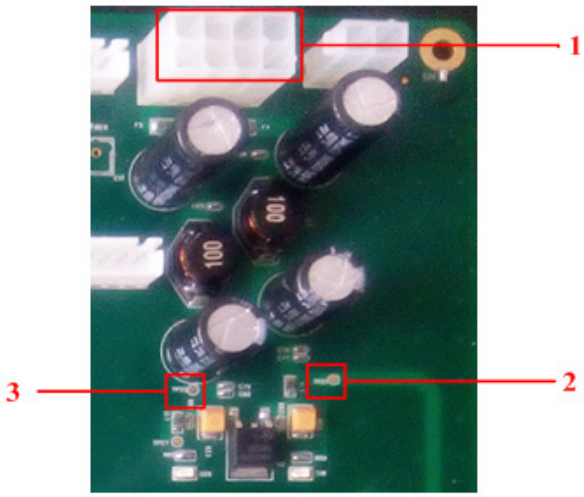


FIGURE 24
Analog power input

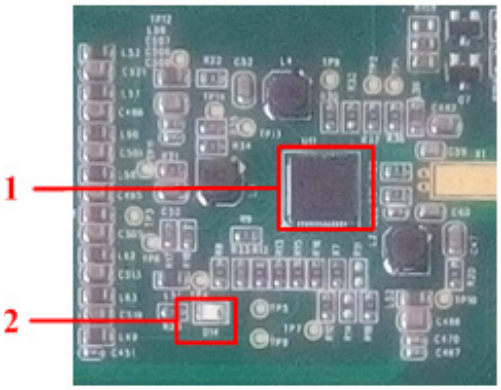
1 **Power inlet**
2 **Testing point**
3 **2 - +12V testing point**

All power inputs on the main control panel derive from the power input of the device. If either of the power inputs on the main control panel receives a surge from a grounded or any other input power source, the device's power supply will activate its automatic protection mechanism and produce a buzzing sound.

For the normal status of power indicator lights shown in the figures above, please refer to the descriptions of the power supply and indicator lights of the main control panel in **2.3.1.1 Composition of the Main Control Panel**. If the power indicator light is in a status different from normal, this means that the power supply is not working properly.

U11 deserves further description as follows. U11 is the ARM power management chip in the digital section of the main control panel.The working status of this chip determines the working status of the main control panel. As shown in Figure 25, D14 turned on indicates the proper working of U11.

FIGURE 25
Analog power input



1 **Power management chip U11**
2 **U11 working indicator**

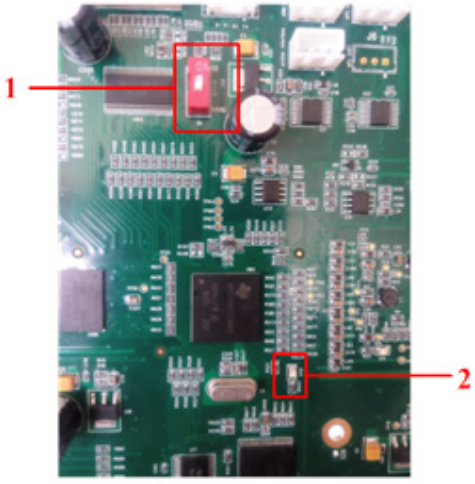
Functional Problems with the Main Control Panel and their Indicators

Functional problems with the main control panel are typically related to one of two causes. One cause may be that the counting function of the main control panel cannot be realized. For example, the digital part's operating system on the main control panel is not operational, the FPGA program does not load, or there is abnormal counting. The other cause refers to control failure of the motor, valve-pump, temperature control, etc.

- ARM OS on the main control panel fails to boot

The ARM on the main control panel boots from NAND using its default factory setting, so the booting media selection switch S6 should be turned to NAND (i.e. OFF state for DIP switches), as shown in Figure 26.

FIGURE 26
ARM booting and running



1 **DIP switch status**
2 **ARM normal working indicator light D79**

When the ARM OS is booted properly, the working-status indicator light D79 will flash on the main control panel. If D79 is not lit up, it means that the ARM OS has failed to boot.

- MPU program loading fails

When the MPU program is booted properly, the working-status indicator light D52 will flash on the main control panel. If D52 is not lit up, it means that the MPU program has failed to boot. The location of D52 is shown below.

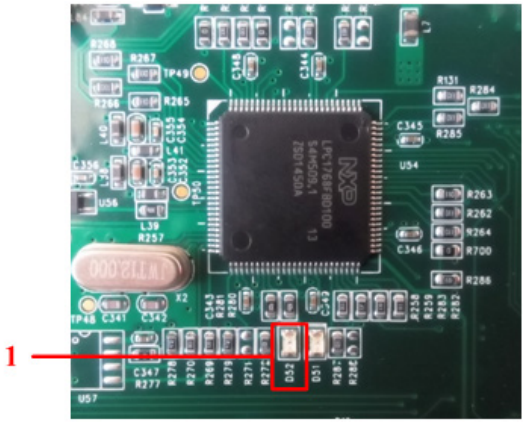


FIGURE 27
Location of D52

1 MPU status indicator light

- Loading problems with the FPGA program

The FPGA program is loaded from the serial port FLASH. A successful loading of the FPGA will cause the indicator light D90 to flash. If D90 is not lit up, it means that FPGA program has not loaded. The location of D90 is shown in Figure 28.

FIGURE 28
Indicator of FPGA working status

1 FPGA status indicator light

- Counting abnormalities

There are many causes that lead to counting abnormalities, and they can include problems with main control panel problem. Counting abnormalities caused by main control panel problems usually involve counting results of zero or overly

Note: Panel maintenance is time-consuming. In principle, panel maintenance is not performed on-site. If a panel problem is confirmed on-site, please replace the panel.

high counting results on multiple occasions. A counting result of zero usually results from a failure to apply the CC source to the counting bath, while an overly high counting result is usually caused by too much noise in the analog-channel circuit.

2.3.2 OTHER PANELS

Except for the above-mentioned main control panel, other panels (including reagent testing panel, laser driver panel, optical preamplifier panel, reagent sealing panel, front display panel, LCD screen driver panel) will not be repaired in principle. If problems with any small panel are found on site, please replace it directly.

Functions of interfaces on other panels are briefly introduced below.

2.3.2.1 Reagent Testing Panel

Reagent testing panel is mainly responsible for testing whether there is or no reagent. Functions of interfaces on the reagent testing panel are shown in Figure 29.

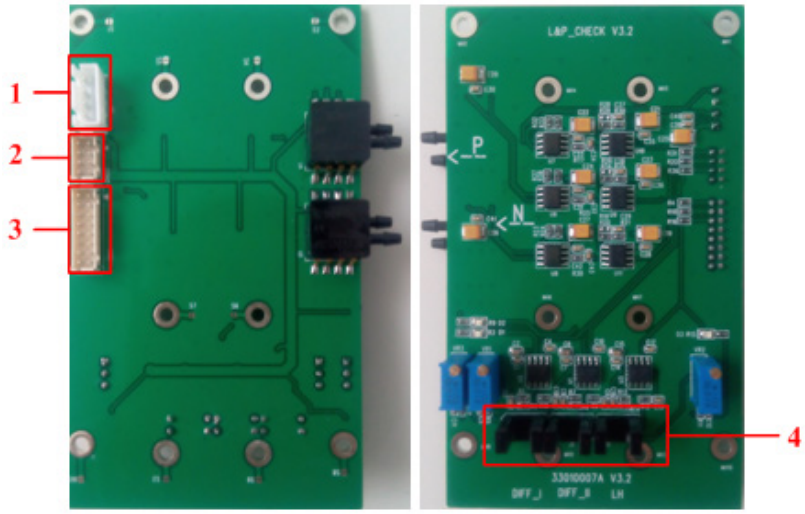


FIGURE 29
ARM booting and running

1. **Sheath flow pressure signal output interface**
2. **Positive and negative pressure signal output interface**
3. **Reagent presence detection interface**
4. **Installation position for optical coupling card port**

2.3.2.2 Laser Driver Panel

Functions of interfaces on the laser driver panel are shown in Figure 30.

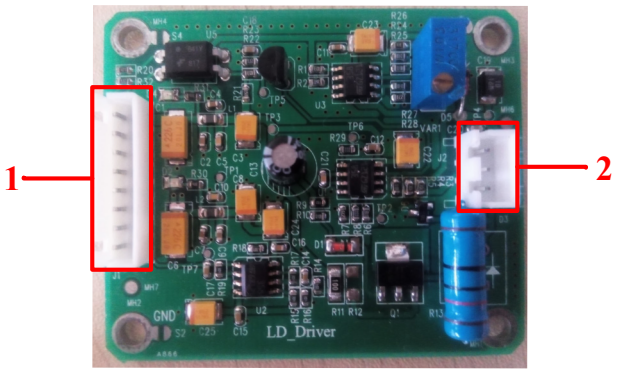


FIGURE 30
ARM booting and running

1 **Power interface for connecting to main control panel**
2 **Output interface of laser driver**

2.3.2.3 Optical Preamplifier Panel

In general, the optical preamplifier panel is classified into two small panels, one for LS, MS signal amplification panel, as shown in Figure 31; the other for HS signal amplification panel, as shown in Figure 32.

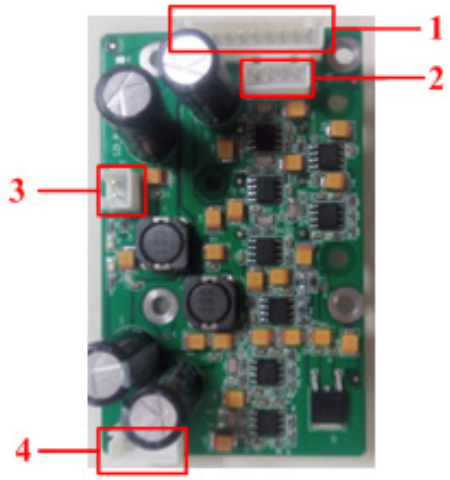


FIGURE 31
Physical picture of LS, MS Signal Amplifier Pane

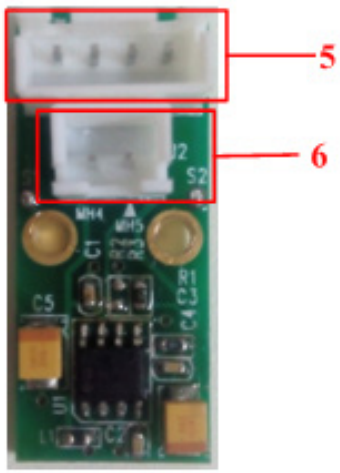


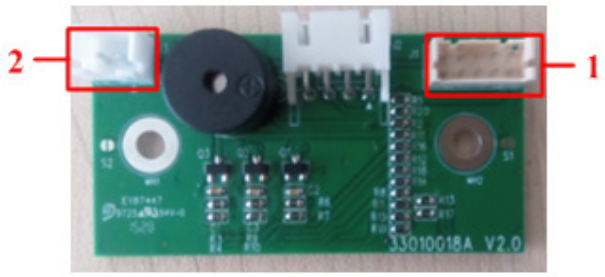
FIGURE 32
Physical picture of HS Signal Amplifier Panel

1 **Panel card power interface**
2 **Signal testing interface**
3 **HS signal input interface**
4 **HS panel power outlet interface**
5 **HS panel power inlet interface**
6 **HS signal output interface**

2.3.2.4 Front Panel

The front panel is mainly responsible for indicating the running status of the device, alarm notification and linking with the manual control of the sampling touch signal switch, as shown in Figure 33.

FIGURE 33
Picture of the front panel



1 Control signal communication interface
2 Micro-switch interface

2.4 Optical System

2.4.1 REMOVING OF OPTICAL SYSTEM

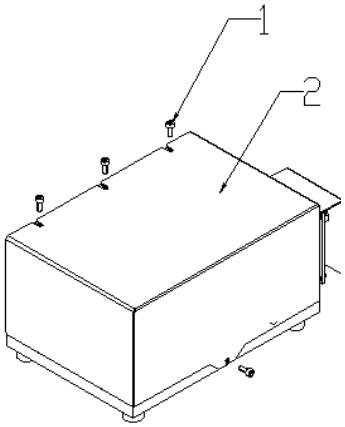
! Note: If the sealings on the optical head are damaged due to unotorized opening warranty will be lost. Please only open the optical head when Human Tech Service authorized you to do so. Repair or adjustments are only possible at the Manufacturer workshop, this is not possible in the field.

1. Tools/Spare Parts
#2 (Ph2) Phillips screw driver
Medical syringe attached to a silicone tube
Optical components that have passed tuning tests

2. Preliminary Steps
1. Turn off the power switch on the left side of the device.
2. Pull out the power cord plug from the rear panel of the device.
3. Open the right-side door and disassemble the top cover panel.

3. Disassembly
① Use a #2 (Ph2) Phillips screwdriver to disassemble the four M3x8 cross-recessed pan-head combination screws which affix the cover panel of the optical system, and carefully detach it.

FIGURE 34



② Pull out the tubing.

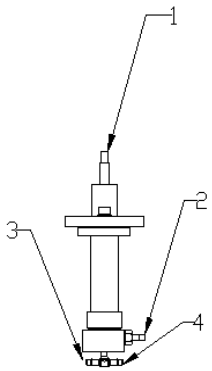


FIGURE 35
Picture of the front panel

1 LDS-A
2 LDS-B
3 LDS-D
4 LDS-C

③ Use a #2 (Ph2) Phillips screwdriver to disassemble the four M3x8 cross-recessed pan-head combination screws which affix the optical assembly, and take off the four large D3 gaskets. Carefully push upwards and slowly detach the optical assembly.

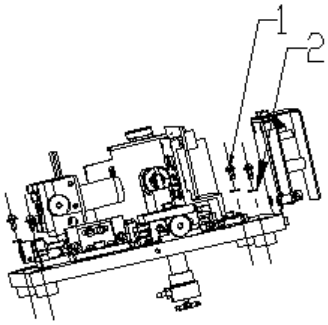


FIGURE 36
Picture of the front panel

1 M3x8 cross-recessed pan-head combination screw (x4)
2 Large D3 gasket

④ Pull out the wiring: Pull out the wires from the J33 and J36 ports on the rear panel; then pull out the heating wire inside the optical system box, the temperature sensor wire, and the temperature switch wire. To take the optical assembly apart, slowly hold it up and remove the flow chamber from the opening of the affixed optical panel.

4. Install the new optical component.

1) Connect the tube as the picture shows below

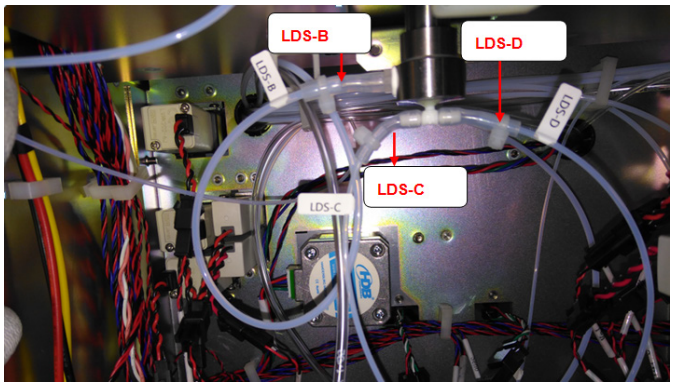
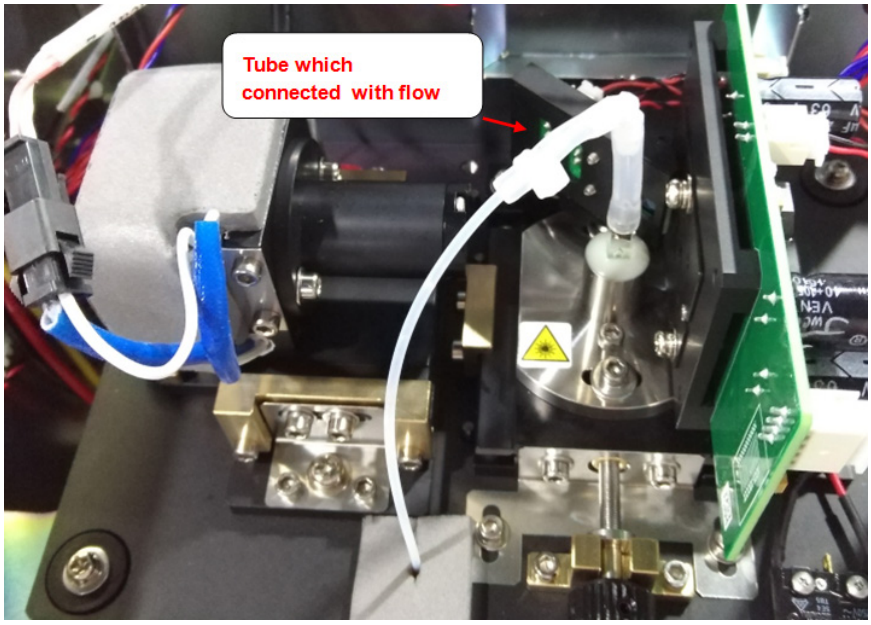


FIGURE 37

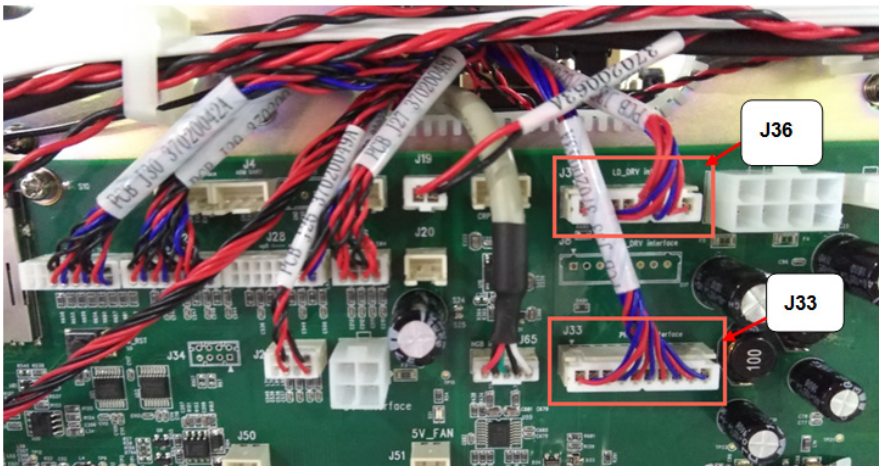
FIGURE 38



2) Connect the cables as the pictures show below

a) Connect the J33 and J36 cables

FIGURE 39



b) Connect the Heat 2 and Temp sensor connection cable Connect the J33 and J36 cables

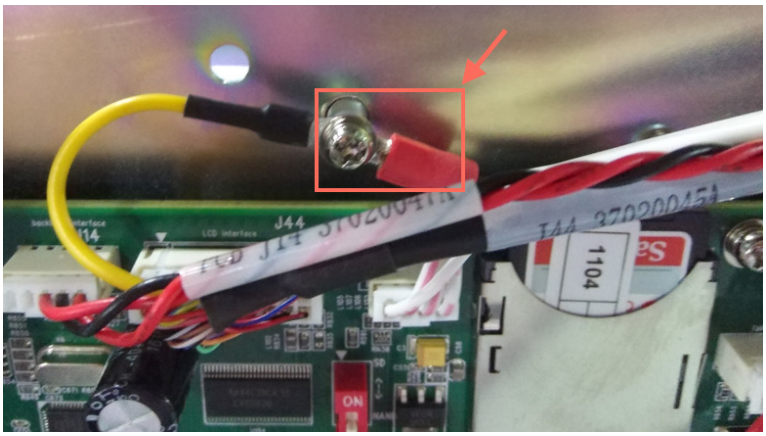


FIGURE 40

2.4.2 MANUAL CLEANING OF FLOW CHAMBER

Pull out the tube which connect LV11 Valve to the flow chamber and then place it into a bottle which contains the cleaner.

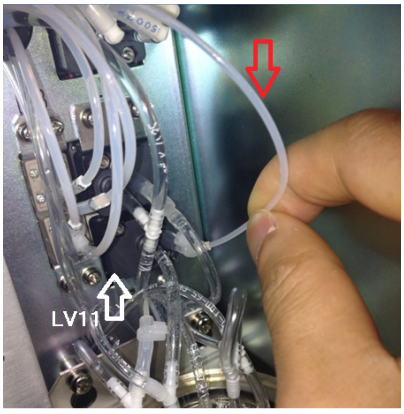


FIGURE 41

Pull out the tube which is connected port 1 of the LV10 valve. The tube is marked as No 3. And then connect it to the syringe

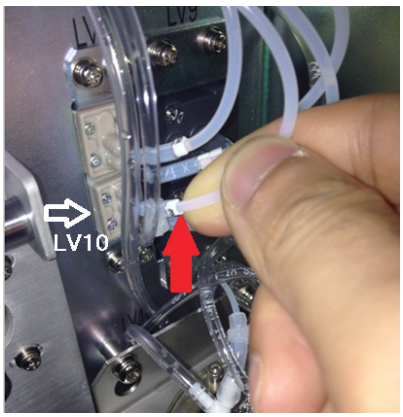
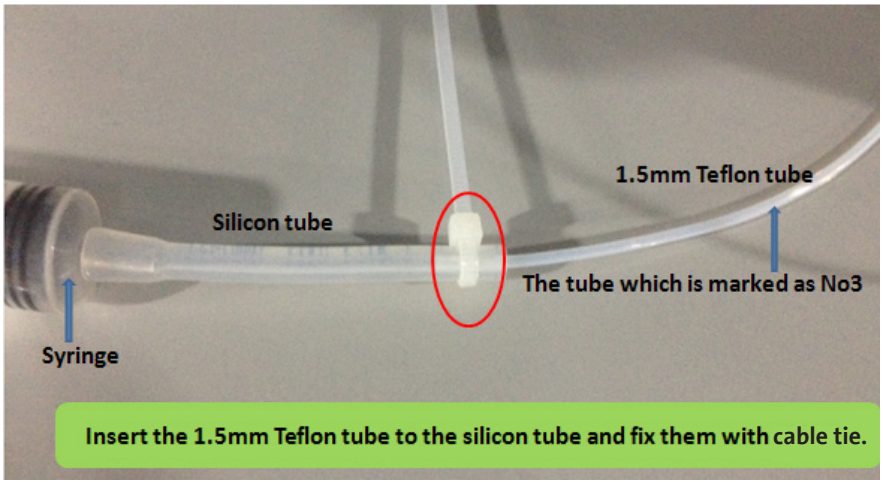


FIGURE 42

Connect the tube which is marked as No3 to the syringe as the picture shows below.

FIGURE 43



- Pull the syringe to aspirate the cleaner to the flow chamber meanwhile press the LV12 Valve with your finger.

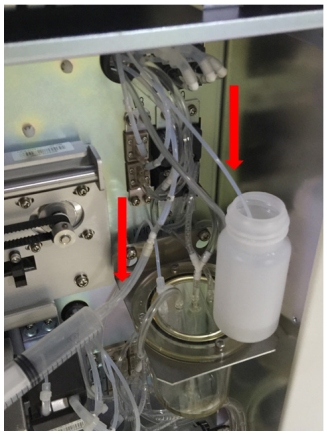


FIGURE 44

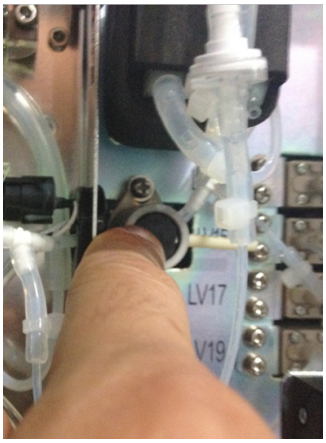


FIGURE 45

Note: Press the pinch Valve 12 with the fingers of one hand, and pull the plastic syringe with the other hand, to absorb the cleaner into the flow chamber. If the absorption resistance is high, the plastic syringe shall be pulled with hand to hold for a certain time, and release to enter into the probe cleaner stage after the level of the diluted probe cleanser in small sample cup is observed to drop.

3 INSTALLATION

3.1 Pre installation requirements

- Temperature: 15-30 °C
- Humidity: 30% - 85%
- Atmospheric pressure: 70-110KPa.
- Power: ≤ 250VA, AC 100-240V, 50/60 Hz, Good grounding (less than 0,5V)
- Steady Workbench, without vibrations
- No direct sunlight, dust free area

Dimensions

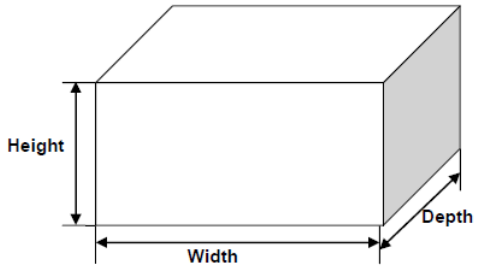


FIGURE 46

Analyzer	Dimensions and Weight
Width (mm)	≈360 mm
Height	≈470 mm
Depth (mm)	≈430 mm
Weight (kg)	≈28 Kg

3.2 Unpacking

Packing list. Please check that all items are included in your delivery.

No.	Name	Quantity	Unit
1	Auto Hematology Analyzer	1	PCS
2	Power Cable	1	PCS
3	Peripheral Grounding Cable	1	PCS
4	Operator's Manual	1	PCS
5	Quick Operation Guide Card	1	PCS
6	Diluent Adapter Tube	1	PCS
7	Waste Float Adapter Tube	1	PCS
8	Waste container	1	PCS
9	Reagent Operation Guide for Closed System	1	PCS

1. Remove the outer packaging carton.

FIGURE 47

2. Remove the protection foam from the analyzer.

FIGURE 48

3. Remove protective plastic cover.

FIGURE 49

4. Lift analyzer out of box.

FIGURE 50

Note: Take care to handle the analyzer on the marked area. Always handle the analyzer with two persons to avaiod any injury.

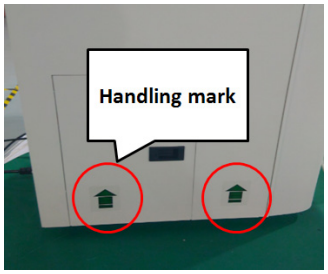


FIGURE 51

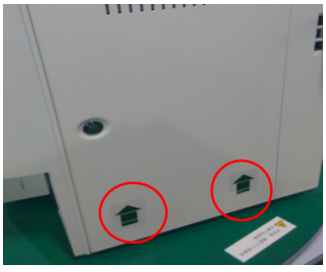


FIGURE 52

3.3 Remove transport protection

Remove the two clips which are securing the sampling arm.

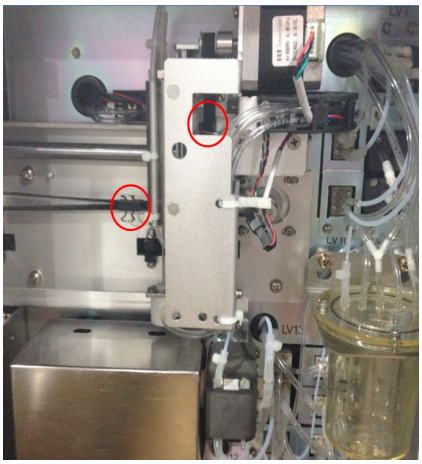


FIGURE 53

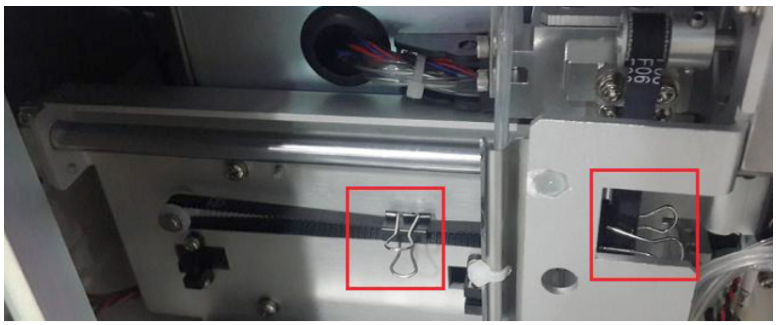


FIGURE 54

3.4 Installation Process

Install diluents float sensor.

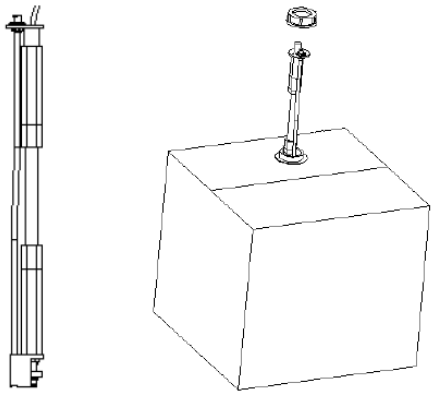
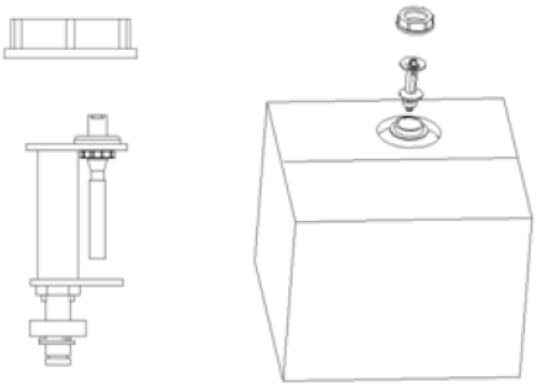


FIGURE 55

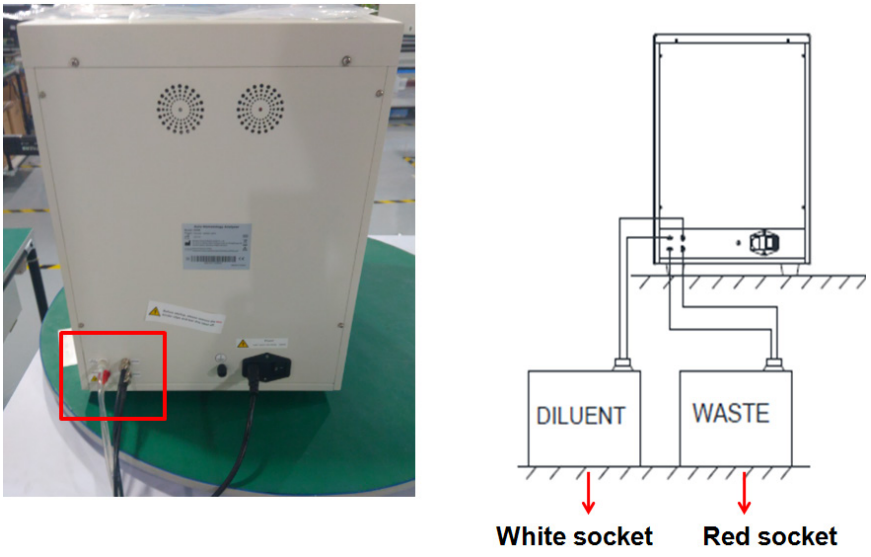
Install waste float sensor.

FIGURE 56



Connect Reagents and Waste container

FIGURE 57



Connect Lyse Reagents in left door.

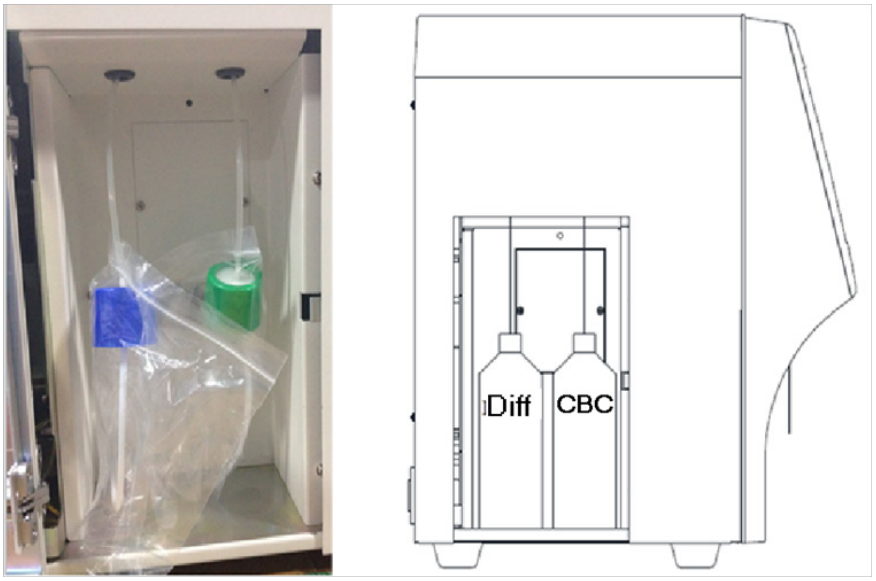


FIGURE 58

Connect power cable

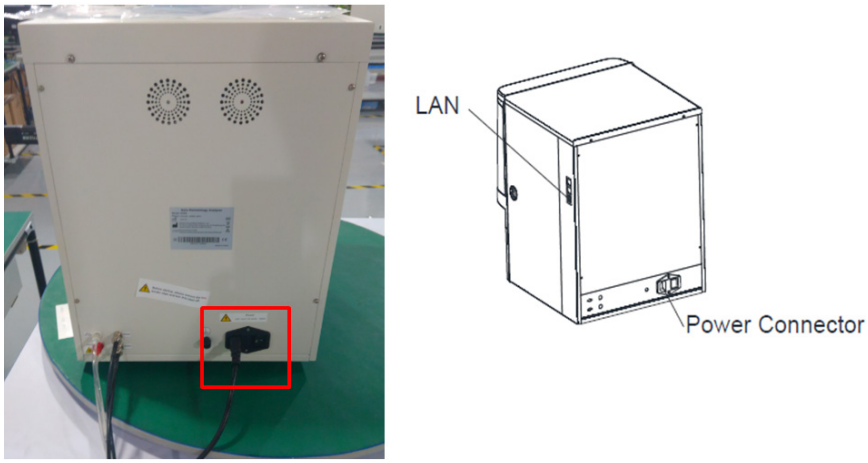
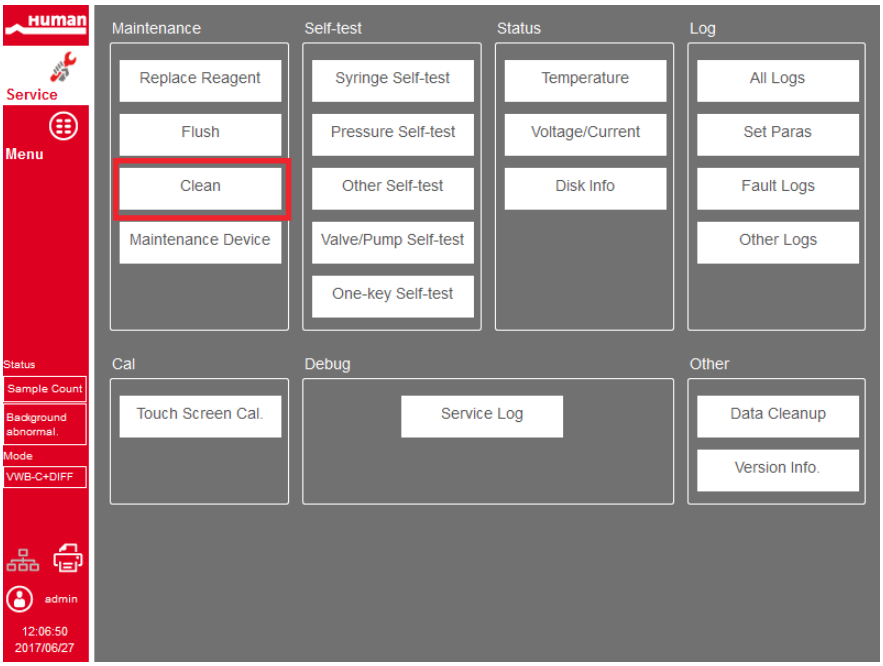


FIGURE 59

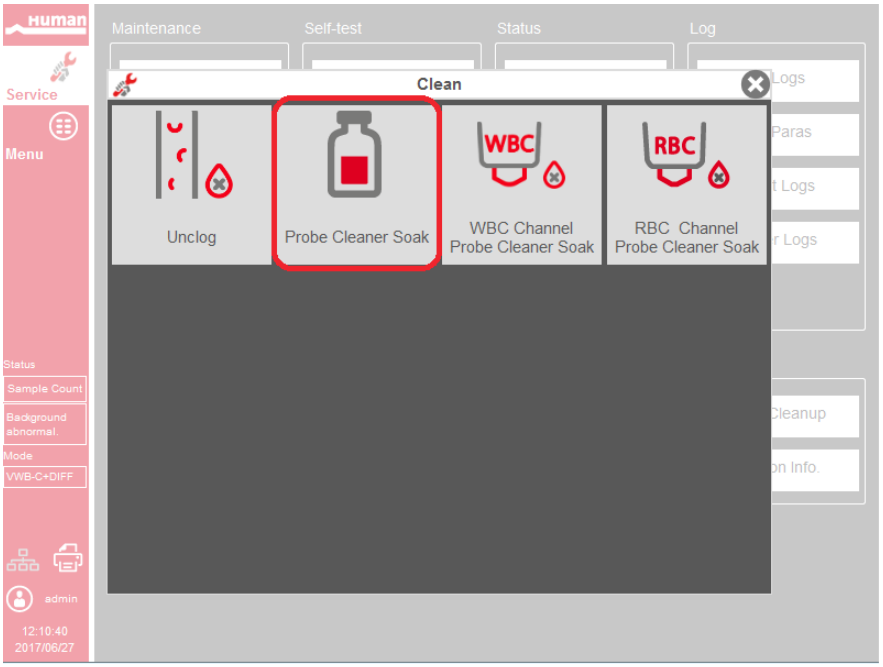
Please enter Service menu and press “Clean” button

FIGURE 60



Please perform the “Probe Cleaner Soak”

FIGURE 61



Normal Background test results should be:

WBC ≤ 0.2×10^{9}/L
RBC ≤ 0.02×10^{12}/L
HGB ≤ 1g/L
HCT ≤ 0.5%
PLT ≤ 5×10^{9}/L

4 MAINTENANCE

4.1 Check and clean sampling needle.

Inspect the needle, needle should be straight if you found the needle bended please exchange with a new one.
Use a cleaning tissue or paper with alcohol to clean the surface of the sampling needle.

4.2 Valves

Activate each valve from the service menu. A switching sound should be heard.

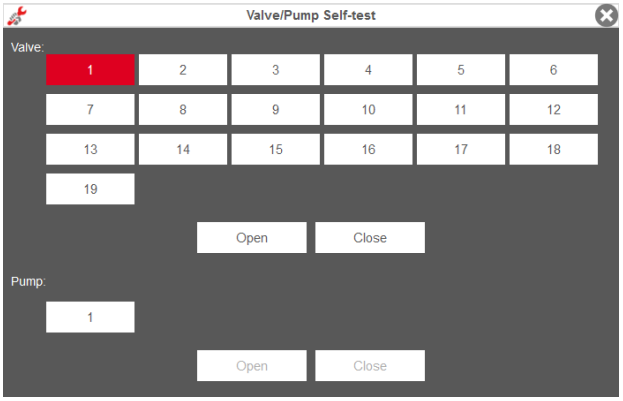


FIGURE 62

4.3 Selftest

Perform the One-key self test in the service menu. All parameters should be in range.

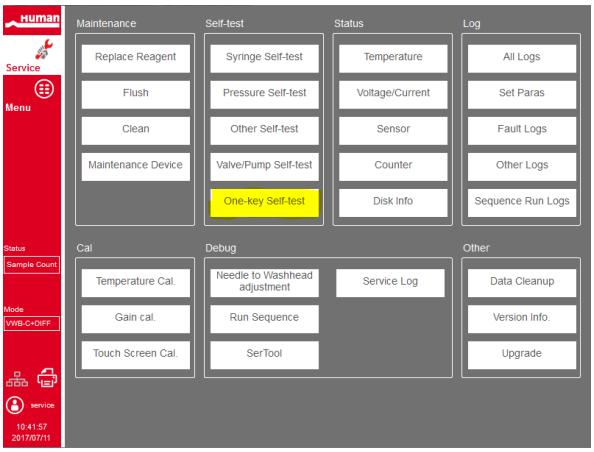
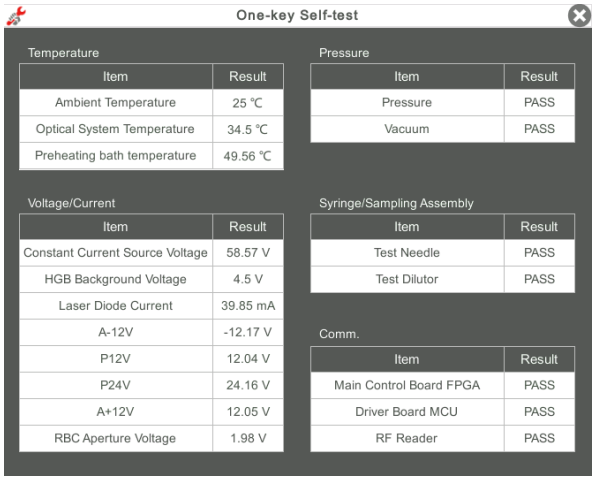


FIGURE 63

FIGURE 64

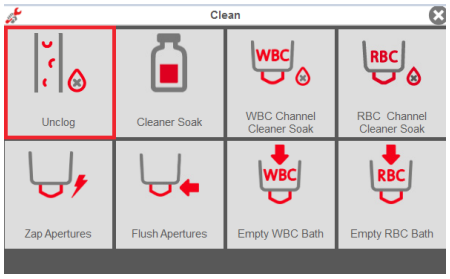


4.4 Cleaning

Please enter the cleaning section of the service menu.

4.4.1 PERFORM “UNCLOG”

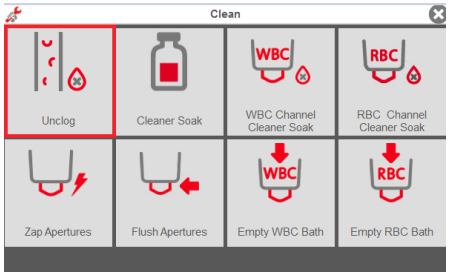
FIGURE 65



4.4.2 PERFORM “CLEANER SOAK”

The whole process takes 20 minutes.

FIGURE 66



4.5 Preliminary Inspect

Content	Requirement	When fails to meet the requirement
Shelf Life	Check if the reagent is expired or not	Remind the end user to replace new reagent.
HGB Blank Voltage	4.50V±0.10V	Adjust HGB Blank Voltage to 4.5V

4.6 Hydraulic System Maintenance

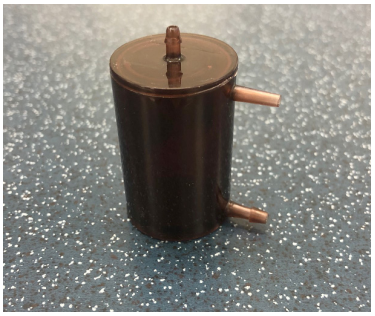
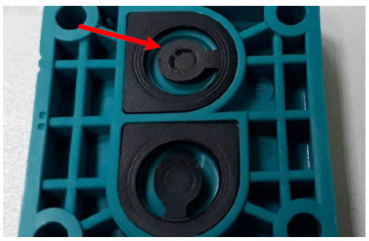
	Parts Name	Instructions
	Isolation Chamber	 Replace the isolation chamber for RBC RBC chamber upper port blocked.
Waste discharge Pump	Disassemble the pump to replace the membrane with a new one	

FIGURE 67

FIGURE 68

Tube Type	Tube Label	Tube length (mm)	Replacement Frequency	Qty Need	Total Length (mm)	Step No.
3603 tube	T168	140	Once a year	2	280	Step No.1
3603 tube	T212	130	Once a year	1	130	Step No.2
S-50-HL,AAX02002,1 /16"ID ×1/8"	T80	25	Once a year	10	250	Step No.3
S-50-HL,AAX02002,1 /16"ID ×1/8"	T197	40	Once a year	3	120	Step No.4
S-50-HL,AAX02002,1 /16"ID ×1/8"	T171	300	Once a year	1	300	Step No.5
S-50-HL,AAX02004,3/32"ID ×5/32 "	T195	25	Once a year	5	125	Step No.6
S-50-HL,AAX02004,3/32"ID ×5/32 "	T172	70	Once a year	3	210	Step No.7
S-50-HL,AAX02004,3/32"ID ×5/32 "	T167	150	Once a year	1	150	Step No.8
S-50-HL,AAX02004,3/32"ID ×5/32 "	T65	240	Once a year	1	240	Step No.9
ABW0002mm Silicone	T69	50	Once a year	1	50	Step No.10

1. There are two positions for T168 tube (tube length is 140mm). The tube connected to LV16 and J8 connector and LV15 and J8 connector and pump is T168 tube, please replace it. Also replace the two J8 connectors N430/420-1 Connector.

FIGURE 69

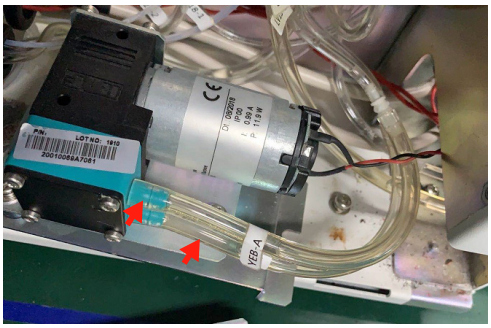
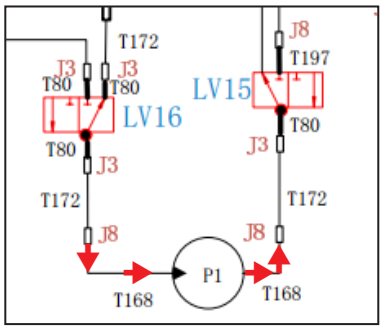
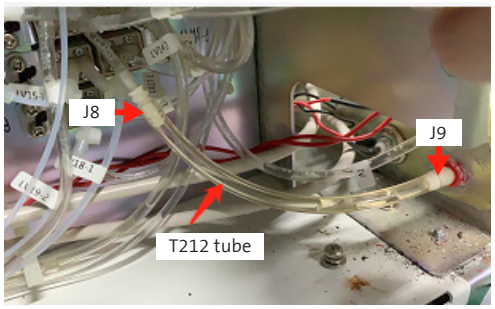


FIGURE 70



2. Please replace tube T212, between J8 connector and J9 connector, the tube length is 130mm.



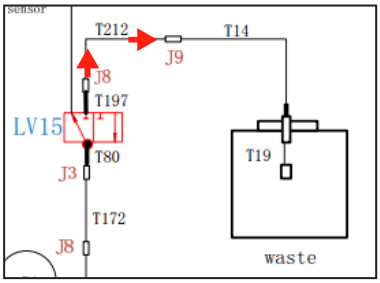


FIGURE 71

FIGURE 72

3. There are 10 pieces **T80 tube** (interchange tube for small valve). For example, the tube connected between small valves LV15 and other tube is **T80 tube** (tube length is **25mm**), please replace it.

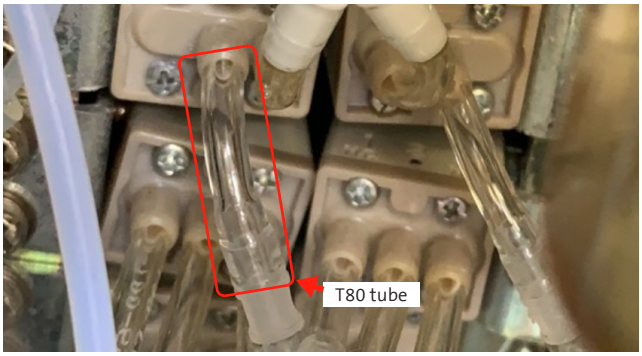


FIGURE 73

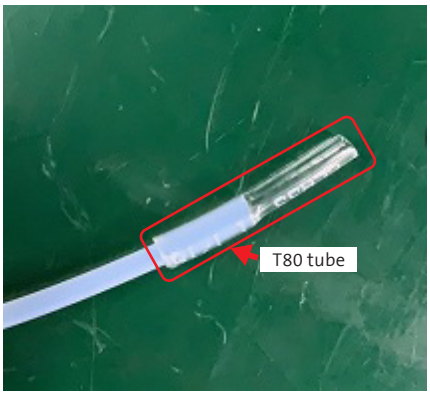


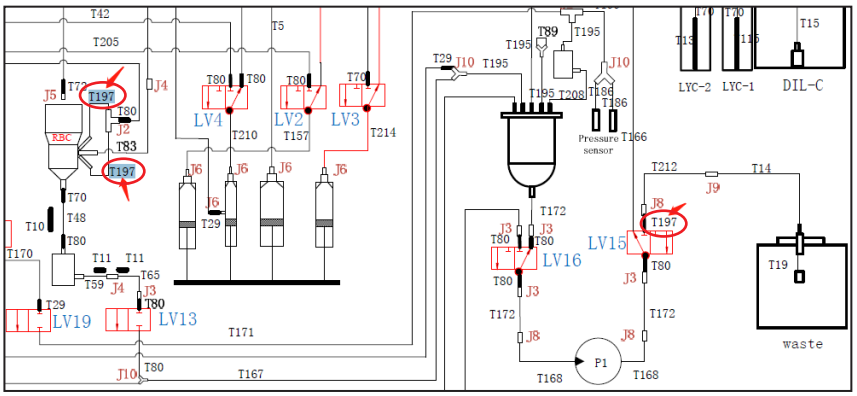
FIGURE 74

The T80 tube is connected to the following valves:

Tube	Valve Item	Qty	Instruction Guide
T80 tube	For LV4 valve tube interchange	2	Replace T80 tube
T80 tube	For LV13 valve tube interchange	2	Replace T80 tube
T80 tube	For LV14 valve tube interchange	2	Replace T80 tube
T80 tube	For LV15 valve tube interchange	1	Replace T80 tube
T80 tube	For LV16 valve tube interchange	3	Replace T80 tube
Total		**10**	

4. There are three pieces T197 tube (tube length is 40mm), please replace it.

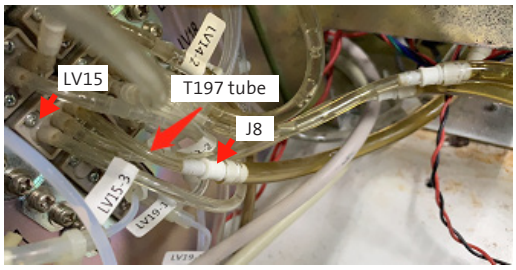
FIGURE 75

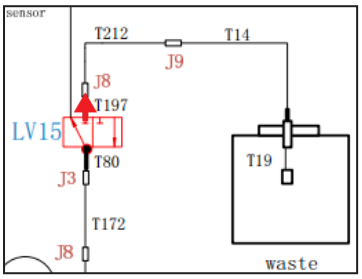


Position 1 for T197 tube (between LV15 and J8 connector)

FIGURE 76

FIGURE 77





Position 2 & 3 for T197 tube (RBC rear bath connection)

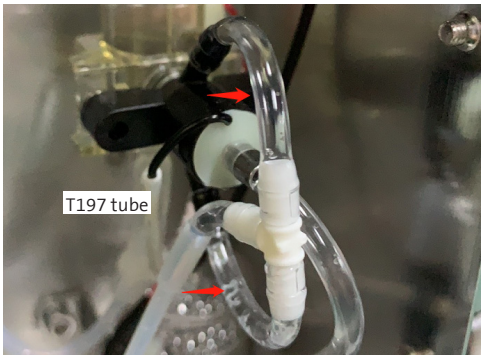


FIGURE 78

5. The tube which is marked as T171, between LV18 and pressure chamber, the tube length is **295mm**, please replace it.

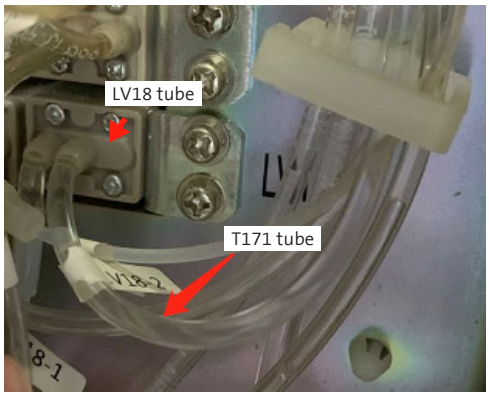


FIGURE 79

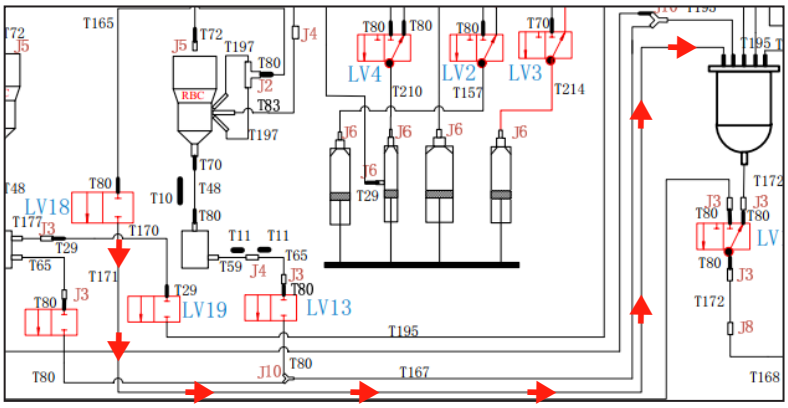


FIGURE 80

6. There are **5** positions for **T195 tube** (tube length is **25mm**), so the tube Qty is **5**. **T195 tube** is for Large two way or Large three way valve interchange connection, please replace it accordingly.

Position 1 for T195 tube (between LV9 and J2 connector)

FIGURE 81

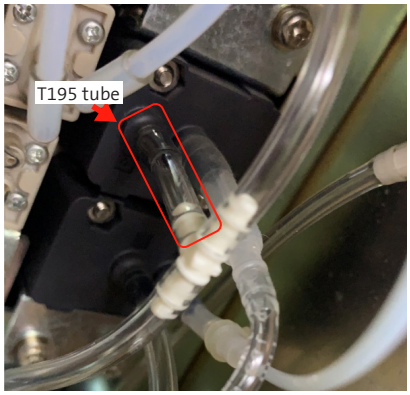
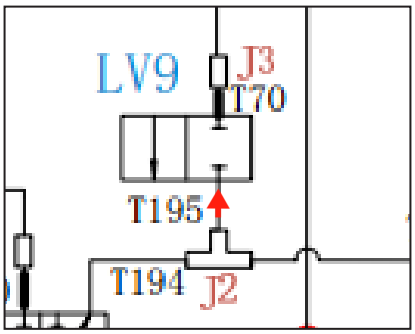


FIGURE 82



Position 2/3/4 for T195 tube

FIGURE 83

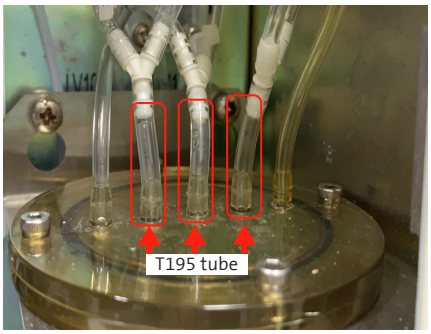
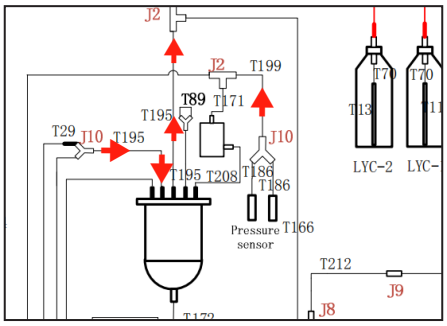


FIGURE 84



Position 5 for T195 tube (between J2 connector and isolation chamber)

FIGURE 85

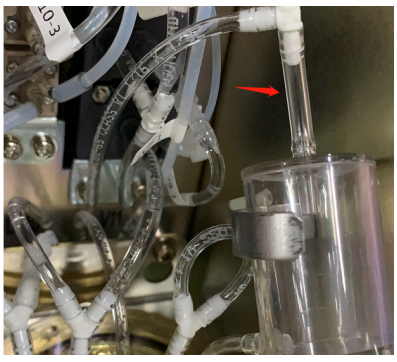
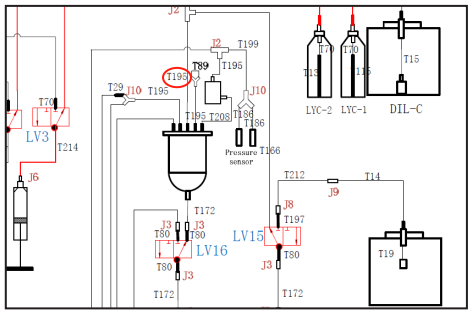
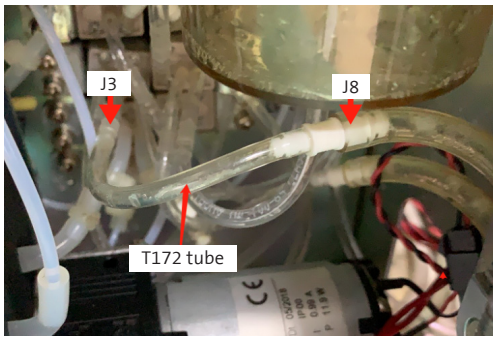


FIGURE 86



7. There are two positions for tube T172 (tube length **70mm**), so the tube Qty is **3**, please replace it accordingly.

Position 1 for T172 tube (connected to LV16 and between J3 and J8 connector)



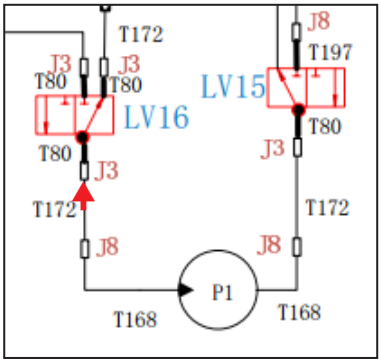
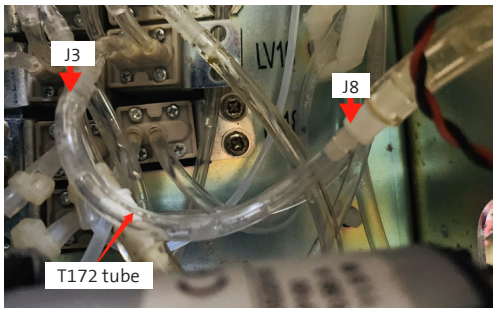


FIGURE 87

FIGURE 88

Position 2 for T172 tube (connected to LV15 and between J3 and J8 connector)



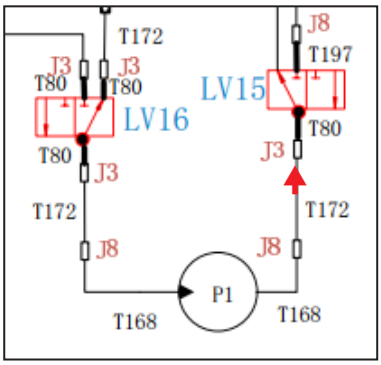
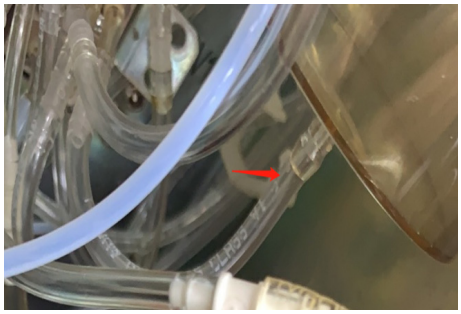


FIGURE 89

FIGURE 90

Position 3 for T172 tube (between vacuum chamber and J3 connector)



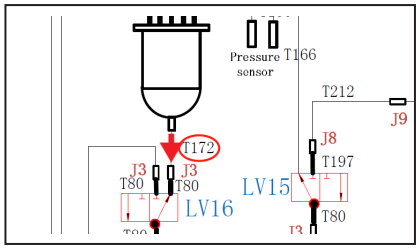


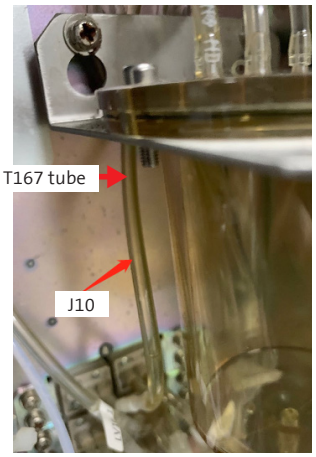
FIGURE 91

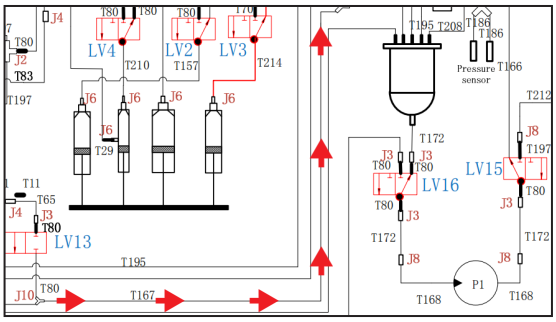
FIGURE 92

8. The tube which is marked as T167, between J10 connector and pressure chamber its tube length is **150mm**, please replace it.

FIGURE 93

FIGURE 94

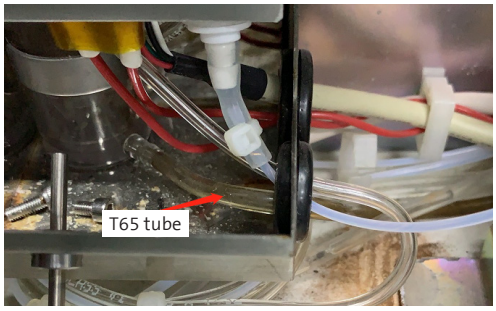


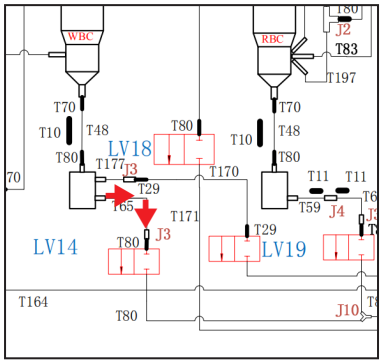


9. The tube between WBC isolation chamber and J3 connector is **T65 tube** (tube length is **240mm**), please replace it.

FIGURE 95

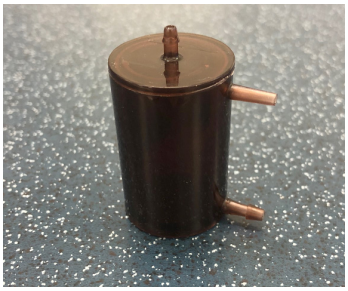
FIGURE 96





Also please replace the WBC isolation chamber with a new one.

FIGURE 97



Furthermore please exchange the T connector 420-1.

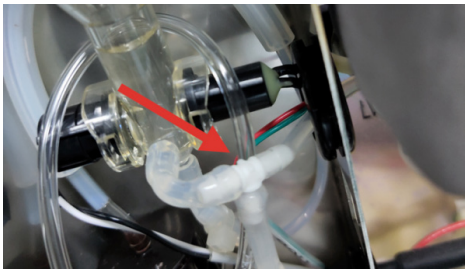
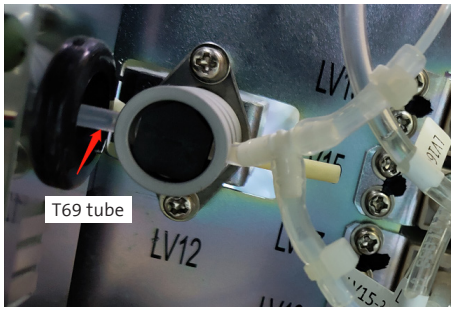


FIGURE 98

FIGURE 99

10. The tube which is marked as T69 connected to LV12 pinch valve the tube length is 40mm, please replace it.



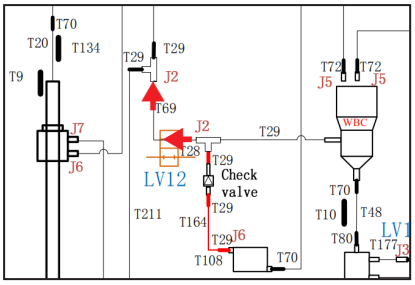


FIGURE 100

FIGURE 101

Exchange the T420-1 connector at Pinch Valve LV12.

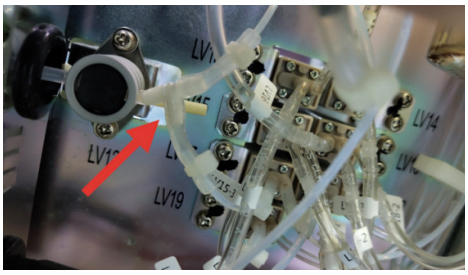
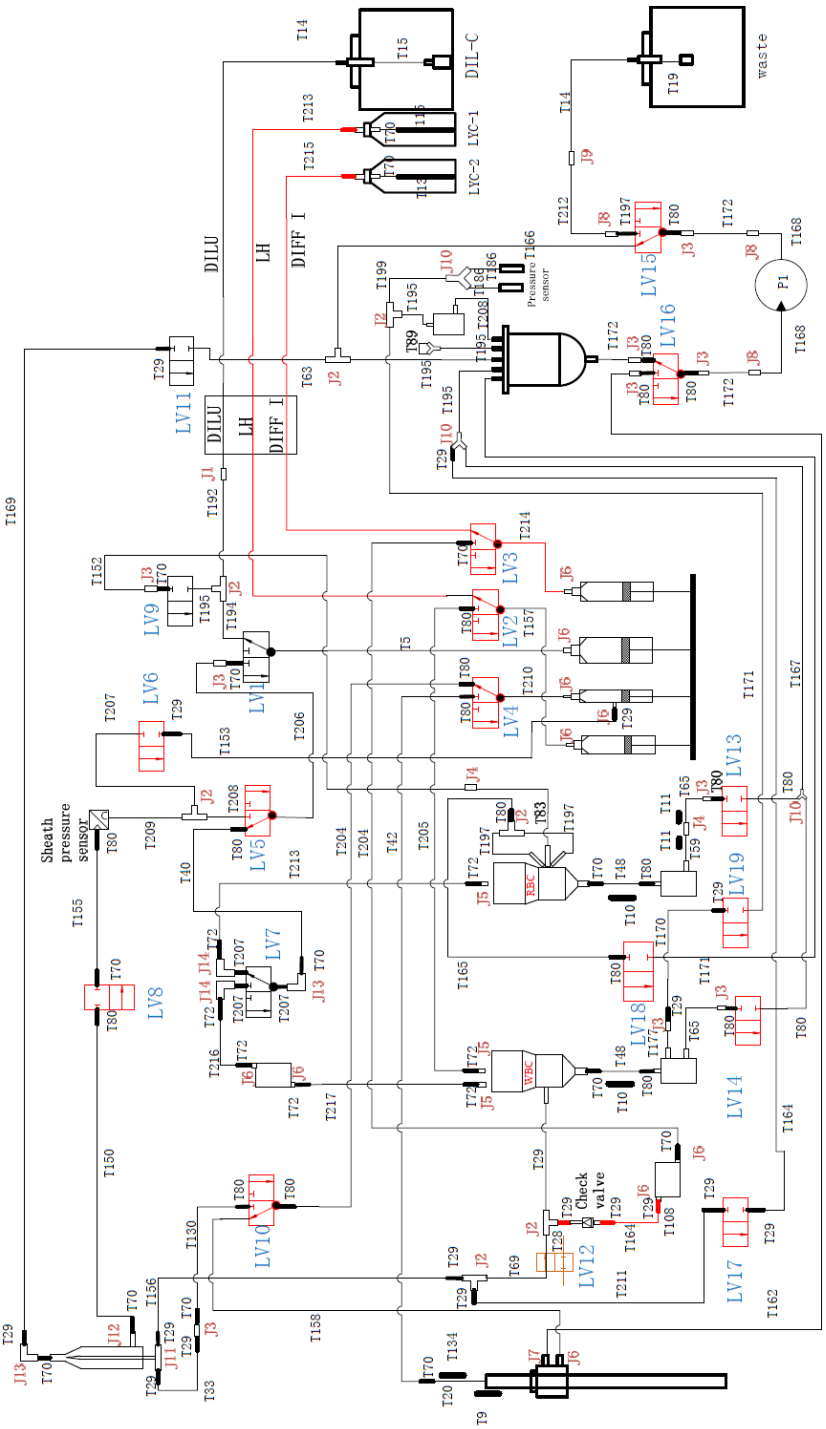


FIGURE 102

FIGURE 103

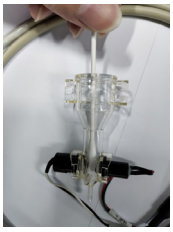
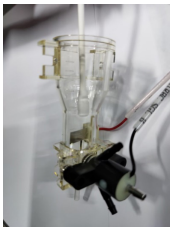
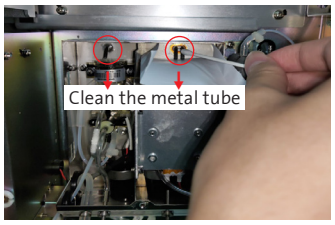
Appendix Tubing Diagram

FIGURE 104



4.7 Counting Chamber Maintenance

	Spare Parts Name	Instructions
Spare Parts requirement	Medical Syringe	Flush the RBC rear bath
	Probe Cleaner	Proportion of cleaner and pure water is 1:3.
	Cotton Swab	Clean the outer wall of each chamber.
	Alcohol	Clean the dust and the crystal of reagent.

	Process	Notes
Counting Chamber — Rear Bath	Use the syringe to aspirate 1:3 cleaner, connect it with the middle outlet of the RBC bath and push the plunger gently to flush the RBC aperture with cleaner. Push and Pull the Cleaner two or three times gentle through the aperture.	 FIGURE 105
Counting Chamber — Front Bath	1. Log in to the service account and get into Service interface. 2. Click Service - Clean - and Empty WBC/RBC Bath (do not click OK). 3. Use a cotton swab with 1:3 cleaner to clean the inner wall of chamber. After finishing cleaning, click OK to re-fill the chamber with diluents.	 FIGURE 106  FIGURE 107
The Titanium Pipes of Counting Chamber	1. Fold a piece of paper and put it above the counting bath to cover it. 2. Use the cotton swab to clean the Titanium pipe with alcohol.	 FIGURE 108

4.8 Sampling Assambly Maintenance

	Spare Parts Name	Instructions
Spare Parts Requirement	Lubricating oil for Sampling Module	 Lubricate the sampling assembly module

FIGURE 109

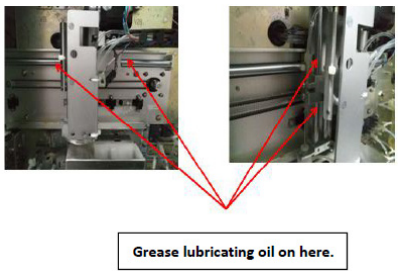
	Process	Note
Lubricaiting Sampling Assembly Module with Lubrication Oil	1. Switch off the power and push the horizontal/ vertical motor to the middle position 2. Clean up the slider with alcohol. 3. Grease appropriate slider with lubricating oil. 4. Manually push the motor back and forth 10 times. 5. After finish step 4 repeat step 2 and step 3.	

FIGURE 110

Sample Probe Maintenance

1. Use cotton swab to clean the outer wall of sample probe with 1:3 cleanser. Then clean it again with pure water.
2. Clean the inner wall of sample probe. Use a syringe to aspirate 1:3 cleaner and connect it to the sample probe. Push the cleaner through the sample probe.

FIGURE 111

FIGURE 112

Cleaning Wash Head

1. Take out the washing head and connect the exit with a syringe.
2. Soak the washing head in a cup of 1:3 cleaner and flush the washing head with the syringe.
3. Use cotton swab to clean the outer wall of the washing head with 1:3 cleaner.

FIGURE 113

FIGURE 114

FIGURE 115

4.9 Dilutor Maintenance

	Spare Parts Name	Instructions
Spare Parts Requirement	Cotton Swab	Clean the slider.
	Grease (white cup) 	Grease for mechanics of Dilutor module
	Alcohol	Clean the slider.
	O-ring for Diluent Syringe	Replace the O-ring
	O-ring for Lyses Syringe 1	Replace the O-ring
	O-ring for Lyses Syringe 2	Replace the O-ring
	O-ring for Sampling Syringe	Replace the O-ring

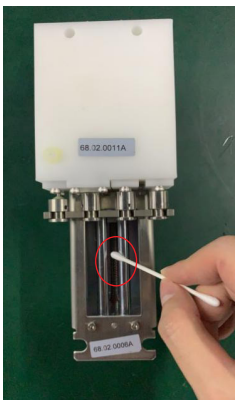
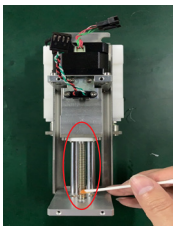
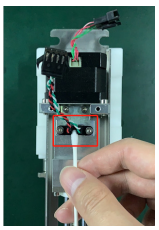
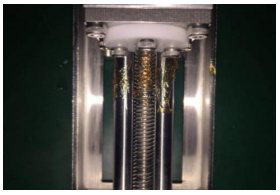
	Process	Note
Syringe Maintenance	1. Use cotton swab to clean the syringe assembly with alcohol. 2. If it gets air-leakage or liquid-leakage, replace the whole syringe.	
Grease Dilutor	1. Remove the back cover of Dilutor and clean the dust and black debris. 2. Grease the slider with grease (white cup). 3. Move the syringes up and down (very hard movement) to distribute the grease. 4. Clean the opto sensor with a cotton tip	  

FIGURE 116

FIGURE 117

FIGURE 118

FIGURE 119

FIGURE 120

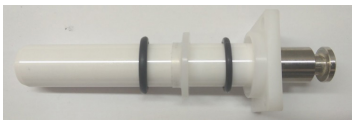
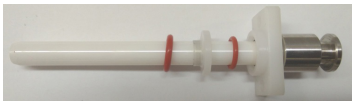
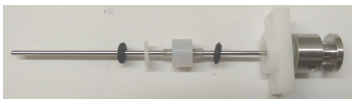
O-ring for Diluent Syringe	Disassemble the syringe to replace the O-rings with new ones.	
O-ring for Lyses Syringe	Disassemble the syringe to replace the O-rings with new ones.	
O-ring for Sampling Syringe	Disassemble the syringe to replace the O-rings with new ones.	

FIGURE 121

FIGURE 122

FIGURE 123

4.10 Dust Removal Maintenance

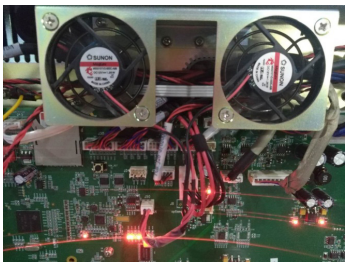
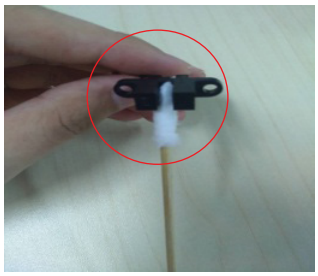
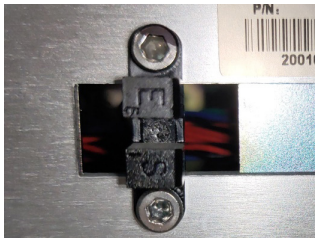
	Spare Parts Name	Instructions
Spare Parts Requirement	Cloth	Clean the surface of mental.
	Fan	Replace the old fans.
	Cotton swab	Clean the corner.
	Alcohol	Clean the dust.
	Process	
Remove the Dust for Power Fan	1. Switch off the power from analyzer. 2. Check if the fan gets abnormal noise. If it does, replace the fan 3. If the fan is normal, clean the fan blade.	
Remove the Dust from Optocoupler	1. Use cotton swab to clean the sensitive part of optocoupler.	
		

FIGURE 124

FIGURE 125

FIGURE 126

4.11 Calibration

Please perform calibration with HC calibrator from Human. Calibration factors should be in range.

4.12 Chapter 8 QC

QC verification

Please perform QC measurements with Hc 5D control material for all three levels.

Test Content	Requirement
Test all three levels	All results must meet target values

4.13 Fresh & Healthy blood samples.

Repeat-ability Verification (5 times repeating testing with fresh healthy blood).

Item	WBC	HGB	MCV	RBC	PLT
No.1					
No.2					
No.3					
No.4					
No.5					
CV Requirement	≤2.0%	≤1.5%	≤1%	≤1.5%	≤4.0%

Scatter gram Verification

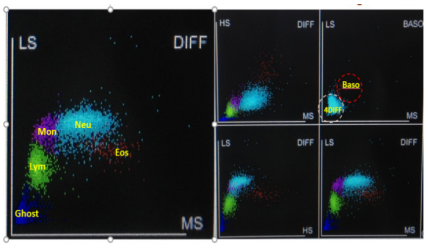
Inspection Process	Standard Scatter Gram
Run fresh healthy blood sample testing and check the scatter gram if it is normal. Each scatter group is separated from each other without overlapping	

FIGURE 127

5 SERVICE SOFTWARE

5.1 Preface

This chapter describes the functions of the HumaCount 5D analyzer operated by the service engineer only.

In addition, the service engineer has the entire administrator's authority. The instructions for administrators also apply to service engineers, so that won't be covered again here. For details, see the ***Operator's Manual.***

5.2 Accessing the Interface

When the login message box is visible, enter the service name and password.

User Name: service

Password: 486265D

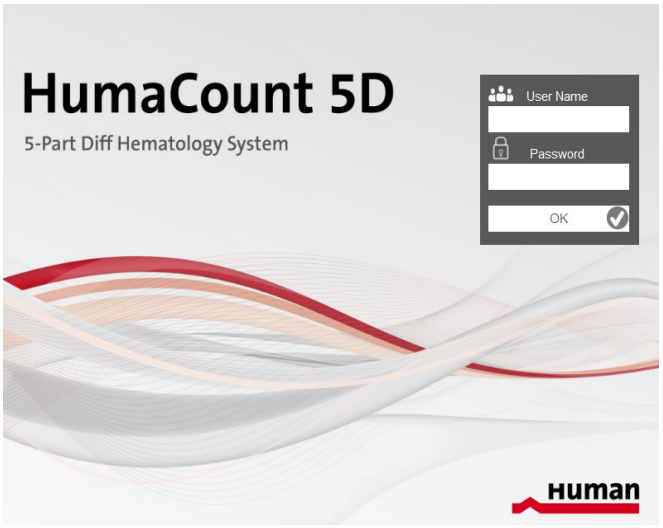


FIGURE 128

The analyzer will perform self-test and initialization sequence.

When a pop-up dialog box prompts you to run startup clean maintenance, click the Yes button to the run the maintenance before accessing the operating interface, or click the No button to cancel the maintenance and access the operating interface at once.

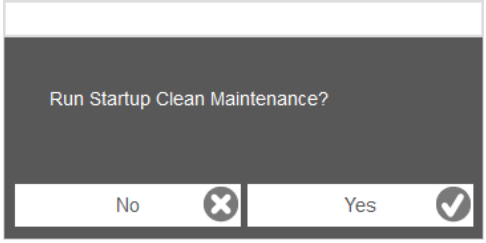
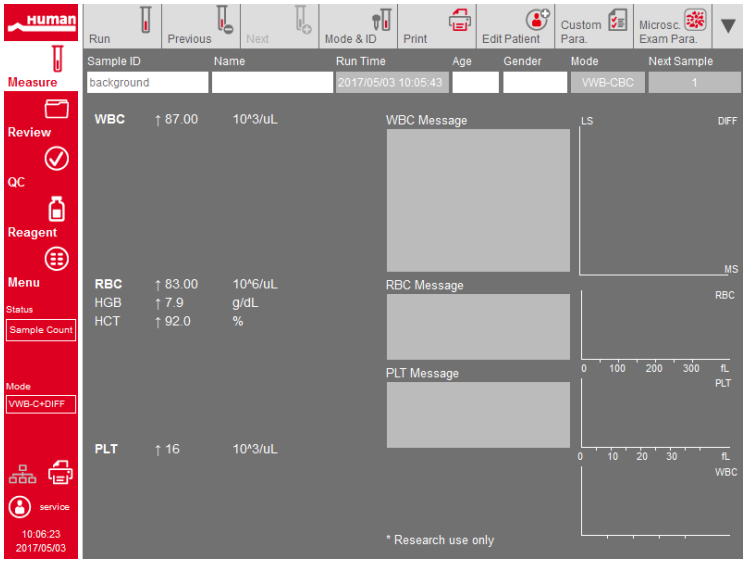


FIGURE 129

The whole process lasts for 3 to 10 minutes. (Time needed for initializing the fluidic systems depends on how the analyzer was previously shut down.)
The operating inteface displays as below.

FIGURE 130

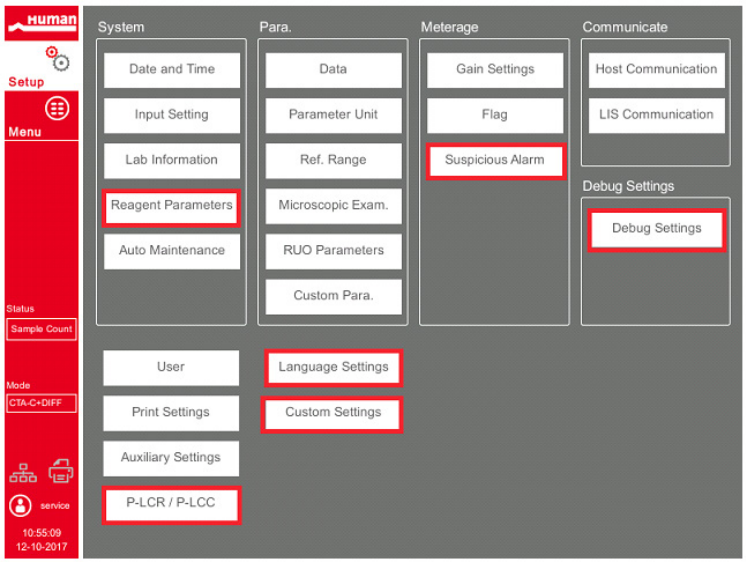


5.3 Setup

5.3.1 ACCESSING THE INTERFACE

Select **Menu** > **Setup** to accessing the **Setup** interface.

FIGURE 131



5.3.2 REAGENT PARAMETERS

Select this button in the **System** section to set the reagent information, including reagent model and name.

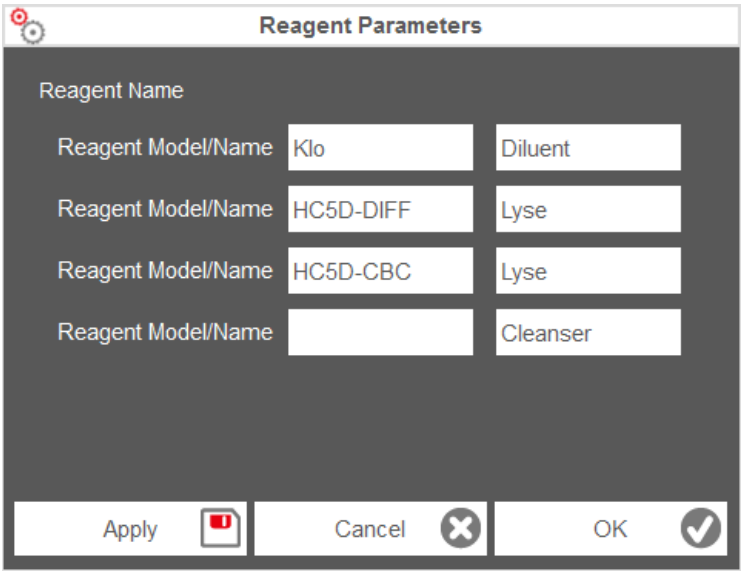


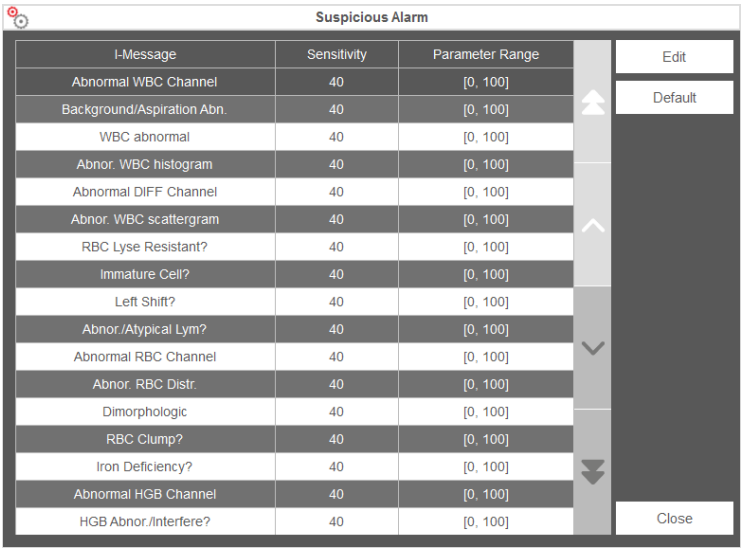
FIGURE 132

Edit the value of Reagent Model/Name respectively in the corresponding textboxes.
Click the **Apply** button to save the modifications.
Click the **Cancel** button to close the dialog box without modification.
Click the **OK** button save the modifications and close the dialog box.

5.3.3 SUSPICIOUS ALARM

Select this button in the **Meterage** section. The **Suspicious Alarm** interface display the suspicious alarm messages for the analyzer, including message name, sensitivity and parameter range.

FIGURE 133

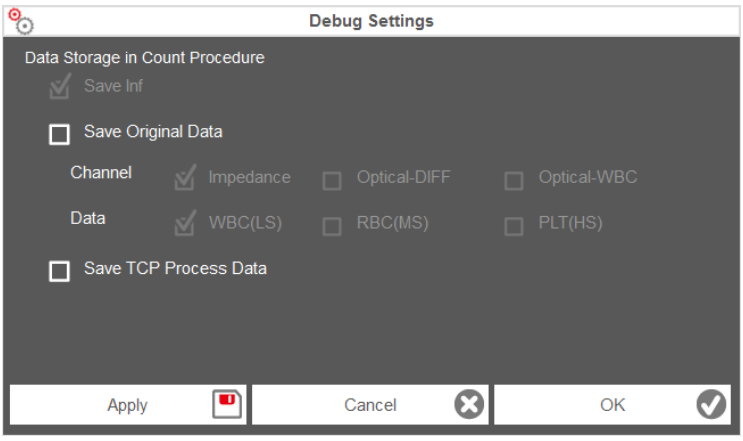


Select a message and click the **Edit** button to change the sensitivity of the message.
0 would be very sensitive and 100 would very unsensitive.
Click the **Default** button to restore any of the parameter to the default value.
Click the **Close** to close the dialog box.

5.3.4 DEBUG SETTINGS

Select this button in the **Debug Settings** section. In the **Debug Settings** interface, you can choose the debug data to be saved in the counting procedure.

FIGURE 134



- Check box **Save Inf**
- The INF data is saved by default and cannot be cancelled.
- Checkbox **Save Original Data**
- It's unselected by default, the impedance channel data and the WBC (LS) data are saved in the counting procedure.
- If selected, the options for the channel and the data are enabled. You can choose whether to save the DIFF channel data, WBC channel data, WBC(LS) data, RBC(MS) data PLT(HS) data or not. In addition, the Impedance channel data is saved by default and cannot be cancelled.
- This function is only needed after advice of Human Service Team.
- Checkbox **Save TCP Process Data**
- It's unselected by default, which means no TCP process data is saved.
- If selected, the TCP process data is saved during the counting procedure.
- This Function is only needed after advice of Human Service Team.
- Button **Apply** saves the settings.
- Button **Cancel** cancels the settings and closes the dialog box.
- Button **OK** saves the settings and closes the dialog box.

The saved debug data can be exported to a USB flash disk by the button **Service Log** in Debug section in **Service** interface, for developers to find and solve problems.

5.3.5 P-LCR & P-LCC

FIGURE 135

If the **Yes** checkbox is selected, the P-LCR and P-LCC parameters are displayed in the parameter list, and the P-LCR and P-LCC are included in the counting results. Otherwise, the P-LCR and P-LCC are not displayed.
Click the **Cancel** button to cancel the settings and close the dialog box.
Click the **OK** button to save the settings and close the dialog box.

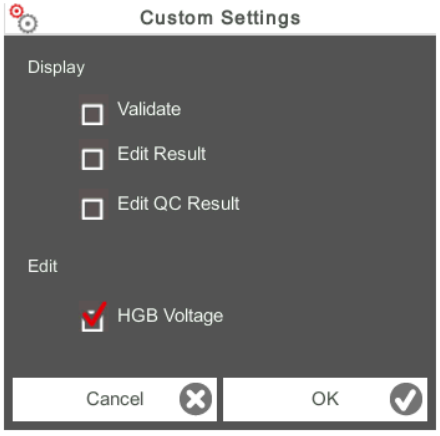
5.3.6 LANGUAGE SETTINGS.

FIGURE 136

Select the display language of the analyzer from the dropdown list of **Current Language.**
Click the OK button to save the settings and close the dialog box. A dialog box displays for confirmation. To be sure to change the language, click **Yes**. To cancel the settings, click **No**.
After the language is changed, the analyzer needs to be restarted for the change to take effect.

5.3.7 CUSTOM SETTINGS

FIGURE 137



- Checkbox **Validate**
  It's unchecked by default, which means the validation function is disabled.
  If it's checked, the **Validate** button is displayed on the **Measure** and **Review** interface. The sample results can be validated or cancelled validation.
- Check box **Edit Result**
  It's unchecked by default, which means the sample results cannot be changed.
  If it's checked, the **Edit Result** button is displayed on the Measure and Review interface. The sample results can be edited.

- Check Box **Edit QC Result**
  It´s unchecked by default, which means the QC results cannot be changed. If it´s checked, the Edit QC Results button is displayed. The QC result can be edited.
- Button **Cancel** cancels the settings and closes the dialog box.
- Button **OK** saves the settings and closes the dialog box.

5.4 Cal

5.4.1 ACCESSING THE INTERFACE

Select **Menu** > **Cal** to access the calibration interface.

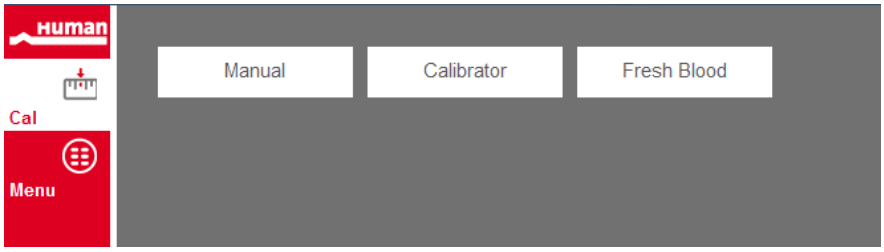


FIGURE 138

5.4.2 MANUAL

Select this button to access the manual calibration interface.

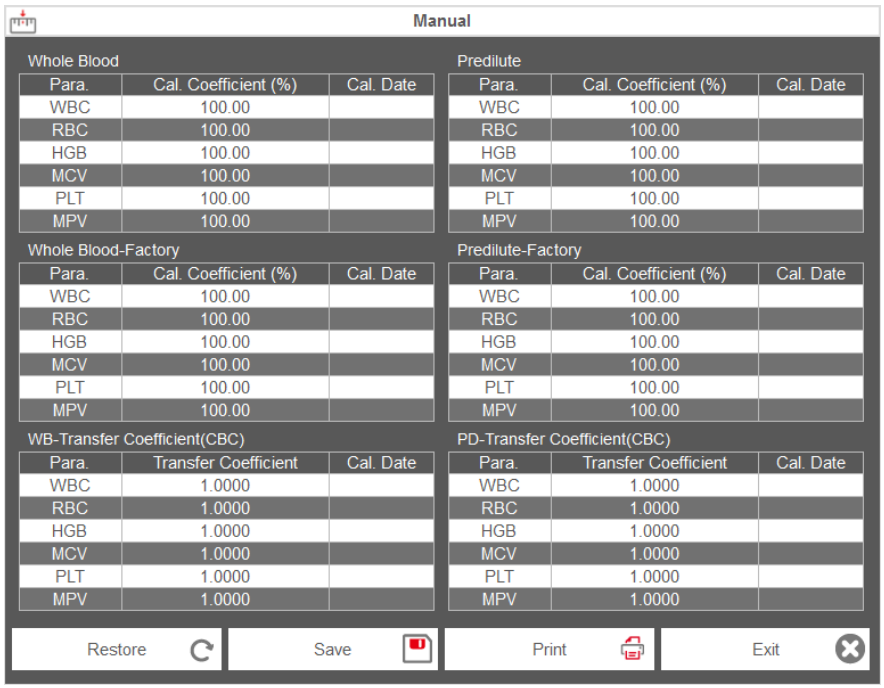


FIGURE 139

The interface displays the factory calibration coefficients and transfer coefficients besides the user calibration coefficients.

- Column **Para**.
- This column displays the parameters to be manually calibrated.
- Column **Cal. Coefficient (%)**, **Transfer Coefficient**
- This column displays the calibration coefficient/transfer coefficient of the corresponding parameter.
- Column **Cal. Date**
- This column displays the last calibration date of the parameter after the value of the coefficient is modified.
- Modify a value of coefficient
- Click the cell corresponding to the **Cal. Coefficient (%)/Transfer Coefficient** column of the parameter, and enter a value.
- Button **Save** saves the modifications.
- Button **Restore** restores the parameter to the default value.
- Button **Print** prints the calibration data.
- Button **Exit** closes the dialog box.

5.4.3 AUTO CALIBRATION USING CALIBRATORS FOR SERVICE-LEVEL USERS

All the samples, controls, calibrators, reagents, wastes and areas in contact with them are potentially biohazardous. Wear proper personal protective equipment (e.g. gloves, lab uniforms, etc.) and follow laboratory safety procedures when handling them and the relevant areas in the laboratory.

Note:

- **Only Human-specified calibrators shall be used. Human will not be responsible for any erroneous result caused by using other calibrators.**
- **See the instructions for use of the calibrators for the lot No., Exp.Date and the target.**
- **The calibration procedures for administrator-level are different from the service-level. To perform the calibration procedures with service level, please log out and log in as service-level access.**

Complete the calibration with calibrators as per the following procedure

1. Click **Cal** in the menu page to access the calibration interface.
2. Click **Calibrator**.
   The Calibrator interface pops up as shown in Figure 140.

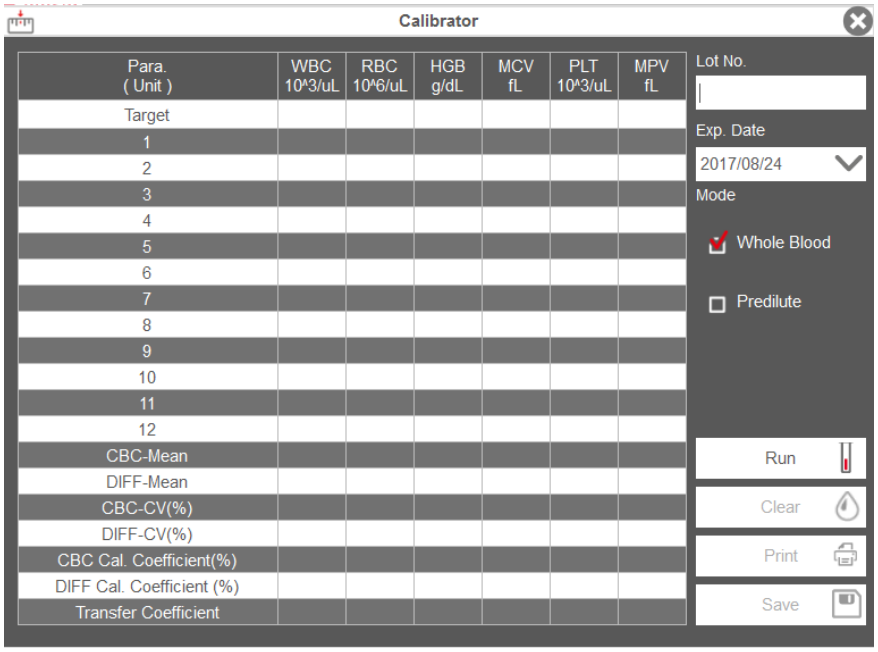


FIGURE 140

3. Enter the lot No. of the calibrator into the Lot No. box.
4. Click the **Exp. Date** box, and then edit the **Exp. Date.**
5. Select whole blood mode

Note:

- **The Exp. Date can be no earlier than the current system date.**
- **The entered Exp. Date should be either the Exp. Date printed on the labeling or the open-container expiration date, whichever is earlier. The open-container expiration date is calculated as follows: The date on which the container is opened + the open-container stability days.**

6. Input the target values of the parameters in the corresponding cell of the **Target**.
7. Prepare the calibrators following their instructions for use and place the calibrators under the sampling probe.

8. Press the aspirate key to start the calibration counting.
   After every calibration run, the progress bar will close automatically and the analyzer will have different responses according to different analysis results.
   - The valid results within the linearity range will be displayed directly.
   - If the calibration counting data of any parameter in the current counting are out of the display range or linearity range of the parameter, a message box will pop up on the screen prompting that the calibration data is invalid.
     Click OK to close the message box and delete the data from the table without saving.
   - If any of the parameter's value in the calibration counting differs from the Target value by more than 50%, the system will prompt you with a message box asking if the calibration counting results should be kept.
     To keep the results, click **Yes**; to remove the results, click **No**.

Note:
- **After the valid calibration result is obtained, the parameters with corresponding checkboxes ticked off will be involved in the calculation of the calibration coefficients by default.**
- **If you switch to other interfaces before the new calibration coefficients are obtained, the system will discard the current calibration data and keep the original calibration coefficients.**

9. There are 12 counting results in total, to get the former 6 valid counting results, repeat steps 7~8 six times. The analyzer will, by default, calculate the Mean, CV% and the new calibration coefficients of CBC mode based on all the ticked-off calibration data according to the formulae.
10. To get the following 6 valid counting results, repeat steps 7~8 six times. The analyzer will, by default, calculate the Mean, CV% and the new calibration coefficients of DIFF mode based on all the ticked-off calibration data according to the formulae.
11. When the amount of the valid calibration data in the list reaches 12, the transfer coefficient is obtained according to the below formula. A message box of Calibrator calibration done! will pop up. Click **OK** to close the message box.

$$\text{Transfer coefficient} = \frac{\text{DIFF - Mean}}{\text{CBC} - \text{Mean}}$$

Note:
- **The out-of-range CV% does not influence the display of the calibration coefficients days.**

12. Click **Save**.
- If the calculated calibration coefficients of all parameter are within the range of 75%~125% and the CV% of all parameter are also within the repeatability, then a dialog box prompting the successful calibration setting will pop up. Click **OK** to close the message box.
- If the obtained calibration coefficient of any parameter is not within the range of 75%~125% or the CV% of any calibrated parameter does not meet the repeatability, the calibration coefficient will not be saved and a dialog box indicating invalid new calibration coefficient will pop up. Click **Yes** to close the dialog box and repeat the calibration operations.

13. (Optional) Click **Print** to print the calibration results.
14. Select Prediluted mode and repeat steps 6-12 to perform calibration for prediluted mode.

5.5 Service

5.5.1 ACCESSING THE INTERFACE

Select **Menu** > **Service** to access the service and maintenance interface.

5.5.2 STATUS > SENSOR

Select **Sensor** in the Status section. The **Sensor** screen consists of 5 sections: **Sampling Assembly Photocoupler, Reagent Photocoupler, Float Sensor, Syringe Photocoupler and Other.**

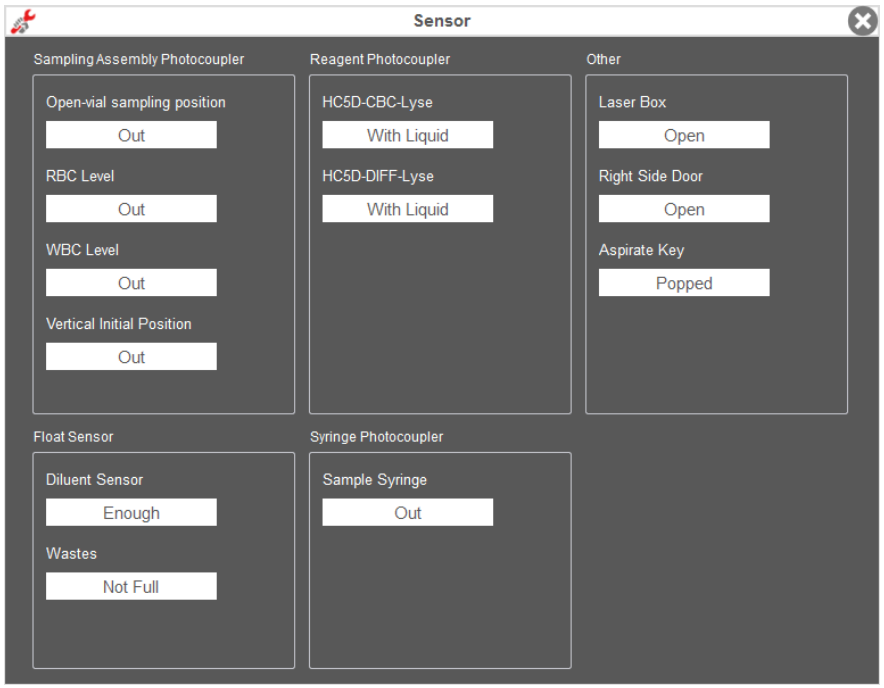


FIGURE 141

5.5.2.1 Section Sampling Assembly Photocoupler

The field in this section displays the state of the corresponding photocoupler: In or Out.

5.5.2.2 Section Reagent Photocoupler

The field in this section displays the state of the lyse: With Liquid or No Liquid.

5.5.2.3 Section Float Sensor

Display field Diluent Sensor displays the state of the diluent: Enough or None (Empty).

Display field Wastes displays the state of the waste container: Full or Not Full.

5.5.2.4 Section Syringe Photocoupler

The field in this section displays the state of the syringe photocoupler: In or Out.

5.5.2.5 Section Other

Display field Laser Box displays the state of the laser box: Open or Close.

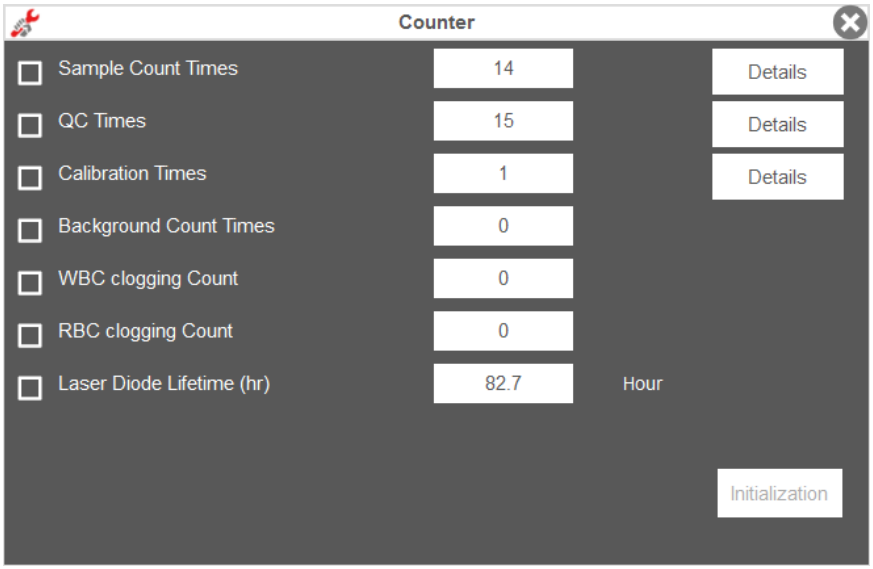
Display field Right Side Door displays the state of the right side door: Open or Close.

Display field Aspirate Key displays the state of the aspirate key: Popped or Pressed.

5.5.3 STATUS > COUNTER

Select Counter in the Status section. The Counter screen displays the device related statistics.

FIGURE 142



- Display field for the sample count times
- Button **Details** displays the detailed statistics of sample count times in different measurement modes.
- Display field for the QC times
- Button **Details** displays the detailed statistics of QC count times in different QC modes.
- Display field for the calibration times
- Button **Details** displays the detailed statistics of calibration times in different calibration modes.
- Display field for the background count times
- Display field for the WBC clogging count
- Display field for the RBC clogging count
- Display field for the Laser diode lifetime (hr)
- Button **Initialization** resets the selected counter to 0.

5.5.4 LOG > SEQUENCE RUN LOG

Select **Sequence Run Log** in the **Log** section. The **Run Sequence Log** screen displays the sequence running records of the analyzer.

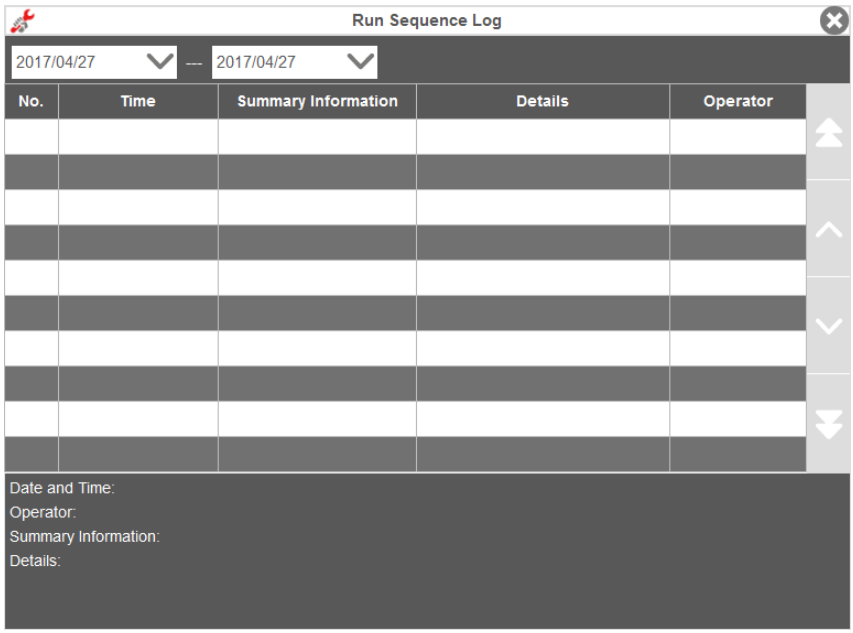


FIGURE 143

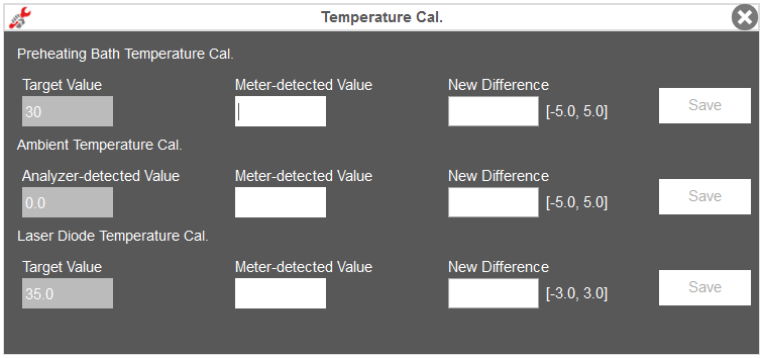
View the logs of the specified date: select the dates in the two date textboxes, and then you can view the all logs within the date range, including operation date and time, operation details and the operator.

5.5.5 CAL > TEMPERATURE CAL.

- **Before temperature calibration, the right side door should be opened and the panel cover should be disassembled. For details, see the service manual.**
- **The temperature calibration should be performed after the analyzer is turned on for at least 5 minutes.**

Select **Temperature Cal.** in the Cal section. In the **Temperature Cal.** Interface, you can perform the preheating bath temperature calibration, ambient temperature calibration and laser diode temperature calibration.

FIGURE 144



5.5.5.1 Section Preheating Bath Temperature Cal.

If the real measured temperature is between **48.5 - 51.5** there is no need to perform a calibration.

- Display field **Target Value**
- Display of **Target Value** shows the current value for the preheating bath temperature.
- Edit field **Meter-detected Value**
- The edit field is the temperature of the preheating bath measured and entered by user.
- Display field **New Difference**
- Display of **New Difference** shows the difference between target value and meter-detected value. The value that exceeds the normal range (-5.0~5.0) displays in a red background.
- Button **Save** saves the calibration.
- How to calibrate the preheating bath temperature

a. Place the thermometer probe with the appropriate amount of thermal compound and attach the probe to the preheating bath heating plate.
b. When the test value is stable, fill the value in the **Meter-detected Value** text box. The value of **New Difference** displays automatically.

c. If the **New difference** is in the specified range, Click **Save;** if not, contact Human Support.

5.5.5.2 Section Ambient Temperature Cal.

- Display field **Analyzer-detected Value**
- Display of **Analyzer-detected Value** shows the current value for the ambient temperature for the analyzer.
- Edit field **Meter-detected Value**
- The edit field is the ambient temperature measured and entered by user.
- Display field **New Difference**
- Display of **New Difference** shows the difference between target value and meter-detected value. The value that exceeds the normal range (-5.0~5.0) displays in a red background.
- Button **Save** saves the calibration.
- How to calibrate the ambient temperature
  d. Place the thermometer in the air.
  e. When the test value is stable, fill the value into the **Meter-detected Value** text. The value of New Difference displays automatically.
  f. If the **New difference** is in the specified range, Click Save; if not, contact Human Support.

5.5.5.3 Laser Diode Temperature Cal.

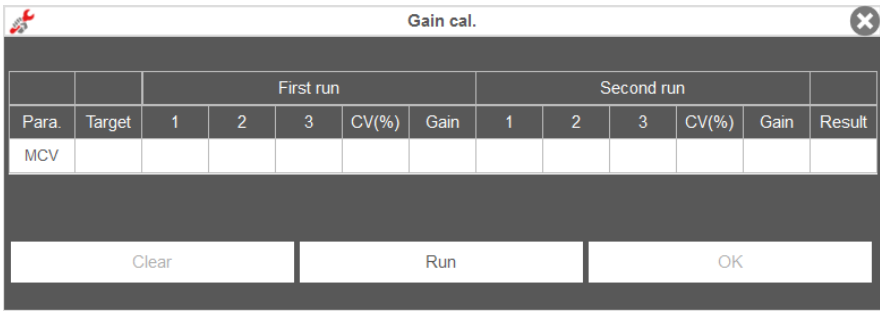
- Display field **Target Value**
- Display of **Target Value** shows the current value for the laser diode temperature.
- Edit field **Meter-detected Value**
- The edit field is the temperature of the laser diode measured and entered by user.
- Display field **New Difference**
- Display of **New Difference** shows the difference between target value and meter-detected value. The value that exceeds the normal range (-5.0~5.0) displays in a red background.
- Button **Save** saves the calibration.
- How to calibrate the laser diode temperature
  g. Place the thermometer probe with the appropriate amount of thermal grease and insert the probe into the hole on the top of the laser.
  h. When the test value is stable, fill the value into the **Meter-detected Value** text box. The value of **New Difference** displays automatically.
  i. If the New Difference is in the specified range, Click Save; if not, contact Human Support.

5.5.6 CAL > GAIN CAL.

NOTE: Gain calibration needs only to be performed for the replacement of RBC bath and/or main control panel.

Select **Gain Cal.** in the **Cal** section to access the gain calibration interface.

FIGURE 145



The gain calibration procedures are as follows:

1. Fill in the **Target** cell corresponding to MCV with the MCV reference value for quality control.
2. Perform the QC test for three times in a row for the first run.
   The results for each time will be automatically displayed.

➢ If the CV falls within reasonable parameters, the screen will show the CV and Gain values for the first run. Go to step 3.

➢ If it does not fall within reasonable parameters, you'll be prompted to redo the calibration. Please click OK to close the message box. Then click Clear to delete the data, and repeat the step 2.

3. Perform the QC test for three times in a row for the second run.
   The results for each time will be automatically displayed.

➢ If the CV falls within reasonable parameters, the screen will show the CV and Gain values for the second run, and show the final results. Please click "OK" to complete gain calibration.
   If it does not fall within reasonable parameters, you'll be prompted to redo the calibration. Please click OK to close the message box. Then click Clear to delete the data, and repeat the step 3.

5.5.7 DEBUG

NOTE: Before the debugging of Needle to Washhead adjustment, the right side door should be opened.

5.5.7.1 Needle to Washhead adjustment

Select this button in the **Debug** selection. In the **Needle to Washhead** adjustment screen, you can reset the washhead height after the replacement of the sampling assembly and relevant parts of the wash head.

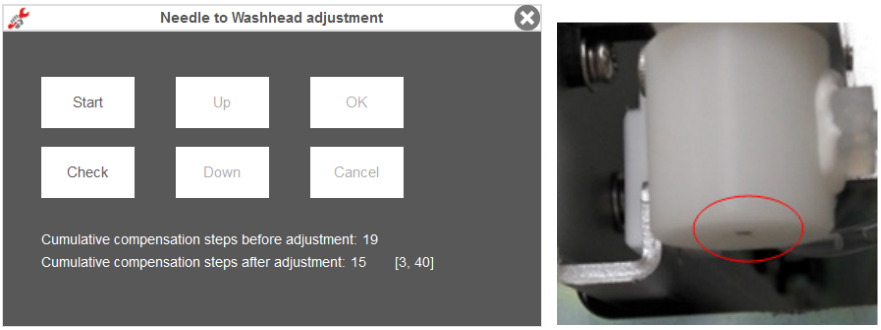


FIGURE 146

- Button **Start**, **Up**, and **Down**
  Click **Start** and check the distance between the bottom of the sample probe and the bottom of the washhead. If the sample probe is lower than the washhead, click Up; if higher, click Down. Each click will move the sample probe slightly.
  In the end, the bottom of the sample probe will be aligned with the bottom of the washhead.
- Button **OK** confirms the adjustment.
- Button **Check** runs the initialization of the sample probe.
- After clicking the **Check** button, check if the bottom of the sample probe is still aligned with the bottom of the swab. If it is, click OK to complete the tuning; if not, Click the **Start** button to reset the position.
- Button **Cancel** cancels the tuning.

5.5.7.2 Run Sequence

FIGURE 147

! Note: Use of the Run Sequence interface is restricted to developers only. Select this button in the Debug selection to access the sequence execution screen.

When a sequence task is required, enter the **Sequence No.** and the **Execution Times** in the corresponding text box, and then click **Start Executing** to start the task.
Select the **Stop Executing** button the stop the sequence if necessary.
Select the **Clear Record** button to clear the sequence execution record.

5.5.7.3 SerTool

Select this button in the **Debug** selection to access the service tool interface.

FIGURE 148

Button Ping

Click the **Ping** button in the **SerTool** screen.

FIGURE 149

Input an IP address (or website) in the **IP/Website** edit field. Click the **Ping** button to check the network connections between the IP address (or website) and the analyzer.
Button **Clear** deletes the value of the edit field **IP/Website** for you to enter a new IP address (or website).
Display field **Result** shows the running result of the ping command.

Button Switch Mode

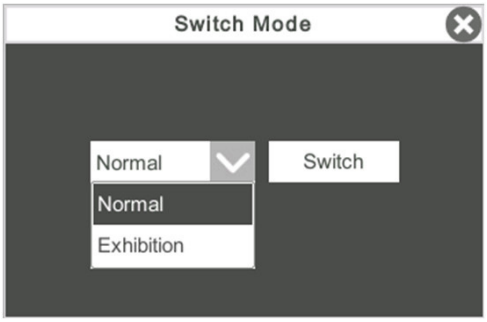


FIGURE 150

Here you have the possibility to change the mode of the analyzer.

Normal: should be always used when you would like to operate the analyzer as usual.
Exhibition: should be used for example when you only would like to demonstrate the analyzer. For example during a exhibition. The mechanics and fluidics will not be used but you can show the whole software of the analyzer.

5.5.8 OTHER > UPGRADE

Select the **Upgrade** button in the **Other** section. In the **Upgrade** screen, you can upgrade the software of the analyzer.

Preparation

Before starting with the upgrade, the following steps should be performed:

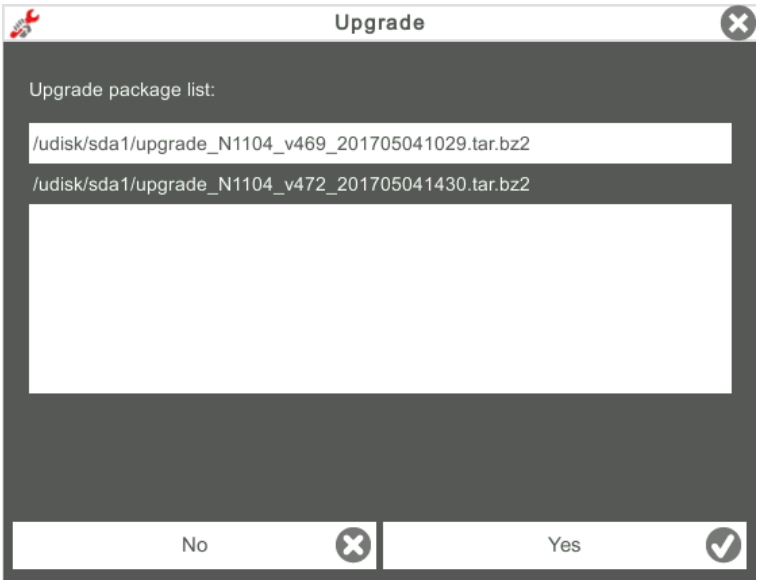
1. Get officially provided upgrade package, and prepare a USB flash disk for storing the upgrade package.
2. Copy the upgrade package to the root directory of the USB flash disk (Do not paste it into any newly-created folder).
3. Insert the USB flash disk with upgrade package into the USB interface of the host.
4. Use service authority to log in.

! Please adopt USB flash disks manufactured by legitimate manufacturers. The USB flash disk capacity shall be larger than 1G, and the format is FAT32.

Upgrading Steps

After accessing the **Upgrade** interface, the host will detect the USB flash disk. 2~5 seconds later, if the USB flash disk cannot be recognized, there will be corresponding prompt in the interface, please insert the USB flash disk again; if the USB flash disk can be recognized, there will be dialog box in the interface as follows.

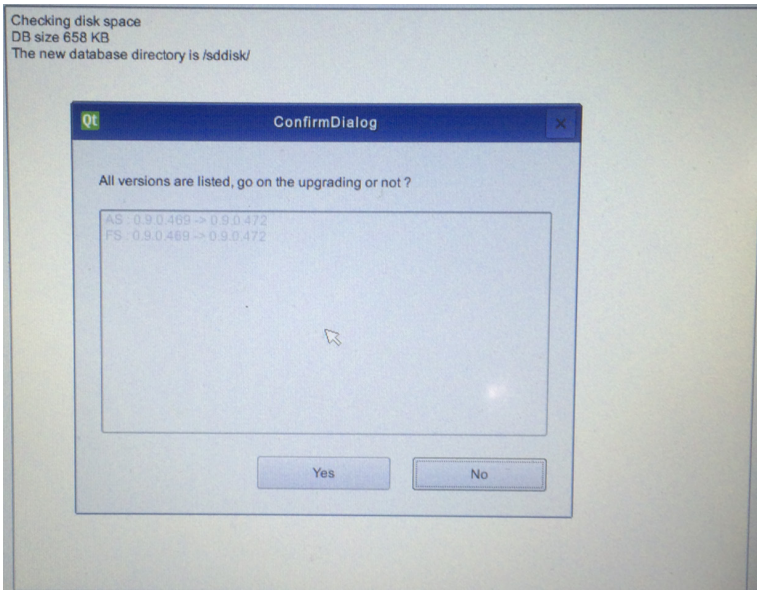
FIGURE 151



Do as follows:

1. Select the upgrade file **upgrade_N1104_**vxxx_XXXXXXXXXXXX.**tar**, and click **Yes**.
   vxxx indicates the version of the upgrade file, and XXXXXXXXXXXX indicates the release date of the upgrade file.
   The system will pop up a similar interface as follows, listing the modules able to be upgraded and their versions.

FIGURE 152



2. Click **Yes** to start the upgrade; or click **No** to cancel the upgrade and restart the analyzer.
   There will be prompt with the upgrading progress on the screen. The picture below indicates the upgrade is successful, the progress bar will display 100%. See the picture below.

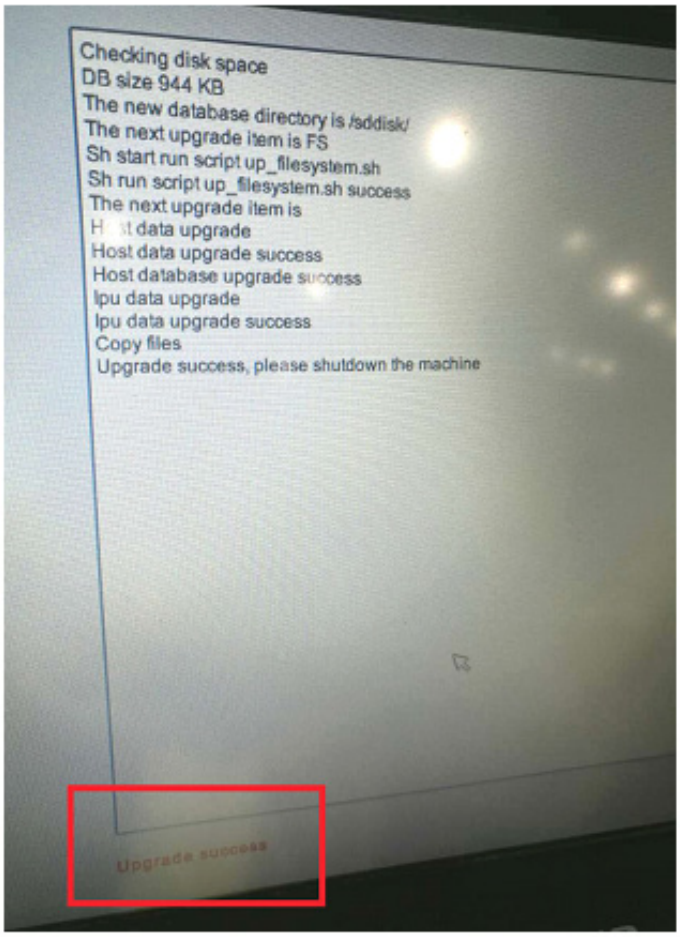


FIGURE 153

3. Turn off the power supply of the analyzer, and restart the analyzer.

6 HOW TO REPLACE PARTS

6.1 Overview

The repair engineer can repair the analyzer using standard tools. See the following section for repairing procedures (including the tools needed). If any repairing step requires a validating step, the repair engineer should strictly follow the procedure and take the validating step.

! When following the repairing procedure as specified in this section, the operator should put on rubber gloves and clean both hands with disinfectant after performing any repair work.

6.2 Preparatory Work Before Repairs

6.2.1 DISASSEMBLING THE LEFT SIDE PANEL

Purpose

While performing regular machine maintenance and inspection, the left-side door needs to be opened to disassemble the sample syringe assembly, reagent testing panel, or electromagnetic valve assembly, which are all in the left section of the machine.

Tools/Spare Parts

#2 (Ph2) Phillips screwdriver

Opening

1. As shown in Figure 154, use #2 (Ph2) cross screw driver to take out four M3×8 cross recessed pan-head combination screws on the back panel, and take off the back panel.

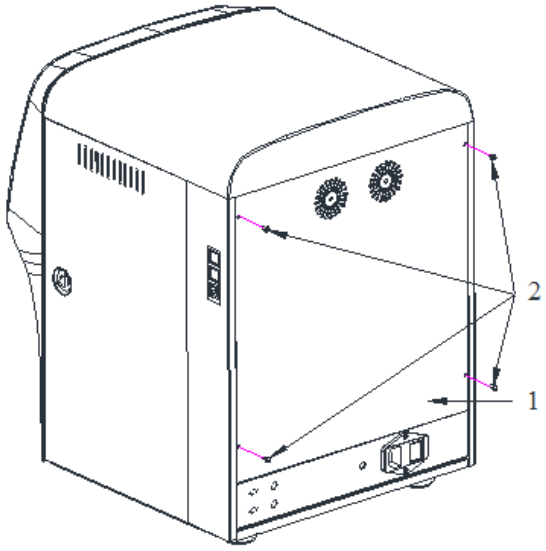


FIGURE 154
Disassembling the back panel

1 Back panel
2 M3×8 cross-recessed pan-head combination screw (×4)

2. As shown in Figure 155, use #2 (Ph2) cross screw driver to take out three M3×8 cross recessed pan-head combination screws on the left side panel, and take off the left side panel.

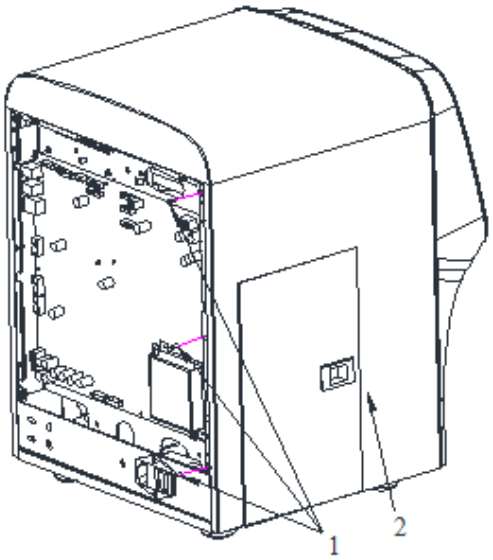


FIGURE 155
Disassembling the left side panel

1 M3×6 cross-recessed countersunk-head screw (×3)
2 Left side panel

6.2.2 OPEN THE RIGHT SIDE DOOR

Purpose
While performing machine maintenance and inspection, the right side door needs to be opened to disassemble the preheating bath assembly, pinch valve, sampling assembly, liquid pump assembly, impedance counting reaction bath assembly (WBC & RBC), negative-pressure chamber, or electromagnetic valve & pump assembly, which are all in the right section of the machine.

Tools/Spare Parts
Slot-type screwdriver

Opening
As shown in Figure 156, insert the slot-type screwdriver into the slot in the right side door lock and rotate 90° counterclockwise, then manually open the right side door.

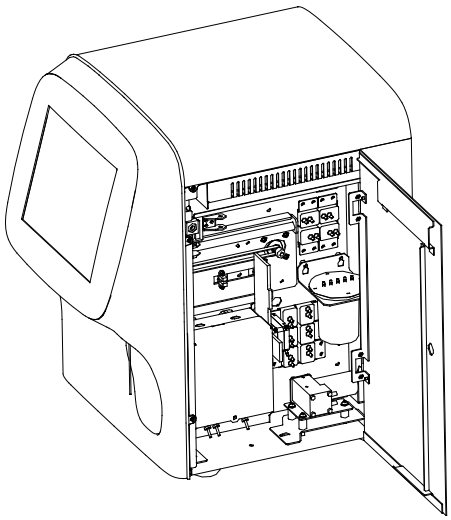


FIGURE 156
Opening the right side door

6.2.3 DISASSEMBLING THE PANEL COVER

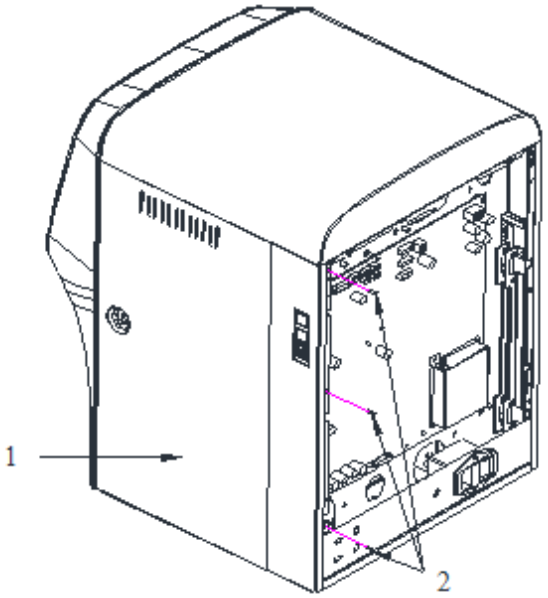
Purpose
While performing regular machine maintenance and inspection, the panel cover needs to be taken down for disassembling the sample probe, cleaning the wash-head, sampling assembly, or indicator light panel.

Tools/Spare Parts
#2 (Ph2) Phillips screwdriver

Preliminary Steps
1. Turn off the power switch on the left side of the device and pull out the power cord plug from the back panel of the device.
2. The left side panel has been disassembled. See **6.2.1 Disassembling the Left Side Panel.**
3. The right-side door is opened. See **6.2.2 Open the Right Side Door.**

Disassembly
1. Disassembly the back panel: use a #2 (Ph2) Phillips screwdriver to disassemble the three M3×6 cross-recessed pan-head combination screw on the back panel, and take off the back panel, as shown in Figure 157.

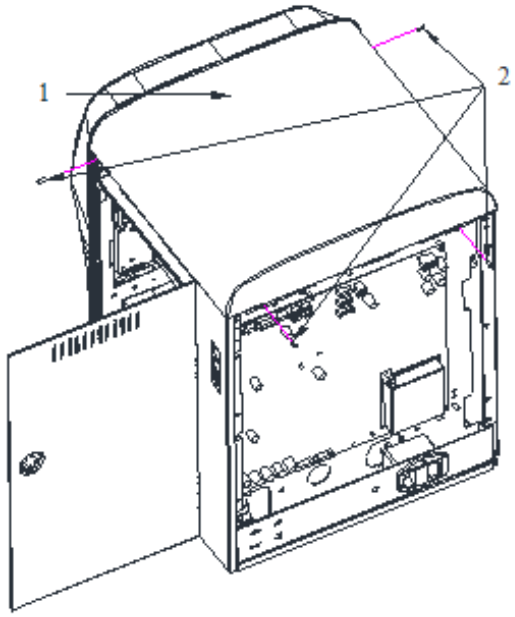
FIGURE 157
Disassembling the back panel



1 Right side door
2 M3×8 cross-recessed countersunk-head screw (×3)

2. Diassembling top cover: Open the right side door and disassemble 4 M3×8 cross-recessed countersunk-head screws on both sides of top cover by #2 (Ph2) Philips screwdriver, the top cover can be removed, as shown in Figure 158.

FIGURE 158
Disassembling the top cover panel



1 Top cover panel
2 M3×8 cross-recessed countersunk-head screw (×4)

When removing the panel cover, make sure to pull out the wires connected to the display circuit panel on the panel cover.

3. Take off the panel cover: as shown in Figure 211, take out the six affixing M3×8 cross-recessed countersunk head screws in order to take off the panel cover.

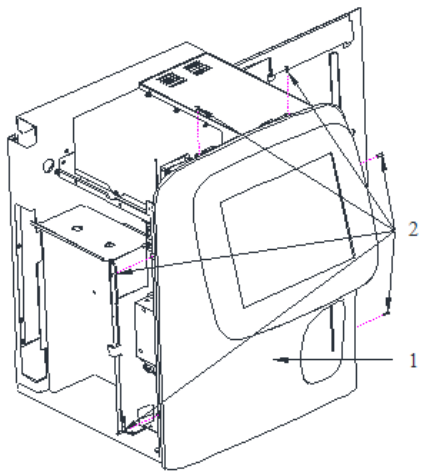


FIGURE 159
Disassembling the panel cover

1 Panel cover
2 M3×8 cross-recessed countersunk-head screw (×6)

6.3 Display Screen Assembly Replacement

6.3.1 REPLACING THE TOUCH SCREEN

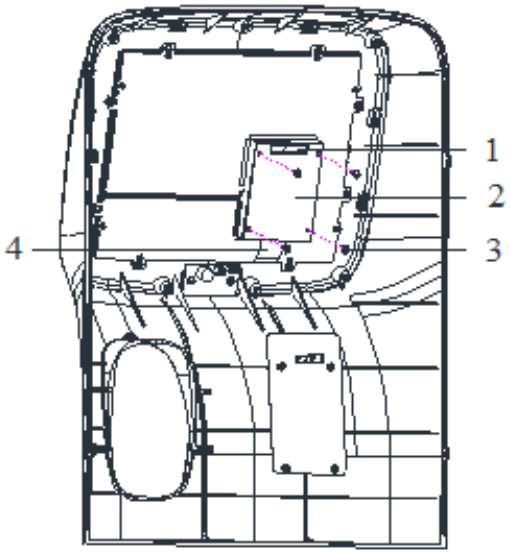
Purpose
The display screen can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts
- #2 (Ph2) Phillips screwdriver
- Display screen

Disassembly
1. Pull out both interfaces at the shield panel of the LCD screen interface panel, use #2 (Ph2) cross screw driver to remove four M3×8 cross recessed pan-head combination screws on the shield panel, take off the shield panel, then detach the black buckles on both ends, gently pull out the golden ribbon cable, as shown in Figure 160.

FIGURE 160

Replacement of display screen (1)

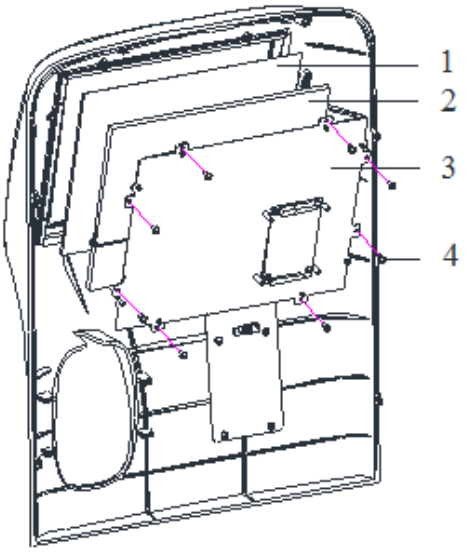


1 **Bunch interface**
2 **LCD screen interface panel**
3 **M3×8 cross recessed pan-head combination screw (×4)**
4 **Ribbon cable interface**

2. Use #2 (Ph2) cross screw driver to remove eight M3×8 cross recessed pan-head combination screws on the screen support, take off the screen support, display screen and touch screen respectively, as shown in Figure 161.

FIGURE 161

Replacement of display screen (2)



1 **Touch screen**
2 **Display screen**
3 **Screen support**
4 **M3×8 cross recessed pan-head combination screw (×8)**

6.4 Sampling Assembly Replacement

6.4.1 REPLACING THE SAMPLE PROBE

Purpose

The sample probe can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- Sample probe

Disassembly

1. Pull out the washhead snap ring to detach it from the lower bracket panel. See Figure 162.

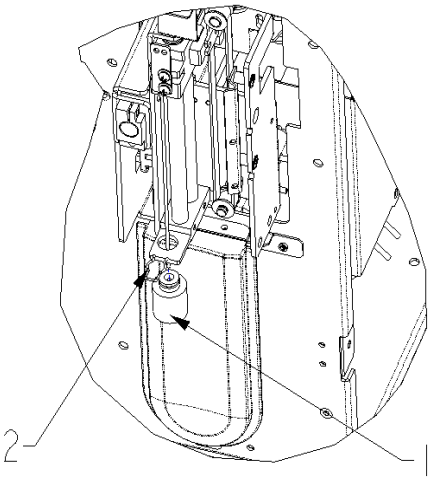


FIGURE 162
Replacement of sample probe (1)

1 Cleaning washhead
2 Washhead circlip

2. Use a #2 (Ph2) Phillips screwdriver to take out the two M3×6 small cross recessed pan head combination screws on the fixed pressure plate of the sample probe, and then take off the fixed pressure plate. See Figure 5 10.

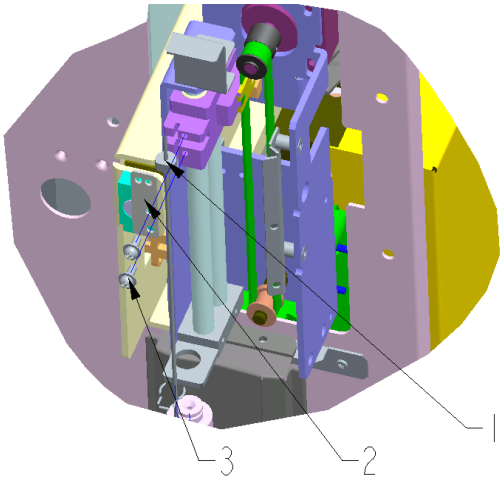


FIGURE 163
Replacement of sample probe (1)

1 **Sample probe**
2 **Pressure plate affixing the sample probe**
3 **M3×8 cross-recessed pan-head combination screw (×2)**

6.4.2 REPLACING THE OPTOCOUPLER

Purpose
The optocoupler can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts
- 2.5mm hex-socket screwdriver
- Optocoupler

Disassembly
Use the 2.5mm hex wrench to remove the M3 hex screw affixing the optocoupler, then pull out the plug attached to the optocoupler wire to disassemble the optocoupler to be replaced. See Figure 164.

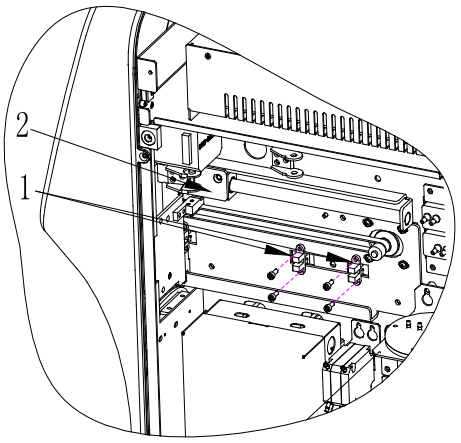


FIGURE 164
Replacement of sample probe (1)

1 **Optocoupler**
2 **Sampling assembly**

6.4.3 REPLACING THE SAMPLING ASSEMBLY IN X- OR Y-DIRECTION

Purpose

The sampling assembly can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- diagonal cutting pliers

Disassembly

1. Use the diagonal cutting pliers to cut off all the nylon binding tapes affixing the fluid tubes (aspiration tubes of the sample probe and washhead tubes), then pull out the fluid tubes of the sample probe and the washhead to detach them from the sampling assembly.
2. Pull out all the motor wires and optocoupler plug from the horizontal moving module of the sample assembly, and use a #2 (Ph2) Phillips screwdriver to take out the three M3×6 cross recessed countersunk head screws affixing the bracket for drag chains to detach the sampling-specific drag chain from the sampling assembly. See Figure 165.

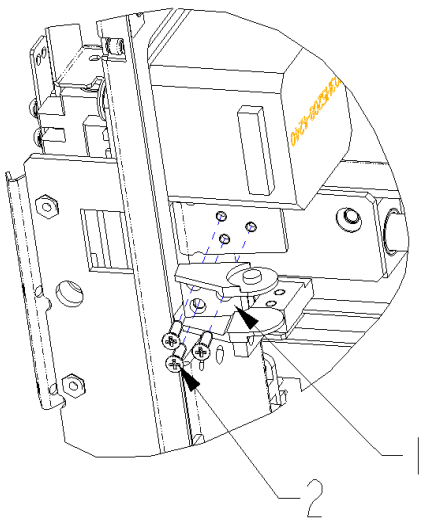


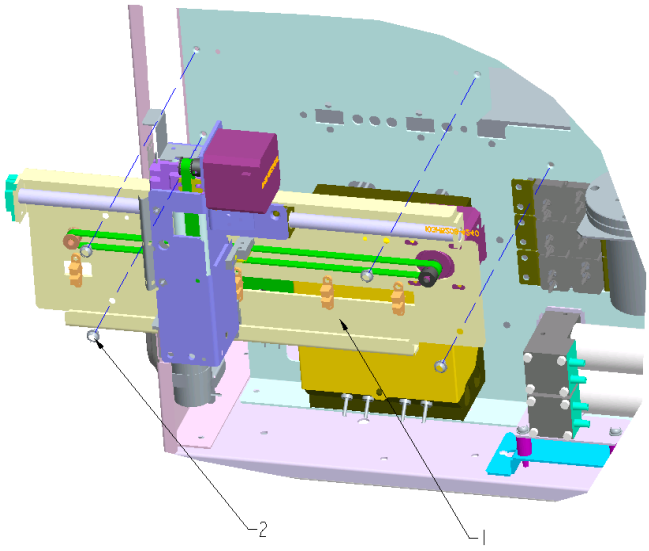
FIGURE 165
Replacement of the sampling assembly in X- or Y-direction (1)

1 Tank drag chain connector
2 M3×6 cross-recessed countersunk-head screw (×3)

3. Use a #2 (Ph2) Phillips screwdriver to take out the four M4×10 cross recessed pan head combination screws affixing the sampling assembly, and then carefully and gently take the sampling assembly out of the machine; during

the process of removal, carefully pull out the wires and plugs for the horizontal motor and optocoupler of the sampling assembly from the corresponding apertures in the machine. Then pull out all the plugs to completely remove the sampling assembly. See Figure 166.

FIGURE 166
Replacement of the sampling assembly in X- or Y-direction (1)



1 Sampling assembly
2 M4×10 cross-recessed pan-head combination screw (×4)

6.5 Power Assembly Replacement

Purpose

The power assembly can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- Phillips screwdriver
- Power assembly with the same specifications

Disassembly

1. Use Phillips screwdriver to take out four M3×8 cross recessed pan-head combination screws on the back of the device power supply assembly, then remove one M3×8 cross recessed pan-head combination screw on the front, as shown in Figure 167.

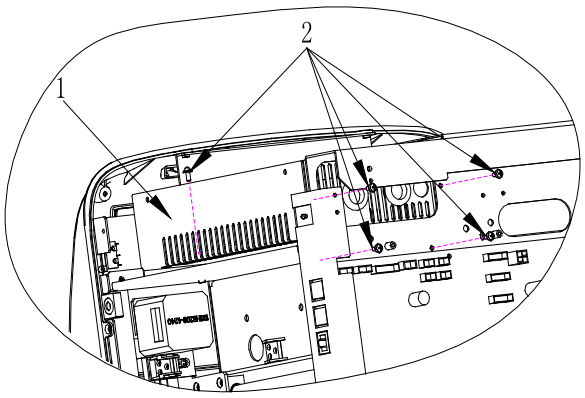


FIGURE 167
Replacement of power assembly

1 Power assembly
2 M3×8 cross-recessed pan-head combination screw (×5)

2. Unplug all the connectors attached to the lead wire of the power assembly.
3. Take off the power supply required to be replaced from the power supply assembly, and replace with a new power supply, fix it with screws.

6.6 Hydraulics Components incl. Valves, Pumps, and Pressure Chambers Replacement

6.6.1 REPLACING THE VALVE ASSEMBLY

Purpose

The valve assembly can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- The replacement valve with the same specifications

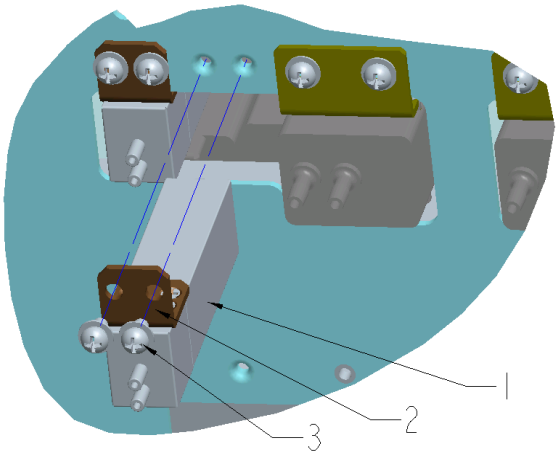
Preliminary Steps

1. Turn off the power switch on the left side of the device.
2. Pull out the power cord plug from the rear panel of the device.
3. If it is only the electromagnetic valve on the left or right clapboard that needs to be replaced, open the corresponding left- or right-side door; if the one on the front panel needs to be replaced, remove the front panel cover by following the instructions in **6.2.3 Disassembling the Panel Cover.**

Disassembly

1. Disassemble the peripheral fluid tubes connected to the valve assembly.
2. Use a #2 (Ph2) Phillips screwdriver to disassemble the two M3×8 cross-recessed pan-head combination screws which affix the valve assembly, and carefully take out the valve assembly while making sure to unplug the attached wires. See Figure 168.

FIGURE 168
Replacement of valve assembly



1 The corresponding replacement valve Sampling assembly
2 Installation panel affixing the valvescrew (×4)
3 M3×8 cross-recessed pan-head combination screw (×2)

Note:
- Make sure to the use correct model of valve and create a reliable connection
- All the wirings need to be set up according to the original positions of the machine components to prevent them from being crushed or otherwise damaged.
- This machine involves a great number of valves. Only one valve is discussed as an example here, and all the other valves follow the same maintenance procedures.

Follow the corresponding disassembly steps in reverse order.

6.6.2 REPLACING THE LIQUID PUMP ASSEMBLY

Purpose

The liquid pump assembly can be disassembled and replaced by following the procedures specified in this section; however, in each case, 5.2 Preparatory Work Before Repairs need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- 2.5mm hex-socket screwdriver
- The replacement liquid pump with the same specifications

Preliminary Steps

1. Turn off the power switch on the left side of the device.
2. Pull out the power cord plug from the rear panel of the device.
3. Open the right side door.

Disassembly

1. Pull out the peripheral fluid tubes and wire connectors attached to the liquid pump.
2. Use a #2 (Ph2) Phillips screwdriver to loosen the two M4×10 cross-recessed pan-head combination screws which affix the liquid pump, and move the liquid pump assembly to the left till the big hole on the affixing panel of the liquid pump is aligned to the affixing screw, then carefully hold up the liquid pump assembly to take it out. See Figure 169.

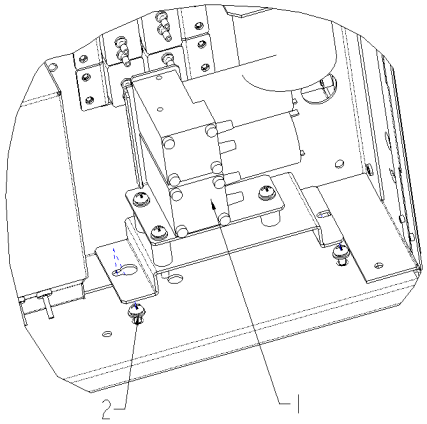


FIGURE 169
Replacement of liquid pump assembly (1)

1 Liquid pump assembly
2 M4×10 cross-recessed pan-head combination screw (×2)

3. The further dismantling of the liquid pump assembly is shown in Figure 170.

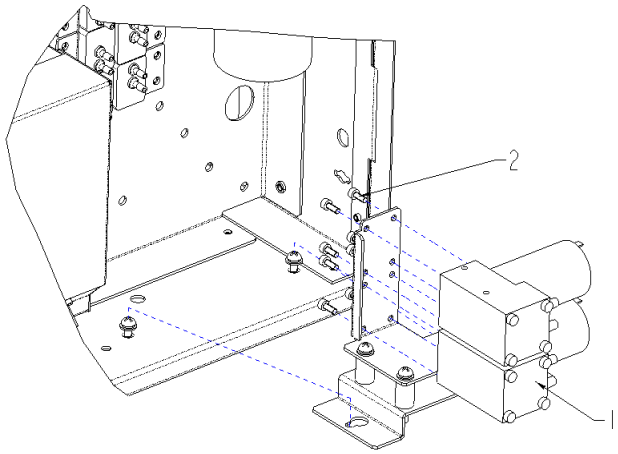


FIGURE 170
Replacement of liquid pump assembly (2)

1 Liquid pump
2 M3×8 stainless-steel inner hex screw (×8)

Note:

- All the wirings need to be set up according to their original positions to prevent them from being crushed or otherwise damaged, and to prevent the working liquid pump from being shaken, which affects the fluid tubes.All the wirings need to be set up according to the original positions of the machine components to prevent them from being crushed or otherwise damaged.
- Pay special attention to the tubing joints and ensure that the connections are sound.

Follow the corresponding disassembly steps in reverse order.

Resetting the Machine

1. Close the right side door.
2. Plug the power cord into the back panel of the device and turn on the power switch on the left panel of the device.

6.6.3 REPLACING THE NEGATIVE-PRESSURE CHAMBER ASSEMBLY

Purpose

The negative-pressure chamber assembly can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- 2.5mm hex-socket screwdriver
- The replacement parts or assembly of the negative-pressure chamber with the corresponding specifications

Preliminary Steps

Open the right side door.

Disassembly

1. Disassemble the peripheral fluid tubes connected to the negative-pressure chamber.
2. Use a #2 (Ph2) Phillips screwdriver to disassemble the two M4×10 cross-recessed pan-head combination screws which affix the negative-pressure chamber, and carefully take out the negative-pressure chamber assembly. See Figure 171.

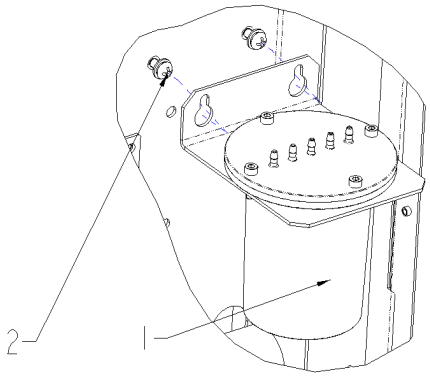


FIGURE 171
Replacement of negative-pressure chamber assembly

1 Negative-pressure chamber assembly
2 M4×10 cross-recessed pan-head combination screw (×2)

3. The further dismantling of the negative-pressure chamber assembly is the same as that of the positive-pressure chamber assembly.

Note:
- Make sure to place the seal ring into the seal tank to keep the pressure chamber airtight.
- All the tubing needs to be set up according to the relevant standards or the original positions of the machine components to prevent them from being crushed or otherwise damaged.

Follow the corresponding disassembly steps in reverse order.

Resetting the Machine
Close the right side door.

6.7 Sheath Flow Syringe Assembly Replacement

6.7.1 REPLACING THE SYRINGE

Purpose
The syringe can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

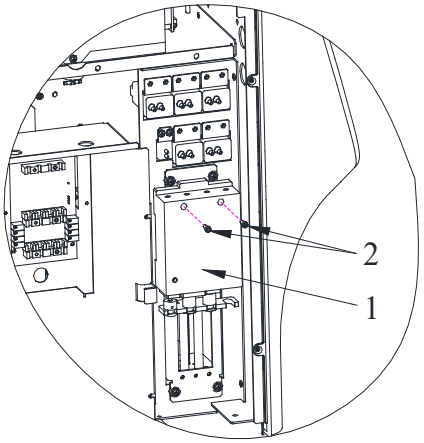
Tools/Spare Parts
- 2.5mm hex-socket screwdriver
- The replacement syringe assembly with the same specifications

Preliminary Steps
- Open the left side door.

Disassembly

1. Pull out the peripheral fluid tubes connected to the syringe assembly to be replaced.
2. Use the 2.5mm hex-socket screwdriver to disassemble the two M3×8 stainless-steel inner hex screws affixing the syringe assembly. Then take out the syringe assembly. See Figure 172.

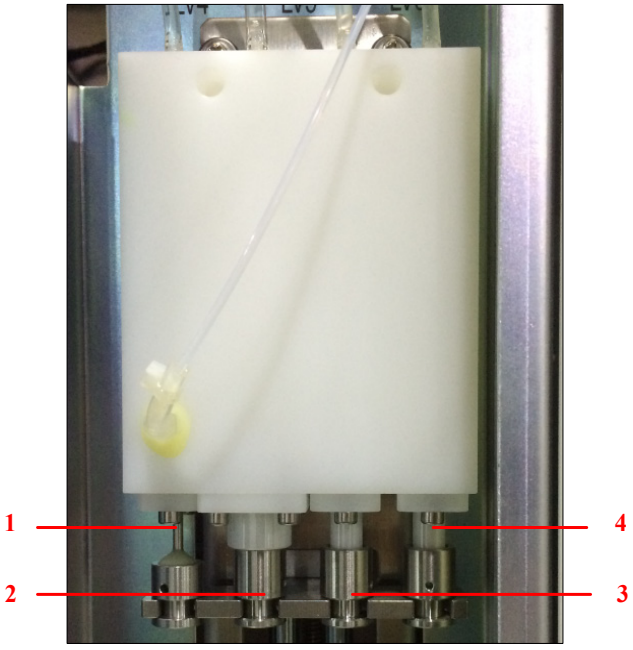
FIGURE 172
Replacement of syringe



1 Syringe module
2 M3×8 stainless-steel inner hex screw (×2)

See Figure 173 for the physical picture of the syringe assembly.

FIGURE 173
Picture taken of the Syringe Assembly



1 Sample syringe
2 Diluent syringe
3 CBC syringe
4 Diff syringe

Installation
Follow the corresponding disassembly steps in reverse order.

6.7.2 REPLACING THE MOTOR

Tools/Spare Parts
- 2.5mm hex-socket screwdriver
- #2 (Ph2) Phillips screwdriver
- The replacement syringe assembly with the same specifications

Preliminary Steps
Open the left side door.

Disassembly
1. Pull out the peripheral fluid tubes connected to the syringe module to be replaced.
2. Use #2 (Ph2) cross screw driver to remove four M3×8 cross recessed pan-head combination screws, take off the syringe assembly. See Figure 174.

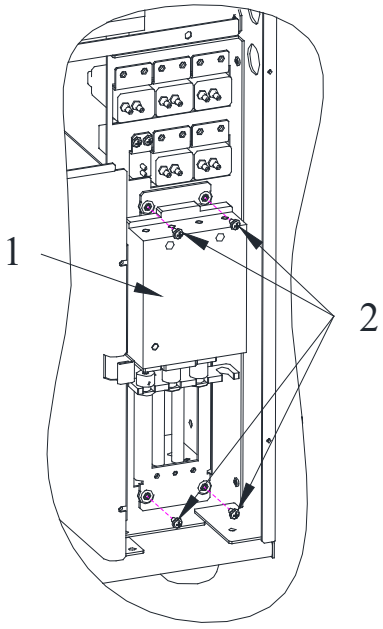


FIGURE 174
Replacement of motor (1)

3. Use the 2.5mm hex-socket screwdriver to disassemble the two M3×8 stain-less-steel inner hex screws affixing the syringe module. Then take out the syringe. See Figure 172.

4. Take out the two M3×8 inner hex screws on the shield cover, then remove the white bolt from the motor. Next, remove the four M3×8 inner hex screws from the back of the motor for the replacement. See Figure 175.

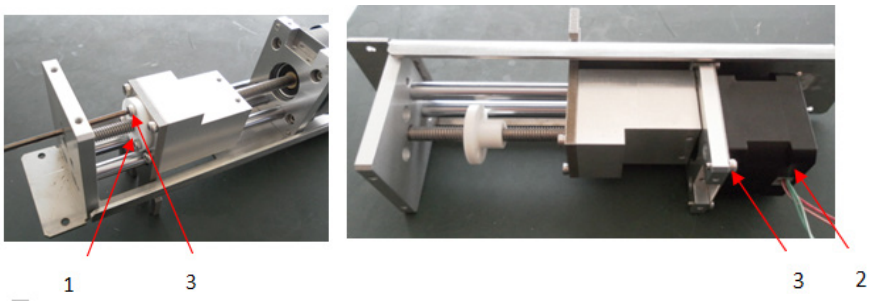


FIGURE 175
Replacement of motor (2)

1 Motor bolt
2 Motor
3 M3×8 stainless-steel inner hex screw (×9)

Installation
Follow the corresponding disassembly steps in reverse order.

6.8 WBC and RBC Bath Assemblies Replacement

6.8.1 DISMANTLING AND REPLACING THE WBC BATH ASSEMBLY

Purpose
The WBC counting bath assembly can be disassembled and replaced by following the procedures specified in this section; however, in each case, Preliminary Steps needs to be taken before you begin.

Tools/Spare Parts
- #2 (Ph2) Phillips screwdriver
- 2.5mm hex-socket screwdriver
- The replacement WBC counting bath assembly with the same specifications

Preliminary Steps
1. Run the draining sequence of the software to drain any residual liquid inside the machine.
2. Turn off the power switch on the left side of the device and pull out the power cord plug from the back panel of the device.
3. Open the right side door.

Disassembly
1. Use a #2 (Ph2) Phillips screwdriver to disassemble the M3×8 cross-recessed pan-head combination screw in the lower section of the shield cover to remove the cover; to take out the screw, move slightly upwards for 3mm or

so and apply force in a direction perpendicular to the right clapboard. See Figure 176.

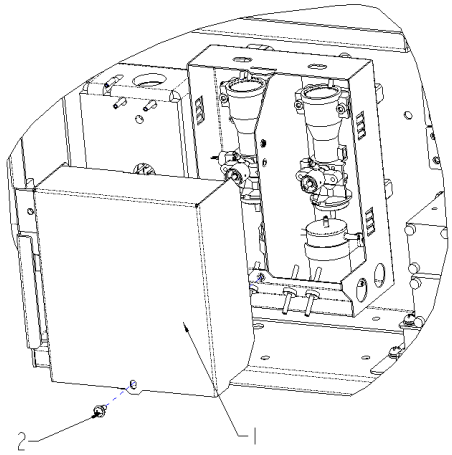


FIGURE 176
Dismantling and replacing the WBC bath assembly (1)

1 **Shield cover of the counting bath**
2 **Cross-recessed pan-head combination screw**

2. Pull out the peripheral fluid tubes attached to the WBC counting bath assembly. Pay attention to handling the residual fluid; try to prevent it from flowing onto the other components in the machine, and wipe clean if necessary.
3. Use a #2 (Ph2) Phillips screwdriver to disassemble the M3×8 cross-recessed pan-head combination screw for grounding on the middle clapboard of the shield case cover and pull out the grounding wire. See Figure 177.

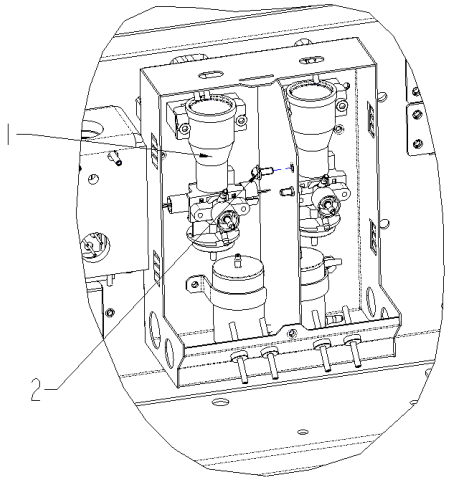
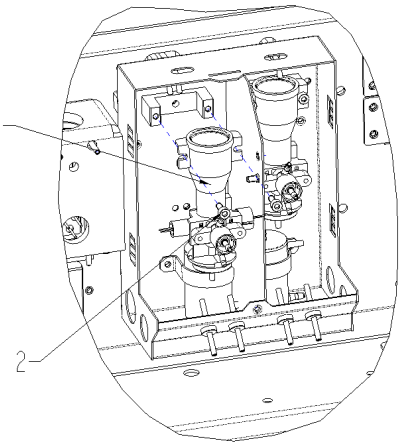


FIGURE 177
Dismantling and replacing the WBC bath assembly (2)

1 **WBC counting chamber assembly**
2 **M3×8 cross-recessed pan-head combination screw**

4. Use 2.5mm hex wrench to remove the two M3×8 stainless-steel hex-socket screws affixing the upper section of WBC counting bath assembly.
See Figure 178.

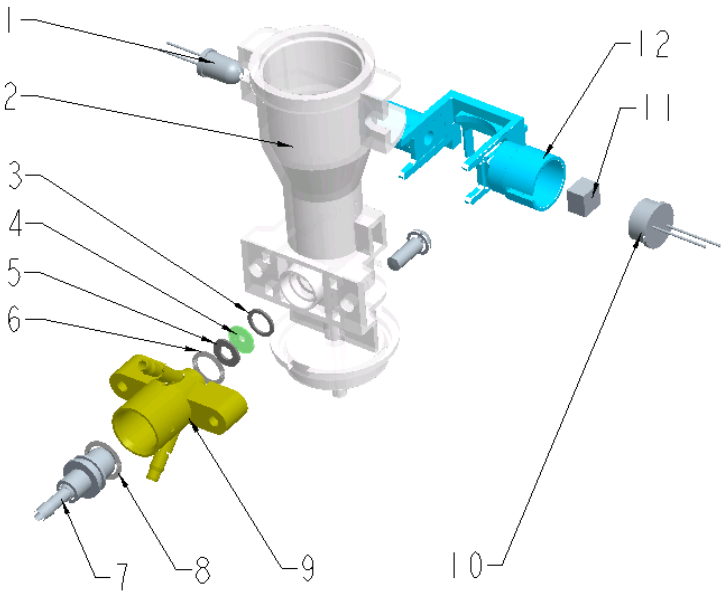
FIGURE 178
Dismantling and replacing the WBC bath assembly (3)



1 **WBC counting chamber assembly**
2 **M3×8 stainless-steel inner hex screw (×2)**

5. Carefully and slowly take out the WBC counting bath assembly.Pay attention to the wiring in the process of moving to avoid breaking the wires.
6. Remove the protective ring from the shield case and open the wire clip to take out the inner wire along the stretching direction of the wire.Then take out the WBC counting bath assembly as a whole.
7. The further dismantling of the WBC counting chamber assembly. See Figure 179.

FIGURE 179
Dismantling and replacing the WBC bath assembly (4)



1 **LED**
2 **Front counting bath**
3 **Flat rubber gasket 6*4.5*0.5**
4 **WBC aperture**
5 **Flat rubber gasket 6*3*0.5**
6 **O-shaped ring 5.5*1.0**
7 **Electrode of the rear bath**
8 **O-shaped ring 6.5*1.0**
9 **Rear chamber**
10 **Optical receiver**
11 **Optical filter of the counting bath assembly**
12 **HGB bracket**

Installation

Note:
- All the wirings need to be set up according to the working procedures or the original positions of the machine components to prevent them from being crushed or otherwise damaged.
- Pay special attention to the tubing joints and ensure that the connections are sound.
- The aperture, seal gasket, and seal ring need to be correctly positioned and oriented in the right direction.

Resetting the Machine

1. Reinstall the shield case cover.
2. Close the right side door.
3. Plug the power cord into the back panel of the device and turn on the power switch on the left panel of the device.

6.8.2 DISMANTLING AND REPLACING THE RBC BATH ASSEMBLY

Purpose

The RBC counting bath assembly can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- 2.5mm hex-socket screwdriver
- The replacement WBC counting bath assembly with the same specifications

Preliminary Steps

1. Run the draining sequence of the software to drain any residual liquid inside the machine.
2. Turn off the power switch on the left side of the device and pull out the power cord plug from the back panel of the device.
3. Open the right side door.

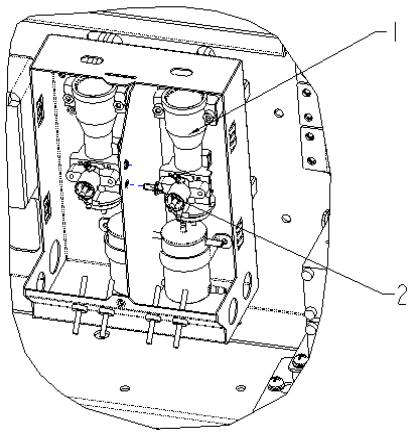
Disassembly

1. Use a #2 (Ph2) Phillips screwdriver to disassemble the M3×8 cross-recessed pan-head combination screw in the lower section of the shield cover to remove the cover; to take out the screw, move slightly upwards for 3mm or so

and apply force in a direction perpendicular to the right clapboard. Refer to the corresponding section in 6.8.1 Dismantling and replacing the WBC bath assembly.

2. Pull out the peripheral fluid tubes attached to the RBC counting bath assembly. Pay attention to handling the residual fluid; try to prevent it from flowing onto the other components in the machine, and wipe clean if necessary.
3. Use a #2 (Ph2) Phillips screwdriver to disassemble the M3×8 cross-recessed pan-head combination screw for grounding on the middle clapboard of the shield case cover and pull out the grounding wire. See Figure 180.

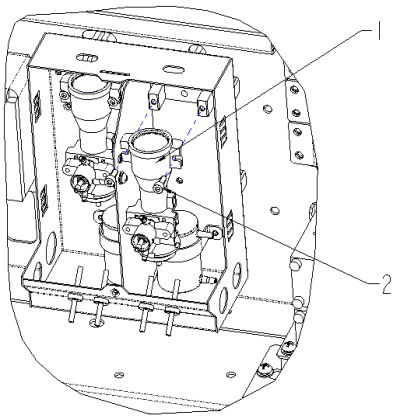
FIGURE 180
Dismantling and replacing the RBC bath assembly (1)



1 RBC counting chamber assembly
2 M3×8 cross-recessed pan-head combination screw

4. Use 2.5mm hex wrench to remove the two M3×8 stainless-steel inner hex screws affixing the upper section of the RBC counting bath assembly. See Figure 5 28.

FIGURE 181
Dismantling and replacing the RBC bath assembly (2)



1 RBC counting chamber assembly
2 M3×8 stainless-steel inner hex screw (×2)

5. Carefully and slowly take out the RBC counting bath assembly. Pay attention to the wiring during the process of moving to avoid breaking the wires.
6. Remove the protective ring from the shield case and open the wire clip to take out the inner wire along the stretching direction of the wire. Then take out the RBC counting bath assembly as a whole.
7. The further dismantling of the RBC counting chamber assembly. See Figure 182.

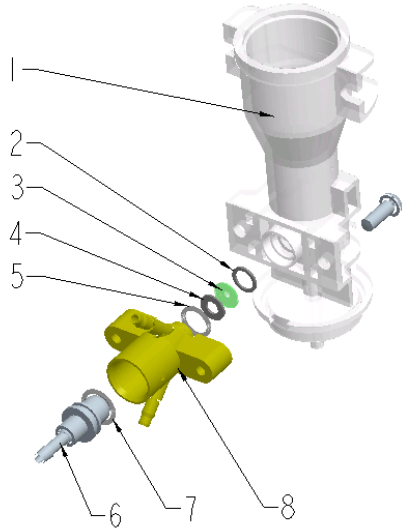


FIGURE 182
Dismantling and replacing the RBC bath assembly (4)

1 Front counting bath
2 Flat rubber gasket 6*4.5*0.5
3 RBC aperture
4 Flat rubber gasket 6*3*0.5
5 O-shaped ring 5.5*1.0
6 Electrode of the rear bath
7 O-shaped ring 6.5*1.0
8 Rear chamber

Note:
- All the wirings need to be set up according to the working procedures or the original positions of the machine components to prevent them from being crushed or otherwise damaged.
- Pay special attention to the tubing joints and ensure that the connections are sound.
- The aperture, seal gasket, and seal ring need to be correctly positioned and oriented in the right direction.

Follow the corresponding disassembly steps in reverse order.

Resetting the Machine

1. Reinstall the shield case cover.
2. Close the right side door.
3. Plug the power cord into the back panel of the device and turn on the power switch on the left panel of the device.

6.9 Main Control Panel Replacement

Purpose

The main control panel can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- Phillips screwdriver
- Corresponding specifications needed to replace the main control panel

Preliminary Steps

1. Pull out the power cord plug from the rear panel of the analyzer, and turn off the power switch.
2. Disassemble the screws on the back panel of housing and remove the back panel of the housing.

Disassembly

1. Pull out the peripheral wires and connectors attached to the main control panel.
2. As shown in Figure 183, disassemble four M4×8 cross recessed pan-head combination screws fixing the main control panel, and remove the main control panel.

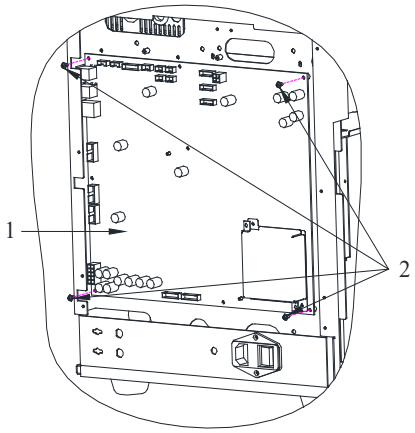


FIGURE 183
Replacement of the main control panel

1 Main control panel
2 M3×8 cross-recessed pan-head combination screw (×4)

Installation

Follow the corresponding disassembly steps in reverse order.

Resetting the Machine

1. Assemble the back panel of housing.

2. Plug the power cord into the back panel of the device and turn on the power switch.

6.10 Reagent Testing Panel Replacement

Purpose

The reagent testing panel can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- The replacement reagent testing panel with the same specifications

Preliminary Steps

1. Turn off the power switch on the left side of the device and pull out the power cord plug from the back panel of the device.
2. Open the left side door.

Disassembly

1. Remove the four M3×8 cross recessed pan-head combination screws affixing the protective cover of the reagent testing panel and remove the protective cover. See Figure 184.

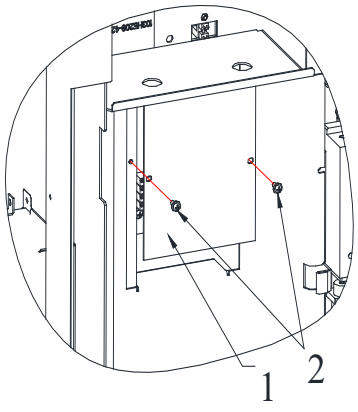


FIGURE 184
Replacement of reagent testing panel (1)

1 Protective cover
2 M3×8 cross-recessed pan-head combination screw (×4)

2. Pull out all the exposed peripheral wires connected to the reagent testing panel.
3. Remove the four M3×8 cross-recessed pan-head combination screws affixing the reagent testing panel and carefully take out the reagent testing panel. Make sure that the metal parts will not scratch the wiring at the rear of

the panel. Pull out the rear wiring to remove the reagent testing panel. See Figure 185.

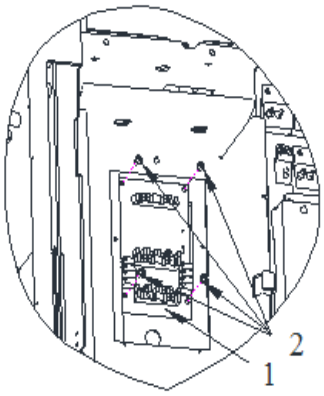


FIGURE 185
Replacement of reagent testing panel (2)

1 Reagent detection panel
2 M3×8 cross-recessed pan-head combination screw (×4)

Installation

Note:
- All the wirings need to be set up according to the working procedures or the original positions of the machine components to prevent them from being crushed or otherwise damaged.
- Pay attention to the position of wires when installing the sensor panel so as to prevent the wires from breaking.

Resetting the Machine

1. Close the corresponding left side door.
2. Plug the power cord into the back panel of the device and turn on the power switch on the left panel of the device.

6.11 Temperature Sensor and Sheath-flow Pressure Sensor Replacement

6.11.1 DISASSEMBLING AND REPLACING THE TEMPERATURE SENSOR

Purpose

The temperature sensor can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- 2 hex-socket screwdriver
- The replacement temperature sensor with the same specifications

Preliminary Steps

1. Turn off the power switch on the left side of the device and pull out the power cord plug from the back panel of the device.
2. Open the left side door and the front panel cover.

Disassembly

Loosen the screws in the bracket for temperature sensor to take the sensor out. Then replace it with a new sensor and tighten the screws. See Figure 186.

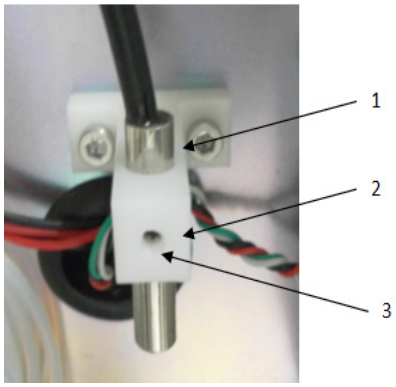


FIGURE 186
Disassembling the temperature sensor

1 Temperature sensor
2 Temperature sensor bracket
3 M3×8 fixation screws

Installation

Follow the corresponding disassembly steps in reverse order.

Resetting the Machine

1. Re-install the front panel cover, and close the corresponding left side door.
2. Plug the power cord into the back panel of the device and turn on the power switch on the left panel of the device.

6.11.2 DISASSEMBLING AND REPLACING THE SHEATH-FLOW PRESSURE SENSOR

Purpose

The temperature sensor can be disassembled and replaced by following the procedures specified in this section; however, in each case, **6.2 Preparatory Work Before Repairs** need to be taken before you begin.

Tools/Spare Parts

- #2 (Ph2) Phillips screwdriver
- 2 hex-socket screwdriver
- The replacement temperature sensor with the same specifications

Preliminary Steps

1. Turn off the power switch on the left side of the device and pull out the power cord plug from the back panel of the device.
2. Open the left side door and the front panel cover.

Disassembly

Unplug the wire stock and tubing connected to the pressure sensor, and take the pressure sensor out. Then replace it with a new sensor. See Figure 187.

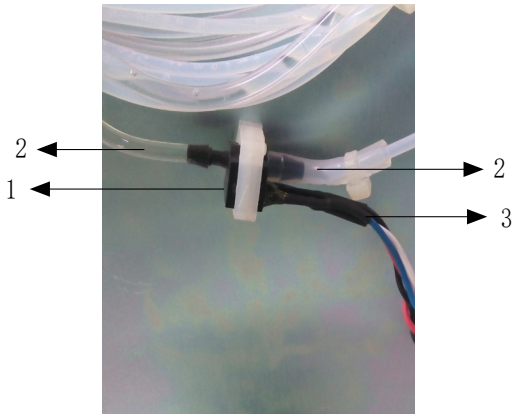


FIGURE 187
Disassembling the sheath-flow pressure sensor

1 Sheath-flow pressure sensor
2 Sheath-flow pressure sensor connecting tubing
3 Sheath-flow pressure sensor connecting wire

Installation

Follow the corresponding disassembly steps in reverse order.

Resetting the Machine

1. Re-install the front panel cover, and close the corresponding left side door.
2. Plug the power cord into the back panel of the device and turn on the power switch on the left panel of the device...
3. ...and restart the analyzer.

7 COMPREHENSIVE DEVICE TUNING

Since the replacement and maintenance of some components can lead to changes in relevant tuning parameters, this section introduces the tuning procedures for the parameters that may be affected.

7.1 Gain Setting

HGB gain setting

NOTE: The HGB voltage gain setting needs to be performed for the replacement of WBC bath, HGB wire and/or main control panel. In Service mode you can enable or disable this function to be displayed for the Admin account.

1. In the **Setup > Meterage** screen, click **Gain Settings.**
2. Click the up/down adjustment button after the filling blank for HGB value and HGB background voltage value will change accordingly within 4.5+/-0.3V.
3. Click **OK** (see Figure 188).

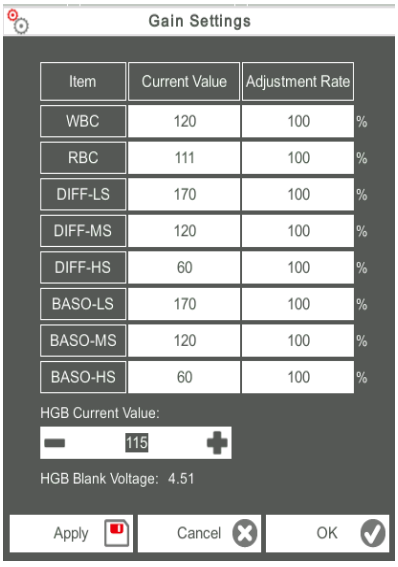


FIGURE 188
Gain setting

Note: In case you need to replace the mainbaod please note down these values and store them back after exchange of the mainbaord.

DIFF gain setting

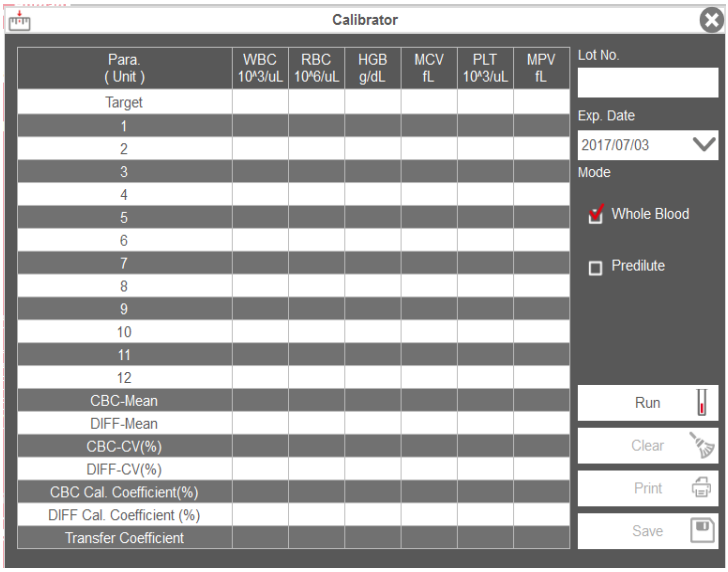
In case of a optical head replacement we will provide you the new Diff gain settings for your optical head. Please save those provided values here.

7.2 Calibration with calibrators

7.2.1 CALIBRATION IN WHOLE-BLOOD MODE

1. In standby mode, click **Cal** to enter the calibration screen.
2. Select **Calibrator** (see Figure 189).

FIGURE 189
Calibration Using Calibrators



Note: The Calibration with calibrator for the replacement of the WBC bath, the RBC bath, and/or the main control panel.

3. Input the calibrator lot No. in the text box for Lot No., and click the Exp. Date control to set the expiry date of the calibrator.
4. Input the target value of the current calibrator parameter.
5. The calibration mode is Whole Blood by default, so there is no need to set the mode.
6. Set the well-shaken calibrator under the sample probe, then press the aspiration key on the analyzer to start the calibration counting.
7. Repeat step 5 for a total of 12 times to get 12 results of calibration counting.

➢ After the counting is complete, a dialog box will pop up indicating that the test is complete. Click the Save button to save the calibration result.

➢ If significant differences are found across results, a dialog box for data abnormality will pop up.Please redo the calibration.

7.2.2 CALIBRATION IN PREDILUTE MODE

1. In standby mode, click **Cal** to enter the calibration screen.
2. Select **Predilute** on the right side of the screen.
3. Input the calibrator lot No. in the text box for Lot No., and click the **Exp. Date** control to set the expiry date of the calibrator.

4. For calibration using the prediluted calibrators, please refer to steps 4~6 in whole-blood mode.

7.3 Temperature Calibration

1. Click **Service > Temperature Cal.** to access the temperature calibration screen. See Figure 190.

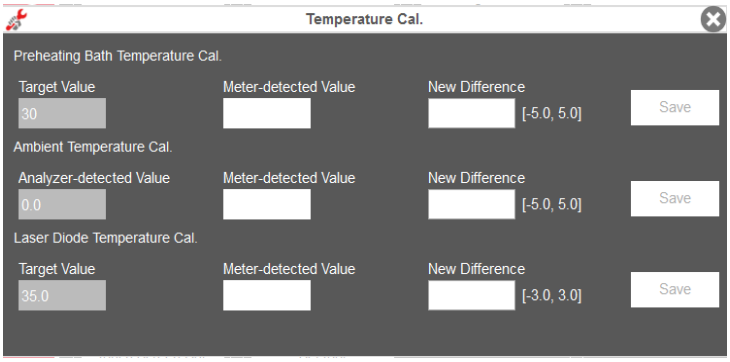


FIGURE 190
Temperature Calibration

! The "Temperature Cal." should be used when temperature senser is not accurate after replacing a new one. Perform the temperature calibration after the analyzer is turned on for at least 5 minutes.

2. Calibrate the preheating bath temperature.

a. Place the thermometer probe with the appropriate amount of thermal grease and attach the probe to the preheating bath heating plate.

b. When the test value is stable, fill the value into the **Meter-detected Value** text box in the **Preheating Bath Temperature Cal.** area.
The value of New Difference displays automatically.

c. If the **New difference** is in the specified range, Click **Save**; if not, contact our aftersales service department.

3. Calibrate the ambient temperature.

a. Place the thermometer in the air.

b. When the test value is stable, fill the value into the **Meter-detected Value** text box in the Ambient Temperature Cal. area.
The value of **New Difference** displays automatically.

c. If the New difference is in the specified range, Click **Save;** if not, contact our aftersales service department.

4. Calibrate the laser diode temperature.

a. Place the thermometer probe with the appropriate amount of thermal grease and insert the probe into the hole in the top of the laser.

b. When the test value is stable, fill the value into the **Meter-detected Value** text box in the Laser Diode Temperature Cal. area.
The value of **New Difference displays** automatically.

c. If the **New Difference** is in the specified range, Click **Save;** if not, contact our aftersales service department.

8 TROUBLESHOOTING

8.1 Error Messages

This section introduces error messages that can appear in the analyzer, possible causes, and troubleshooting steps to be taken by the operator. If the problem persists after troubleshooting, please take hardware issues into account and consider replacing the relevant parts or panels.

For the following issues, please click the error message box at the bottom right corner of the software interface, then click “Remove Error” in the popup dialog box. Usually the problem will be automatically resolved; if it persists, refer to the “Solution” column for further maintenance.

Problem No.	Problem Name	Problem Description	Solution
1	Syringe problem	The syringe fails to leave its initial position. Syringe fails to return to its initial position. The syringe takes too many steps to return to its initial position. The sample syringe is busy. Sample syringe timeout	This syringe problem can occur while it is being moved. Please refer to the following solution: 1. Follow the instructions in **6.7 Sheath Flow Syringe Assembly Replacement** to disassemble the syringe, then remove the dust cover and optocoupler. Plug the optocoupler into the connector of the syringe optocoupler. The user enters the **Status > Sensor** screen and covers the center of the optocoupler with a piece of paper. Check if the optocoupler status shown in the screen is blocked; if yes, then the optocoupler is working properly. 2. Follow the instructions in **6.7.2 Replacing the Motor** to disassemble the syringe motor and replace it with a new motor. Then go to syringe self-test under **Service > Self-test > Syringe;** if the syringe is working, then the maintenance has been successful.

Problem No.	Problem Name	Problem Description	Solution
2	Horizontal motor problem	The horizontal motor fails to leave its initial position. The horizontal motor fails to return to its initial position. The motor fails to move to the WBC position. The motor fails to move to the RBC position. The motor fails to move to the open sampling position. The horizontal motor is busy. Horizontal motor timeout The optocoupler of the horizontal motor is not working properly.	1. The user enters the Status > Sensor screen and covers the center of the optocoupler with a piece of paper. Check if the optocoupler status shown in the screen is blocked. If it is, then the optocoupler is working properly; if not, then refer to **6.4.2 Replacing the Optocoupler** on how to replace the optocoupler. 2. Refer to **6.4.3 Replacing the Sampling Assembly in X- or Y-direction** to disassemble the sampling assembly and make sure the motor wiring is secure. If the wiring is OK, then disassemble the motor and replace it with a new one. After the installation, make proper adjustments to the belt's tension, then go to the syringe self-test under Service > Self-test > Syringe. If the syringe is working, then the maintenance process is OK.

Problem No.	Problem Name	Problem Description	Solution
3	Vertical motor problem	The vertical motor fails to leave its initial position. The vertical motor fails to return to its initial position. The motor fails to move into position to isolate the air bubbles. The motor fails to move to the DIFF bath position. The motor fails to move to the counting bath position. The motor fails to move to the open sampling position. The vertical motor is busy. Vertical motor timeout	1. The user enters Status > Sensor screen and covers the center of the vertical optocoupler with a piece of paper. Check if the corresponding optocoupler status shown in the screen is blocked. If it is, then the optocoupler is working properly; if not, then refer to **6.4.2 Replacing the Optocoupler** on how to replace the optocoupler. 2. Refer to **6.4.3 Replacing the Sampling Assembly in X- or Y-direction** to disassemble the motor from the sampling assembly and make sure motor wiring is secure. If the wiring is OK, then disassemble the motor and replace it with a new one. After the installation, make the proper adjustments to the belt tension, then go to the syringe self-test under Service > Self-test > Syringe. If the syringe is working, then it has been successfully fixed.
4	The CC source voltage is abnormal	The Constant Current Source voltage is abnormal.	Refer to **6.9 Main Control Panel Replacement** to replace the main control panel.

Problem No.	Problem Name	Problem Description	Solution
6	The 12V power is not working properly	+12V power is not working properly. -12V power is not working properly.	Refer to **6.9 Main Control Panel Replacement** to replace the main control panel.
7	Abnormal background voltage	Abnormal HGB background voltage. (The rated range of background voltage is 4.2~4.8V; a system message “abnormal background voltage” will be shown to remind the user to adjust HGB gain.)	1. Take another measurement after performing the soaking with probe cleanser to see if the problem has been resolved. If not, enter into the system for multiple times to check HGB background voltage. If the voltage is steady and exceeds the standard ratings, please perform the following procedures. 2. Go to Setup > Meterag > Gain Settings screen, adjust the current HGB gain and set HGB background voltage within 4.5+/-0.1V. 3. If the problem persists, please try to clean the transmitting end and the receiving end of the HGB bracket. These two areas should not be cleaned with alcohol or organic solvents. Instead, use a rubber pipette bulb for purging. If the counting bath is contaminated with overflown liquid, wipe it clean with tissue paper that will not flake. 4. If the problem persists after the above steps are taken, please consider replacing any relevant components such as the HGB bracket or analog panel.

Problem No.	Problem Name	Problem Description	Solution
8	Abnormal temperature	The ambient temperature exceeds the working range.	Check if the ambient temperature is within the specified range of 15~30°C; if yes, refer to **6.11.1 to replace the temperature sensor.**
		Preheating bath temperature out of working range	Check if the wiring between the optical temperature sensor and the heating rod in the DIFF bath is loose; If the connection is OK, use a thermometer to measure the temperature inside the aperture at the top of the front-end optical assembly.Check if the temperature is within the working range. If it is not, replace the heating rod; otherwise, replace the temperature sensor.
		Optical system temperature out of working range.	Check if the wiring between the optical temperature sensor and the heating rod in the DIFF bath is loose; If the connection is OK, use a thermometer to measure the temperature inside the aperture at the top of the front-end optical assembly.Check if the temperature is within the working range. If it is not, replace the heating rod; otherwise, replace the temperature sensor.

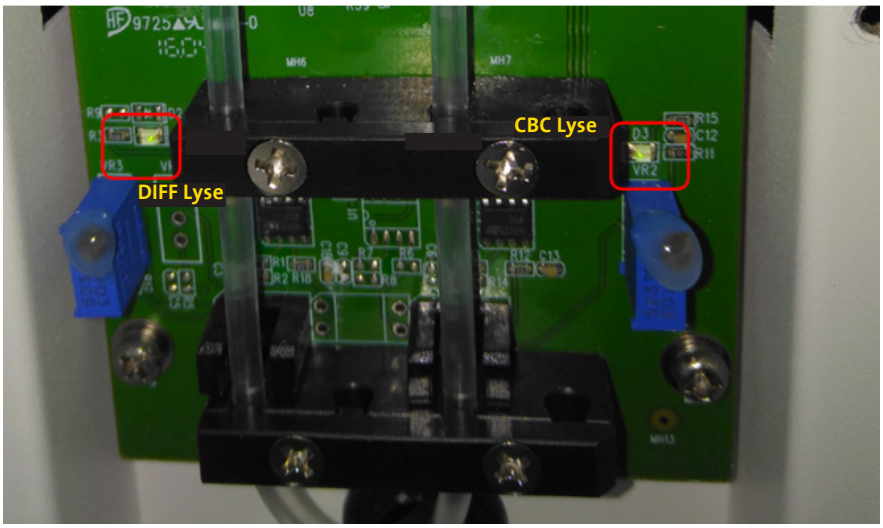
Problem No.	Problem Name	Problem Description	Solution
9	Pressure chamber problem	The positive-pressure chamber fails to create pressure	Refer to **8.1.1.9 Problems with Creating Positive Pressure** for troubleshooting.
		Abnormal pressure of positive-pressure chamber (lower than normal)	
		Abnormal pressure of positive-pressure chamber (higher than normal)	
		The negative-pressure chamber fails to create pressure	Refer to **8.1.1.9 Problems in Creating the Negative Pressure** for troubleshooting.
		Abnormal pressure of negative-pressure chamber (lower than normal)	
		Abnormal pressure of negative-pressure chamber (higher than normal)	
10	Clogging of flow chamber/DIFF probe	Flow cell clog. DIFF probe clogging.	Refer to **8.1.1.3 Clogging of the Flow Chamber/DIFF Probe** to clean the flow chamber or DIFF probe for multiple times. If the problem persists, refer to **6.11.2 Disassembling and Replacing the Sheath-flow Pressure Sensor** to replace the sheath-flow sensor.
11	Abnormal background	Abnormal background. (One or multiple results of background measurement exceed the background range.)	1. Check if the reagent has expired or is contaminated. 2. Go to the Service > Maintenance > Maintain screen and click cleanser soaking to clean the hydraulics. Then return to the Sample Analysis screen and conduct background measurements to see if the problem has been resolved. 3. If the problem persists, please check for any peripheral interference from the grounding wire or shield wire, or if any electric-brush devices such as drills are being used on and off in the area.This can influence the counting results. 4. If there is no such interference, please check the airtightness of each syringe and the rear chamber of the counting bath. If the airtightness is unsatisfactory, then replace accordingly.

Problem No.	Problem Name	Problem Description	Solution
12	Abnormal RBC counting	RBC clogging.	1. Go to the **Service > Maintenance > Maintain** screen and click **Unclog** to start unclogging. 2. Go to the **Service > Self-test > Valve/Pump Self-test** screen, click Valve 18 and check if it is working. If it is OK, please refer to **8.1.1.4 Aperture Clogging of the RBC Channel** for operation. 3. Go to the **Service > Maintenance > Maintain** screen and click **RBC Channel Cleanser Soak.**
13	Waste overflow	Waste container is full.	Check the connection of the float sensor at the rear section of the machine; if the connection is OK, replace the float sensor for waste overflow detection.
14	Abnormal reagent	DIL-C expiration. Insufficient DIL-C. DIL-C not replaced. Diff Lyse expiration. Insufficient CBC Lyse. Diff Lyse not replaced. Diff Lyse expiration. Insufficient CBC Lyse. CBC Lyse not replaced.	Expired reagent or insufficient residual amount.This means that the reagent has gone out of date or the amount remaining is insufficient to support hydraulics operations such as counting. Please following the troubleshooting procedures below: Go to the Reagent Management > Setup screen, scan the barcode of the new reagent as shown in the alarm message, and then load the reagent to resolve the problem.
15	Door or cover open error.	The right-side door is open. Optical assembly cover is open.	Check if the right-side door is open. The door should not press against the microswitch. If the door is properly closed, please replace the microswitch on the side door. Open the optical shield cover, then close it again to check if the problem has been resolved; if not, replace the optical microswitch.

16 No CBC Lyse or no Diff Lyse

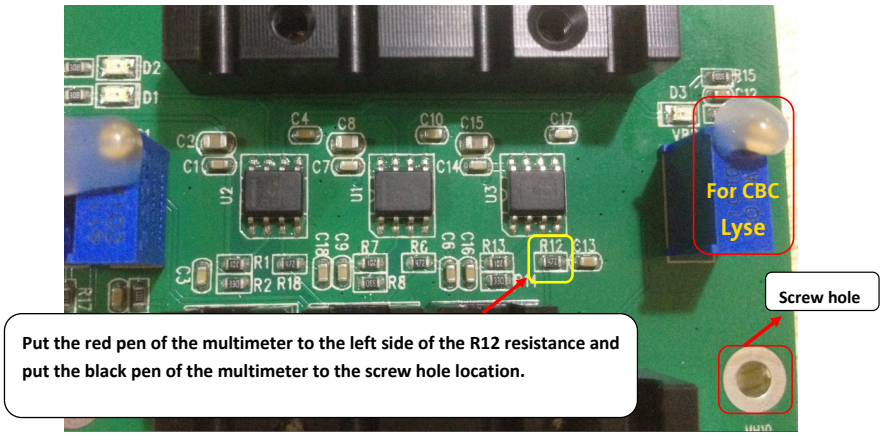
1. When the error message appears, please click one button to remove the error.
2. If the error message appears again, please do as below to check.
   Make sure there is enough reagent left in relevant reagent bottle. If the reagent is enough, then check the optocoupler indicator light of the reagent testing panel is on or not.

FIGURE 191



3. Troubleshooting of NO CBC Lyse error:
   If the optocoupler indicator light is on, please drain the liquid from the corresponding tube and use a multimeter to press the spot as shown in the picture. Adjust the potentiometer and set the voltage at 1.5V+-0.1. You should adjust the voltage when the tube is empty.

FIGURE 192



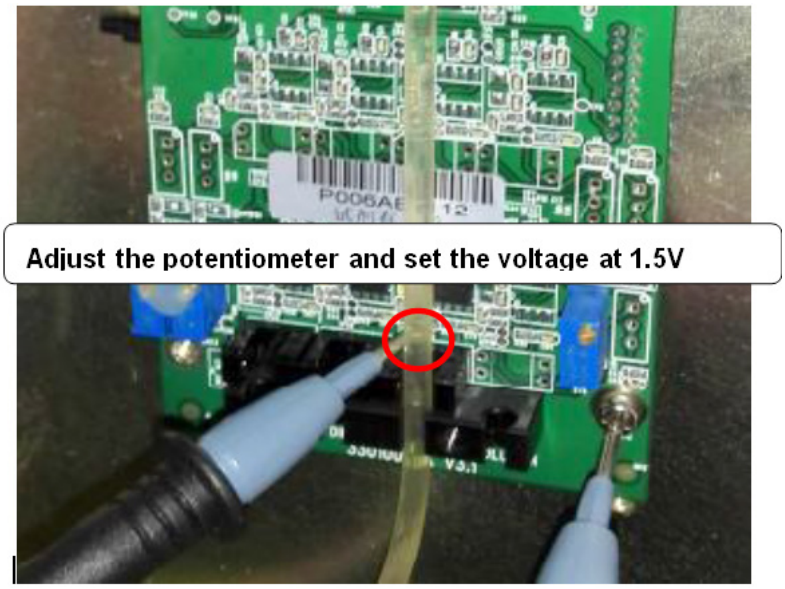


FIGURE 193

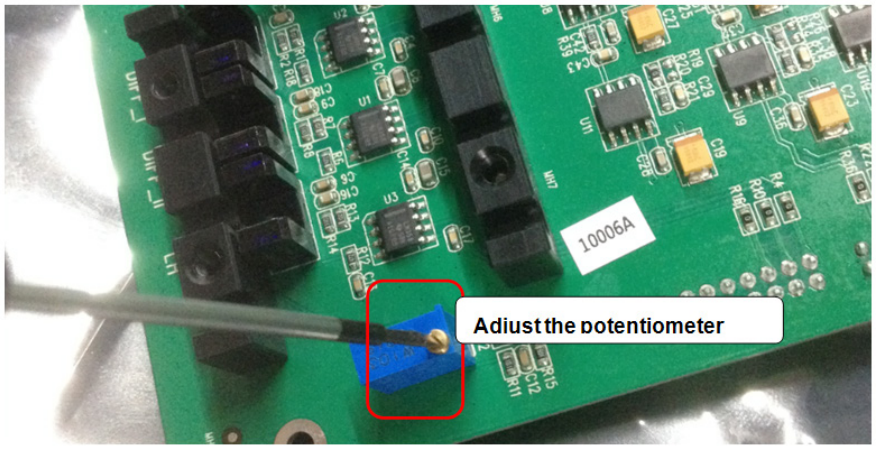
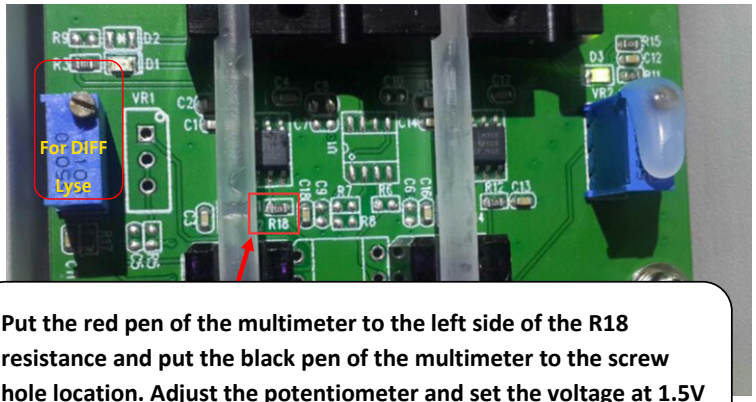


FIGURE 194

4. Troubleshooting of NO DIFF Lyse error: drain the liquid from the corresponding tube (the second one from left to right).

FIGURE 195



Put the red pen of the multimeter to the left side of the R18 resistance and put the black pen of the multimeter to the screw hole location. Adjust the potentiometer and set the voltage at 1.5V

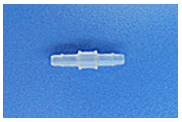
5. If you do not have multimeter at hand, please do as below to check:

➢ If the optocoupler indicator light is off, adjust the screw of the potentiometer and rotate counterclockwise to activate the optocoupler indicator light. If the light is on, ignore this step.

➢ Adjust the screw of the potentiometer and rotate clockwise to extinguish the optocoupler indicator light. **And then adjust the screw of the potentiometer and rotate clockwise half a circle.**

8.1.1 TROUBLESHOOTING HYDRAULICS PROBLEMS

Used Equipment and Tools

Name	Illustration	Usage	Remarks
Small sample cup		- Used to contain liquid after a tube is pulled out - Used as a diluent container - The ratio of probe cleanser to diluent is 1:3.	None
Plastic syringe (disposal syringe with no pillow)		- Used to manually unclog the WBC and RBC channels - Used to inject other liquids.	None
Barrel connector		Tubing connection	None

Silicone tube		Used to connect tubing and the plastic syringe	None
Q-tips		- Used to scrub and clean the washhead - Used for other scrubbing and cleaning tasks	None

8.1.1.1 Inspection and Troubleshooting of Valve Clogging

1. To prevent the possibility of liquid flowing onto the base plate when the tube connected to the valve is pulled out, the tube pulled out needs to be placed into the small sample cup, and tissue paper should be used as a pad to prop up any affected components.The sample cup should be removed once the liquid has stopped flowing.
2. Disassemble the valve. Then open the valve cap to check if there is any clogging caused by impurities; if so, remove the impurities.
3. See Figure 196 and Figure 197.

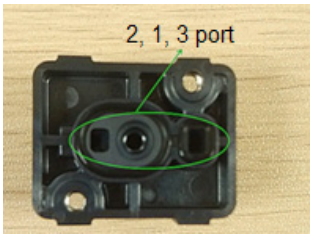


FIGURE 196
3-way valve (L)

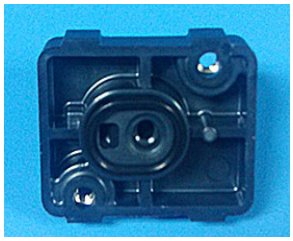


FIGURE 197
2-way valve (L)

4. Place the components in their original positions. (note that the parts with instructions are kept on the same side during installation. Then remove the tissue paper and scrub and clean the bottom.)

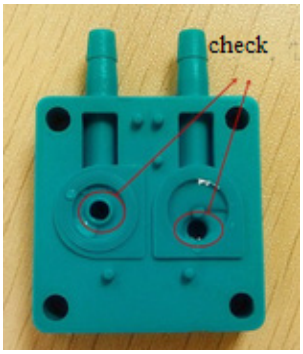
FIGURE 198
Installation of the large valve

FIGURE 199
Installation of the small valve

8.1.1.2 Liquid Pump Clogging: Inspection and Troubleshooting

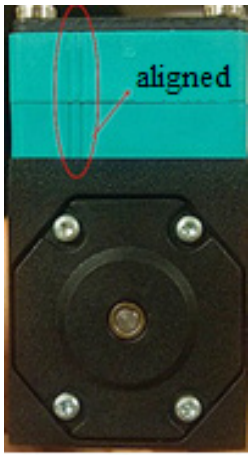
1. Pull out the tubing and place it into the small sample cup. Then prop up any relevant parts with tissue paper and disassemble the pump.
2. Use the Phillips screwdriver to open the pump cap to observe any clogging resulting from impurities, as shown in Figure 200.

FIGURE 200
Pump cap



3. Remove the impurities and place the pump in its original position. Make sure to align the two marked lines correctly while installing, as shown in Figure 201.

FIGURE 201
Installing the marked lines



4. Make sure the liquid inlet and outlet are connected to the correct tubing (see Figure 202).

FIGURE 202
Symbols for inflow and outflow direction

8.1.1.3 Clogging of the Flow Chamber/DIFF Probe

In the case of flow chamber/DIFF probe clogging, you can manually push the probe cleanser to clean the flow chamber/DIFF probe. Detailed steps are shown in Chapter 2.4.2.

8.1.1.4 Aperture Clogging of the RBC Channel

Aperture clogging can be resolved by implementing the procedure for cleaning the WBC bath and using the aperture backflush. The procedures are shown as below:

1. Go to **Service > Maintenance > Clean** and click the **RBC Channel probe cleaner soak** button.
2. Go to the **Service > Maintenance > Clean** screen, and click the **Flush Apertures** and then the **Zap Apertures** button.
3. After you are done, click the error message area, and then click **Remove Error** in the pop-up dialog box to see if the clogging problem is resolved.

If clogging persists, the probe cleanser needs to be manually pushed through to clean the RBC-channel aperture, and the following steps should be taken:

1. Empty the RBC bath.

   There are two ways of emptying the RBC bath:

- After obtaining permission from qualified service personnel, go to the **Service > Maintenance > Flush screen**, click the **Empty RBC Bath** button (note that a prompt box will pop up for confirmation after draining; do not press the OK button, otherwise the RBC bath will be refilled with liquid).
- The liquid can also be aspirated manually using a plastic syringe or other tools.

2. Pull out the tubing connected to the RBC outflow tube and connect the plastic syringe filled with the diluted probe cleanser (with a ratio of probe cleanser to diluent of 1:3) to the RBC outflow tube (as shown in Figure 203). Pushing the plastic syringe back and forth will facilitate the repeated flushing of the aperture with the probe cleanser.

FIGURE 203
Cleaning the flow chamber/DIFF probe

Apply proper force while pushing to prevent the tube from dropping and spilling (you can hold the tube with your hand to keep it in place).

3. Flush back and forth ten times, and then let it settle for 3 minutes. Afterward, flush it three more times with a syringe containing the pure diluent using the aforementioned method.
4. After the diluent cleaning, drain the liquid inside the WBC bath and reconnect the original tubing. (To drain the RBC bath by interface operation, click the **OK** button in the prompt confirmation box after draining.)
5. Click the error message area, and then click **Remove Error** in the pop-up dialog box to see if the clogging problem is resolved.
6. If aperture clogging persists, redo the above procedures until the problem has been resolved.

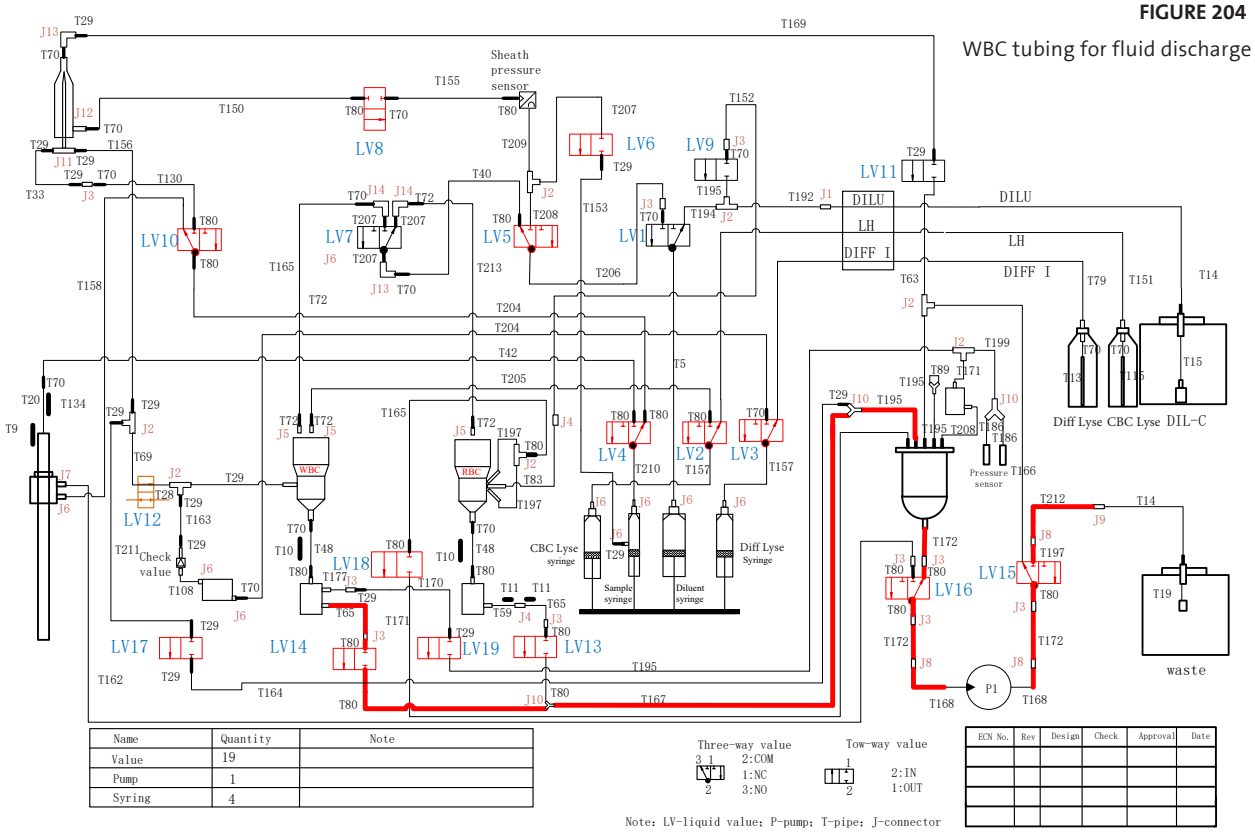
8.1.1.5 Overflowing of the WBC Bath

First wipe off the liquid with tissue paper, and perform the following troubleshooting steps:

1. Check if the liquid pump is clogged.
   Follow the steps specified in **8.1.1.2 Liquid Pump Clogging: Inspection and Troubleshooting** to inspect and resolve any clogging of the liquid pump. After troubleshooting, run the CBC+DIFF counting procedure to see if the problem has been resolved.
   If the problem has been resolved, end the procedure; if the problem persists, continue to perform the following steps:
2. Check if Valve 14 is clogged.
   Follow the steps specified in **8.1.1.1 Inspection and Troubleshooting of Valve Clogging** to inspect and resolve any clogging of Valve 14. After the troubleshooting, run the whole-blood counting procedures to see if the problem has been resolved.
   If the problem has been resolved, end the procedure; if the problem persists, continue to perform the following steps:
3. Check if there are any kinks or damage along the tubing.
   Check if there are any kinks or damage along the tubing, as highlighted in red in the picture below, and replace the corresponding tubing if the problem persists. After the troubleshooting, run the whole-blood counting to see if the problem has been resolved.

FIGURE 204

WBC tubing for fluid discharge



Name	Quantity	Note
Value	19	
Pump	1	
Syring	4	

ECN No.	Rev	Design	Check	Approval	Date

If the problem has been resolved, end the procedure; if the problem persists, continue to perform the following steps:

4. Check whether or not the isolation chamber is airtight.
   a. Empty the WBC bath. There are two ways of emptying the WBC bath:

Method I: after obtaining permission from qualified service personnel, go to the Service > Maintenance > Clean screen, click the Empty WBC Bath button (note that a prompt box will pop up for confirmation after draining; do not press the OK button, otherwise the WBC bath will be refilled with liquid).

Method II: the liquid can be aspirated dry manually using a plastic syringe or other tools.

b. Disassemble the isolation chamber below the WBC bath and pull out the corresponding tubing. Use the thick No. 50 tube or 1.6mm (i.d.) silicone tube to attach the two connectors to the side of the isolation chamber, plugging both apertures. Then attach the plastic syringe to the connector above the isolation chamber using a 1.6mm (i.d.) silicone tube. Push the plastic syringe to pressurize the isolation chamber, and hold the syringe steady for 30 seconds to check for

any appearance of air bubbles. If any air bubbles occur, the isolation chamber needs to be replaced. See Figure 205.

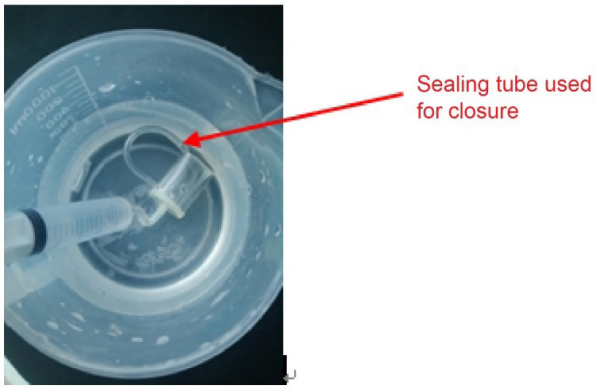


FIGURE 205
Checking whether or not the isolation chamber is airtight

5. After inspection, the components and tubing need to be restored to their original locations. Click the **OK** button in the confirmation box that pops up after the counting bath is drained by opening the user interface.

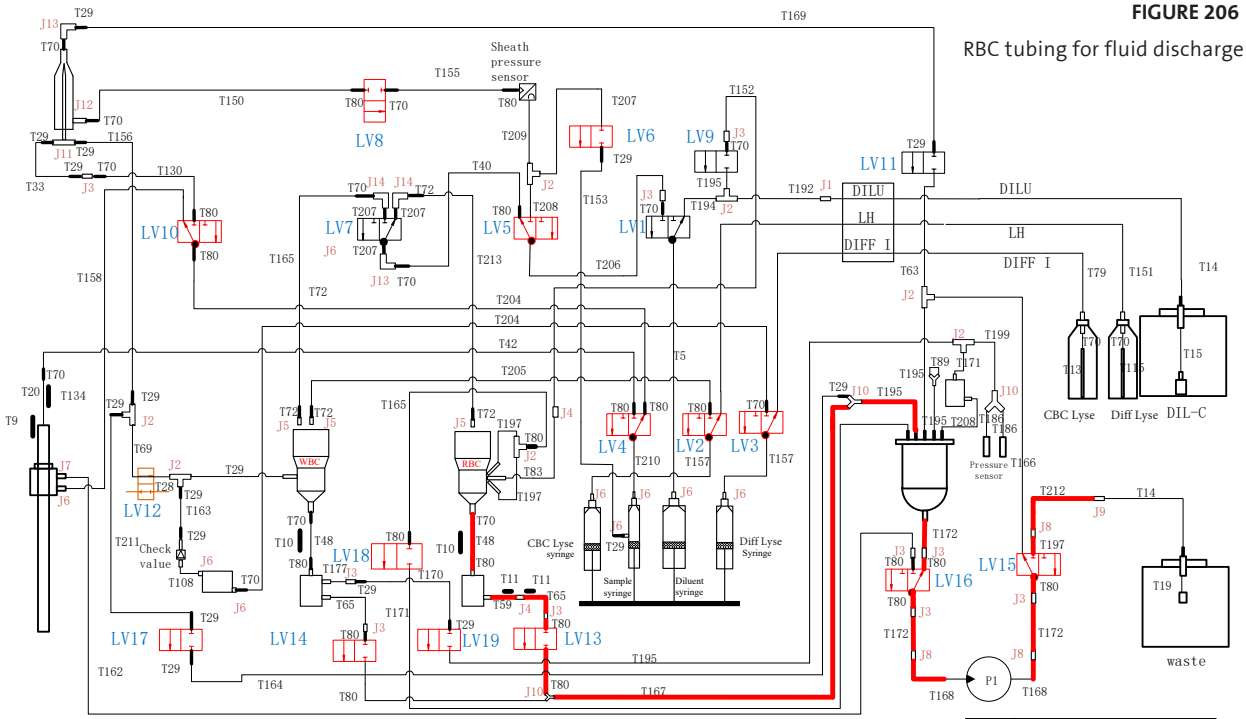
! Note: If the liquid level in the WBC bath is found to be too high, immediately shut down the device to prevent any further overflowing.

8.1.1.6 Overflowing of the RBC Bath

The troubleshooting procedure is the same as that in **8.1.1.5 Overflowing of the WBC Bath**; the only difference is that valve to be inspected is Valve 13. The tubing for inspection is shown in the picture below, and the isolation chamber to be inspected is the one below the RBC bath.

FIGURE 206

RBC tubing for fluid discharge



Name	Quantity	Note
Value	19	
Pump	1	
Syring	4	

Three-way value
2:COM
1:NC
3:NO

Tow-way value
2:IN
1:OUT

Note: LV-liquid value; P-pump; T-pipe; J-connector

ECN No.	Rev	Design	Check	Approval	Date

8.1.1.7 Leakage from the Washhead

First wipe off any liquid with tissue paper, and then perform the following troubleshooting steps:

1. Check if the liquid pump is clogged.

Follow the steps specified in **8.1.1.2 Liquid Pump Clogging**: Inspection and Troubleshooting to inspect and resolve any clogging of the liquid pump. After the troubleshooting, run the whole-blood counting procedures to see if the problem has been resolved.

2. Check if Valve 17 is working normally.
   Follow the steps specified in **8.1.1.1 Inspection and Troubleshooting of Valve Clogging** to inspect and resolve any clogging of Valve 17. After the troubleshooting, run the CBC+DIFF counting procedures to see if the problem has been resolved.
   If the problem has been resolved, end the procedure; if the problem persists, continue to perform the following steps:
3. Check if there are any kinks or damage along the tubing.
   Check if there are any kinks or damage along the tubing, as highlighted in red in the picture below, and replace the corresponding tubing if the problem persists. After the troubleshooting, run the whole-blood counting to see if the problem has been resolved.

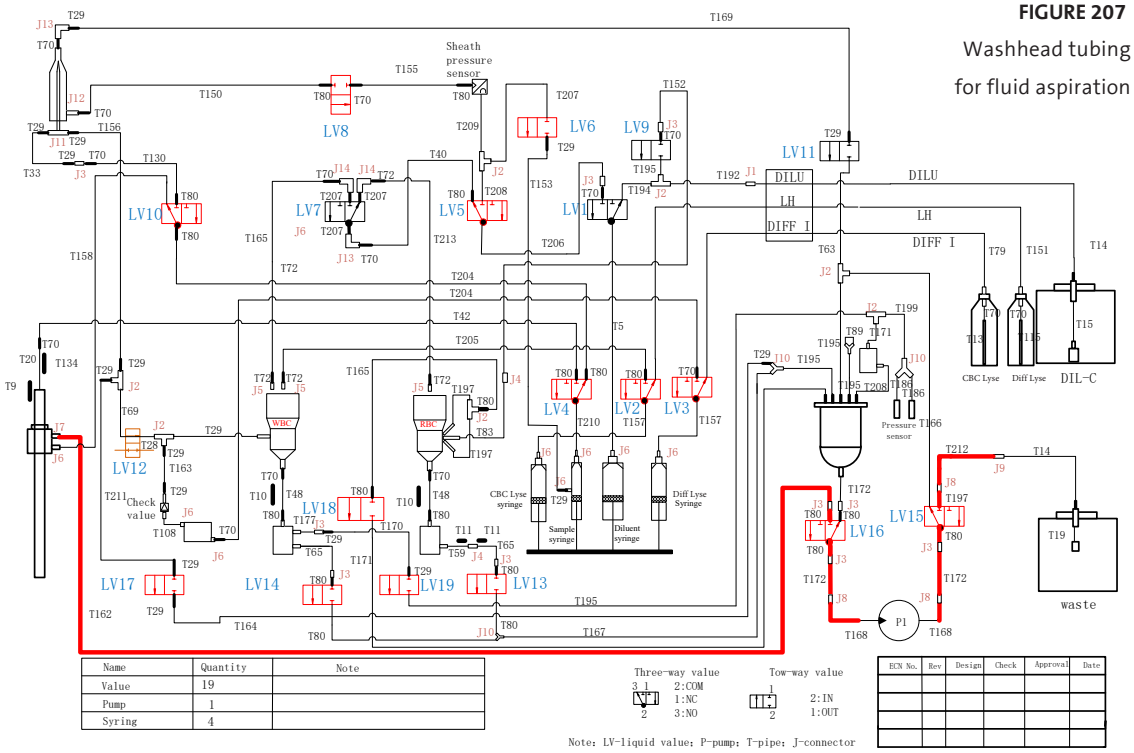


FIGURE 207
Washhead tubing for fluid aspiration

If the problem has been resolved, end the procedure; if the problem persists, continue to perform the following steps:

4. Check if there is perforation at the bottom of the sample probe.
   a. Set the small sample cup below the probe. When pulling out the tube above the probe (push the tube end outward to pull it out; otherwise there will be crimping in the sampling tube connected to the end of the probe), disassemble the probe, and connect it to the plastic syringe filled with the diluent using a 1.6mm (i.d.) silicone tube. Manually push the syringe to see if any liquid flows from the bottom end of the probe.If such a flow is detected, this indicates that perforation exists at the bottom of the probe (the liquid normally flows from the sides. Be sure to collect the waste when pushing the liquid to the correct location, as shown in the picture below).

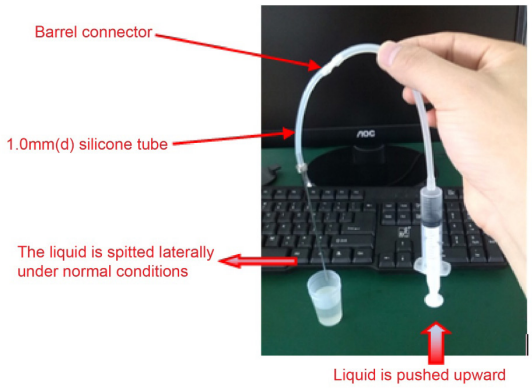


FIGURE 208
Check the liquid pushing of the sample probe

b. Restore the tubing to its original status (cut off the crimped part at the front end of the sampling tube, and readjust the tubing for installation. Make sure to check if the sampling tubing gets into the way of other assemblies whenever the sampling assembly moves up and down, or if it feels too tight. If this is the case, continue to adjust the sampling tubing until it looks like it fits properly.)

5. Check for any wear and tear in the top aperture of the washhead.
   a. To disassemble, take off the washhead fixed jump ring.Pull out the washhead inflow and outflow tubes.
   b. Measure the upper-section aperture with a caliper; an aperture with a diameter of more than 1.71mm indicates that the washhead needs to be replaced.
   c. When reinstalling or replacing the washhead, first put the inflow tube and outflow tube in place , then put on the washhead (insert the probe into the washhead aperture) and tap the washhead fixed jump ring to complete the procedure.

! Note: The inflow tube is the Thin 50 tube, connected to the bottom connector; the outflow tube is the Thick 50 tube, connected to the top connector.

8.1.1.8 Problems with Creating Positive Pressure

The troubleshooting steps are:

1. Check if the pressure chamber is broken: Disassemble the pressure chamber if necessary and seal the openings with rubber tubes.Then place the pressure chamber into the water tank.Use a syringe or other equipment to pressurize the pressure chamber.Any air bubbles detected indicate that the pressure chamber needs to be replaced.
2. Check if there are any kinks or damage along the tubing to the pressure chamber.Any replacements should be made using tubing of the proper length and type.

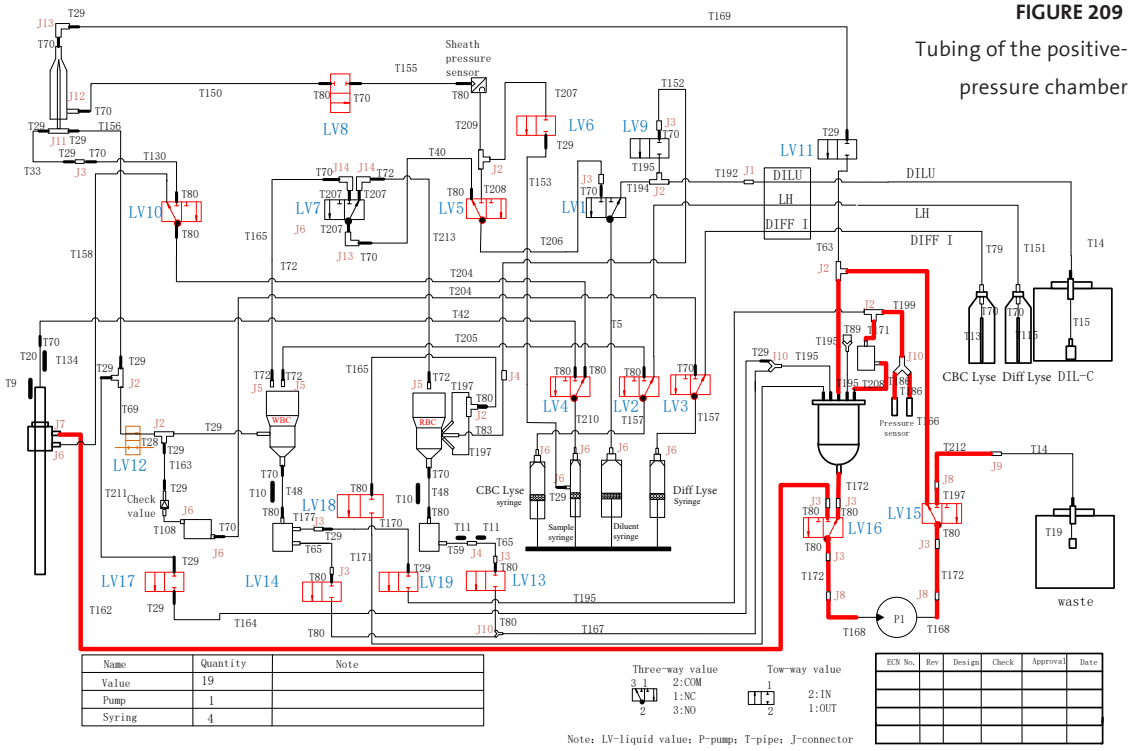


FIGURE 209
Tubing of the positive-pressure chamber

3. Check if the pump is working; if not, replace the pump.
4. Check if the positive-pressure sensor and the corresponding electrical circuit are in normal working order. First replace a reagent testing panel and reconnect its tubing, then check if the positive pressure is normal in the status interface; if it is normal after the replacement, this means that the positive-pressure sensor and the corresponding electrical circuit are causing a problem with building positive pressure (After the reagent testing panel is replaced, note that the tubing needs to be connected correctly.First keep a record of where it was by marking it before disassembling the tubing).
5. Check the valve directly connected to the tubing of the positive-pressure chamber to see 1) whether the on-off switch is normally; and 2) whether there is any clogging.
6. After troubleshooting, complete the steps shown in the Remove Error wizard.

8.1.1.9 Problems in Creating the Negative Pressure

The troubleshooting steps are as follows:

1. Check if the negative-pressure chamber is broken:Disassemble the negative-pressure chamber if necessary and seal the openings with rubber tubes. Then put the negative-pressure chamber into the water tank.Use a syringe

or other equipment to pressurize the negative-pressure chamber.Any air bubbles that occur indicate that the negative-pressure chamber needs to be replaced.

2. Check if there are any kinks or damage along the tubing connected to the negative-pressure chamber.Any replacements should be made using tubing of the proper length and type.

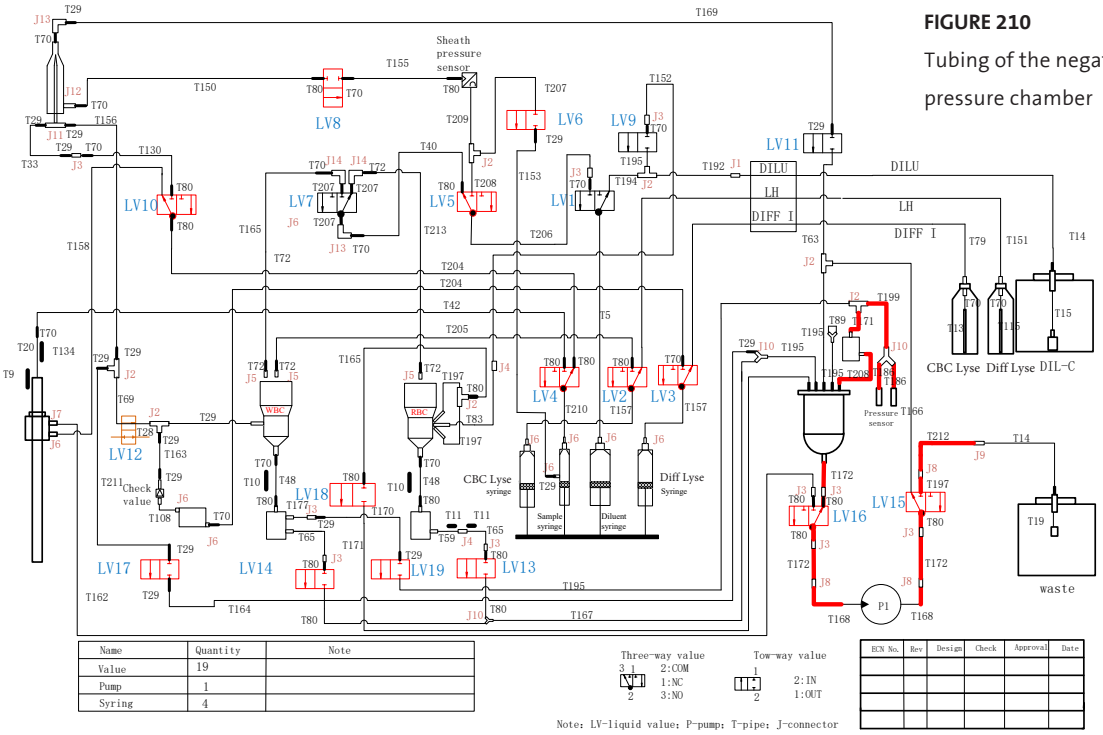


FIGURE 210
Tubing of the negative-pressure chamber

3. Check if Liquid Pump 2 is working; if not, replace the pump.
4. Check if the negative pressure sensor and the corresponding electrical circuit are in normal working order. First replace a reagent testing panel and reconnect its tubing; then check if the negative pressure is normal in status interface. If it is normal after the replacement, this means that the negative-pressure sensor and the corresponding electrical circuit have caused a problem with building negative pressure (After the reagent testing panel is replaced, note that the tubing needs to be connected correctly. First keep a record of where it was by marking it before disassembling the tubing).
5. Check the valve directly connected to tubing of the negative-pressure chamber to see 1) whether the on-off switch is normally; and 2) whether there is any clogging.
6. After troubleshooting, complete the steps shown in the **Remove Error** wizard.

8.1.1.10 No Scattergram

Troubleshooting steps are as follows:

1. Check if the two tubes are connected correctly in pinch valve LV22. First confirm that they are correctly positioned; then determine whether both soft tubes are tucked into the bottom of the tank (as shown in Figure 211). (Note that the position of tubes marked in red in the following figure shall not be installed reversely.)

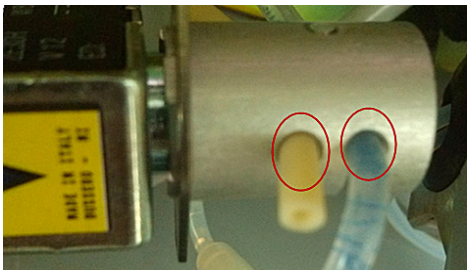


FIGURE 211

Tubing connection of pinch valve

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