

8.2.4 X QC

The X QC method is derived from the average value–standard deviation quality control method. While the basic principle remains the same, the key difference is that each point on the QC graph represents the average of two QC results, rather than a single QC value. Based on this averaged value, the standard deviation (SD) and coefficient of variation (CV) are calculated.

8.3 L-J QC

Click “Menu” → “QC” → “L-J” - “Test” to enter the L-J Quality Control test interface, as shown in Figure 73.

The screenshot displays the L-J QC test interface. At the top, there is a navigation bar with icons for Menu, Test, Data, and Maintain. Below this, a table lists various parameters and their results. The table is divided into two columns: 'Report param.' and 'Research param.'. The 'Report param.' column includes parameters like WBC, LYM%, MON%, NEU%, EOS%, BASO%, IMG%, LYM#, MON#, NEU#, EOS#, BASO#, IMG#, PLT &O, MPV, PDW, and PCT. The 'Research param.' column includes parameters like RBC, HGB, HCT, MCV, MCH, MCHC, RDW_CV, RDW_SD, RET%, IRF, LFR, MFR, HFR, IPF, and RHE. The results are displayed in the 'Result' column, with some values highlighted in red (e.g., H 22.1, H 40.33, H 30.25, H 10.08, L 0.21) and others in blue (e.g., L 59.67). To the right of the table, there is a section for patient information, including Sample ID: 071502, Patient name, Species: Cat, Gender, and Test mode: Whole blood+CDR. Below this, there are tabs for Alarm info, Diff, and RETIC. The bottom of the interface features a status bar with buttons for New sample, Prev record, Next record, Worksheet, Print, Dispense diluent, and Transfer. The status bar also displays the Next sample ID: 25, Test mode: Whole blood+CDR, Lis status: Disconnected, and the date and time: 2025-07-16 11:32:54.

Parameter	Result	Unit	Parameter	Result	Unit
WBC	12.41	10 ⁹ /L	RBC	9.96	10 ¹² /L
LYM%	56.02	%	HGB	140	g/L
MON%	2.38	%	HCT	43.3	%
NEU%	38.18	%	MCV	43.5	fL
EOS%	3.20	%	MCH	14.1	pg
BASO%	0.22	%	MCHC	323	g/L
IMG%	0.00	%	RDW_CV	H 22.1	%
LYM#	6.952	10 ⁹ /L	RDW_SD	36.6	fL
MON#	0.295	10 ⁹ /L	RET%	0.12	%
NEU#	4.739	10 ⁹ /L	RET#	12.0	10 ⁹ /L
EOS#	0.397	10 ⁹ /L	IRF	H 40.33	%
BASO#	0.027	10 ⁹ /L	LFR	L 59.67	%
IMG#	0.000	10 ⁹ /L	MFR	H 30.25	%
PLT &O	347	10 ⁹ /L	HFR	H 10.08	%
MPV	12.8	fL	IPF	L 0.21	%
PDW	12.3	fL	RHE	21.4	pg
PCT	0.44	%			

Sample ID: 071502
 Patient name:
 Species: Cat
 Gender:
 Test mode: Whole blood+CDR
 Time: 2025-07-15 16:06:26

Alarm info | Diff | RETIC

Anisocytosis

Abnormal PLT distribution

New sample | Prev record | Next record | Worksheet | Print | Dispense diluent | Transfer

Next sample ID: 25 | Test mode: Whole blood+CDR | Lis status: Disconnected | 2025-07-16 11:32:54

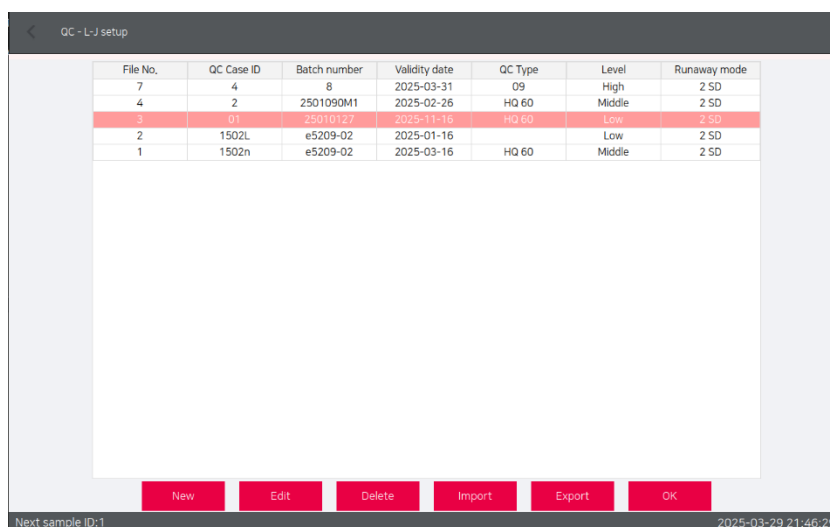
Figure 73 QC test interface

The interface displays quality control data from the most recent test.

Use “Prev Record” and “Next Record” to navigate through the sample data.

8.3.1 L-J QC settings

In the L-J Quality Control test interface click “Setup” to open the settings interface, as shown in Figure 74.



QC - L-J setup

File No.	QC Case ID	Batch number	Validity date	QC Type	Level	Runaway mode
7	4	8	2025-03-31	09	High	2 SD
4	2	2501090M1	2025-02-26	HQ 60	Middle	2 SD
3	01	25010127	2025-11-16	HQ 60	Low	2 SD
2	1502L	e5209-02	2025-01-16	HQ 60	Low	2 SD
1	1502n	e5209-02	2025-03-16	HQ 60	Middle	2 SD

Next sample ID:1

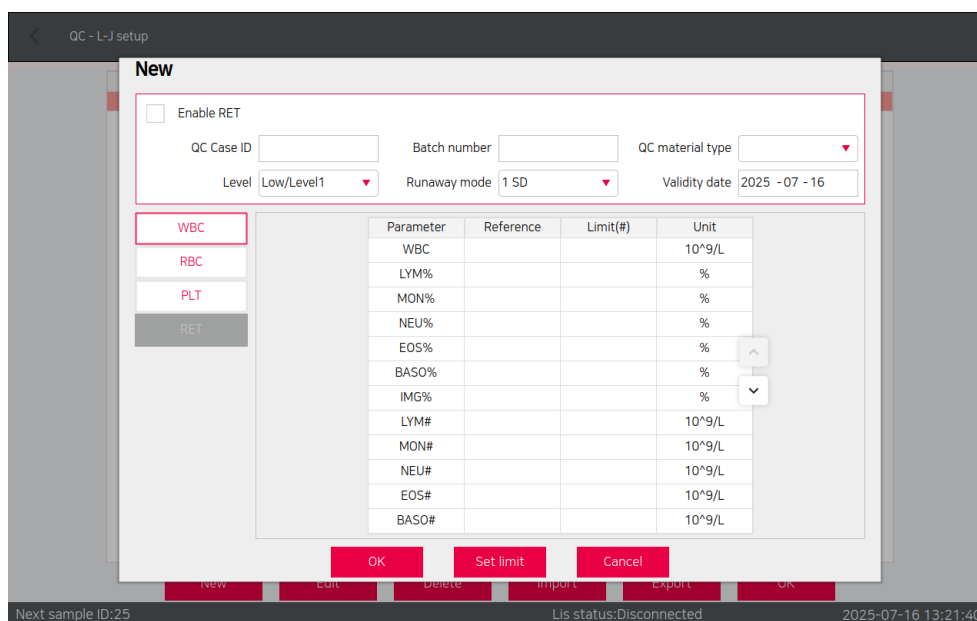
2025-03-29 21:46:29

New Edit Delete Import Export OK

Figure 74 Quality control settings

The Quality control settings interface shown in Figure 75 displays previously recorded quality control (QC) entries and demonstrates how to manage QC groups. Users can create multiple QC groups based on their requirements. Click “New” to create a new QC group, or “Delete” to remove the selected group. Click “Edit” to modify the QC data. Use “Import” to load previously backed-up QC data, or “Export” to save the current QC configuration. Finally, click “OK” to activate the selected QC group and proceed to the testing interface.

To add a new quality control entry: Click “New”, as shown in Figure 75.



QC - L-J setup

New

☐ Enable RET

QC Case ID Batch number QC material type

Level Runaway mode Validity date

WBC RBC PLT RET

Parameter	Reference	Limit(#)	Unit
WBC			10 ⁹ /L
LYM%			%
MON%			%
NEU%			%
EOS%			%
BASO%			%
IMG%			%
LYM#			10 ⁹ /L
MON#			10 ⁹ /L
NEU#			10 ⁹ /L
EOS#			10 ⁹ /L
BASO#			10 ⁹ /L

OK Set limit Cancel

Next sample ID:25

Lis status:Disconnected

2025-07-16 13:21:40

Figure 75 Adding new information

Enter the required details: QC Case ID, Batch Number, QC material type and Level, Runaway Mode, Validity Date (Ensure proper localization Format).

For QC parameter settings, the system categorizes quality control (QC) parameters into three types: WBC, RBC, and PLT. To configure QC parameters: Click on a category to access the corresponding parameter series. Enter the reference values and deviation limits, as provided in the target value table included with the QC material. Reference is the standard value used for

QC counts. Limit defines the allowable deviation range. Note that the limit cannot exceed the reference value. If it does, the new limit cannot be saved to the database.

After entering the information, click “OK” to save the settings and return to the settings interface.

Clicking the “Set Limit” allows you to choose how the deviation limit is calculated—either by absolute value or by percentage.

Clicking “Cancel” will return you to the settings interface, and all entered QC information will be discarded.

NOTE

- The sample ID and batch number for the new quality control materials cannot be empty.

In the quality control settings interface, click “Edit” to modify existing quality control entries, as shown in Figure 76. The process for editing existing quality control entries is the same as creating new quality control entries.

QC - L-J setup

New

☐ Enable RET

QC Case ID Batch number QC material type

Level Runaway mode Validity date 2025 -08 -04

Parameter	Reference	Limit(#)	Unit
WBC			10 ⁹ /L
LYM%			%
MON%			%
NEU%			%
EOS%			%
BASO%			%
IMG%			%
LYM#			10 ⁹ /L
MON#			10 ⁹ /L
NEU#			10 ⁹ /L
EOS#			10 ⁹ /L
BASO#			10 ⁹ /L

OK Set limit Cancel

Next sample ID:1 Lis status:Disconnected 2025-08-04 11:29:30

Figure 76 Edit

8.3.2 L-J QC graph

In the quality control settings interface, select the desired QC configuration. Place the corresponding QC material under the sample probe, ensuring the entire needle is fully immersed before and after aspiration. Click “OK” to begin aspiration. The system will then proceed to the L-J Quality Control test interface.

To monitor quality control (QC) and ensure it remains within the acceptable range, go to “Graph” in the L-J Quality Control test interface. This section displays WBC data deviations from the target values, as shown in Figure 77.

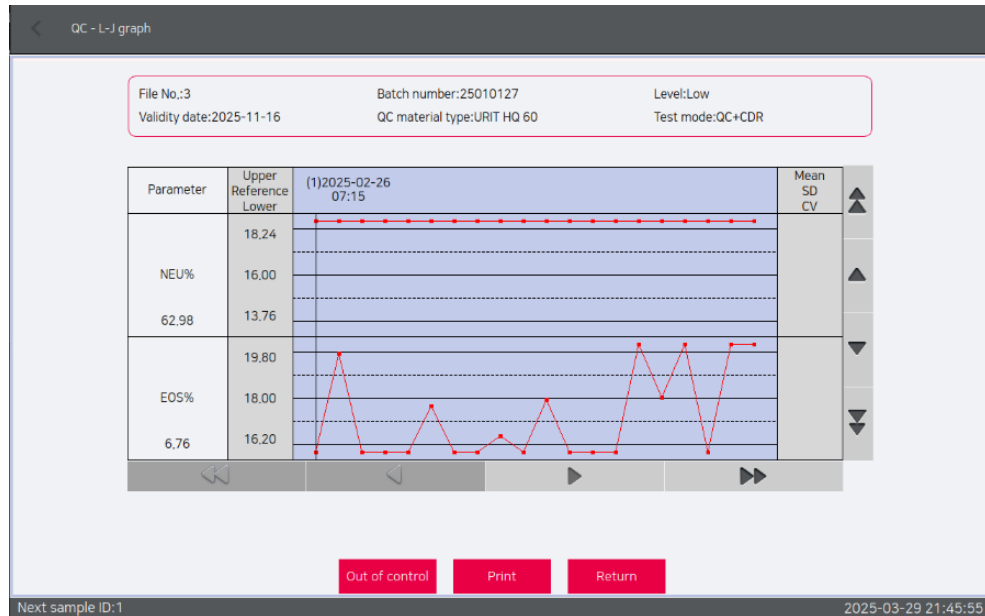


Figure 77 WBC monitoring graph

Middle line – Represents the reference value of the control material.

Lower line – Represents reference value - 1 SD (Standard Deviation).

Average calculation – Total value / Number of samples.

Meaning of QC points

If a QC point falls within the upper and lower lines, it is within the control range.

If a QC point falls outside these limits, it is out of control and requires further investigation.

Select the out-of-control QC data and click “Out of Control” to enter or specify the root cause of the deviation.

Click “Print” to print the QC trend chart.

Click “Return” to exit the QC graph interface.

8.3.3 L-J QC list

In the L-J quality control test interface, click “List” to view the data of tested samples, as shown in Figure 78.

QC - L-J data

File No.:3 Batch number:25010127 Level:Low
 Validity date:2025-11-16 QC material type:HQ 60 QC Case ID:01

	Date	Time	WBC	LYM%	MON%	NEU%	EOS%	BAO%	IMG%	LYM#	MON#
Reference	/	/	11.00	12.00	14.00	16.00	18.00	12.00	15.00	25.000	12.000
Limit(%)	/	/	2.00	3.00	5.00	7.00	5.00	5.00	3.00	8.00	3.00
75	2025-02-26	15:15:38	7.01	23.04	7.22	62.98	6.76	0.00	1.06	1.615	0.506
74	2025-02-25	11:49:11	8.15	22.98	9.25	48.05	19.72	0.00	0.83	1.873	0.754
73	2025-02-25	11:47:43	19.82	23.46	5.36	55.56	15.62	0.00	0.82	4.650	1.062
72	2025-02-25	11:46:00	20.10	25.40	3.77	58.61	12.22	0.00	0.81	5.105	0.758
71	2025-02-25	11:44:31	20.75	29.12	1.26	58.49	11.13	0.00	0.87	6.042	0.261
70	2025-02-25	11:43:04	20.81	23.12	7.87	51.33	17.68	0.00	0.60	4.811	1.638
69	2025-02-25	11:41:35	19.30	24.40	4.49	56.48	14.63	0.00	1.29	4.709	0.867
68	2025-02-25	11:40:05	20.17	26.81	3.47	53.74	15.98	0.00	0.59	5.408	0.700
67	2025-02-25	11:38:37	20.44	25.53	6.32	51.64	16.51	0.00	0.69	5.218	1.292
66	2025-02-25	11:37:10	19.39	25.00	3.06	57.07	14.87	0.00	0.59	4.848	0.593

Next sample ID:1 2025-03-29 21:45:22

Figure 78 QC list

In the quality control list interface, the up, down, left and right buttons can be used to review the results of the tested samples.

Click the “Delete” button to delete the selected test results. Click the “Export” button to export the list data. Click the “Clear” button to clear all the data.

In this interface, the Reference and Limit displays the reference value and deviation limit entered by the user in the Quality Control Settings. When the user changes the reference value and deviation limit in the Quality Control Settings, the reference value and deviation limit in the quality control list should also be changed.

Click the “Return” button to return to the L-J quality control test interface, click “Print” button to print the result report, clicking “Export” allows you to export the selected QC data (highlighted in pink) to a USB drive.

8.3.5 Transfer

In the L-J quality control test interface click “Transfer” to transfer the selected quality control results to the Lis system.

NOTE

- Before testing, let the control material sit at room temperature for 15 minutes after being removed from cold storage.
- Ensure the correct amount of QC material is used, as insufficient volume may result in inaccurate test results.
- Use only quality control materials provided by the company.
- Verify that the test mode matches the sample being tested.

8.3.6 Print

In the L-J Quality Control test interface click “Print” to print the QC test results.

8.4	X-B QC
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Click “Menu” → “QC” → “X-B” → “Test” to access the X-B Quality Control test interface, as shown in the Figure 79.

←
QC - X-B test

Select	Date	Time	MCV	MCH	MCHC

Parameter	MCV	MCH
Result		

MCHC

Calculate
Delete
Setup
Graph
List

Next sample ID:1
2025-03-29 21:57:46

Figure 79 X-B QC test interface



- All clinical samples, control materials, and calibrators are potentially infectious. It is essential to follow established laboratory or clinical safety protocols and wear protective clothing, medical gloves, and safety goggles when handling these materials.

CAUTION

- The sample probe has a sharp needle tip and can cause injury. Additionally, it may carry infectious agents when in contact with blood samples. Avoid direct contact with the probe.
- If the room temperature exceeds the Analyzer's normal operating range, test results may be unreliable. A temperature exception alarm will appear in the fault information area if this occurs.

NOTE

- Ensure that the test mode matches the sample being tested to obtain accurate results.
- Do not open the front cover of the Analyzer once the counting process has started to prevent interruptions and potential errors.

8.4.1 X-B QC settings

Click “Setup” to select the number of samples per group, which can range from 20 to 200 (default: 20 groups). Set the reference values for MCV, MCH, and MCHC, along with their SD values. During testing, the measured values must fall within the specified upper and lower limits to be considered valid, as shown in Figure 80.

The screenshot shows the 'QC - X-B setup' interface. At the top, there is a header bar with a back arrow and the text 'QC - X-B setup'. Below this, there is a section for 'Sample No./group' with a text input field containing '20' and a range indicator '[20,200]'. The main area is divided into two sections: 'Reference/Limit' and 'Sample validity'. The 'Reference/Limit' section contains a table with three columns: 'Parameter', 'Reference', and 'Limit(#)'.

Parameter	Reference	Limit(#)
MCV	0.0	0.0
MCH	0.0	0.0
MCHC	0	0

The 'Sample validity' section contains a table with three columns: 'Parameter', 'Lower limit', and 'Upper limit'.

Parameter	Lower limit	Upper limit
RBC	0.00	0.00
MCV	0.0	0.0
MCH	0.0	0.0
MCHC	0	0

At the bottom of the screen, there are two red buttons: 'Restore Default' and 'Set limit'. The footer shows 'Next sample ID:1' on the left and the timestamp '2025-03-29 21:57:38' on the right.

Figure 80 X-B QC settings

The reference value of X-B QC serves as the standard value against which QC counting results are compared. The deviation limit represents the acceptable deviation range or percentage by which QC results may vary from the reference value. Note that the deviation limit must not exceed the reference value. If the deviation limit is greater than the reference value, it cannot be saved in the database.

Click “Restore Default” to restore default values; Click “Set Limit” to select the display mode for deviation limits.

8.4.2 X-B QC graph

After the operator completes the quality control counting, they can review the quality control results of the three parameters through the quality control graph. In the X-B Quality Control test interface click “Graph” button to review the X-B QC Graph.

The MCV, MCH, and MCHC values obtained by the user every time the sample group is counted will be drawn as a point on the QC graph.

For instance, if the user selects 20 samples/group in the X-B QC settings. The instrument will automatically calculate the X-B QC result after every 20 counts and generate the corresponding QC point, which is displayed in the QC graph, as shown in Figure 81.



Figure 81 X-B QC graph

In the “X-B QC Graph” interface, the quality control display is shown in the center of the screen and is divided into three separate charts based on parameter type: MCH, MCHC, and MCV. When a group of QC data (e.g., 20 samples) is completed, all three QC charts are updated simultaneously.

The arrows located below the graphs allow users to scroll and review additional QC points. Each point on the graph displays the date and time corresponding to the last test result from that sample group.

QC graph instructions

(1) The graph displays: Horizontal axis → Number of QC counts over time., Vertical axis → QC count results for each test.

(2) Each page displays up to 20 results per parameter. Navigate to another page to view additional data points.

(3) Graph line meanings:

Upper line → Reference value + Deviation limit

Middle line → Reference value (Standard QC value)

Lower line → Reference value - Deviation limit

If a QC point falls between the upper and lower lines, the result is within control. If a QC point falls outside these limits, the result is out of control and requires investigation.

Click “Print” to print the QC trend chart; Click “Return” to exit the “X-B QC Graph” interface.

8.4.3 X-B QC list

In the X-B quality control test interface, click “List” to view the data of tested samples, as shown in Figure 82.

	Date	Time	MCV	MCH	MCHC
Reference	/	/	0.0	0.0	0
Limit	/	/	0.0	0.0	0

Next sample ID: 1

2025-03-29 21:57:21

Figure 82 X-B QC list

In the quality control list interface, the up, down, left and right buttons can be used to review the results of the tested samples.

Click the “Delete” button to delete the selected test results. Click the “Export” button to export the list data. Click the “Clear” button to clear all the data.

In this interface, the reference and limit displays the reference value and deviation limit entered by the user in the quality control settings. When the user changes the reference value and deviation limit in the quality control settings, the reference value and deviation limit in the quality control list should also be changed.

Click the “Return” button to return to the X-B quality control test interface, click “Print” button to print the result report, clicking “Export” allows you to export the selected QC data (highlighted in pink) to a USB drive.

8.5 X-R QC

X-R QC is a type of quality control method that uses control materials. The Analyzer must aspirate the quality control sample to perform the QC test. If a blank count is run instead, the system will issue an alarm indicating that the QC result is invalid.

Click “Menu” → “QC” → “X-R” → “Test” to enter the X-R quality control test interface, as shown in Figure 83.

QC - X-R test

File No.: Batch number: QC Case ID:

Level: QC material type: Validity date:

Parameter	First	Second	Mean	Range	Parameter	First	Second	Mean	Range
WBC					RBC				
LYM%					HGB				
MON%					HCT				
NEU%					MCV				
EOS%					MCH				
BASO%					MCHC				
IMG%					RDW_CV				
LYM#					RDW_SD				
MON#									
NEU#									
EOS#									
BASO#									
IMG#									
PLT									
MPV									
PDW									
PCT									
P_LCR									
P_LCC									

Setup Graph List

Next sample ID:1 2025-03-29 21:58:28

Figure 83 X-R QC test interface

8.5.1 X-R QC settings

Click “Setup” to enter the X-R quality control settings interface, as shown in Figure 84.

QC - X-R setup

File No.	QC Case ID	Batch number	Validity date	QC Type	Level
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New Edit Delete Clear OK

Next sample ID:1 2025-03-29 21:58:21

Figure 84 X-R QC setting interface

- New: Create a new quality control set.
- Edit: Modify existing quality control entry.
- Delete: Remove the selected quality control set.
- Clear: Clear all quality control entries.
- OK: Return to the main X-R quality control test interface.

8.5.2 X-R QC graph

Click “Graph,” as shown in Figure 85.

Parameter	Upper Reference	Lower	Mean	SD	CV
WBC X					
0.00					
WBC R					
0.00					

Figure 85 X-R graph

The X-R QC interface contains two graphs:

X graph – Displays the mean value as a dot.

R graph – Displays the range value as a dot.

If the operator selects “Low” and performs the QC test twice, the corresponding dot appears on the X graph under the low-level category. Similarly, dots for other QC sets appear in the corresponding range (R) graph.

Understanding the WBC X Graph

1. The horizontal axis represents the QC count times.
2. The vertical axis represents the QC count results.
3. Each parameter can display up to 100 QC data points.
4. The center line represents $\bar{X}$, which is the overall mean of QC results.
5. The upper limit line is calculated as: $\bar{X} \text{ Upper Limit} = \bar{X} + A \times R$
6. The lower limit line is calculated as: $\bar{X} \text{ Lower Limit} = \bar{X} - A \times R$
7. The three values displayed on the left side of the graph:

Upper line $\rightarrow \bar{X} \text{ upper limit} = \bar{X} + A \times R$

Middle line $\rightarrow \bar{X}$ (Mean value)

Lower line $\rightarrow \bar{X} \text{ lower limit} = \bar{X} - A \times R$

L-J QC review interfaces, the X-R QC review interface displays only three QC results per page. Each QC result consists of: Mean value and Range. On the first page of the QC review form, the first two data columns display the total mean and total range values. These are not the reference value or deviation limit.

The QC form updates automatically every time two QC counts are completed. The values displayed in the QC form represent the mean value of two QC counts.

Click the “Delete” button to delete the selected test results. Click the “Export” button to export the list data. Click the “Clear” button to clear all the data.

Click the “Return” button to return to the X-R quality control test interface, click “Print” button to print the result report, clicking “Export” allows you to export the selected QC data (highlighted in pink) to a USB drive.

8.6 X QC

Click “Menu” → “QC” → “X” → “Test” to enter the X-R quality control test interface, as shown in Figure 87.

Figure 87 X QC test interface

The X QC method is a quality control process that requires control materials. The Analyzer must aspirate the quality control sample to perform the QC test. The operator can conduct QC tests for up to 26 parameters. If needed, the operator may select specific parameters instead of testing all 26. The system provides three QC document levels for saving results: High, Medium, Low.

8.6.1 X QC settings

Click “Setup” to enter the X quality control settings interface, as shown in Figure 88.

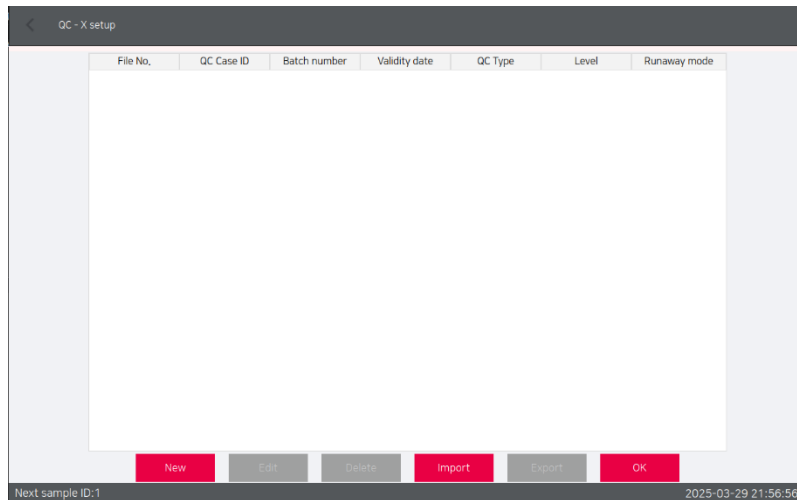


Figure 88 X QC settings

- **New:** Create a new quality control (QC) set, as shown in Figure 89.
- **Edit:** Modify an existing QC entry. Editable information includes QC Case ID, Batch number, QC material type, level, Runaway mode, validity date, and reference, and deviation limits. Click “Set Limit” to select a display method for deviation limits, as shown in Figure 90. After entering the information, click “OK” to save the settings and return to the settings interface. Clicking “Cancel” will return you to the settings interface, and all entered QC information will be discarded.

New

☐ Enable RET

QC Case ID Batch number QC material type

Level Runaway mode Validity date

Parameter	Reference	Limit(#)	Unit
WBC			10 ⁹ /L
LYM%			%
MON%			%
NEU%			%
EOS%			%
BASO%			%
IMG%			%
LYM#			10 ⁹ /L
MON#			10 ⁹ /L
NEU#			10 ⁹ /L
EOS#			10 ⁹ /L
BASO#			10 ⁹ /L

Figure 89 X QC new information

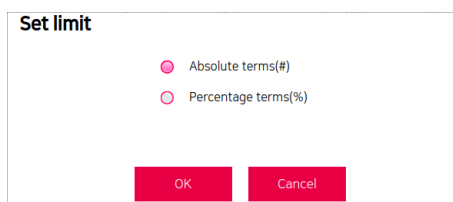


Figure 90 Deviation limit display

- Delete: Remove the selected QC set.
- Import: Load QC information from a USB drive into the Analyzer.
- Export: Save selected QC information to a USB drive for backup.
- OK: Return to the X-R quality control test interface.

8.6.2 X QC graph

Click “Graph,” to enter the X quality control graph interface, as shown in Figure 91.

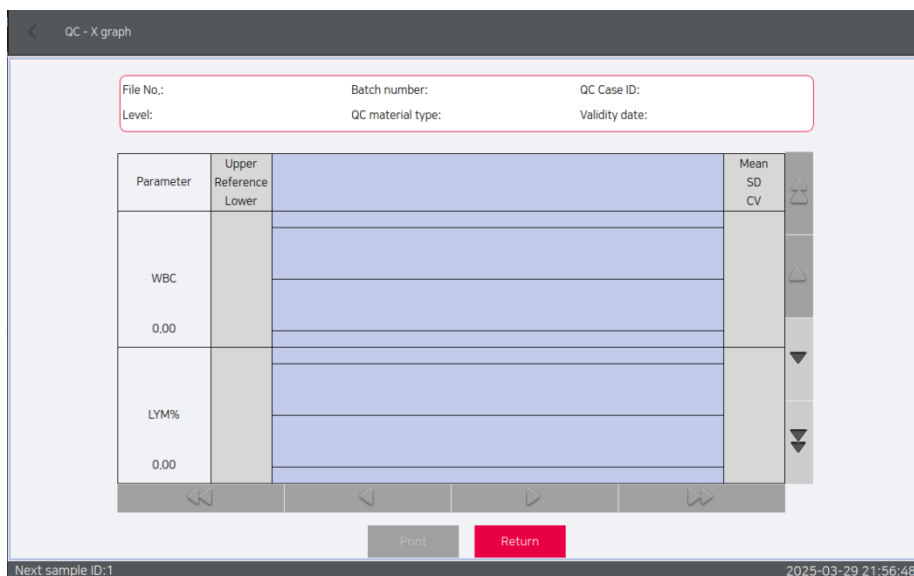


Figure 91 X QC graph

The X QC Graph functions similarly to the L-J quality control graph. After completing QC operations, the operator can review the quality control results for 26 parameters using the graph.

Unlike L-J QC, where each dot represents a single QC result, in X QC, each dot represents the mean value of two QC results. The X QC Graph consists of three separate graphs based on QC type: Low QC graph, normal QC graph, high QC graph. If the user selects the Low-value group in the QC operation interface and performs two QC counts, the graph will display a QC point corresponding to the average of those two counts. The same applies for normal and high QC counts.

QC graph instructions

1. The horizontal axis represents the QC count times.
2. The vertical axis represents the QC count results.
3. Each parameter can display up to 100 QC data points.
4. Graph line meanings:

Upper line → Reference value + Deviation limit

Middle line → Reference value (Standard QC value)

Lower line → Reference value - Deviation limit

If the QC dot falls within the upper and lower limit lines, the result is within control. If the QC dot falls outside these limits, the result is out of control and requires further investigation.

Click “Print” to print the X QC graph; Click “Return” to exit the “X QC Graph” interface.

8.6.3 X QC list

In the X quality control test interface, click “List” to enter the X quality control list interface shown in Figure 92.

The screenshot shows the 'QC - X data' interface. At the top, there is a header bar with a back arrow and the text 'QC - X data'. Below this is a form with six input fields: 'File No.', 'Batch number', 'QC Case ID', 'Level', 'QC material type', and 'Validity date'. Below the form is a table with the following columns: 'Reference', 'Date', 'Time', 'WBC', 'LYM%', 'MON%', 'NEU%', 'EOS%', 'BASO%', 'IMG%', and 'LYM#'. The table has two rows: 'Reference' and 'Limit'. The 'Date' and 'Time' columns in both rows contain a forward slash '/'. Below the table is a large empty rectangular area. At the bottom of the interface, there is a navigation bar with several buttons: 'Export', 'Print', 'Delete', 'Clear', and 'Return'. The 'Return' button is highlighted in red. To the left of the buttons, there is a status bar showing 'Next sample ID:25', 'Lis status:Disconnected', and a timestamp '2025-07-16 13:37:44'.

Figure 92 X QC list

In the quality control list interface, the up, down, left and right buttons can be used to review the results of the tested samples.

Click the “Delete” button to delete the selected test results. Click the “Export” button to export the list data. Click the “Clear” button to clear all the data.

Click the “Return” button to return to the X Quality Control test interface, click “Print” button to print the result report, clicking “Export” allows you to export the selected QC data (highlighted in pink) to a USB drive.

Chapter 9 Calibration

9.1 Overview

The Analyzer undergoes strict testing and calibration before leaving the factory. However, due to various factors, measurement results may drift over time. Calibration ensures the accuracy of test results by correcting any deviation between the measured value and the reference value through necessary factor adjustments.

The Analyzer can be calibrated using three methods:

1. Manual calibration – Adjusts calibration settings manually based on reference values.
2. Standard calibration – Uses a standard reference material to automatically adjust measurements.
3. Blood calibration – Uses actual blood samples to calibrate the Analyzer for clinical accuracy.

WARNING

- Calibration must be performed using the calibrator specified by BIONOTE.
- Store and use the calibrator according to the User Manual guidelines.
- Inspect the calibrator container before use to ensure it is not damaged or cracked.
- After removing the calibrator from storage, allow it to reach room temperature and gently shake it before use.
- Verify that the calibrator is within its validity period.
- Ensure the Analyzer is functioning properly and meets precision requirements before starting calibration.
- Test data should not be used for trial or clinical purposes until all parameters have been accurately calibrated.

NOTE

- Gently remove the blood calibrator from the refrigerator and rub the vial between your palms to bring it to room temperature.
- Invert the vial at least 30 times to ensure thorough mixing of plasma and blood cell.

9.2 Calibration frequency

To ensure stable and reliable test results, the Analyzer should undergo full or partial calibration of the WBC, RBC, PLT, HGB, and MCV parameters under the following circumstances:

- (1) Significant changes in the working environment.
- (2) Drift in measurement results for one or more parameters.
- (3) Major repairs or replacement of components that may affect measurement accuracy.
- (4) Re-use after a long period of inactivity.
- (5) Calibration required for clinical trials or laboratory protocols.
- (6) Change in reagents used.
- (7) Obvious deviation detected during QC operations

MCV and HCT are closely related parameters. If the value of one parameter is provided, the Analyzer can calculate the value of the other. As a result, calibration is only required for MCV. Typically, the calibrator manufacturer provides the reference values for both MCV and HCT parameters.



- All clinical samples, control materials, and calibrators may contain animal blood or serum, posing a potential infection risk. Follow established laboratory or clinical procedures and wear protective clothing, medical gloves, and safety glasses when handling these materials.
- Operators must comply with regional and national regulations regarding the discharge and disposal of reagents, waste liquids, and waste samples, etc.

9.3 Calibration preparation

Before performing calibration, the Analyzer must be verified using the following steps:

1. Ensure that the reagents are not expired, contaminated, or insufficient.
2. Run a blank test to verify that results meet the requirements in Appendix A.6.5.
3. Confirm that there is enough calibrator material to complete the calibration process.
4. Check that the Analyzer is functioning properly with no detected errors. Perform 11 continuous counts using median control material or normal blood. Use the results from the 2nd to 11th counts and check the CV values in IPU software. Ensure that the CV values fall within the specified range (see Appendix A.6.1).
5. Perform three consecutive counts using high-value control material. Replace the high-value

control material with low-value control material and immediately count three more times. Calculate the carryover rate using the prescribed formula. Ensure that the results meet the required standards (refer to Appendix A.6.4).

$$\text{Carryover rate (\%)} = \frac{\text{First low value sample result} - \text{third low value sample result}}{\text{Third high value sample result} - \text{third low value sample result}} \times 100\%$$

9.4 Calibration method

Click “Menu” → “Cal” to access the calibration interface. The calibration menu includes the following submenus, as shown in Figure 93.

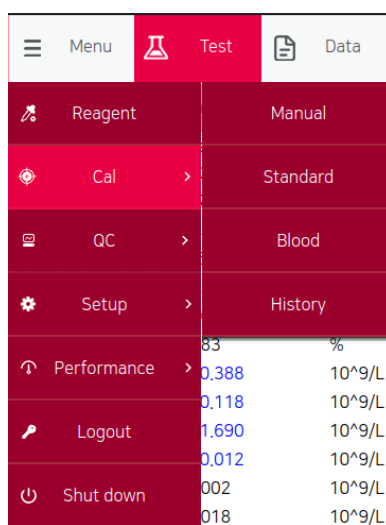


Figure 93 Calibration menu

9.4.1 Manual calibration



- All clinical samples, control materials, and calibrators may contain animal blood or serum, posing a potential infection risk. Follow established laboratory or clinical procedures and wear protective clothing, medical gloves, and safety glasses when handling these materials.

To enter Manual Calibration: Click “Menu” → “Cal” → “Manual”. This will open the whole blood calibration interface, as shown in Figure 94.

Calculation principle of the new calibration value:

Step 1: Calculate the average value of calibration

$$\text{Average value of calibration} = \frac{(\text{Measured Value 1} + \text{Measured Value 2} + \text{Measured Value 3} + \text{Measured Value 4})}{\text{Number of Measurements}}$$

Step 2: Calculate the new calibration value

$$\text{New Calibration Value} = \left(\frac{\text{Reference Value}}{\text{Average Value of Calibration}} \right) \times \text{Original Calibration Value}$$

If the new calibration value is less than 70%, it is set to 70%. If the new calibration value is greater than 130%, it is set to 130%.

For example:

- PLT reference value of calibrator: 220
- Current calibration factor: 103%
- Analyzer test result of calibrator: 230

$$\text{New Calibration Factor} = \frac{220}{230} \times 103\% = 98.52\%$$

The screenshot shows the 'Cal - Manual' interface. At the top, there is a header 'Cal - Manual' and a back arrow. Below the header, there is a section 'Mode information: Whole blood+CD'. The main part of the interface is a table with the following columns: Parameter, Coefficient (%), Reference, Measured, New coefficient (%), and Calibration date. The table contains 10 rows of parameters: WBC, RBC, HGB, HCT, PLT, MPV, RDW_CV, RDW_SD, and PDW. Each row has input fields for the Reference, Measured, and New coefficient (%) values. The Calibration date is set to 2022-10-01 00:00:00 for all parameters. At the bottom of the interface, there are several buttons: 'Animal', 'Service', 'Test mode', 'Save', 'Export', and 'Calculate'. Below the buttons, there is a status bar showing 'Next sample ID: 1' and the date '2025-03-29 21:36:43'.

Parameter	Coefficient (%)	Reference	Measured	New coefficient (%)	Calibration date
WBC	100				2022-10-01 00:00:00
RBC	100				2022-10-01 00:00:00
HGB	100				2022-10-01 00:00:00
HCT	100				2022-10-01 00:00:00
PLT	100				2022-10-01 00:00:00
MPV	100				2022-10-01 00:00:00
RDW_CV	100				2022-10-01 00:00:00
RDW_SD	100				2022-10-01 00:00:00
PDW	100				2022-10-01 00:00:00

Buttons: Animal, Service, Test mode, Save, Export, Calculate

Next sample ID: 1 2025-03-29 21:36:43

Figure 94 Manual calibration

In this interface, enter the reference value and measured value of the calibrator for the parameters to be calibrated. Click “Calculate”, and the system will automatically compute the new calibration coefficient and update the calibration date. Click “Save” to save the new calibration coefficient. Click “Export” to export the calibration coefficient.

Click “Animal” to select the animal type for calibration. If “Cus1” is selected in the animal category dialog, the new calibration coefficients will apply to all animal types.

The “Service” option is reserved for engineers only.

To calibrate other modes, such as RET or Pre-diluted, click “Test mode” to switch, as shown in Figure 95.

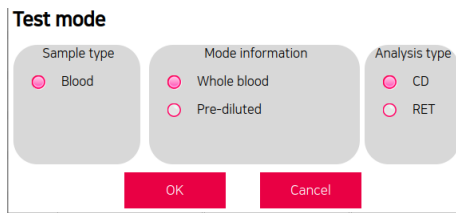


Figure 95 Select calibration mode

NOTE

- The Analyzer can be used to calibrate any or all of the following parameters: WBC, WBC_D, RBC, HGB, MCV, MPV, RDW_CV, RDW_SD, PLT, and PDW.
- If you exit the calibration interface without clicking “Save”, the data will not be saved.

Verify calibration coefficient:

After calibration, the calibration coefficient must be verified. The following steps are recommended in the “Test” interface:

- (1) Analyze the calibrator at least three times and check whether the results are within the allowable range.
- (2) Analyze high, medium, and low-value control materials at least three times per concentration and verify if results are within the allowable range.
- (3) Analyze at least three normal blood samples with known reference values at least three times per sample, ensuring the results are within the acceptable range.

NOTE

- The allowable calibration coefficient range is 70–130%.
- If the calculated new calibration coefficient exceeds this range, the critical value of the calibration coefficient range will be used as the new calibration coefficient. In such cases, the operator must investigate the cause and re-calibrate.

9.4.2 Standard calibration

- All clinical samples, control materials, and calibrators are potentially infectious. Follow established laboratory or clinical procedures and wear protective clothing, medical gloves, and safety glasses when handling these materials.
- Operators must comply with regional and national regulations regarding the discharge and disposal of reagents, waste liquid, and waste samples.

Click “Menu” → “Cal” → “Standard” to enter the standard calibration interface. This is the standard calibration interface, as shown in Figure 96.

Target	WBC	RBC	HGB	HCT	PLT
1					
2					
3					
4					
5					
Mean					
SD					
New					
Original	100	100	100	100	100

Figure 96 Standard calibration interface

On the left side of the interface, enter the batch number and expiry date of the calibrator. Then, input the calibration target values for each parameter in the first line.

To perform the calibration test:

1. Place the calibrator under the sample probe.
2. Click “Count button” on the front of the Analyzer to start the test
3. A minimum of 5 counts is required, but 10 continuous counts are recommended.

After completing the test: Click “Calculate” to generate a new calibration coefficient. Click “Save” to store the calibration coefficient. Click “Delete” to remove the selected data.

Click “Animal” to select the animal type for calibration. If “Cus1” is chosen in the animal category dialog, the new calibration coefficients will override all animal types.

Verify calibration coefficient:

After calibration, the calibration coefficient must be verified. The following steps are recommended in the “Test” interface:

- (1) Analyze the calibrator at least three times and check whether the results are within the allowable range.
- (2) Analyze high, medium, and low-value control materials at least three times per concentration and verify if results are within the allowable range.
- (3) Analyze at least three normal blood samples with known reference values at least three times per sample, ensuring the results are within the acceptable range

Calculation principle of new calibration value:

Average value of calibration:

$$\text{Mean} = \frac{\sum_{i=1}^n X_i}{n}$$

$$\text{New Calibration Value} = \left(\frac{\text{Reference Value}}{\text{Average Value of Calibration}} \right) \times \text{Original Calibration Value}$$

If the new calibration value is less than 70%, it is set to 70%. If the new calibration value is greater than 130%, it is set to 130%.

To calibrate other modes, click “Test mode” to switch, as shown in Figure 97.

Test mode

Sample type

☒ Blood

Mode information

☒ Whole blood

☐ Pre-diluted

Analysis type

☒ CD

OK

Cancel

Figure 97 Select calibration mode

9.4.3 Blood calibration



- All clinical samples, control materials, and calibrators are potentially infectious. Follow established laboratory or clinical procedures and wear protective clothing, medical gloves, and safety glasses when handling these materials.
- Operators must comply with regional and national regulations regarding the discharge and disposal of reagents, waste liquid, and waste samples.

Click “Menu” → “Cal” → “Blood” to enter the blood calibration interface, as shown in Figure 98.

Cal - Blood

☒ No. 1

☐ No. 2

☐ No. 3

☐ No. 4

☐ No. 5

Mode information:Whole blood+CD

WBC

RBC

HGB

HCT

PLT

Target					
1					
2					
3					
4					
5					
Mean					
SD					
New					
Original	100	100	100	100	100

Animal

Test mode

Save

Delete

Calculate

Next sample ID:12025-03-29 21:35:05

Figure 98 Blood calibration

- (1) Prepare five normal blood samples and measure them using other reference analyzers at least three times. Calculate the average value of the measurements and use it as the reference value. Alternatively, perform measurements using a reference method, and take the obtained data as the reference value.
- (2) Test the prepared normal blood sample on the Analyzer, obtaining an average measured value from at least 5 counts and at most 10 counts. Click “Calculate” to generate a new calibration coefficient.

Repeat step 2 for all five blood samples. Once the calibration coefficients for all five samples are obtained, calculate the average value of these coefficients.

Click “Save” to store the new calibration coefficient.

Click “Animal” to select the animal type for calibration. If “Cus1” is chosen in the animal category dialog, the new calibration coefficients will override all animal types.

Click “Delete” to remove the selected test results.

$$\text{New Calibration Value} = \left(\frac{\text{Reference Value}}{\text{Average Value of Calibration}} \right) \times \text{Original Calibration Value}$$

If the new calibration value is less than 70%, it is set to 70%. If the new calibration value is greater than 130%, it is set to 130%.

Click “Test Mode” to select different calibration modes, as shown in Figure 99.

Test mode

Sample type
☒ Blood

Mode information
☒ Whole blood
☐ Pre-diluted

Analysis type
☒ CD

OK Cancel

Figure 99 Select calibration mode

NOTE

- After counting, click “Save” to save the results. If you exit the calibration interface without clicking “Save”, the data will not be saved.

9.4.4 Calibration history

Click “Menu” → “Cal” → “History” to enter the calibration history interface. In this interface, you can review past calibration records, allowing you to track the entire calibration process, as shown in Figure 101.

Click “Test Mode” to select and view historical calibration records for different modes.

Click “Animal” to select an animal species and view its corresponding calibration history. The “Service” module requires engineer-level authorization.

Select a calibration record and click “Replace” to apply that calibration as the current setting.

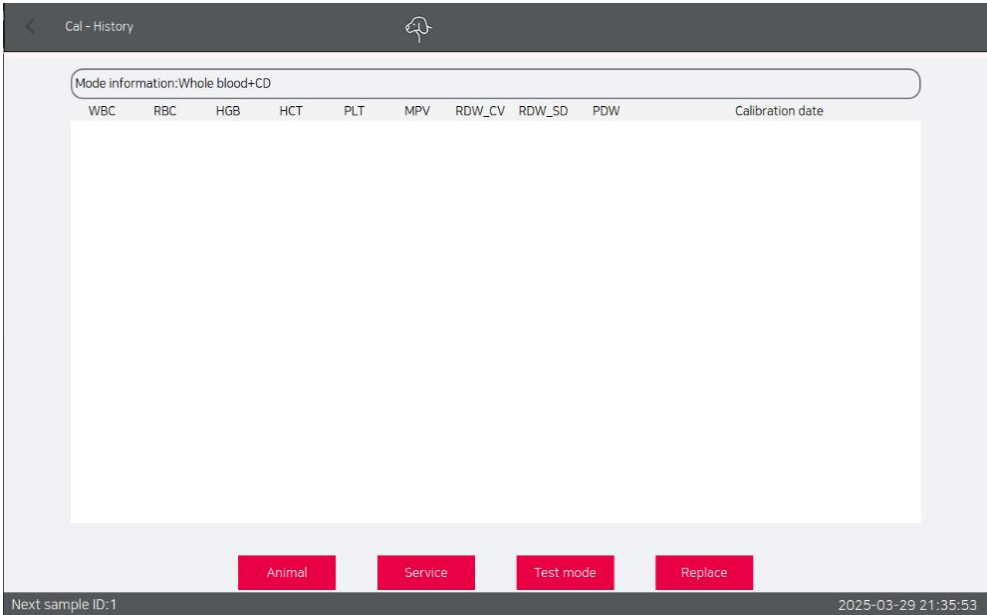


Figure 100 Calibration history

Chapter 10 Maintenance

10.1 Overview

To keep the Analyzer in optimal working condition, maintain measurement accuracy, minimize failures, and extend its service life, both daily and regular maintenance must be performed.

This chapter describes the methods and steps for preventive maintenance. For further details, please contact BIONOTE. According to the Analyzer's maintenance requirements, preventive maintenance is divided into daily, weekly, and monthly routines, along with targeted maintenance as needed.



- All surfaces of the Analyzer may be potentially infectious. Take appropriate safety precautions during operation and maintenance to prevent infection, electric shock, or burns. Wear gloves during cleaning and maintenance, and wash hands with disinfectants after completing the work.

WARNING

- Always follow the User Manual for maintenance and operation. Failure to do so may result in personal injury or damage to the Analyzer.
- Maintain a safe distance from the movement mechanism to prevent injury to clothes, hair, or hands.
- If any damaged parts are found, contact BIONOTE or your local agent.

CAUTION

- For any unclear issues during maintenance, contact BIONOTE, and a specialist will provide maintenance guidance.
- During maintenance, avoid touching the tip of the sample probe to ensure safety.

10.2 Periodic maintenance of the Analyzer

10.2.1 Daily maintenance

10.2.1.1 Complete soak

After daily sample testing, it is recommended to perform a complete soak of the Analyzer to ensure the liquid circuit remains clean, as shown in Figure 101:

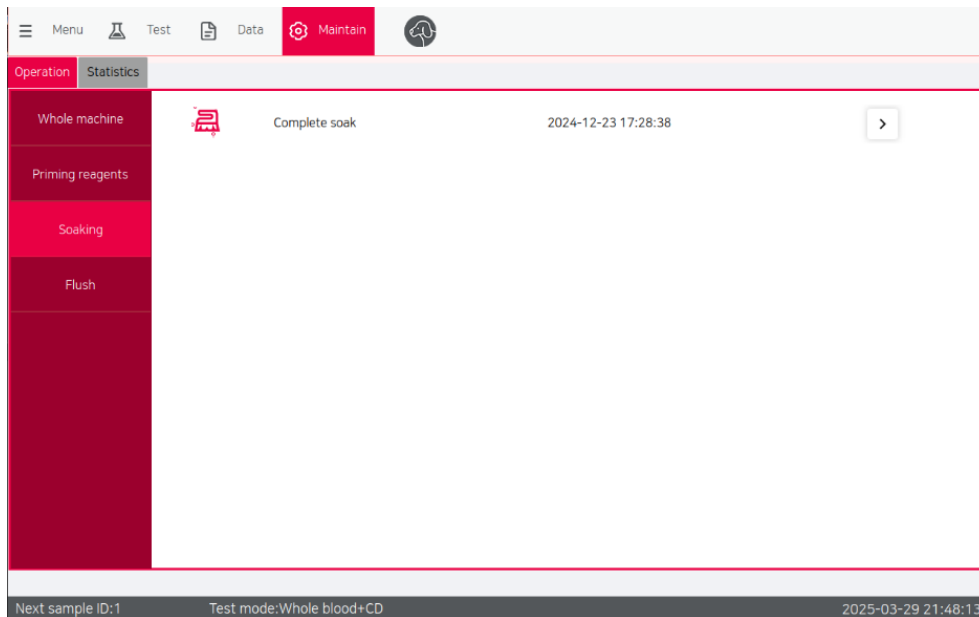


Figure 101 Complete soak

10.2.1.2 Shutdown

Residual substances in the Analyzer can cause measurement errors, making it essential to clean the sample cups and related liquid paths. Failure to follow proper maintenance and cleaning procedures may result in incorrect test results. After every 300 samples or at the end of each workday, perform pipeline cleaning during shutdown. If the Analyzer is used continuously, it should be turned off and restarted at least once every 24 hours. For detailed shutdown procedures, refer to Section 6.9 “Shutdown and Soak”.

10.2.2 Weekly maintenance

10.2.2.1 Appearance maintenance

The surface of the Analyzer, especially areas where blood sample splashes may remain around the sample probe, must be cleaned weekly to prevent protein deposition, mildew, and contamination.

Clean the surrounding surfaces of the sample probe, probe wiper, and blood-preventing bracket with a clean cloth dipped in neutral detergent, ensuring that stains on other surfaces of the Analyzer are also removed.

Wipe the crystal surface of the fluorescent reaction cup with a cotton swab dipped in alcohol.

For detailed cleaning instructions, refer to Section 10.3.4 “Instructions for Cleaning and Disinfection of the Analyzer”.

10.2.2.2 Maintenance of test parts

After testing a large number of samples, protein residues may accumulate in the tested components. It is recommended to soak and maintain these components weekly and clean the interior to ensure the stability of test data. For the soaking process, refer to Section 10.3.1 “Maintain and soak”.

NOTE

- Do not wipe the surface of the Analyzer with corrosive acids, alkalis, or highly volatile organic solvents such as acetone, ether, or chloroform. Only neutral detergents should be used.

10.2.3 Monthly maintenance

For monthly maintenance, daily maintenance should be performed in conjunction with weekly maintenance.

NOTE

- Do not wipe the surface of the Analyzer with corrosive acids, alkalis, or highly volatile organic solvents such as acetone, ether, or chloroform. Only neutral detergents should be used.

10.2.4 Semi-annual maintenance

10.2.4.1 Maintenance of mechanical parts

Maintenance primarily involves mechanical components, including the cleaning and lubrication of the syringe motor guide rod and the X and Y guide rods of the sampling mechanism.

Wipe off dust and dirt from the syringe motor guide rod and the sampling mechanism motor guide rod shaft using a paper towel. Evenly apply grease to the guide rod using a cotton swab.

For detailed cleaning instructions, refer to Section 10.3.4 “Instructions for Cleaning and Disinfection of the Analyzer.”

NOTE

- Before performing the above operations, turn off the Analyzer’s power supply to ensure it is in a non-operating state.
- Only trained personnel are allowed to open the front housing of the Analyzer to clean the sampling mechanism guide rail.

10.3 Soaking and complete maintenance

10.3.1 Maintain and soak

Click “Maintain” → “Soaking” to enter the complete soak interface, as shown in Figure 102.

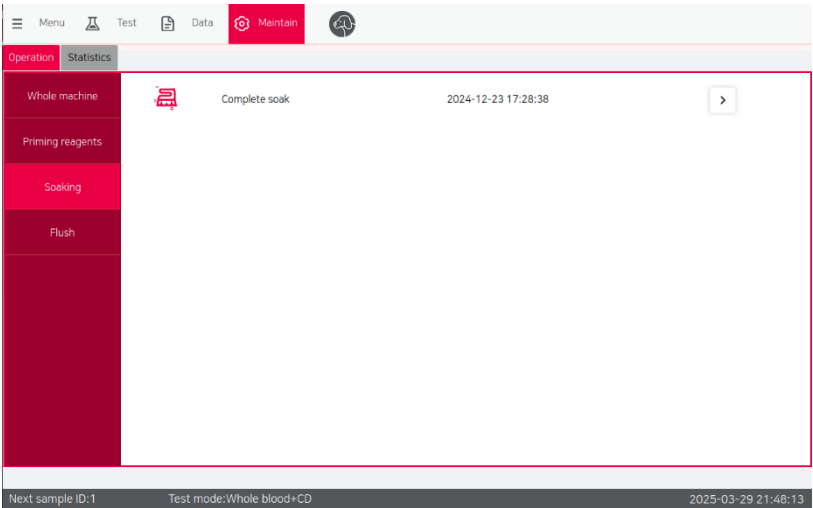


Figure 102 Complete soak

Table 31 Soaking instructions

Action	When to perform	Purpose
Complete soak	When background test results do not meet the standard, or data instability is observed.	To soak and clean all measurement components of the Analyzer

10.3.2 Complete maintenance

Click “Maintain” → “Whole Machine” to enter the whole machine maintenance interface, as shown in Figure 103.

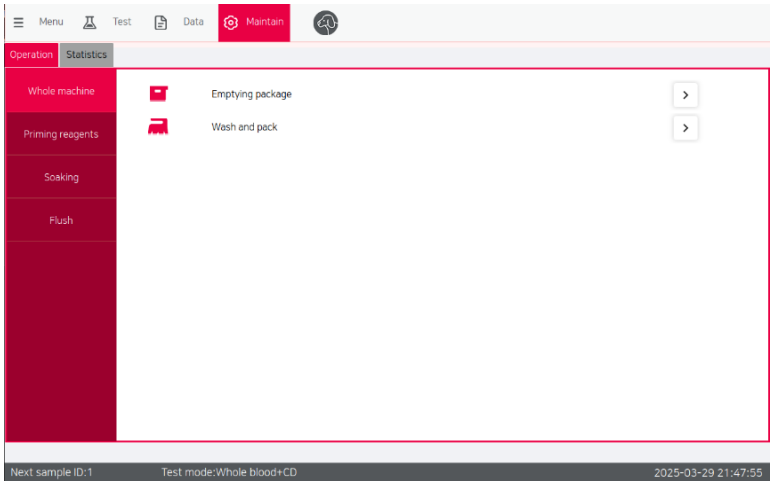


Figure 103 Whole machine maintenance interface

10.3.2.1 Emptying package

If the Analyzer will not be used for more than 10 days or needs to be transported, it must be emptied following the shipping preparation procedure. Refer to Section 10.3.3 for details.

10.3.2.2 Wash and pack

Fully rinse all pipelines and test components inside the Analyzer.



- Since clinical samples, control materials, and calibrators are potentially infectious, follow established laboratory procedures and wear protective clothing, medical gloves, and safety glasses when handling them.

NOTE

- Allow reagents to stand still before use to ensure stability.
- After replacing the diluent and lyse, perform a blank test to confirm that the background values are within the normal range.
- Probe cleaner is corrosive. Operators must wear protective clothing and gloves and follow laboratory safety regulations when handling it.

10.3.3 Emptying package

Perform this procedure before the Instrument is left unused for more than 10 days or transported.

Operation Steps:

- (1) Disconnect all reagent and fluorescent dye pipes from their containers(bottle). Insert them into bottles containing deionized or distilled water. Click “Maintain” → “Whole Machine” → “Wash and pack”. Click “OK” to start the rinsing process.
- (2) Once the rinsing process is complete, remove the reagent pipes (including fluorescent dye) from the deionized or distilled water.
- (3) Click “Emptying package” then click “OK” to begin emptying the system.
- (4) After completing the preparing shipping process, remove the pipes from the Analyzer. Properly store reagent tubes to prevent dust contamination. Fluorescent dye needles must be connected to an empty reagent bottle for protection, and the bottle should rest on the support plate.
- (5) Seal and store any remaining reagents according to the manufacturer’s instructions. Ensure proper storage conditions to prevent deterioration, misuse, or accidental ingestion. Do not store reagents in extremely hot or cold environments.

10.3.4 Instructions for cleaning and disinfection of the Analyzer



- Samples, control materials, calibrators, and waste liquids pose potential biological infection hazards. Operators must follow established laboratory or clinical safety protocols and wear protective clothing, medical gloves, and safety glasses when handling these materials.

⚠ WARNING

- Do not use detergents that may chemically react with the parts or internal materials of the Analyzer. If unsure, contact BIONOTE.

⚠ CAUTION

- Regularly clean the front housing of the Analyzer using recommended cleaning materials. Using unapproved materials that may damage the housing will void any warranty or guarantee.

The surface shell, sample probe, probe wiper, blood-preventing bracket, and syringe guide rod should be regularly cleaned and maintained. Wipe these components with a clean cloth dipped in neutral detergent to remove blood sample residues or other contaminants. After cleaning the syringe guide rod, apply grease to ensure smooth motor operation.

Recommended cleaning materials: Clean water, 75% ethanol

Prohibited cleaning materials: Acetone, ether, chloroform.

10.4 Maintenance and replacement of parts

10.4.1 Maintenance of parts

Some components require maintenance after reaching their usage limit to ensure they remain in optimal condition.

Table 32 Maintenance conditions and operations

Parts	Maintenance time	Maintenance operations
Optical sheath flow syringe	12 months or 30,000 sample counts	1. Check the syringe plunger for any crystal deposits and wipe it with a cotton swab if necessary. 2. Inspect the syringe for leakage and replace it if any are found.
Impedance sheath flow syringe	12 months or 30,000 sample counts	1. Check the syringe plunger for any crystal deposits and wipe it with a cotton swab if necessary.

		2. Inspect the syringe for leakage and replace it if any are found.
Sample aspirating syringe	12 months or 30,000 sample counts	1. Check the syringe plunger for any crystal deposits and wipe it with a cotton swab if necessary. 2. Inspect the syringe for leakage and replace it if any are found.
Probe wiper	6 months or 30,000 sample counts	1. Remove crystals and foreign matter from the surface. 2. Check if the chamber is blocked by foreign matters and remove any obstructions.
Sample probe	6 months or 30,000 sample counts	1. Remove the crystals and other foreign matters on the surface; 2. Inspect the probe tip for damage and replace it if necessary.

NOTE

- The likelihood of component failure increases significantly once they exceed their intended usage limit.
- Components that have reached the end of their service life may cause data instability.
- Operators must receive proper training before performing maintenance on the Analyzer.

10.4.2 Replacement of consumables

Some consumables must be replaced once they reach the end of their service life.

The replacement schedule for parts and consumables, along with the required tools, is as follows:

Table 33 Consumables replacement instructions

Parts	Replacement time	Replacement method
Optical sheath flow syringe	24 months or 60,000 sample counts	1. Loosen the bolts and disconnect the syringe pipe, then replace it with a new one. 2. Lubricate the mechanical drive components.
Impedance sheath flow syringe	24 months or 60,000 sample counts	1. Loosen the bolts and disconnect the syringe pipe, then replace it with a new one. 2. Lubricate the mechanical drive components.
Sample aspirating syringe	24 months or 60,000 sample counts	1. Loosen the bolts and disconnect the syringe pipe, then replace it with a new one. 2. Lubricate the mechanical drive components.
Waste filter of HGB reaction pool	12 months or 30,000 sample counts	1. Remove the pipes from both ends of the filter and replace it with a new one.
Waste filter of WDF reaction pool	12 months or 30,000 sample counts	1. Remove the pipes from both ends of the filter and replace it with a new one.
Waste filter of RET reaction pool	12 months or 30,000 sample counts	1. Remove the pipes from both ends of the filter and replace it with a new one.

Probe wiper	24 months or 60,000 sample counts	1. Remove the pipes from both ends of the filter and replace it with a new one.
Sample probe	24 months or 60,000 sample counts	1. Remove the pipes from both ends of the filter and replace it with a new one. 2. Secure the connecting pipe with ties following the original method.

NOTE

- Components that have reached the end of their service life may cause data instability.
- Replacement parts must be provided by BIONOTE; otherwise, the Analyzer may be damaged.
- Operators must be properly trained before replacing parts.

10.5

Replacing reagents



- Samples, control materials, calibrators, and waste liquids pose potential biological infection hazards. Operators must follow established laboratory or clinical protocols and wear protective clothing, medical gloves, and safety glasses when handling these materials.

WARNING

- If a reagent comes into contact with the skin, wash the area immediately with plenty of clean water. If it contacts the eyes, rinse thoroughly with clean water and seek medical attention immediately.

CAUTION

- To ensure accurate test results, do not mix fresh reagents with remaining reagents.
- When replacing reagents, ensure they are of the same type and properly connected to avoid errors.
- After replacing the reagent container or bag, check that the reagent pipe is not twisted.

10.5.1. Replacing of DS diluent

If a “No Reagent” alarm occurs, check whether the reagent container is empty. If the reagent is insufficient, replace it with a new container following these steps:

1. Prepare a new DS diluent container.
2. Remove the support plate from the old reagent container.
3. Unscrew the reagent pipe from the old reagent container cover and remove the cover assembly counterclockwise (keep the pipe clean).
4. Insert the reagent pipe into the new reagent container and secure the cover assembly clockwise.
5. Reinstall the support plate onto the container cover.
6. Refer to Section 6.3: Reagent Management for instructions on replacing the DS diluent using the reagent card.
7. If a reagent depletion alert appears despite sufficient DS diluent remaining, either click “Resolve” on the alert screen or go to “Maintain” → “Prime reagents”, then click “Prime DS diluent” to begin the priming process.

10.5.2 Replacing the fluorescent dye reagent bottle

Before replacing the fluorescent dye, confirm that the name and color of the new reagent bottle match those of the old reagent bottle. Once confirmed, follow these steps:

1. Open the front reagent cover of the Analyzer.
2. Unscrew the pipe from the old reagent bottle counterclockwise, remove the bottle cap, pierce the sealing aluminum film at the neck of the new reagent bottle with the pipe needle, and insert it into the bottle.
3. Tighten the pipe clockwise.
4. Place the new reagent bottle onto the reagent bracket, ensuring that the bracket rests securely at the bottom of the bottle cap.
5. To resolve a “No Dye” alarm, click “Maintain” → “Prime reagents” to access the corresponding function.



- Fluorescent dye poses a biological infection risk; therefore, operators must take proper laboratory precautions and adhere to relevant laboratory regulations and safety protocols. Wear personal protective equipment (PPE) such as gloves and protective clothing.

CAUTION

- When replacing the fluorescent dye reagent, do not squeeze the bottle to prevent the reagent from spraying out.
- To ensure measurement accuracy, do not mix fresh reagents with remaining reagents.
- When replacing reagents, ensure they are of the same type.

10.5.3 Replacing other reagents

Before replacing any reagent (except DS diluent and fluorescent dye), confirm that the name of the new reagent matches the old one. Then, follow these steps:

1. Prepare a new reagent bottle.
2. Unscrew the reagent pipe from the old reagent container cover and remove the cover assembly counterclockwise (keep the pipe clean).
3. Insert the reagent pipe into the new reagent container and secure the cover assembly clockwise.
4. Refer to Section 6.3: Reagent Management for instructions on replacing the reagents using the reagent card.

5. If a reagent depletion alert appears despite sufficient reagent remaining, either click “Resolve” on the alert screen or go to “Maintain” → “Prime reagents” and select the corresponding reagent to prime.

10.5.4 Replacing waste container

When the Analyzer is in standby mode, follow these steps to replace the waste container:

1. Prepare an empty waste container and remove its cover.
2. Rotate the old waste container counterclockwise and carefully remove the waste container cover assembly.
3. Attach the waste container cover assembly to the empty waste container and tighten it clockwise.
4. Dispose of the waste from the old container properly, following laboratory safety regulations.



- Samples, control materials, calibrators, and waste liquids pose potential biological infection hazards. Operators must follow established laboratory or clinical safety protocols and wear protective clothing, medical gloves, and safety glasses when handling these materials.
- Operators must comply with regional and national regulations regarding the disposal of reagents, waste liquids, and waste samples, etc.

WARNING

- If a reagent comes into contact with the skin, wash the area immediately with plenty of clean water. If it contacts the eyes, rinse thoroughly with clean water and seek medical attention immediately.
- Replace the waste container only when the Analyzer is in standby mode to prevent waste from spraying.

Chapter 11 Troubleshooting

11.1 Overview

This chapter provides methods for identifying and troubleshooting issues with the Analyzer. If the problem cannot be resolved using the guidelines in this chapter or if further assistance is required, please contact BIONOTE.

NOTE

- This Manual is not a maintenance manual; it only provides recommended actions for operators when the Analyzer triggers a fault alarm.



- Potential biological hazards exist. Operators must follow established biosafety procedures during maintenance, repairs, or troubleshooting.

11.2 Troubleshooting guide

The troubleshooting guide is designed to help operators identify and resolve issues with the Analyzer. It also provides guidance on how to obtain technical support from BIONOTE when needed. Effective troubleshooting comes from a deep understanding of the Analyzer and experience gained through use. The more familiar you are with its operation, the easier it becomes to diagnose and resolve issues.

To ensure accurate and efficient troubleshooting, operators should thoroughly read this Manual and understand the Analyzer's normal operation and preventive maintenance procedures.

Troubleshooting should follow these three steps:

- (1) Fault confirmation
- (2) Fault classification
- (3) Fault elimination

Step 1: Fault confirmation

Identify what went wrong and what should be correct under normal operation. A fault can only be eliminated once it is correctly identified.

Step 2: Fault classification

Analyzer faults typically fall into three categories:

- (1) Hardware-related faults
- (2) Software-related faults
- (3) Test failures related to sample analysis

Hardware and software issues must be addressed by BIONOTE or authorized engineers. Test-related faults can often be resolved by the operator under the guidance of BIONOTE engineers.

Step 3: Fault elimination

The maintenance engineer applies the appropriate methods to resolve the issue. If the operator can resolve the fault independently or with the assistance of BIONOTE engineers, downtime can be significantly reduced

11.3 Seeking technical support

If the Analyzer malfunctions and technical support from BIONOTE is required, please contact BIONOTE or your local BIONOTE office. Refer to the Introduction section for the telephone and fax numbers.

When requesting technical support, the operator must provide a detailed and clear description of the issue along with the following relevant information:

1. Analyzer model
2. Serial number and version number
3. Detailed description of the fault, including the operating environment (e.g., what operation was performed, under which window and state).
4. Batch number of the reagents used
5. Data and reports related to the fault

This chapter includes a list of common Analyzer failures and their solutions. If a failure occurs, the operator can identify the cause using the alarm prompt information from the Analyzer and follow the troubleshooting methods and steps provided in this section.

11.4 Fault information and solutions

The common faults of the Analyzer and their corresponding solutions are listed below. If the operator is unable to resolve the issue after following the suggested solutions or requires additional technical support, please contact BIONOTE.

Table 34 Fault information and solutions

Alarm message	Possible causes	Solutions
No DS diluent	1. Insufficient DS diluent. 2. Air leakage or bubbles at the joints of the connecting pipes. 3. Twisted or blocked connecting pipe.	1. Check if the DS diluent level is sufficient. 2. Inspect the DS diluent pipe for any abnormalities (leaks, twists, or blockages).

		3. Click “Solve”—the Analyzer will automatically prime the DS diluent and clear the alarm. 4. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
No LH lyse	1. Insufficient LH lyse. 2. Air leakage or bubbles at the joints of the connecting pipes. 3. Twisted or blocked connecting pipe.	1. Check if the LH lyse level is sufficient. 2. Inspect the LH lyse pipe for any abnormalities (leaks, twists, or blockages). 3. Click “Solve”—the Analyzer will automatically prime the LH lyse and clear the alarm. 4. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
No DR diluent	1. Insufficient DR diluent. 2. Air leakage or bubbles at the joints of the connecting pipes. 3. Twisted or blocked connecting pipe.	1. Check if the DR diluent level is sufficient. 2. Inspect the DR diluent pipe for any abnormalities (leaks, twists, or blockages). 3. Click “Solve”—the Analyzer will automatically prime the DR diluent and clear the alarm. 4. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
No FR fluorescent dye	1. Insufficient FR fluorescent dye. 2. Air leakage or bubbles at the joints of the connecting pipes. 3. Twisted or blocked connecting pipe.	1. Check if the FR fluorescent dye level is sufficient. 2. Inspect the FR fluorescent dye pipe for any abnormalities (leaks, twists, or blockages). 3. Click “Solve”—the Analyzer will automatically prime the FR fluorescent dye and clear the alarm. 4. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
No LD lyse	1. Insufficient LD lyse. 2. Air leakage or bubbles at the joints of the connecting pipes. 3. Twisted or blocked connecting pipe.	1. Check if the LD lyse level is sufficient. 2. Inspect the LD lyse pipe for any abnormalities (leaks, twists, or blockages). 3. Click “Solve”—the Analyzer will automatically prime the LD lyse and clear the alarm. 4. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
No FD fluorescent dye	1. Insufficient FD fluorescent dye. 2. Air leakage or bubbles at the joints of the connecting pipes. 3. Twisted or blocked connecting pipe.	1. Check if the FD fluorescent dye level is sufficient. 2. Inspect the FD fluorescent dye pipe for any abnormalities (leaks, twists, or blockages).

		3. Click “Solve”—the Analyzer will automatically prime the FD fluorescent dye and clear the alarm. 4. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
Expired DS diluent	The DS diluent has been in use beyond the specified time after activation.	1. Check if the DS diluent has expired. 2. Replace the DS diluent and swipe the reagent card as guided by the software. The Analyzer will automatically prime the DS diluent and clear the alarm. 3. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
Expired LH lyse	The LH lyse has been in use beyond the specified time after activation.	1. Check if the LH lyse has expired. 2. Replace the LH lyse and swipe the reagent card as guided by the software. The Analyzer will automatically prime the LH lyse and clear the alarm. 3. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
Expired DR diluent	The DR diluent has been in use beyond the specified time after activation.	1. Check if the DR diluent has expired. 2. Replace the DR diluent and swipe the reagent card as guided by the software. The Analyzer will automatically prime the DR diluent and clear the alarm. 3. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
Expired FR fluorescent dye	The FR fluorescent dye has been in use beyond the specified time after activation.	1. Check if the FR fluorescent dye has expired. 2. Replace the FR fluorescent dye and swipe the reagent card as guided by the software. The Analyzer will automatically prime the FR fluorescent dye and clear the alarm. 3. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
Expired LD lyse	The LD lyse has been in use beyond the specified time after activation.	1. Check if the LD lyse has expired. 2. Replace the LD lyse and swipe the reagent card as guided by the software. The Analyzer will automatically prime the LD lyse and clear the alarm. 3. If the issue persists, contact BIONOTE’s after-sales service department for further assistance.
Expired FD fluorescent dye	The FD fluorescent dye has been in use beyond the specified time after activation.	1. Check if the FD fluorescent dye has expired. 2. Replace the FD fluorescent dye and swipe the reagent card as guided by the software.

		The Analyzer will automatically prime the FD fluorescent dye and clear the alarm. 3. If the issue persists, contact BIONOTE's after-sales service department for further assistance.
No DS diluent	When the "Menu" → "Reagent" interface displays a reagent residual of 0.	1. The DS diluent may be insufficient. Replace the DS diluent. 2. Click "Solve" and swipe the reagent card as guided by the software. The Analyzer will automatically prime the DS diluent and clear the alarm. 3. If the issue persists, contact BIONOTE's after-sales service department for further assistance.
No LH lyse	When the "Menu" → "Reagent" interface displays a reagent residual of 0.	1. The LH lyse may be insufficient. Replace the LH lyse. 2. Click "Solve" and swipe the reagent card as guided by the software. The Analyzer will automatically prime the LH lyse and clear the alarm. 3. If the issue persists, contact BIONOTE's after-sales service department for further assistance.
No DR diluent	When the "Menu" → "Reagent" interface displays a reagent residual of 0.	1. The DR diluent may be insufficient. Replace the DR diluent. 2. Click "Solve" and swipe the reagent card as guided by the software. The Analyzer will automatically prime the DR diluent and clear the alarm. 3. If the issue persists, contact BIONOTE's after-sales service department for further assistance.
No FR fluorescent dye	When the "Menu" → "Reagent" interface displays a reagent residual of 0.	1. The FR fluorescent dye may be insufficient. Replace the FR fluorescent dye. 2. Click "Solve" and swipe the reagent card as guided by the software. The Analyzer will automatically prime the FR fluorescent dye and clear the alarm. 3. If the issue persists, contact BIONOTE's after-sales service department for further assistance.
No LD lyse	When the "Menu" → "Reagent" interface displays a reagent residual of 0.	1. The LD lyse may be insufficient. Replace the LD lyse. 2. Click "Solve" and swipe the reagent card as guided by the software. The Analyzer will automatically prime the LD lyse and clear the alarm.

		3. If the issue persists, contact BIONOTE's after-sales service department for further assistance.
No FD fluorescent dye	When the "Menu" → "Reagent" interface displays a reagent residual of 0.	1. The FD fluorescent dye may be insufficient. Replace the FD fluorescent dye. 2. Click "Solve" and swipe the reagent card as guided by the software. The Analyzer will automatically prime the FD fluorescent dye and clear the alarm. 3. If the issue persists, contact BIONOTE's after-sales service department for further assistance.
RBC clogging	1. Aperture is clogged; 2. Pipe is twisted; 3. Reagent is replaced by mistake; 4. The solenoid valve is faulty.	1. Click "Solve". The Analyzer will automatically execute the flushing process and eliminate the fault; 2. If the fault still exists, please contact our after-sale service department.
RBC bubble	1. The liquid in the front/back chamber of the sample cup is insufficient; 2. The joint of pipe leaks; 3. Reagent is replaced by mistake; 4. The solenoid valve is faulty.	1. Click "Solve". The Analyzer will automatically execute the flushing process and eliminate the fault; 2. If the fault still exists, please contact our after-sale service department.
Full waste container	Full waste container	1. Check the waste container and dispose of the waste. 2. If the fault still exists, please contact our after-sale service department.

Appendix A Specifications

A.1 Associated reagents

See A.7 Reagent Specifications for details.

A.2 Model of blood collection tubes

The Vcheck H6 Analyzer is designed exclusively for open sample aspiration, ensuring compatibility with various specifications of EDTA blood collection tubes.

A.3 Requirements for blood volume

Since the required sample volume varies depending on the type of collection tube, it is essential to follow the manufacturer's sample volume guidelines to prevent:

1. Insufficient sample volume, which may cause the Analyzer to fail to draw the required amount for testing.
2. Excessive sample volume, which can lead to clot formation or platelet aggregation.

A.4 Technical specifications

A.4.1 QC mode

L-J QC mode;

X-B QC mode;

X-R QC mode;

X QC mode;

A.4.2 Calibration method

Manual calibration mode;

Standard calibration mode;

Blood calibration mode.

A.4.3 Measurement and calculation of parameters

The Analyzer features built-in independent test channels for precise quantitative analysis and advanced diagnostic capabilities:

- RET test channel: Utilizes laser flow cytometry and cell nucleic acid fluorescent staining technology to perform quantitative RET analysis and generate RET two-dimensional scatter diagrams.
- WBC differential (DIFF) test channel: Uses laser flow cytometry and cell nucleic acid fluorescent staining technology to enable quantitative WBC differential analysis and produce WBC differential two-dimensional scatter diagrams.
- RBC/PLT test channel: Employs the sheath flow impedance method for quantitative RBC and PLT analysis and provides RBC and PLT histograms.
- HGB test channel: Performs quantitative HGB analysis using colorimetry.
- RET and RBC/PLT methodologies are used to detect platelets.
- Calculated parameters: MCV, HCT, RDW_CV, RDW_SD, MPV, PDW, MCH, MCHC, PCT, derived from stored measurement data.

A.4.4 Input/output device

Mouse and keyboard

WARNING

- Using uncertified external devices may result in abnormal operation or pose a risk of personal injury.

A.5 Physical specifications

A.5.1 Power requirements

Table 35 Power requirements

Optimal working voltage	Operating voltage range	Frequency
220V AC	100-240V AC	50/60Hz

A.5.2 Fuse

WARNING

- Only use fuses that meet the specified specifications.

Analyzer Fuse Specification: T6.3A 250V

A.5.3 EMC performance

It is recommended to assess the electromagnetic environment before using the Analyzer. Avoid using the Analyzer near strong radiation sources (such as unshielded RF sources), as they may interfere with its normal operation.

A.5.4 Sound pressure

Maximum sound pressure: 75dB

NOTE

- Ensure that the Analyzer is stored and used under the specified environmental conditions.

A.5.5 Working environment

Temperature: 15–35°C;

Relative humidity: 30–85%;

Atmospheric pressure: 60–106kPa;

A.5.6 Storage and transportation environment

Temperature: -10–55°C;

Relative humidity: 10–93%;

Atmospheric pressure: 50–106kPa;

A.5.7 Size and weight of the Analyzer

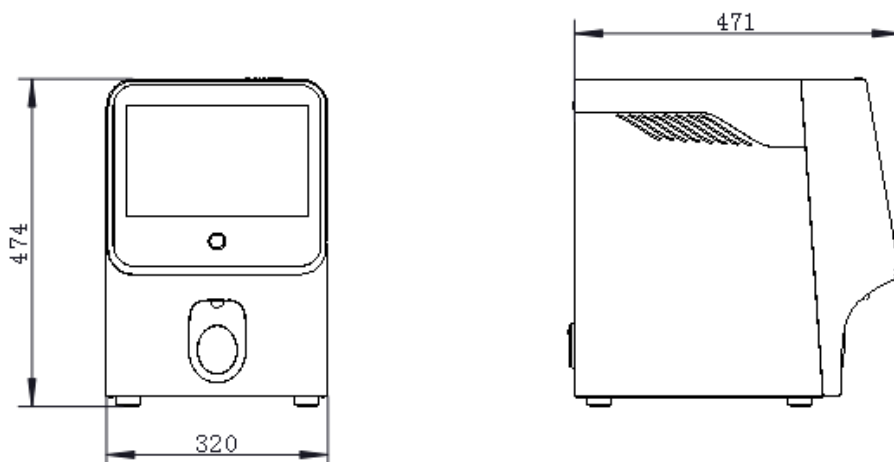


Figure 104 Unit size

Unit size: 474mm×320mm×471mm (height×width×depth)

Unit weight: 31kg

A.5.8 Contraindications

None

A.5.9 Overpressure category and pollution level

The overvoltage category of the Analyzer is Category II.

The pollution level of the Analyzer is Level 2.

A.5.10 Waste

Dispose of waste in accordance with local or national regulations.

A.5.11 Minimum sample volume

Venous whole blood

CBC+DIFF mode (CD Mode) $\leq 28\mu\text{L}$;

CBC+DIFF+RET mode (CDR mode) $\leq 34\mu\text{L}$;

A.5.12 Testing speed

CBC+DIFF mode (CD mode): No less than 60 samples per hour;

CBC+DIFF+RET mode (CDR mode): No less than 40 samples per hour;

A.6 Performance index

A.6.1 Precision

Table 36 Requirements for blood detection precision

Parameter	Detection range	Whole blood repeatability (CV/Absolute deviation d※)
WBC	$3.5 \times 10^9/L - 15.0 \times 10^9/L$	3.00%
RBC	$3.50 \times 10^{12}/L - 6.00 \times 10^{12}/L$	$\leq 1.5\%$
HGB	70 g/L–180g/L	$\leq 1.0\%$
HCT	25%–55%	$\leq 3.0\%$
MCV	50fL–120fL	$\leq 1.0\%$
PLT	$100 \times 10^9/L - 500 \times 10^9/L$	$\leq 4.0\%$
RET% and RET#	RBC $\geq 3.00 \times 10^{12}/L$ RET% 1%–4%	$\leq 15\%$

※Absolute deviation (d) = Measured value - Mean measurement value

A.6.2 Linear range

The linear range requirements for whole blood detection are listed in the table below:

Table 37 Requirements for blood detection linearity

Para -meter	Linear range	Allowable bias range	Linear correlation coefficient r
WBC	$0.00 - 100 \times 10^9/L$	No more than $\pm 0.3 \times 10^9/L$ or $\pm 5\%$	≥ 0.990
	$100.01 \times 10^9/L - 500.00 \times 10^9/L$	No more than $\pm 10\%$	
RBC	$0.00 \times 10^{12}/L - 16.00 \times 10^{12}/L$	No more than $\pm 0.05 \times 10^{12}/L$ or $\pm 5\%$	≥ 0.990
HGB	0 g/L–70 g/L	No more than $\pm 2g/L$	≥ 0.990
	71 g/L–300g/L	No more than $\pm 2\%$	
PLT	$0 \times 10^9/L - 100 \times 10^9/L$	No more than $\pm 10 \times 10^9/L$	≥ 0.990
	$100 \times 10^9/L - 1000 \times 10^9/L$	No more than $\pm 8\%$	
	$1001 \times 10^9/L - 5000 \times 10^9/L$	No more than $\pm 12\%$	
RET%	$1001 \times 10^9/L - 5000 \times 10^9/L$	/	≥ 0.900
RET#	0.0%–23%	/	≥ 0.950
HCT	$0.00 \times 10^{12}/L - 3.0 \times 10^{12}/L$	/	≥ 0.990

A.6.3 Accuracy

Table 38 Accuracy requirements

Parameter	Detection range	Relative deviation standard
WBC	$3.5 \times 10^9/\text{L} - 17.5 \times 10^9/\text{L}$	No more than $\pm 10\%$
RBC	$5.5 \times 10^{12}/\text{L} - 10.5 \times 10^{12}/\text{L}$	No more than $\pm 6\%$
HGB	90g/L–190g/L	No more than $\pm 6\%$
PLT	$117 \times 10^9/\text{L} - 500 \times 10^9/\text{L}$	No more than $\pm 20\%$
MCV	34fL–78fL	No more than $\pm 7\%$
HCT	26%–56%	No more than $\pm 9\%$

A.6.4 Carryover rate

Table 39 Requirements for carryover rate of blood detection

Parameter	Carryover rate
WBC	$\leq 0.5\%$
RBC	$\leq 0.5\%$
HGB	$\leq 0.6\%$
PLT	$\leq 1.0\%$

A.6.5 Blank test

Table 40 Requirements for blank test of blood

Parameter	Measurement range
WBC	$\leq 0.20 \times 10^9/\text{L}$
RBC	$\leq 0.02 \times 10^{12}/\text{L}$
HGB	$\leq 1\text{g/L}$
PLT	$\leq 10 \times 10^9/\text{L}$

A.6.6 Display range of main parameters

Table 41 Display range of parameters

Parameter	Display range
WBC	$0 - 999.99 \times 10^9/\text{L}$
RBC	$0 - 99.99 \times 10^{12}/\text{L}$
HGB	0–300g/L
HCT	0%–100%
MCV	0.0–250.0fL
PLT	$0 - 9999 \times 10^9/\text{L}$

A.7 Reagent specification

Product name	Model
Diluent	Vcheck H H6 DS Diluent
Diluent	Vcheck H H6 DR Diluent
Lyse	Vcheck H H6 LD Lyse
Lyse	Vcheck H H6 LH Lyse
Fluorescent dye	Vcheck H H6 FD Fluorescent dye
Fluorescent dye	Vcheck H H6 FR Fluorescent dye

CAUTION

- When replacing an old reagent with a new one, do not mix the remaining reagent with the new reagent, as this may cause cross-contamination.

A.8 Network security

- 1) Data and device (system) interface: Ethernet port is used for networking and data transmission; it supports dual LIS/HIS system via UBH-HL7 (Version: V1.00) UBH-HL7 protocol to achieve information interconnection between departments; UBH-HL7 protocol conforms to IHE and LOINC standards.

- 2) Access control:

User identity authentication method: The user identity is verified with username and password.

User type: Ordinary users (User) and administrators (Admin).

User access permission: The normal operations of the submenu can be performed under User permission, namely: reagent management, performance, maintenance, setting, statistics, X-B QC, logout and shutdown; in addition to the user permission, Admin permission includes calibration and service as well as addition and deletion of username in the user management of the setting function items.

- 3) Data type: Sensitive medical data.
- 4) Technical feature (network interface): Wired network; LAN; Electrical interface; Ethernet port is used for networking and data transmission; applicable to the bidirectional LIS/HIS system using UBH-HL7 (version: V1.00) protocol to realize information interconnection between departments; UBH-HL7 protocol conforms to IHE and LOINC standards; 10M and above bandwidth.
- 5) Technical feature (electrical interface): USB interface exchanges electronic data with USB device according to USB2.0 transmission protocol (such as USB flash disk).

- 6) Data backup and disaster recovery (DTBK) capability: The integrity and authenticity of data and data backup and disaster recovery capability are ensured through software identification and control. The software provides automatic backup of key databases and data files. When a file goes wrong, the backup of the file is kept in the Analyzer.
- 7) Network security feature: Relevant configuration is completed through IP setting rules.

Appendix B Toxic and Hazardous Substances or Elements

Parts		Toxic and hazardous substances or elements					
		Plumbum (Pb)	Mercury (Hg)	Cadmium (Cd)	Chromium VI (Cr(VI))	Poly- brominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Host	Shell	○	○	○	○	○	○
	Printed circuit board assembly	○	○	○	○	○	○
	Sheet metal parts	○	○	○	○	○	○
	Plastic parts	○	○	○	○	○	○
	Machining parts	○	○	○	○	○	○
	Hardware	○	○	○	○	○	○
	Flow system parts	○	○	○	○	○	○
	Cable	○	○	○	○	○	○
Accessories		○	○	○	○	○	○
Packaging materials		○	○	○	○	○	○

This table is compiled in accordance with SJ/T 11364.

○: The content of toxic or hazardous substances in the homogeneous materials of the parts listed above is within the acceptable range specified in GB/T 26572.

×: The content of a toxic or hazardous substance exceeds the acceptable range specified in GB/T 26572 in at least one homogeneous material of the parts listed above.

(The circuit board uses leaded solder during the assembly process, and some areas of the board contain lead; some sheet-metal parts use hexavalent chromium [Cr VI] for surface treatment.)

Note: The printed circuit board assembly (PCBA) consists of the printed circuit board, capacitors, connectors, and other components. The lithium cells are detachable and recyclable.

Appendix C Routine operating procedures

C.1 Startup and operation

- (1) Ensure that the power cord is properly connected. Check that all reagent tubes are securely in place and not twisted or disconnected. Verify that the waste liquid tank is not full.
- (2) After completing the inspection, power on the Analyzer.
- (3) Once the Analyzer completes the initialization self-test and automatically cleans the liquid circuit, enters the name(username) and password to access the test interface.
- (4) Perform a blank test and daily quality control to confirm that the Analyzer is functioning properly.
- (5) Conduct sample analysis and rechecks as needed.
- (6) Query, output, and print data as required.
- (7) Perform routine maintenance on the Analyzer as specified.

C.2 Shutdown

- (1) Click the “Shutdown” button in the “Menu” interface, then click “OK” in the pop-up dialog box.
- (2) The Analyzer will automatically rinse the fluid circuit.
- (3) Once the shutdown dialog box appears, turn off the Analyzer.

C.3 Daily maintenance (before shutdown)

- (1) Based on the test sample volume, set the frequency for performing maintenance procedures. The system will automatically carry out daily maintenance operations.
- (2) If clogging occurs, enable the “ Complete soak” function under “Maintain” → “Soaking” as needed.
- (3) If the Analyzer is used continuously, perform power on-off operations at least once every 24 hours.

C.4 Weekly maintenance

- (1) Cleaning and maintenance of appearance.
- (2) Cleaning of the probe wiper.
- (3) Cleaning of the sample probe.

C.5 Monthly maintenance

Perform in the same way as the daily and weekly maintenance.

C.6 Semi-annual maintenance

- (1) Check and clean the syringe guide rod.
- (2) Maintenance of mechanical parts.

C.7 Other maintenance

Clean the aperture in case of severe clogging in impedance channel:

1. Enable the “ Complete soak” function under “Maintain” → “Soak”.
2. Place the probe cleaner under the sampling probe and follow the on-screen prompts.
3. The Analyzer will automatically aspirate the probe cleaner into the measurement chamber for aperture soaking.

Appendix D Key Components

SN	Key parts
1	Breadboard
2	Check valve
3	Syringe
4	Step motor
5	Piston pump
6	Optocoupler
7	Solenoid valve
8	Sample cup

Appendix E Packing List

No.	Name	Quantity	Remarks
1	Vcheck H6 Hematology Analyzer	1	
2	Quick Guide	1	
3	Installation Guide	1	
4	Power cord	1	
5	3m network cable	1	Connect to external device
6	Keyboard and mouse	1	
7	BNC waste detection line	1	
8	Waste outlet pipe	1	
9	Fuse	2	
10	Waste container	1	
11	Grease	1	
12	Soft container cover handle	1	
13	Reagent container cover bracket	1	
14	External pipes	1	LH Lyse, LD Lyse, DR Diluent, DS Diluent
15	Stylus pen	1	Pen holder included
16	Plastic test tube	200	