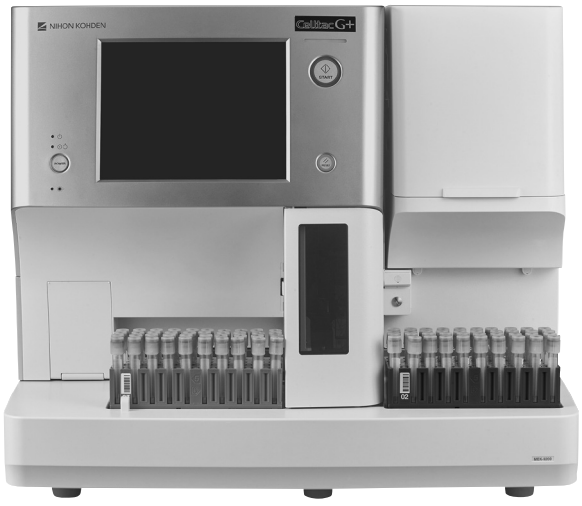
Service Manual

Celltac G+

Automated Hematology Analyzer

MEK-9200



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NIHON KOHDEN

About This Manual

In order to use this product safely and fully understand all its functions, read this manual before using the product. Keep this manual near the instrument or in the reach of the operator and refer to it whenever the operation is unclear.

Accompanying Documentation

The automated hematology analyzer comes with the following manuals. Refer to the manual depending on your needs.

Operator's Manual

Describes the operation and settings of the automated hematology analyzer. Read this manual before use.

Data Management and Setting Guide

Describes the setting procedures performed by administrators. Analyzer administrators should read the Operator's Manual together with this guide. Manage this guide so that it can only be accessed by analyzer administrators.

Service Manual (this manual)

For qualified service personnel. Describes information on servicing the automated hematology analyzer. Only qualified service personnel can service the automated hematology analyzer.

Trademark

The company name and model name are trademarks and registered trademarks of each company.

The mark printed on the SD card that is used in this instrument is a trademark.

This product stores personal patient information. Manage the information appropriately.

Patient names on the screen shots and recording examples in this manual are fictional and any resemblance to any person living or dead is purely coincidental.

The contents of this manual are subject to change without notice. If you have any comments or suggestions on this manual, please contact us at: https://www.nihonkohden.com/

CE

Contents

(Contents continued on next page.)

8 System Settings

9 Maintenance Procedure

Maintenance Check Sheet

General Handling Precautions

In order to operate this device safely and correctly, read the following precautions thoroughly before operation.

These precautions are a list of general provisions for ensuring the safe operation of medical devices and the safety of patients and operators and may include some items that are not relevant to the operation of this device.

For precautions related to the operation of this device, refer to the other sections of this manual.

1. **This device is for use by qualified medical personnel only.**
2. **When using, installing or storing the device, take the following precautions:**
   (1) Place the device in a location where the specified environment conditions are satisfied.
   (2) Avoid moisture or contact with water, direct sunlight, dust, and saline or sulphuric air.
   (3) Place the device on an even, level floor. Avoid vibration and mechanical shock, even during transport.
   (4) Avoid placing the device in an area where chemicals are stored or where there is possibility of gas leakage.
   (5) Connect the device to a grounded 3-pin medical power supply that satisfies the requirements of the device specifications.
3. **Before Operation**
   (1) Check that the specified power cord is used.
   (2) Check that all cables and cords are connected properly. Make sure that sensors and electrodes are properly connected to the device and correctly attached to the patient.
   (3) When the device is used in combination with other devices, check that there is no interference between any of the devices and that all of the devices can be used safely together.
4. **During Operation**
   (1) Only use the device for the time period or number of times necessary for the current examination or other medical procedure.
   (2) Both the device and the patient must receive continual, careful attention.
   (3) Take all appropriate measures to assure the safety of the patient whenever any abnormality is detected in the operation of the device or in the patient condition.
   (4) Avoid direct contact between the device housing and the patient.
5. **After Operation**
   (1) Turn the power off by following the specified procedures.
   (2) Remove the cords gently. Do not use force to remove them or unplug them by pulling the cable.
   (3) Clean all accessories, cords and electrodes and store them appropriately.
   (4) Clean the device for its next use.
6. **When trouble occurs**
   (1) Remove all electrodes and sensors from the patient.
   (2) Turn the power off and remove the power cord from the AC power source.
   (3) Attach an “Out of Order” or “Do Not Use” warning label to the device and immediately contact your Nihon Kohden representative.
7. **The device must not be altered or modified in any way.**
8. **Ensure that the device receives daily checks and periodic inspections and check that it can be used properly and safely.**
9. **Always have an alternative method of performing the device’s function prepared in case of an accident or malfunction affecting the operation of the device.**
10. **Be careful of malfunctions that may occur when the device is exposed to strong electromagnetic fields.**
    Interference from a strong electromagnetic field may cause the device to malfunction or noise to appear in the waveforms. If an unexpected malfunction occurs during operation of the device, check the electromagnetic environment and take the necessary measures to rectify the situation.

    The following items describe some common causes of interference and the recommended actions to take in response.

    (1) Use of cellular phones
    Electromagnetic interference can cause errors in the operation of the device. Turn off cellular phones and other wireless devices, remove them from the location where the device and/or system is installed, or exclude them from the facility altogether.

    (2) Radio-frequency interference from other devices through the AC power supply of the device and/or system
    - Identify the source of the interference and apply measures such as noise reduction circuits to reduce the interference.
    - If the source of the interference is a device that can be turned off, stop using that device and turn its power off.
    - Connect the device to different AC power supply.

    (3) Effect of direct or indirect discharge of electrostatic energy to the device or the surrounding area
    - Make sure all users and patients in contact with the device and/or system are free from electrostatic energy before using it.
    - A humid room can help lessen this problem.

    (4) Lightning
    When lightning occurs near the location where the device and/or system is installed, it may induce an excessive voltage in the device and/or system. In such a case, take the following measures when using the device.
    - Remove the power cord from the AC outlet and operate the device using the internal battery.
    - Use an uninterruptible power supply.

    (5) If the device and/or system interferes with any radio wave receiver such as a radio or television set, locate the device and/or system as far as possible from the radio wave receiver.

    (6) Warning: Use adjacent to or stacked with other equipment
    Malfunctions may occur during operation when the device and/or system is adjacent to or stacked with other equipment. Before use, check that the device and/or system operates normally with the other equipment.

    (7) Warning: Use of unspecified devices and/or cables
    When an unspecified device and/or cable is connected to this device and/or system, it may cause increased electromagnetic emissions or decreased electromagnetic immunity.
    This device and/or system complies with all requirements of the relevant EMC standards when used with the specified accessories and cables. Only use this device and/or system with the specified accessories and cables.

    (8) Measurement with excessive sensitivity
    The device and/or system is designed to measure bioelectrical signals with a specified sensitivity. If the device and/or system is used with excessive sensitivity, artifact may appear as a result of electromagnetic interference and this may cause mis-diagnosis. When unexpected artifact appears, inspect the surrounding electromagnetic conditions and remove the source of the artifact.

    (9) Use with radiation therapy devices
    When the device and/or system is used in a radiotherapy room, it may cause failure or malfunction due to electromagnetic radiation or corpuscular radiation. When you bring the device and/or system into a radiotherapy room, constantly observe the operation of the device and/or system. Prepare countermeasures in case of failure or malfunction.

    (10) Other
    When the device and/or system is used in an unspecified system configuration different from the configuration used for EMC testing, it may cause increased electromagnetic emissions or decreased electromagnetic immunity.

Warranty Policy

Nihon Kohden Corporation (NKC) shall warrant its products against all defects in materials and workmanship for one year from the date of delivery. However, consumable materials such as recording paper, ink, stylus and battery are excluded from the warranty.

NKC or its authorized agents will repair or replace any products which prove to be defective during the warranty period, provided these products are used as prescribed by the operating instructions given in the operator's and service manuals.

No other party is authorized to make any warranty or assume liability for NKC's products. NKC will not recognize any other warranty, either implied or in writing. In addition, service, technical modification or any other product change performed by someone other than NKC or its authorized agents without prior consent of NKC may be cause for voiding this warranty.

Defective products or parts must be returned to NKC or its authorized agents, along with an explanation of the failure. Shipping costs must be pre-paid.

This warranty does not apply to products that have been modified, disassembled, reinstalled or repaired without Nihon Kohden approval or which have been subjected to neglect or accident, damage due to accident, fire, lightning, vandalism, water or other casualty, improper installation or application, or on which the original identification marks have been removed.

In the USA and Canada other warranty policies may apply.

Responsibilities – Professional Users

This instrument must be used by a professional user with a full knowledge of operating this instrument, only for his/her intended use and according to the instructions for use. Instructions in the operator's manual must be followed, especially the following points.

- Storage and stability of reagents
- Handling of reagents
- Instrument installation
- Connection of all tubes to inlets and outlets
- Connection of all tubes to reagents and waste container
- Checking the amount of reagents and waste fluid
- Calibration
- Quality control
- Maintaining and servicing

If deviating from the instructions, the professional user does it at the risk and liability of the laboratory and only after validation by the laboratory. Nihon Kohden has no responsibility for such deviation.

This equipment complies with International Standard EN 55011:2009+Amendment 1:2010 Group 1, Class B. Class B EQUIPMENT is equipment suitable for use in domestic establishments and in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purposes.

Conventions Used in this Manual and Instrument

Dangers, Warnings and Cautions

Level	Description
⚠ DANGER	A danger alerts the user to a hazardous situation which causes death or serious injury.
⚠ WARNING	A warning alerts the user to possible injury or death associated with the use or misuse of the instrument.
⚠ CAUTION	A caution alerts the user to possible injury or problems with the instrument associated with its use or misuse such as instrument malfunction, instrument failure, damage to the instrument, or damage to other property.

Icons in this Manual

Icon	Description
	Gives additional information and alternative operation methods.
	Indicates related pages in this or other manuals which give more details.

Safety Standards

Safety Standard Classification of the Analyzer

Type of protection against electrical shock:	CLASS I EQUIPMENT
Degree of protection against harmful ingress of water:	IPX0 (non-protected)
Degree of safety of application in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE:	Equipment not suitable for use in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE
Mode of operation:	CONTINUOUS OPERATION
ME EQUIPMENT type:	STATIONARY type,
Pollution degree:	2 EQUIPMENT

Symbols

The following symbols are used with the analyzer.

The names and descriptions of each symbol are as shown in the table below.

Analyzer

Symbol	Description
	AC power off
	AC power on
	Stand-by
	“Off” only for part of the equipment
	“On” only for part of the equipment
	Laser on
	Reset
	Start
	Do not touch
	Attention, see instructions for use
	Consult instructions for use
	Inlet
	Outlet
ISOTONAC•3/4	ISOTONAC•3/4 inlet
CLEANAC•710	CLEANAC•710 inlet
Hemolynac•310	HEMOLYNAC•310 inlet

Symbol	Description
Hemolynac•510	HEMOLYNAC•510 inlet
Reticulonac	Reticulonac inlet
WASTE	Waste outlet
	Alternating current
	Equipotential terminal
	Fuse
	USB socket
IVD	In vitro diagnostic medical device
	Biohazard
	LAN socket
	Serial interface
CE	The CE mark is a protected conformity mark of the European Union.
	Products marked with this symbol comply with the European WEEE directive 2012/19/EU and require separate waste collection. For Nihon Kohden products marked with this symbol, contact your Nihon Kohden representative for disposal.

On Screen and Printed Data

Screen Keys

Symbol	Description
	Home key
	Information key
	Manual Measurement key

Symbol	Description
	Eject key
	Change Operator key

Measurement Data

A data identifier is added to the related parameters according to the detected measurement message and abnormal flag.

- Section 3-3 (p. 3-4)
- Data Management and Setting Guide: “Viewing Flags” in Section 4

Classification	Data Identifier	Measurement Value	Description
Data cannot be analyzed	None	Related parameter measurement value not displayed	The data cannot be analyzed.
Measurement condition error detected	None	Related parameter measurement value not displayed	Measurement operation error is detected.
Data with low reliability (Error found during measurement)	?	Measurement value displayed	The analyzer condition is out of the specified range and the reliability of the data is low. The measurement value is the reference value.
Data with low reliability (Abnormal flag detected)	! *	Measurement value displayed	Abnormal flag is detected in the sample. The reliability of measured data is low because abnormal cells exist. If the WBC and PLT values are low, count them with a blood smear.
	C	Measurement value displayed	The reliability of measured data is low because PLT clumps are detected.
Out of normal range	H	Measurement value displayed	The measurement value is out of the upper and lower limits range set in the [Sample Type] in Settings.
	L		
Out of measuring range	None	“OVER” message displayed	The measurement value exceeds the measurable range.

1 General

1-1. Introduction

⚠ CAUTION

Do the maintenance procedure according to the schedule specified by Nihon Kohden. Otherwise, maximum performance cannot be guaranteed. Refer to Section 6 “Maintenance” for details.

This service manual provides useful information to qualified service personnel to understand, troubleshoot, service, maintain and repair the MEK-9200 automated hematology analyzer.

The maintenance must be periodically performed because the analyzer has fluid paths and precision parts. Accordingly, the user is responsible for performing the periodic maintenance. The “Maintenance” section in this service manual describes the maintenance that should be performed by qualified service personnel. The “Maintenance” section in the operator’s manual describes the maintenance that can be performed by the user.

NOTE: If the analyzer has a problem and there has been no periodic maintenance, the analyzer will usually be normal again by cleaning the fluid paths or replacing a consumable with a new one.

The information in the operator’s manual is primarily for the user. However, it is important for service personnel to thoroughly read the operator’s manual and service manual before starting to troubleshoot, service, maintain or repair this analyzer. This is because service personnel needs to understand the operation of the analyzer in order to effectively use the information in the service manual.

1-2. Service Policy

⚠ WARNING

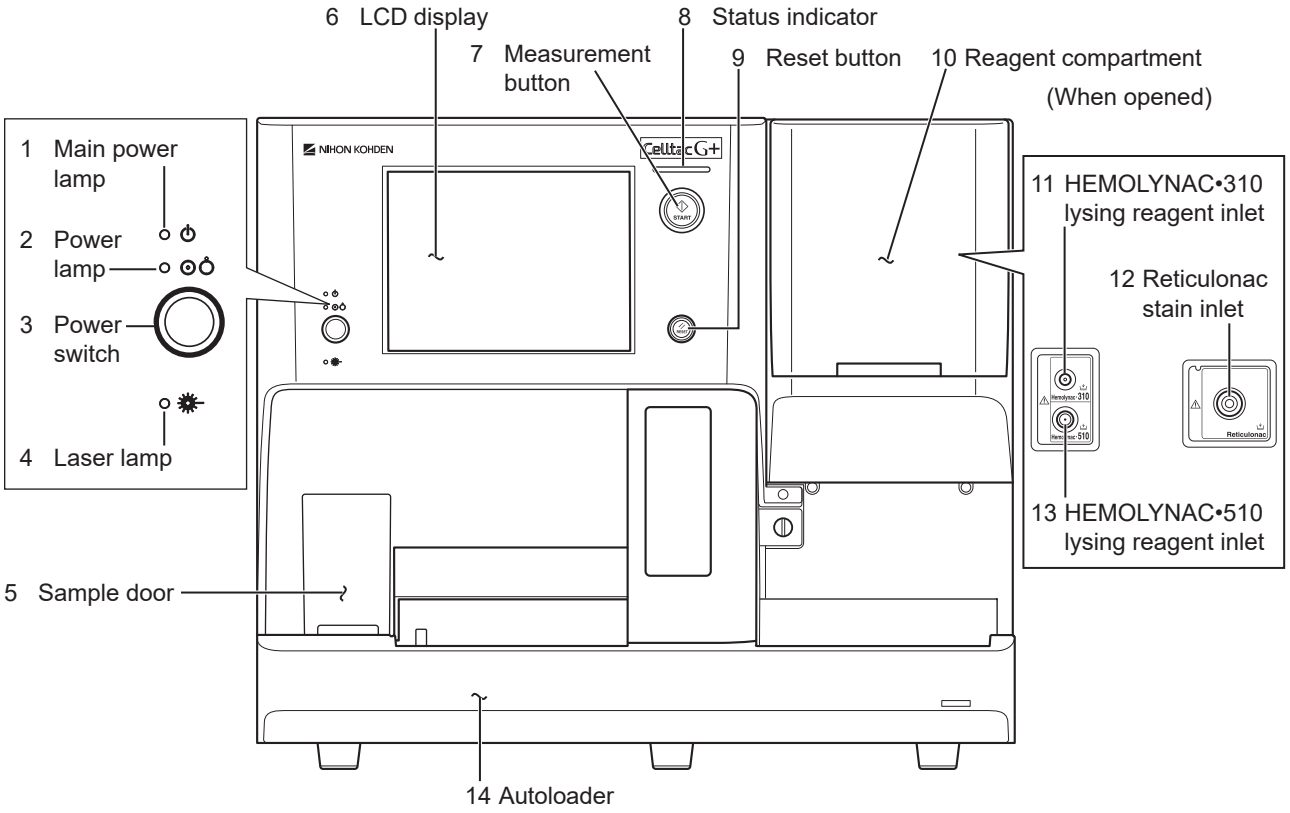
- Be careful not to directly touch any place where blood sample is or may have contacted.
- Always wear rubber gloves to protect yourself from infection.

Nihon Kohden's basic policy for technical service is to replace faulty units, printed circuit boards or parts. We do not support component level repair of boards and units outside the factory.

NOTE
- When ordering parts or accessories from your nearest Nihon Kohden representative, please quote the code number and part name which are listed in this service manual, and the name or model of the unit in which the required part is located. This will help us to promptly attend to your needs.
- Always use parts and accessories recommended or supplied by Nihon Kohden to assure maximum performance from your instrument.

1-3. Panel Description

1-3-1. Front Panel



1 Main power lamp

Lights when the Main power switch on the rear panel is turned on.

2 Power lamp

Lights when the Main power switch on the rear panel and Power switch on the front panel are turned on.

3 Power switch

Turns the analyzer power on or off when the Main power switch on the rear panel is turned on.

4 Laser lamp

Lights when the laser switch is turned on.

5 Sample door

Opens during manual measurement, and the sample tube holder slides out. After you set the sample tube and touch [Measure], the sample tube holder slides in and measurement begins.
After blood aspiration, the sample door opens automatically and the sample tube holder is ejected.

6 LCD display

Displays messages, ID numbers, measured parameters, measurement values and setting values. It has a touchscreen function for changing settings.

7 Measurement button (Auto measurement)

When the button is pressed, measurement of the sample set in the rack begins.

8 Status indicator

The indicator color displays the status of the analyzer such as standby, normal operation, out of reagent, or paused with error.

Operator's Manual:
"Status Indicator" in Section 5

9 Reset button

Stops operation when pressed during operation.

10 Reagent compartment

Stores the lysing reagent container.

11 HEMOLYNAC•310 lysing reagent inlet

Connects the HEMOLYNAC•310 lysing reagent container using the provided HEMOLYNAC•310 tube assy.

12 Reticulonac stain inlet

Connects the reticulonac stain container using the provided reticulonac tube assy.

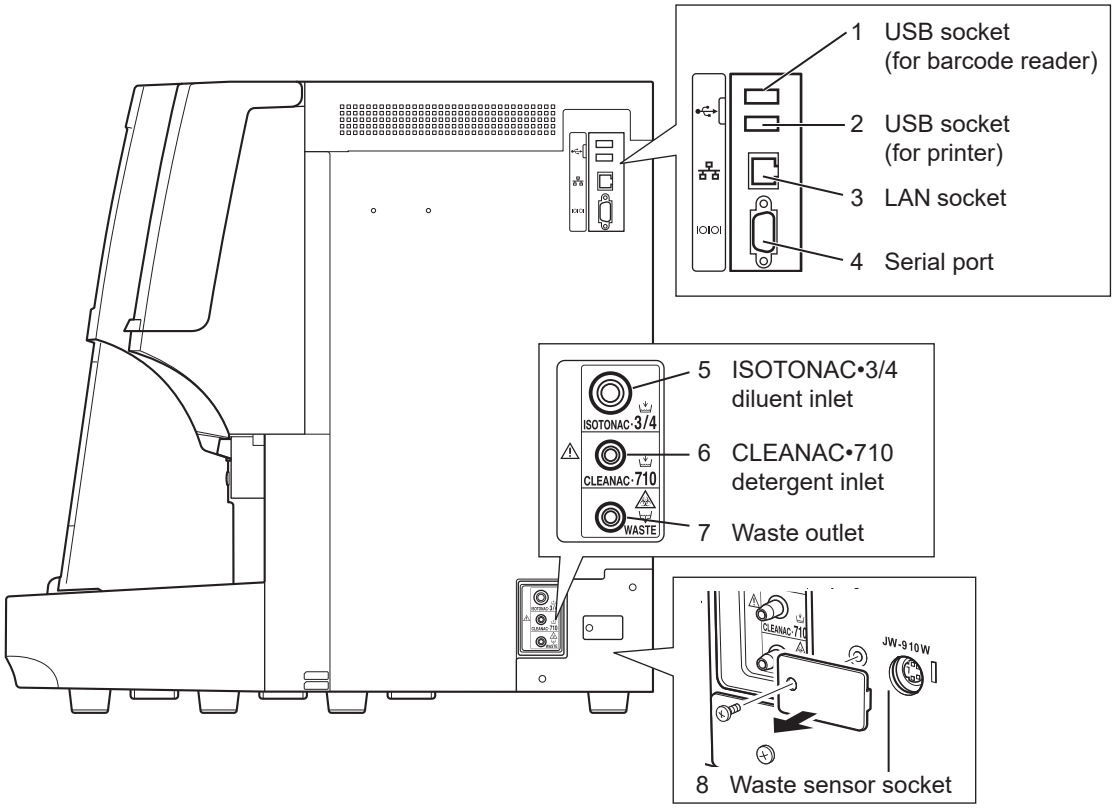
13 HEMOLYNAC•510 lysing reagent inlet

Connects the HEMOLYNAC•510 lysing reagent container using the provided HEMOLYNAC•510 tube assy.

14 Autoloader

Sets the rack.

1-3-2. Right Side Panel



1 USB socket (for barcode reader)

Connects to the provided ZK-910W bar code reader.

2 USB socket (for printer)

Connects to an optional WA-131W ink-jet printer or the equivalent.

3 LAN socket

Connects to the hospital network and sends/receives order info and measurement data to and from the system.

4 Serial port

Connects to an optional WA-461V card printer with serial communication.

5 Diluent (ISOTONAC•3/4) inlet

Connects the diluent container (ISOTONAC•3/4) using the provided ISOTONAC tube assy.

6 Detergent (CLEANAC•710) inlet

Connects the detergent container (CLEANAC•710) using the provided CLEANAC tube assy.

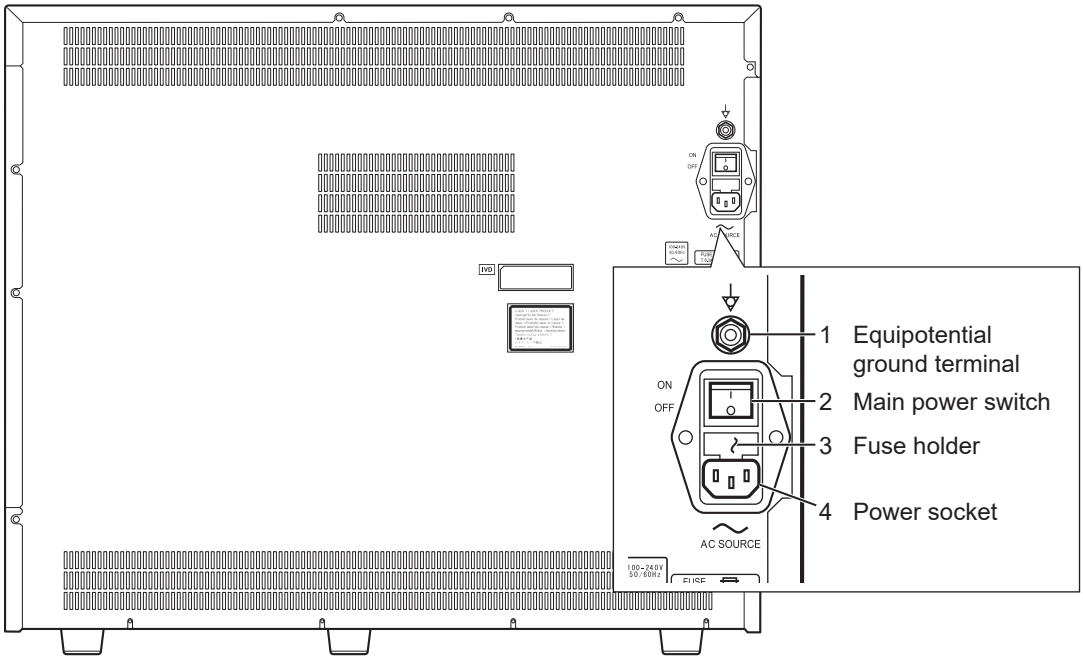
7 Waste outlet

Discharges the used diluent, detergent and aspirated sample. Connects the waste container using the provided waste tube assy.

8 Waste sensor socket

Connects the optional waste sensor.

1-3-3. Rear Panel



1 Equipotential ground terminal

Used when the analyzer is grounded equipotentially to other devices using the provided earth.

2 Main power switch

Supplies power (100 to 240V) to the analyzer when it is turned on. Under normal conditions, keep this switch turned on.

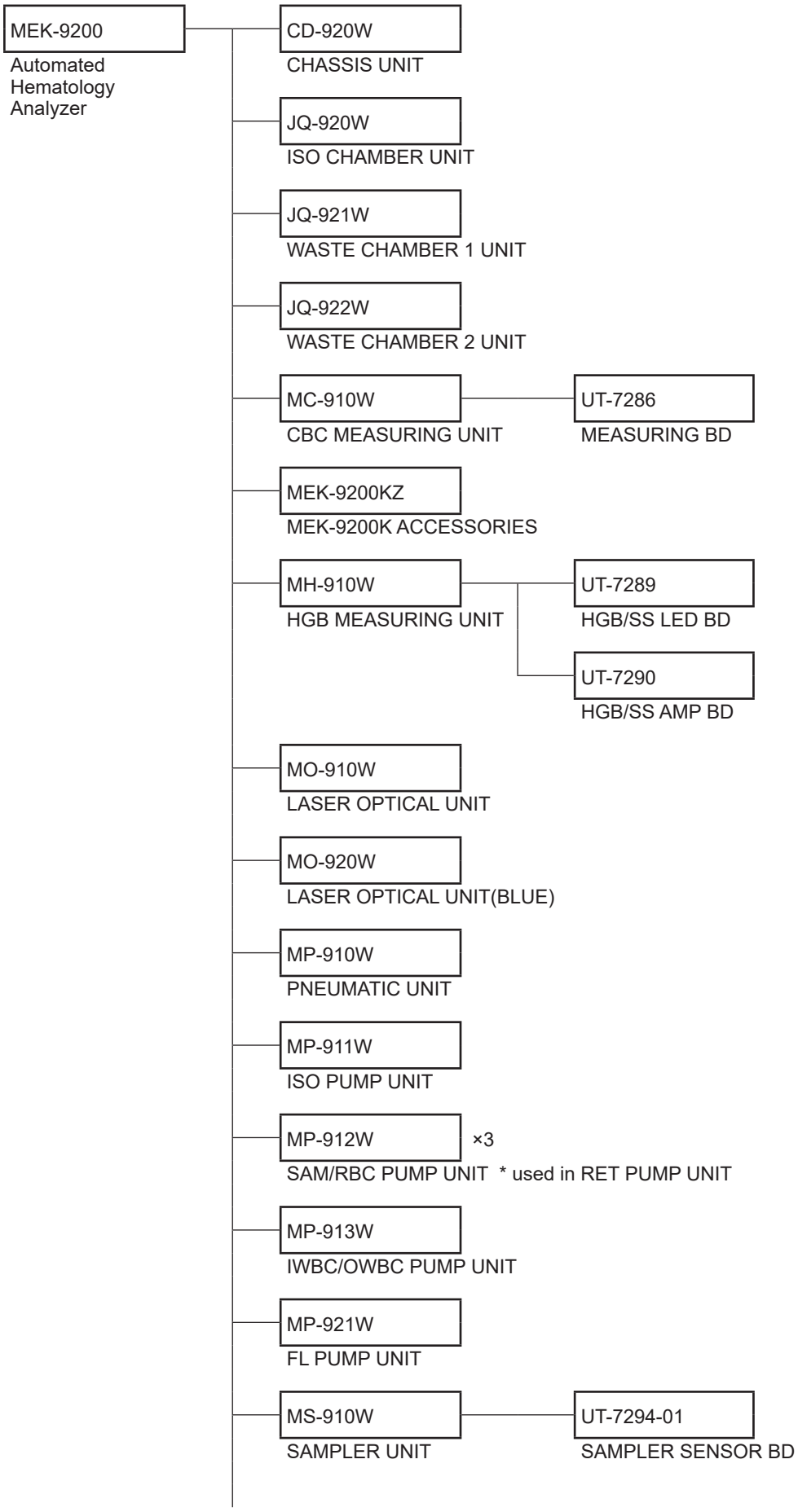
3 Fuse holder

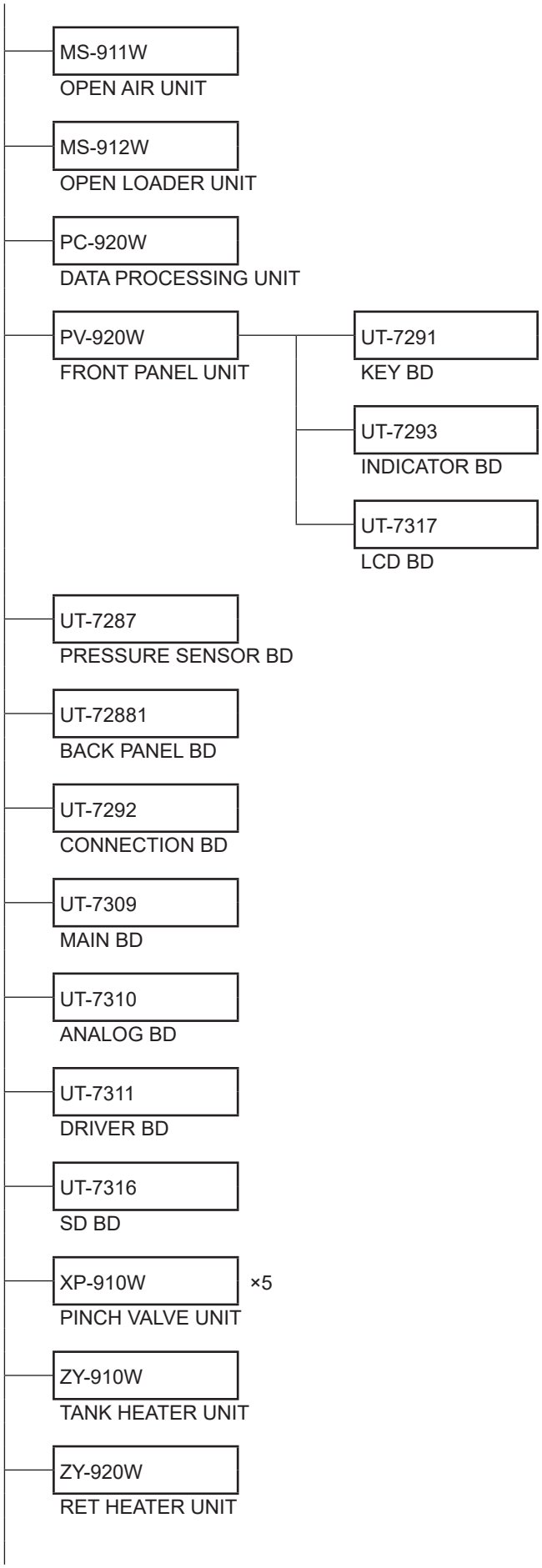
Contains the time-lag fuses. To replace the fuses, contact your Nihon Kohden representative.

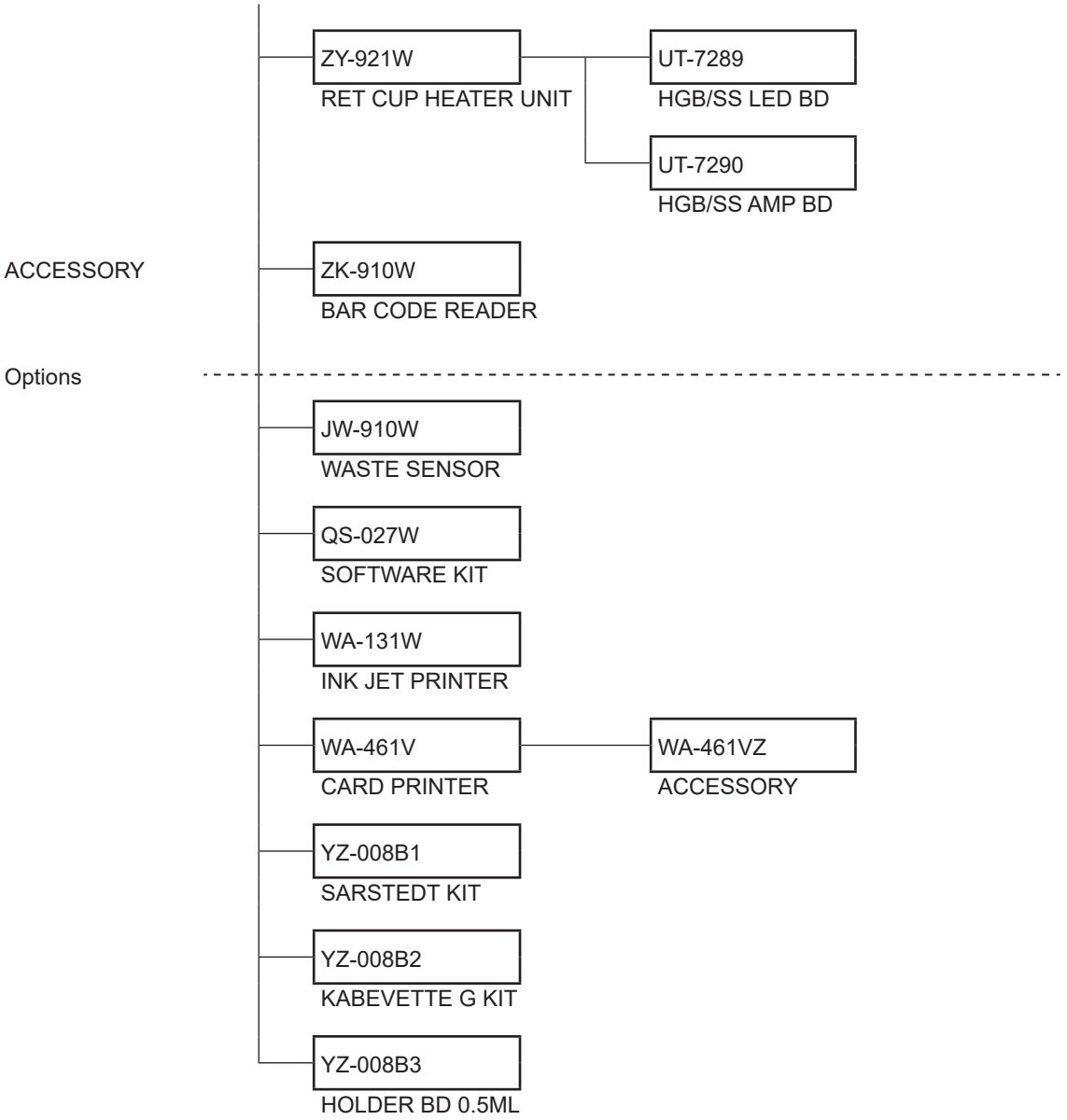
4 Power socket

Connects the power cord to supply power (100 to 240 V) to the analyzer.

1-4. Composition




MS-911W
OPEN AIR UNIT
MS-912W
OPEN LOADER UNIT
PC-920W
DATA PROCESSING UNIT
PV-920W
FRONT PANEL UNIT
UT-7291
KEY BD
UT-7293
INDICATOR BD
UT-7317
LCD BD
UT-7287
PRESSURE SENSOR BD
UT-72881
BACK PANEL BD
UT-7292
CONNECTION BD
UT-7309
MAIN BD
UT-7310
ANALOG BD
UT-7311
DRIVER BD
UT-7316
SD BD
XP-910W
×5
PINCH VALVE UNIT
ZY-910W
TANK HEATER UNIT
ZY-920W
RET HEATER UNIT


ZY-921W
RET CUP HEATER UNIT
UT-7289
HGB/SS LED BD
UT-7290
HGB/SS AMP BD
ACCESSORY
ZK-910W
BAR CODE READER
Options
JW-910W
WASTE SENSOR
QS-027W
SOFTWARE KIT
WA-131W
INK JET PRINTER
WA-461V
CARD PRINTER
WA-461VZ
ACCESSORY
YZ-008B1
SARSTEDT KIT
YZ-008B2
KABEVETTE G KIT
YZ-008B3
HOLDER BD 0.5ML

1-5. Replaceable Units and Boards

1-5-1. Units

Unit Name	Code No.	Replaceable Part Name
AUTO LOADER UNIT	RP-6114937826	Unit. Auto loader for K-type
CHASSIS UNIT	RP-CD920W	Unit. CHASSIS UNIT
ISO CHAMBER UNIT	RP-JQ920W	Unit. ISO chamber
WASTE CHAMBER 1 UNIT	RP-JQ921W	Unit. Waste chamber 1
WASTE CHAMBER 2 UNIT	RP-JQ922W	Unit. Waste chamber 2
CBC MEASURING UNIT	RP-MC910W	Unit. CBC measuring
HGB MEASURING UNIT	RP-MH910W	Unit. HGB measuring
LASER OPTICAL UNIT	RPA-MO910W	Unit. Laser optical
LASER OPTICAL UNIT (BLUE)	RP-MO920W	Unit. laser optical unit (blue)
PNEUMATIC UNIT	RP-MP910W	Unit. Pneumatic
ISO PUMP UNIT	RP-MP911W	Unit. ISO pump
SAMPLE PUMP UNIT [1]	RP-MP912W	Unit. SAM/RBC pump
RBC PUMP UNIT [1]	RP-MP912W	Unit. SAM/RBC pump
RET PUMP UNIT [1]	RP-MP912W	Unit. SAM/RBC pump
IWBC/OWBC PUMP UNIT	RP-MP913W	Unit. IWBC/OWBC pump
FL PUMP UNIT	RP-MP921W	Unit. FL PUMP
SAMPLER UNIT	RP-MS910W	Unit. Sampler
	RPK-MS910W2	Unit. Sampler (included sample tube l265)
OPEN AIR UNIT	RP-MS911W	Unit. Open air
	RPK-MS911W	Unit. open air (included release tube)
OPEN LOADER UNIT	RP-MS912W	Unit. Open loader
DATA PROCESSING UNIT	RP-PC920W	Unit. Data processing
FRONT PANEL UNIT	RP-PV920W	Unit. FRONT PANEL
PINCH VALVE UNIT	RP-XP910W	Unit. Pinch valve
TANK HEATER UNIT	RP-ZY910W	Unit. Tank heater
RET HEATER UNIT	RP-ZY920W	Unit. RET Tank heater
RET CUP HEATER UNIT	RP-ZY921W	Unit. RET Cup heater

[1] The code numbers of SAMPLE PUMP UNIT, RBC PUMP UNIT and RET PUMP UNIT are the same.

1-5-2. Boards

Board Name	Code No.	Replaceable Part Name
MEASURING BD	RP-UT7286	Printed-B. measuring
PRESSURE SENSOR BD	RP-UT7287	Printed-B. Pressure sensor
BACK PANEL BD	RP-UT72881	Unit. BACK PANEL BD
HGB/SS LED BD	RP-UT7289	Printed-B. HGB/SS LED
HGB/SS AMP BD	RP-UT7290	Printed-B. HGB/SS AMP
KEY BD	RP-UT7291	Printed-B. KEY
CONNECTION BD	RP-UT7292	Printed-B. Connection
INDICATOR BD	RP-UT7293	Printed-B. Indicator
SAMPLER SENSOR BD	UT-7294-01	SAMPLER SENSOR BD
MAIN BD	RP-UT7309	Circuit board. Main
ANALOG BD	RP-UT7310	Circuit board. Analog
DRIVER BD	RP-UT7311	Circuit board. Driver
SD BD	RP-UT7316	Circuit board. SD
LCD BD	RP-UT7317	Circuit board. LCD

1-5-3. Options

Name		Model, Code No., Supply Code	Replaceable Part Name
Power cord W		RP-936257	Cord. Power w(nd01-ac2500-jpnk)
Ground lead D		RP-098029C	Cord. Earth 501VKQ-2.D
6.3 A time-lag fuse		RP-9000066197	Fuse. 021506.3mxp 6.3A
ISOTONAC tube assy [1]		T463A	Diluent tube (with blue collar)
		T723A	18 L cap
CLEANAC tube assy [1]		T464E	Detergent tube (with green collar)
		T470A	Tube assy
		T461E	3 L tube assy
		T469	MEK cap
HEMOLYNAC•310 tube assy [1]		T473B	HEMOLYNAC•310 tube
		T447D	HEMOLYNAC•310 cap (orange)
HEMOLYNAC•510 tube assy [1]		T585B	HEMOLYNAC•510 tube (joint: purple)
		T447E	HEMOLYNAC•510 cap (purple)
Reticulonac tube assy [1]		YZ-010B9	Reticulonac tube (joint: brown)
		YZ-011B0	Reticulonac cap (brown)
Waste tube assy [1]		T463B	Waste tube (with red collars)
		T723B	Waste container cap
Open loader adapter kit	For samples	RPA-6124912587	Holder. tube normal
	For micro tubes	RP-6124912589	Holder. tube assist
	For capillary blood collection tubes	RP-6112912223	Holder. TUBE HOLDER MINI COLLECT
	For detergent	RP-6113925829	Holder. TUBE HOLDER CL810
Overflow tray		RPK-6113923883	Kit. waste tray
Rack		–	–

Name	Model, Code No., Supply Code	Replaceable Part Name
Maintenance brush	RP-6114935439	Brush. for maintenance
ZK-910W barcode reader	RP-9000066865	Reader. DS2208-SR00007ZZWW
Barcode reader holder	RP-6113926235	Holder. barcode reader
PSW4×10 screw for attaching the barcode reader	–	–
Short screwdriver	RP-9000069420	Tool. 1760-2-35
SARSTEDT Kit	YZ-008B1	–
KABEVETTE G Kit	YZ-008B2	–

[1] Tube assy consists of a tube and a cap.

2 Technical Information

(Contents continued on next page.)

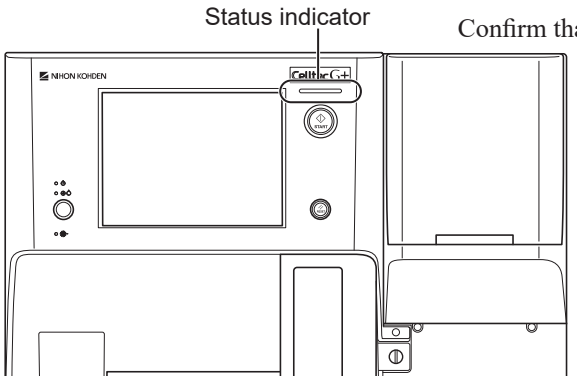
2-1. Checking the Analyzer Status

Check the status indicator on the front panel and the status indication at the top of the screen.

2-1-1. Status Indicator

The color of the indicator displays the operation status (starting, operating and stopped).

Confirm that the indicator is green (standby) before a measurement.



Display		Status
Green	Lit	Standby
	Blinking	Operating
Orange or red	Lit	Stopped due to error
Blue	Blinking	Starting
Off		Power off

2-1-2. Status Indication

The status indication at the top of the screen displays the status of the reagents, quality control and user maintenance.

Confirm that all statuses are green before starting a measurement.

Status Indication	Status
Reagent Management 	Green when all the following conditions are met: • All reagents are within the valid period (before their expiration date and expiration after opening date) • All reagents have more than 0% remaining. • The waste amount is below the warning level.
Quality Control 	Green when all the following conditions are met: • Quality control measurement is performed for all control samples in use. • The last quality controlled measured results of all control samples in use meet the quality control judgment criteria or are approved by the operator.
User Maintenance 	Green when all the following conditions are met: • No user inspection items are past their regular user maintenance dates. • No service inspection items are past their regular service maintenance dates. • The analyzer current status does not need any maintenance. • The analyzer self check has been performed and all items passed.

NOTE: Even if the above conditions are met, the quality control and user maintenance status is red if the following conditions apply.

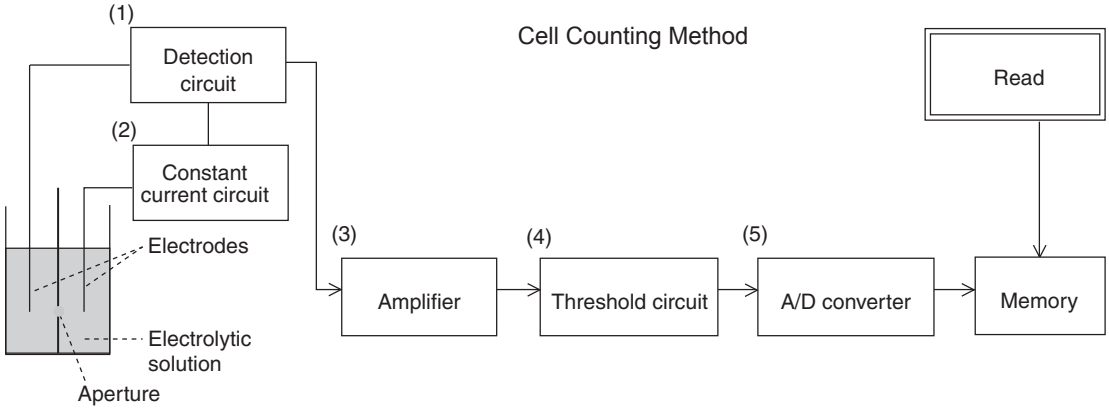
- When power is turned on (when starting)
- More than 24 hours since the last quality control measurement (quality control status) or self check (user maintenance status).

A message showing the cause appears when the status is displayed in red.

2-2. Principle of Operation

2-2-1. Blood Cell Counting

1. Constant current flows between 2 electrodes on both sides of the aperture cap. The electrolytic solution (sample) containing blood cells is aspirated from the aperture caps.
2. The resistance between the electrodes increases when a blood cell passes through the aperture between the electrodes because the DC resistance of the cells is high.
3. When the resistance changes, the amplifier generates a signal of several volts. The peak voltage is proportional to the volume of the blood cell passing through the aperture.
4. The amplified signal is sent to the threshold circuit (discrimination circuit). Here, a constant voltage is applied (threshold level) to eliminate the signals and electrical noise that are generated by non-blood cell material such as dust particles and only signals that exceed the threshold value are passed.
5. To find the peak values, the blood cell signal are sent to the A/D converter. The acquired data is stored in memory for each individual peak value.
6. The data of the blood cell count is calculated and displayed on the screen.



2-2-2. Platelet Measurement

RBC signals and PLT signals are saved in the analyzer memory in the form of voltage peak values.

This information is ultimately organized into a histogram in the analyzer.

There is no problem if the PLT and RBC distributions are clearly separated as in Fig. 1 but the distributions overlap in the case of small red blood cells (Fig. 2) or large platelets (Fig. 3). In these cases, the analyzer automatically moves the threshold level to the lowest distribution position, changes the PLT volume range, and performs a highly accurate PLT count.

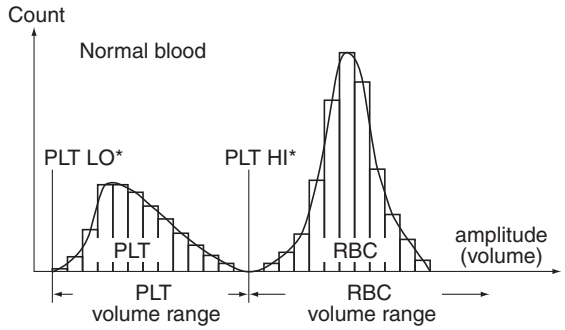


Fig.1

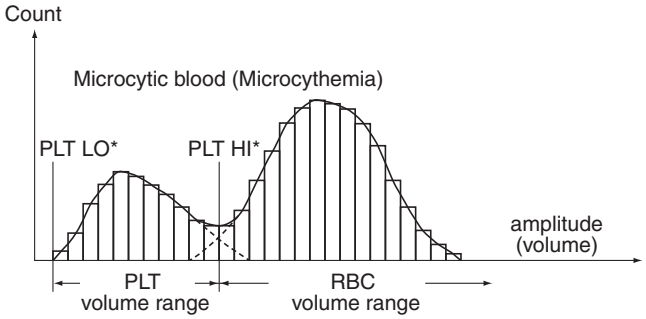


Fig.2

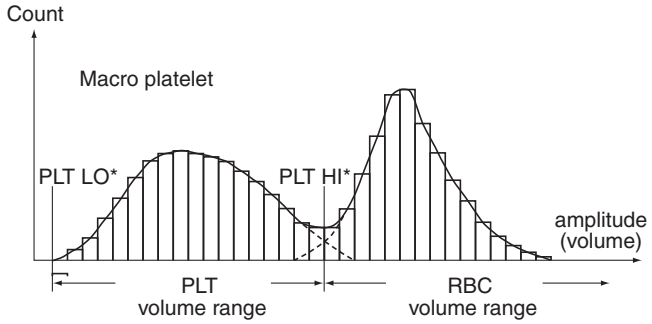


Fig.3

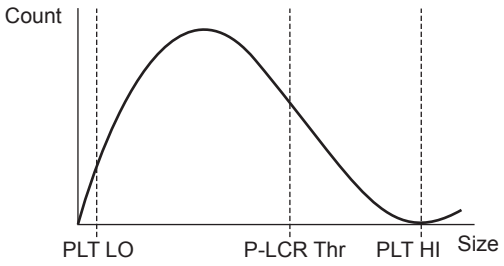
PLT LO*: Lower threshold
PLT HI*: Upper threshold

P-LCR

P-LCR is the ratio of large platelets larger than P-LCR Thr count to the platelet count.

As shown in the figure below, the ratio of the number of particles between PLT LO and PLT HI (platelet count) to the number of particles between P-LCR Thr and PLT HI (large platelet count) is calculated.

$$\text{P-LCR (\%)} = \frac{\text{Large (P-LCR Thr or more) platelet count}}{\text{Platelet count}} \times 100$$

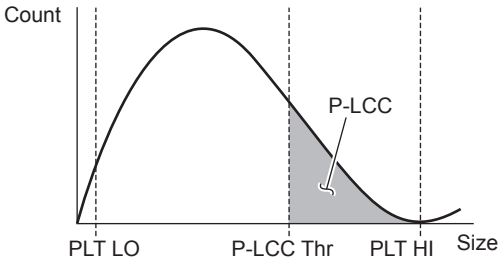


P-LCC

P-LCC is the number of large platelet cells.

It corresponds to the number of particles between P-LCC Thr and PLT HI.

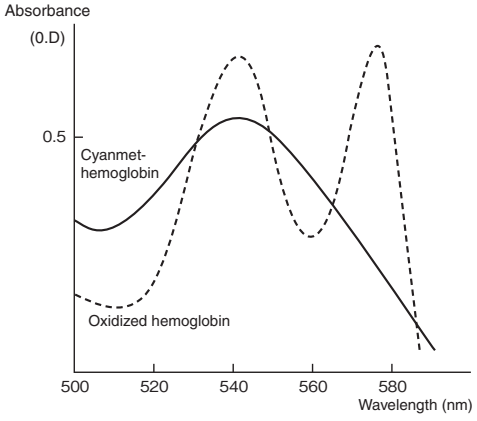
P-LCC = the number of platelets (P-LCC Thr or more)



2-2-3. Hemoglobin Measurement

1. HEMOLYNAC•310 is added to the diluted sample to elute the hemoglobin in the RBC. The eluted hemoglobin reacts with class 4 ammonium salt in the reagent and changes to a hemoglobin compound. The absorbance of the hemoglobin compound is proportional to the hemoglobin concentration so the concentration is determined by measuring the absorbance.
2. The transmittance of light from the LED changes according to the sample in the measurement cell. This light enters the light-receiving element.
3. The light receiving element amplifies the electrical signal corresponding to the light intensity and converts this voltage to a digital value.
4. Measurement of the hemoglobin concentration requires signals of both the diluent and the sample. The sample data is acquired when starting the measurement. The ratio of sample data and diluent data is subjected to logarithmic conversion, multiplied by the coefficient, and displayed on the screen.
5. Samples that are no longer needed are ejected to an direct external device by a pump or a pressure source.
6. The sample is a highly concentrated protein solution. If the sample is left in the measurement baths for a long time, the measurement baths gradually become dirty. To prevent this problem, the measurement baths are automatically cleaned with diluent after each measurement.

Hemoglobin absorption characteristics



2-2-4. Principle of WBC Differential

White blood cells in the sample pass through a very thin flow cell one by one, are irradiated with a laser, and the scattered laser light is detected. (Fig. 1)

The strength and direction of the scattered light indicates the volume and complexity of the blood cells (such as the presence or absence of granules or the structure of the nucleus). The lymphocytes, monocytes, neutrophils, eosinophils, and basophils can be classified from the scattergram with 3 parameters: low-angle scattering in the same direction as the laser linear direction (“Size”), large-angle scattering in the same direction as the laser linear direction (“Complexity”), and vertical direction scattering against the laser linear direction (“Granularity”). (Fig. 2)

Size is the size of the blood cells, Complexity is the complexity of the blood cells, and Granularity is the amount of granules in the blood cells.

Fig. 1. White blood cell differential

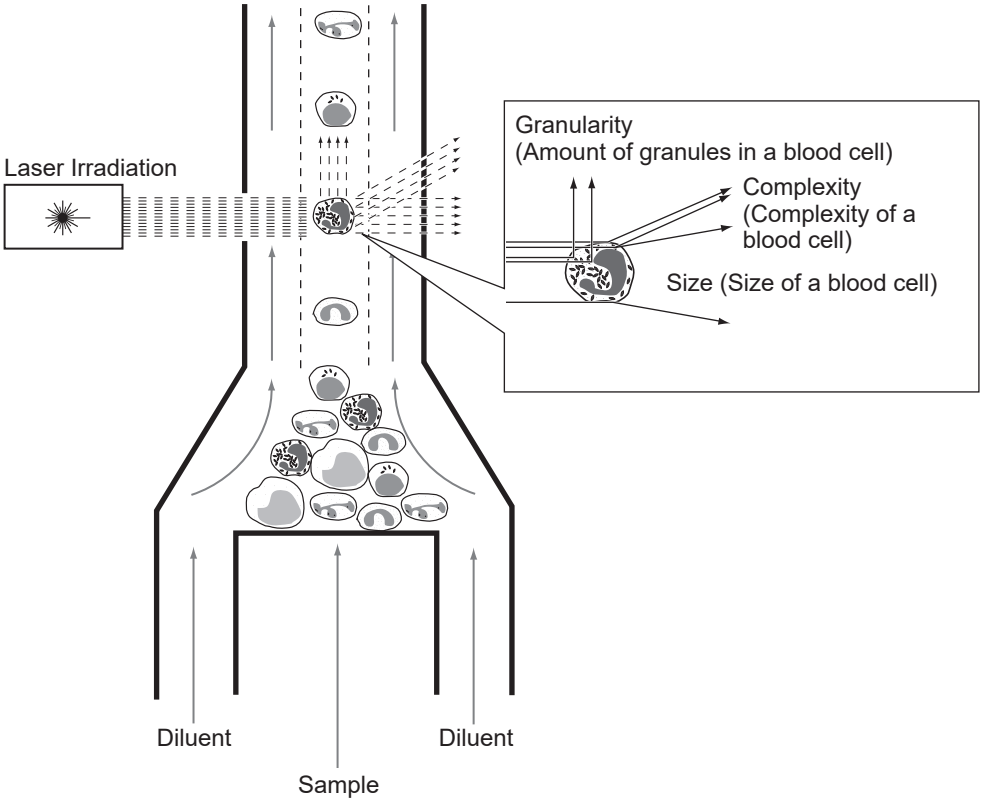
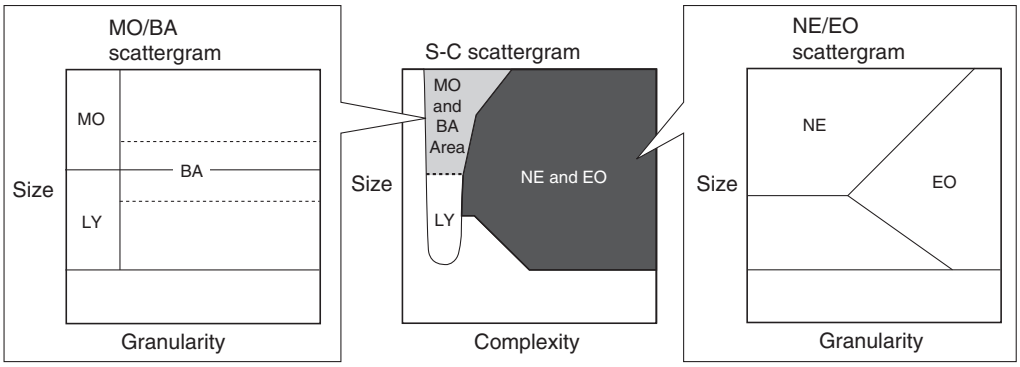


Fig. 2. Scattergram



NE: Neutrophil Count

LY: Lymphocyte Count

MO: Monocyte Count

EO: Eosinophil Count

BA: Basophil Count

There are scattergrams with Size for the vertical axis and Complexity for the horizontal axis (S-C scattergrams), scattergrams with Size for the vertical axis and monocyte and basophils classifications of Granularity for the horizontal axis (scattergrams for MO/BA classification), and scattergrams with Size for the vertical axis and neutrophil and eosinophil classifications of Granularity for the horizontal axis (scattergrams for NE/EO classification).

Lymphocytes are distributed in the LY area of the S-C scattergram. Monocytes and basophils are distributed in the MO/BA area of the S-C scattergram and when the scattergram for MO/BA classification is expanded, the monocytes are distributed in the MO area and the basophils are distributed in the BA area. Neutrophils and eosinophils are distributed in the NE/EO area of the S-C scattergram. When the scattergram for NE/EO classification is expanded, the neutrophils are distributed in the NE area and the eosinophils are distributed in the EO area.

2-2-5. Principles of Reticulocyte Measurement

Blood cells pass through a thin flow cell one by one and are irradiated with a laser. The analyzer detects the scattering and fluorescence of the laser light and uses this to count reticulocytes. (Fig. 1).

The forward scattering reveals the size of each blood cell, and the side fluorescence reveals information on the cell contents and the nucleus.

The analyzer measures the following two types of side fluorescence.

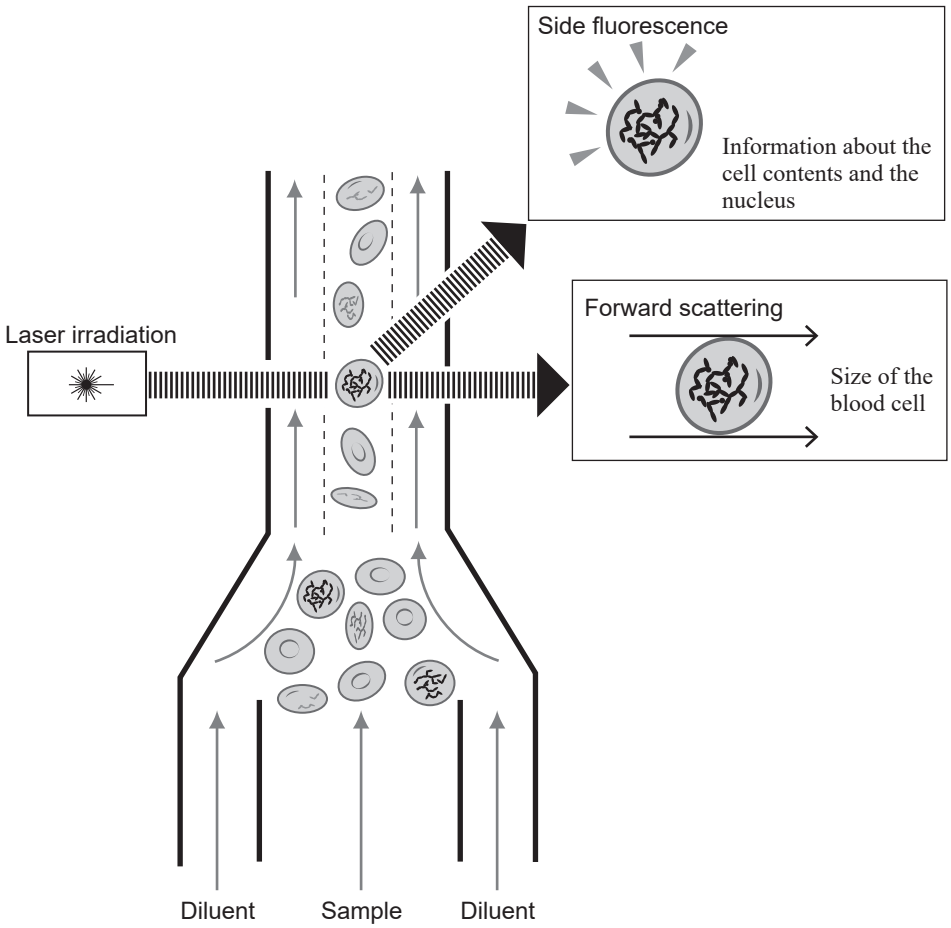
- Green fluorescence caused by the laser exciting molecules of the stain attached to double chain structures in the blood cell. (Represented as FL525)
- Red fluorescence caused by the laser exciting molecules of the stain attached to single chain structures in the blood cell. (Represented as FL650)

After classifying the white blood cells based on the fluorescence information, erythroid series[1] and platelets can be classified according to the RNP[2] scattergram which uses the cell size and the above two types of fluorescence information as parameters. (Fig. 2). The erythroid series data from the RNP scattergram is used to generate an FL650 fluorescence intensity distribution histogram. And the contents classified according to the degree of immaturity of the red blood cells (reticulocytes, immature reticulocyte fraction, low-fluorescence ratio, mid-fluorescence ratio, high-fluorescence ratio) based on the intensity of the luminescence. (Fig. 3)

[1] The erythroid series means “red blood cells and reticulocytes” in this manual.

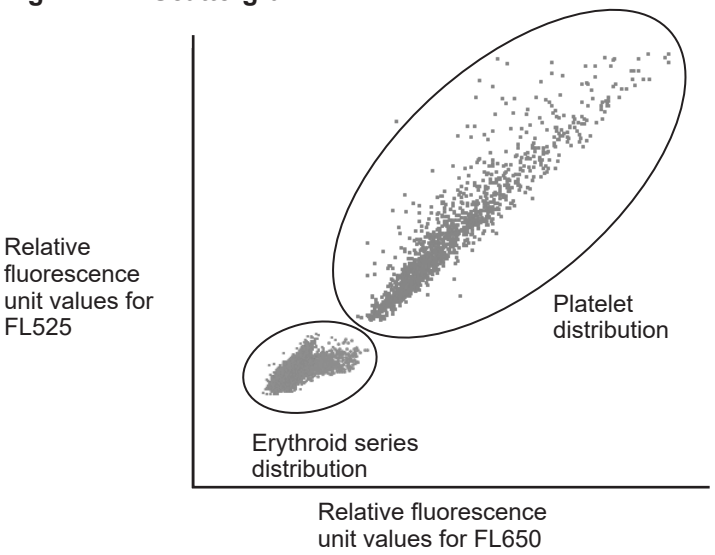
[2] RNP is an abbreviation of Red cells Nucleic acid-containing cells and Platelets.

Fig. 1. Classification of Reticulocytes



The information about the red blood cells and platelets is plotted on the RNP scattergram. (Fig. 2) The vertical axis of the RNP scattergram is the relative fluorescence unit values for FL525 and the horizontal axis is the relative fluorescence unit values for FL650. The cells can be sorted into erythroid series and platelets using the size information for both kinds of cells. (Erythroid series are larger and appear in the erythroid series distribution at the bottom left of the scattergram.

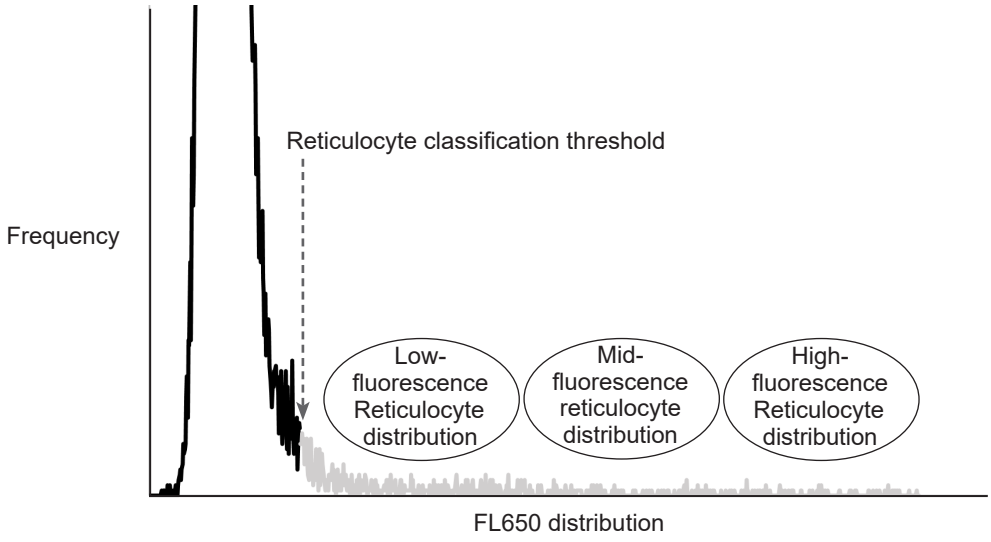
Fig. 2. RNP Scattergram



The RET histogram (Fig. 3) is generated from the erythroid series data in the RNP scattergram. The vertical axis of the RET histogram is frequency and the horizontal axis is the FL650 intensity distribution. Cells with a fluorescence intensity above a certain level (above the reticulocyte separation threshold) are counted as reticulocytes. The number of reticulocytes is the reticulocyte count and the ratio of reticulocytes to the total number of cells measured as erythroid series is the reticulocyte ratio. Also, the measured reticulocytes can be further classified into low-fluorescence reticulocytes, mid-fluorescence reticulocytes and high-fluorescence reticulocytes based on the fluorescence intensity.

The ratio of the low-fluorescence reticulocytes, mid-fluorescence reticulocytes, and high-fluorescence reticulocytes to the total number of cells classified as reticulocytes is the low-fluorescence reticulocyte ratio, mid-fluorescence reticulocyte ratio, and high-fluorescence reticulocyte ratio respectively. The proportion of reticulocytes with medium or greater fluorescent intensity is the immature reticulocyte fraction.

Fig. 3 RET Histogram



2-2-6. Research Parameters

Mentzer Index

The Mentzer Index is a parameter related to β-thalassemia and iron deficiency anemia. It is provided for reference purposes.

It is the RBC volume divided by the RBC count.

$$\text{Mentzer Index} = \frac{\text{Red blood cell volume}}{\text{Red blood cell count}}$$

RDWI

RDWI is a parameter related to β-thalassemia and iron deficiency anemia, provided for reference purposes.

It is calculated using the RBC volume, RBC distribution width and RBC count.

$$\text{RDWI} = \frac{\text{RBC volume} \times \text{RBC distribution width}}{\text{Red blood cell count}}$$

IG, Band, Seg

IG, Band and Seg are parameters related to neutrophils. These are provided for reference purposes.

IG%: Immature Granulocyte Percent

IG#: Immature Granulocyte Count

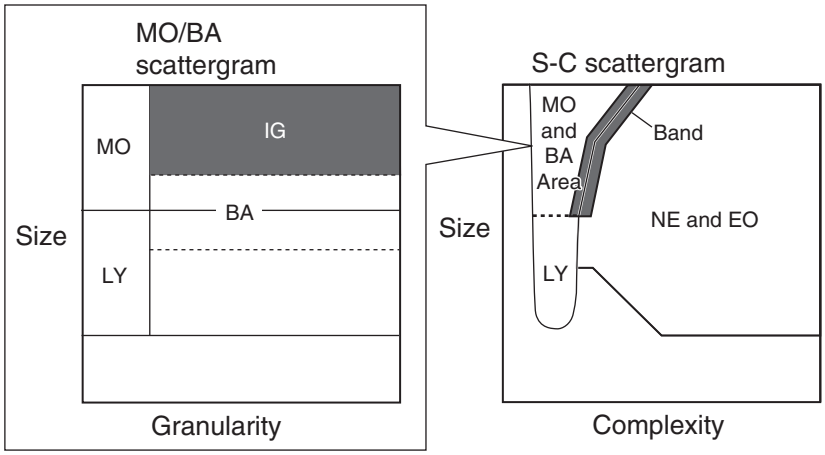
Band%: Band Neutrophil Percent

Band#: Band Neutrophil Count

Seg%: Segmented Neutrophil Percent

Seg#: Segmented Neutrophil Count

As shown in the figure below, immature granulocytes are distributed in the IG area of the scattergram for MO/BA classification and band neutrophils are distributed in the Band area of the S-C scattergram.



IG% is calculated from how much the IG area count accounts for in the optical WBC count.

$$\text{IG\%} = \frac{\text{IG area count}}{\text{Optical WBC count}}$$

IG# is calculated by the WBC count and the IG%.

IG# = WBC count × IG%

Band% is calculated from how much the Band area count accounts for in the optical WBC count.

$$\text{Band\%} = \frac{\text{Band area count}}{\text{Optical WBC count}}$$

Band# is calculated from the WBC count and the Band%.

Band# = WBC count × Band%

Seg% is calculated from the neutrophil ratio and the Band%.

Seg% = NE% − Band%

Seg# is calculated from the neutrophil count and the Band#.

Seg# = NE# − Band#

2-3. Interfering Substances

Measuring Parameter and Interfering Substances		Description
WBC	High WBC levels	When WBC is abnormally high and exceeding 100,000/μL, measure the sample in WBC high dilution mode. If the measurement range is exceeded, dilute with diluent and measure again.
	Nucleated erythrocytes	Nucleated erythrocytes are detected as white blood cells and this causes a falsely high WBC count.
	Poor Hemolyzation	On some rare occasions, the red blood cells in the blood sample might not completely lyse. These non-lysed RBC may be detected as WBC and cause increase in WBC count.
	Leukemia	White blood cells may be fragile in leukemia patients and may be destroyed during measurement and this may cause a falsely low WBC count and WBC differential cannot be accurately determined.
	Chemotherapy	White blood cells become fragile due to anti-cancer agents and immunosuppressive agents and may be destroyed during measurement and the WBC count may become a falsely low value and WBC differential cannot be accurately determined.
	Cryoglobulins	Cryoglobulins may increase and cause falsely high values of WBC, RBC, platelets, and hemoglobin. Increase of cryoglobulins is caused by myeloma, cancer, leukemia, macroglobulinemia, lymphoproliferative disorders, metastatic tumors, autoimmune abnormalities, infection, aneurysm, pregnancy, blood clots, diabetes and other conditions. In such cases, warm the blood sample to 37°C (98.6°F) in a water bath for 30 minutes and measure the sample immediately.
RBC	Leukemia	An increase in white blood cells in leukemia patients causes an increase in red blood cells. If the WBC count is more than 50,000/μL, correct the number of RBC by subtracting the number of WBC.
	Hemagglutination	If hemagglutination is observed, the RBC count becomes falsely low and MCV becomes falsely high. In such cases, you will notice because the values of MCH and MCHC become abnormal. In such samples, when you observe the tube wall while gently tilting the sample tube, the blood appears to be a rough texture. Hemagglutination can also be confirmed by observing a blood smear.
	Cold agglutinins	If cold agglutination of blood cells is observed, the RBC count becomes falsely low and MCV becomes falsely high. In such cases, warm the blood sample to 37°C (98.6°F) in a water bath for 30 minutes and measure the sample immediately. When the cold agglutination value is significantly high, blood appears to clot in the blood smear.
	Hemolysis	When a sample is hemolyzed, RBC becomes falsely low.
HGB	Turbidity of the blood sample	Any physiologic or therapeutic factors may increase HGB concentration.. In such a case, determine the cause of turbidity and take the appropriate action described below. Hemoglobin concentration affects the MCH and MCHC. Therefore, MCH and MCHC values become abnormal. Increased lipids • The plasma of blood with increased lipids is cloudy. This is caused by increased protein and increased lipids. Accurate HGB measurement can be achieved by using a plasma blank. Increased turbidity • When the sample is poor hemolyzation or hyperbilirubinemia, turbidity may increase and cause increase in HGB. Accurate HGB measurement can be achieved by using a plasma blank. High WBC levels • Turbidity of blood increases and the hemoglobin concentration value becomes falsely high if WBC level of the blood sample is abnormally high. Centrifuge the diluted sample and measure the supernatant fluid with a spectrophotometer.
HCT	Hemagglutination	RBC agglutination may cause false HCT and MCV values. This can be checked by abnormal MCH and MCHC values and examination of the blood smear. In this case, measure by centrifugation.
MCV	Excessive number of large PLT	An excessive number of large PLT or excessively high WBC may affect the MCV value. A blood smear observation is required.

Measuring Parameter and Interfering Substances		Description
MCH	Hemoglobin Concentration and RBC count abnormalities	MCH is determined from HGB and RBC values. Therefore the limitations for HGB and RBC also affect MCH value.
MCHC	Hemoglobin Concentration and Hematocrit abnormalities	MCHC is determined from HGB and HCT values. Therefore, the limitations for HGB and HCT also affect the MCHC value.
PLT	Very small fragments	Fragments of small red blood cells, red blood cells, and white blood cells are counted as platelets, and this may cause a falsely high platelet count.
	Excessive number of large PLT	For Bernard-Soulier syndrome, which is a congenital platelet function disorder, platelets of the same size as RBC will appear. If these large platelets cause PLT to exceed the high threshold of the PLT histogram, the PLT count will be falsely low.
	Hemolysis	Hemolyzed samples contain red cell stroma which may increase PLT count.
	Anticoagulated blood	If blood contains anticoagulant other than EDTA (ethylenediaminetetraacetate), PLT agglutination may cause the PLT count to become falsely low.
	PLT Clumps	The agglutinated PLT count value becomes falsely low, and the WBC count value becomes falsely high. For these samples, use a different anticoagulant such as sodium citrate anticoagulant to re-collect the sample then remeasure the PLT only.
MPV	Very small fragments	Very small RBC, RBC, and WBC fragments may interfere with MPV measurement.
	Excessive number of large PLT	If large PLT exceeds the high threshold of the PLT histogram, the MPV count will be falsely low.
	Hemolysis	Hemolyzed samples contain red cell stroma which may interfere with MPV measurement.
	Anticoagulated blood	If blood contains anticoagulant other than EDTA (ethylenediaminetetraacetate), PLT agglutination occurs, potentially causing interference with the MPV measurement.
	PLT Clumps	Samples with agglutinated PLT may interfere with MPV measurement. WBC differential values are derived from the number of WBC. The WBC count will affect the differential of these values.
LY LY%	NRBC, some types of parasite, lysing reagent resistant red blood cells	NRBC, certain parasites, and RBC that are resistant to lysis may interfere with an accurate LY count.
MO MO%	Large lymphocytes, atypical lymphocytes, blasts, excessive number of basocytes	Large lymphocytes, atypical lymphocytes, blasts, and excessive number of basophils may interfere with an accurate MO count.
NE NE%	A large number of eosinophils, metamyelocytes, myelocytes, promyelocytes, blasts, plasmacytes	Excessive eosinophils, metamyelocytes, myelocytes, promyelocytes, blasts and plasmacytes may interfere with an accurate NE count.
EO EO%	Abnormal granules	Abnormal granules may interfere with an accurate EO count.
BA BA%	Juvenile cells, metamyelocyte, myelocytes, promyelocytes, blasts, plasmacytes	Juvenile cells, metamyelocytes, myelocytes, promyelocytes, blasts, and plasmacytes may interfere with an accurate BA count and BA%.
RET% RET IRF LFR MFR HFR	Hemagglutination (Cold agglutination)	When hemagglutination occurs, classification of reticulocytes may be incorrect.
	Excessive number of large PLT	When an excessive number of large PLT exists, classification of reticulocytes may be incorrect.
	Howell-Jolly body	When a Howell-Jolly body occurs, classification of reticulocytes may be incorrect.
	Malaria	When malaria is found in the blood, classification of reticulocytes may be incorrect.

2-4. Displayed Data

2-4-1. Explanation of Data (Messages and Flags)

A data identifier is added to the related parameters according to the detected measurement message and abnormal flag.

Classification	Data Identifier	Measurement Value	Description
Data cannot be analyzed	None	Related parameter measurement value not displayed	The data cannot be analyzed.
Measurement condition error detected	None	Related parameter measurement value not displayed	Measurement operation error is detected.
Data with low reliability (Error found during measurement)	?	Measurement value displayed	The analyzer condition is out of the specified range and the reliability of the data is low. The measurement value is the reference value.
Data with low reliability (Abnormal flag detected)	! *	Measurement value displayed	Abnormal flag is detected in the sample. The reliability of measured data is low because abnormal cells exist. If the WBC and PLT values are low, count them with a blood smear.
	C	Measurement value displayed	The reliability of measured data is low because PLT clumps are detected.
Out of normal range	H	Measurement value displayed	The measurement value is out of the upper and lower limits range set in the [Sample Type] in Settings.
	L		
Out of measuring range	None	"OVER" message displayed	The measurement value exceeds the measurable range.

2-4-2. Abnormal Flags

The following table shows the parameter parameters which can also have an identifier related to the abnormal flag.

The flag display ON/OFF and its judgment conditions can be changed in [Flags] in Settings.

Section 8-1-5 (p. 8-5)

Flag	Identifier																							Judgment Condition
	WBC	RBC	HGB	HCT	MCHC	PLT	PCT/MPV/PDW	NE	LY	MO	EO	BA	NE%	LY%	MO%	EO%	BA%	RET%	RET	IRF	LFR	MFR	HFR	
PLT clumps1	C					C																		Presence of PLT clumps is suspected
Poor Hemolyzation1	!																							There are many RBC ghosts
Abnormal MCHC1					!																			MCHC is below 28.0 g/dL or above 38.0 g/dL
Blasts								*	*	*	*	*	*	*	*	*	*							Presence of small nucleated cells is suspected
Immature granulocyte								*		*			*		*									Presence of immature granulocytes is suspected
Left Shift								*		*			*		*									Left shifted neutrophil is suspected
Atypical Ly									*	*				*	*									Presence of atypical lymphocytes is suspected
Ly-Mo Interference									*	*				*	*									Overlap of lymphocytes and monocytes is suspected
Small Nucleated Cell	*																							Presence of small nucleated cells is suspected
Ne-Eo Interference								*			*		*			*								Overlap of neutrophil and eosinophil is suspected
PLT-RBC Interference		*				*																		Overlap of population of PLT and RBC is suspected
Leukocytosis	Identifiers cannot be added																							WBC: 180 × 10^2/µL or more
Leukopenia																								WBC: less than 25 × 10^2/µL
Neutrophilia																								NE: 110 × 10^2/µL or more
Neutropenia																								NE: less than 10 × 10^2/µL
Lymphocytosis																								LY: 40 × 10^2/µL or more
Lymphopenia																								LY: less than 8 × 10^2/µL
Monocytosis																								MO: 10 × 10^2/µL or more
Eosinophilia																								EO: 7 × 10^2/µL or more
Basophilia																								BA: 2 × 10^2/µL or more
Erythrocytosis																								RBC: 650 × 10^4/µL or more
Anemia																								HGB: 10.0 g/dL or less
Anisocytosis																								RDW: 20.0% or less
Microcytosis																								MCV: less than 70 fL
Microcytosis																								MCV: 110 fL or more
Hypochromia																								MCHC: 29.0 g/dL or less
Thrombocytosis																								PLT: 60.0 × 10^4/µL or more
Thrombocytopenia																								PLT: less than 6.0 × 10^4/µL
RET Abnormal Scatter																			*	*	*	*	*	Abnormality in RET scattergram is suspected

[1] When the flag of “PLT Clumps”, “Poor Hemolyzation” or “Abnormal MCHC” are displayed, measure a hematology control and check that the analyzer operates correctly. Then measure the abnormal sample again.

2-5. Reference Method

WBC

ICSH 1988

The assignment of values to fresh blood used for calibrating automated blood cell counters. Clin Lab Hematol. 1988;10:203-212

RBC

ICSH 1988

The assignment of values to fresh blood used for calibrating automated blood cell counters. Clin Lab Hematol. 1988;10:203-212

HGB

CLSI H15-A3 Vol.20 No.28;

Reference and Selected Procedures for the Quantitative Determination of Hemoglobin in Blood; Approved Standard - Third Edition, 2000

HCT

CLSI H07-A3 Vol.20 No.18;

Procedure for Determining Packed Cell Volume by the Microhematocrit Method; Approved Standard - Third Edition, 2000

PLT

ICSH/ISLH 2001:

International Council for Standardization in Hematology Expert Panel on Cytometry and International Society of Laboratory Hematology Task Force on Platelet Counting. Platelet counting by RBC/platelet ratio method. A reference method. Am Journal of Clinical Pathology 115:460-464 2001

WBC Differential

CLSI H20-A2:Vol.27 No.4;

Reference Leukocyte (WBC) Differential Count (proportional) and Evaluation of Instrumental Methods; Approved Standard - Second Edition, 2007

CLSI H26-A2:Vol.29 No.40;

Validation,Verification,and Quality Assurance of Automated Hematology Analyzers; Approved Standard - Second Edition, 2010

RET

CLSI H44-A2 (Vol. 24 No. 8);

Methods for Reticulocyte Counting (Automated Blood Cell Counts, Flow Cytometry, and Supravital Dyes); Approved Guidance-Second Edition, 2004

CLSI H26-A2 (Vol.30 No.14);

Validation, Verification, and Quality Assurance of Automated Hematology Analyzers; Approved Standard-Second Edition. Clinical and Laboratory Standards Institute, 2010.

2-6. Specifications

2-6-1. Function and Performance

Measured Parameters

Blood cell count (WBC, RBC, PLT): Electrical resistance detection

Hemoglobin concentration (HGB): Colorimetric method (surfactant method)

Hematocrit (HCT): Peak integration method using blood cell pulses (calculated from RBC histogram)

RBC distribution width (MCV, MCH, MCHC):
Calculated from RBC, HGB and HCT

WBC blood cell differential (NE%, LY%, MO%, EO%, BA%, NE, LY, MO, EO, BA):
Calculated from scattergram

Platelet crit (PCT): Peak integration method using blood cell pulses (calculated from PLT histogram)

Mean platelet volume (MPV): Calculated from PLT and PCT

RBC distribution width (RDW-CV, RDW-SD):
Calculated from RBC histogram

Platelet distribution width (PDW): Calculated from PLT histogram

Platelet large cell ratio (P-LCR): Calculated from PLT histogram

Platelet large cell count (P-LCC): Calculated from PLT and P-LCR

Reticulocytes (RET%, RET, IRF, LFR, MFR, HFR):
Calculated from scattergram

Display Range

Measured Parameters	Name	Measuring Range (Display Range)
White Blood Cell Count	WBC	0.0 to 2999 × 10^2/μL
Neutrophil percent	NE%	0.00 to 100%
Lymphocyte Percent	LY%	
Monocyte Percent	MO%	
Eosinophil Percent	EO%	
Basophil Percent	BA%	
Neutrophil Count	NE	0.0 to 2999 × 10^2/μL
Lymphocyte Count	LY	
Monocyte Count	MO	
Eosinophil Count	EO	
Basophil Count	BA	
Red Blood Cell Count	RBC	0 to 999 × 10^4/μL
Hemoglobin Concentration	HGB	0.00 to 29.9 g/dL
Hematocrit	HCT	0.0 to 99.9%
Mean Corpuscular Volume	MCV	20.0 to 199 fL
Mean Corpuscular Hemoglobin	MCH	10.0 to 50.0 pg
Mean Corpuscular Hemoglobin Concentration	MCHC	10.0 to 50.0 g/dL
Red Blood Cell Distribution Width in Coefficient of Variation	RDW-CV	0.0 to 50.0%
Red Blood Cell Distribution Width in Standard Deviation	RDW-SD	0.0 to 199 fL

Measured Parameters	Name	Measuring Range (Display Range)
Platelet Count	PLT	0.00 to 250 × 10^4/μL
Platelet Crit	PCT	0.00 to 2.99%
Mean Platelet Volume	MPV	0.0 to 20.0 fL
Platelet Distribution Width	PDW	0.0 to 50.0%
Platelet Large Cell Ratio	P-LCR	0.0 to 100%
Platelet Large Cell Count	P-LCC	0.00 to 250× 10^4/μL
Reticulocyte Percent	RET%	0.00 to 99.99%
Reticulocyte Count	RET	0.0 to 99.9 × 10^4/μL
Immature Reticulocyte Fraction	IRF	0.0 to 100%
Low Fluorescence Ratio	LFR	0.0 to 100%
Middle Fluorescence Ratio	MFR	0.0 to 100%
High Fluorescence Ratio	HFR	0.0 to 100%

Measurement Range

WBC: 0.0 to 950 × 10^2/μL
RBC: 0 to 850 × 10^4/μL
HGB: 0.0 to 25.0 g/dL
HCT: 0.0 to 70.0 %
PLT: 0.00 to 150 × 10^4/μL
RET%: 0.00 to 30.00 %
RET: 0.00 to 72.0 × 10^4/μL

Precision (Reproducibility)

Normal mode (difference from CV or mean value)

WBC: 2.0% or less (WBC: 40.0 × 10^2/μL or more)
RBC: 1.5% or less (RBC: 400 × 10^4/μL or more)
HGB: 1.5% or less
HCT: 1.5% or less
MCV: 1.0% or less
MCH: 2.0% or less
MCHC: 2.0% or less
RDW-CV: 3.0% or less
RDW-SD: 3.0% or less
PLT: 4.0% or less (PLT: 10.0 × 10^4/μL or more)
PCT: 6.0% or less
MPV: 4.0% or less
PDW: 10.0% or less
P-LCR: 18.0% or less
P-LCC: 18.0% or less
NE%: 5.0% or less (NE%: 30.0% or more AND WBC: 40.0 × 10^2/μL or more)
LY%: 5.0% or less (LY%: 15.0% or more AND WBC: 40.0 × 10^2/μL or more)
MO%: 12.0% or less (MO%: 5.0% or more AND WBC: 40.0 × 10^2/μL or more)
EO%: 20.0% or less OR within ±1.0 Eo% (WBC: 40.0 × 10^2/μL or more)
BA%: 30.0% or less OR within ±1.0 Ba% (WBC: 40.0 × 10^2/μL or more)
NE: 8.0% or less (NE: 12.0 × 10^2/μL or more)
LY: 8.0% or less (LY: 6.0 × 10^2/μL or more)

MO: 20.0% or less (MO: 2.0 × 10^2/µL or more)
EO: 25.0% or less OR within ±1.0 × 10^2/µL (WBC: 40.0 × 10^2/µL or more)
BA: 30.0% or less OR within ±1.0 × 10^2/µL (WBC: 40.0 × 10^2/µL or more)
RET%: 15.0% or less (RET%: 1.00% or more AND RBC: 300 × 10^4/µL or more)
RET: 15.0% or less (RET%: 1.00% or more AND RBC: 300 × 10^4/µL or more)
IRF: 30.0% or less (IRF: 20.0% or more AND RET%: 1.00% or more AND RBC: 300 × 10^4/µL or more)
LFR: 30.0% or less (LFR: 20.0% or more AND RET%: 1.00% or more AND RBC: 300 × 10^4/µL or more)
MFR: 50.0% or less (MFR: 20.0% or more AND RET%: 1.00% or more AND RBC: 300 × 10^4/µL or more)
HFR: 100.0% or less, or within ±2.0 HFR (RET%: 1.00% or more AND RBC: 300× 10^4/µL or more)

Pre-dilution mode (CV)

WBC: 6.0% or less (WBC: 40.0 × 10^2/µL or more)
RBC: 4.5% or less (RBC: 400 × 10^4/µL or more)
HGB: 4.5% or less
HCT: 4.5% or less
MCV: 4.5% or less
MCH: 4.5% or less
MCHC: 4.5% or less
PLT: 12.0% or less (PLT: 10.0 × 10^4/µL or more)

Accuracy

WBC: within ±3.0% OR ± 3 × 10^2/µL
RBC: within ±3.0% OR ± 8 × 10^4/µL
HGB: within ±1.5% OR ± 0.2 g/dL
HCT: within ± 3.0% OR ± 1.0% (HCT)
MCV: within ±3.0% OR ± 2.0 fL
PLT: within ± 5.0% OR ± 1.0 × 10^4/µL
NE%: within ± 4.0% (NE%)
LY%: within ± 4.0% (LY%)
MO%: within ± 2.0% (MO%)
EO%: within ± 2.0% (EO%)
BA%: within ± 1.5% (BA%)

Linearity

WBC: within ±3.0% OR ± 3 × 10^2/µL (WBC: 2.0 to 950 × 10^2/µL)
RBC: within ±3.0% OR ± 8 × 10^4/µL (RBC: 2 to 850 × 10^4/µL)
HGB: within ±1.5% OR ± 0.2 g/dL (HGB: 0.10 to 25.0 g/dL)
HCT: within ± 3.0% OR ± 1.0% (HCT) (HCT: 10.0 to 70.0%)
PLT: within ± 10.0% OR ± 2.0 × 10^4/µL (PLT: 1.00 to 150 × 10^4/µL)
RET%: within ±20% OR ± 0.30% (RET%) (RET%: 0.50 to 30.00%)
RET: within ±20% OR ± 1.50 × 10^4/µL (RET: 0.50 to 72.0 × 10^4/µL)

(Specifications above applies to the normal mode)

Background Noise

WBC: $2.0 \times 10^2/\mu L$ or less

RBC: $2 \times 10^4/\mu L$ or less

HGB: 0.1 g/dL or less

PLT: $1.00 \times 10^4/\mu L$ or less

TOC: 100 count or less

TFC: 100 count or less

(The background noise of the flow cytometry measurement system is evaluated with TOC (Total Optical Count, WBC differential) and TFC (Total Fluorescence Count, reticulocyte measurement).)

Carryover

WBC: 1.0% or less

RBC: 1.0% or less

HGB: 1.0% or less

PLT: 1.0% or less

TOC: 1.0% or less

TFC: 2.0% or less

(The carryover of the flow cytometry measurement system is evaluated with the TOC and TFC.)

Counting Time

Auto measurement (CBC, CBC+DIFF):	Maximum 90 samples/hr (40 s/sample)
Auto measurement (CBC+DIFF+RET, CBC+RET):	Maximum 55 samples/hr (65 s/sample)
Manual measurement (CBC, CBC+DIFF):	Up to a maximum of 90 seconds/sample
Manual measurement (CBC+DIFF+RET, CBC+RET):	Up to a maximum of 110 seconds/sample

Sample Volume

Normal mode (CBC+DIFF, CBC+DIFF+RET, CBC+RET):	47 µL
Normal mode (CBC):	32 µL
Pre-dilution mode (CBC, CBC+DIFF):	20 µL

Laser

Class 1 (built-in laser class: Class 3B)

2-6-2. Safety Standards

IEC 61010-1:2010+Amendment 1:2016
IEC 61010-2-101:2018
IEC 61010-2-081:2019
EN 61010-1:2010
EN 61010-2-101:2017
EN 61010-2-081:2015
IEC 61326-1:2012
IEC 61326-2-6:2012
EN 61326-1:2013
EN 61326-2-6:2013
CISPR 11:2009+Amendment 1:2010
EN 55011:2009+Amendment 1:2010
IEC 62304:2006+Amendment 1:2015
EN 62304:2006+Amendment 1:2015
EN ISO 14971:2012
JIS T 14971:2012
IEC 60825-1:2014
EN 60825-1:2014

2-6-3. Classification

Type of protection against electrical shock:	CLASS I EQUIPMENT
Degree of protection against harmful ingress of water:	IPX0 (non-protected)
Degree of safety of application in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE:	Equipment not suitable for use in the presence of FLAMMABLE ANAESTHETIC MIXTURE WITH AIR, OR WITH OXYGEN OR NITROUS OXIDE
Mode of operation:	CONTINUOUS OPERATION
ME EQUIPMENT type:	STATIONARY type
Pollution degree:	2 EQUIPMENT

2-6-4. Environment

Storage Environment

Temperature:	–20 to +60°C (–4 to +140°F)
Humidity:	10 to 95% (noncondensing)
Atmospheric pressure:	700 to 1060 hPa (altitude: < 3000 m)

Transport Environment

Temperature:	–20 to +60°C (–4 to +140°F)
Humidity:	10 to 95% (noncondensing)
Atmospheric pressure:	700 to 1060 hPa (altitude: < 3000 m)

Operating Environment and Power

Operating environment

Temperature:	15 to 30°C (59 to 86°F)
Humidity:	30 to 85% (noncondensing)
Atmospheric pressure:	700 to 1060 hPa (altitude: < 3000 m)

Power Requirements

AC only

Line voltage:	AC 100 to 240 V
Allowable fluctuation range:	±10%
AC type:	Switching regulator
Power input:	360 VA
Line frequency:	50/60 Hz
Allowable fluctuation range:	±5%

Noise

IEC 61010-1:2010+Amendment 1:2016

Cooling System

Natural cooling

2-6-5. EMC Standards

CISPR 11:2003 Group 1 Class B
IEC 61326-1:2012
EN 61326-1:2013
CISPR 11:2009+Amendment 1:2010
EN 55011:2009+Amendment 1:2010
IEC 61326-2-6:2012
EN 61326-2-6:2013

2-6-6. Dimensions and Weight

Dimensions:	675 W × 589 D × 576 H (mm) ±10% (Main unit only, excluding protruding parts)
Weight:	76 kg ±10%

2-7. Clock Accuracy

The accuracy of the IC for the clock used by the analyzer is as follows:

- At an operating temperature of 25°C (77°F), the accuracy is about ±60 seconds per month.

Check that the date and time is correct every time you start using the analyzer.

The date and time must be adjusted if they are not correct.

To change the settings, refer to the Data Management and Setting Guide.

Section 8-1-9 (p. 8-9)

2-8. Options and Consumables

2-8-1. Standard Accessories

⚠ CAUTION

Only use Nihon Kohden specified consumables for the analyzer. Otherwise the accuracy of the measurement result cannot be guaranteed.

Item		Qty	Supply Code
Power cord W		1	–
Power cord UL		1	936248
Ground lead D		1	–
6.3 A time-lag fuse		2	–
ISOTONAC tube assy		1	–
CLEANAC tube assy		2	–
HEMOLYNAC•310 tube assy		1	–
HEMOLYNAC•510 tube assy		1	–
Reticulonac tube assy		1	YZ-010B9
Waste tube assy		1	–
Open loader adapter kit	For samples	1	–
	For micro tubes	1	–
	For capillary blood collection tubes	1	–
	For detergent	1	–
Overflow tray		1	–
Rack		1 set	–
Maintenance brush		1	T603A
ZK-910W barcode reader		1	–

Item	Qty	Supply Code
Barcode reader holder	1	–
PSW4×10 screw for attaching the barcode reader	2	–
Short screwdriver	1	–

2-8-2. Options

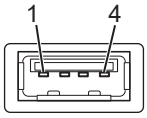
Item		Qty	Model, Supply Code
WA-131W ink-jet printer		1	–
WA-461V card printer		1	–
JW-910W waste sensor		1	–
Extra sample racks		8	T411A
Waste container (Selectable option, 10 or 20 L)	10 L	1	T417B
	20 L	1	T417C
Serial DB9-DB9 crossover cable		1	–
LAN cable, 5.0 m		1	–
USB cable, 2.0 m		1	–
SARSTEDT Kit		1	YZ-008B1
KABEVETTE G Kit		1	YZ-008B2
Holder BD 0.5mL [1]		1	YZ-008B3
QS-027W software kit		1	–

[1] This is an adapter that enables measurement using the following BECTON DICKINSON blood collection tubes.

- BD Microtainer® 365974
- BD Microtainer® 365975

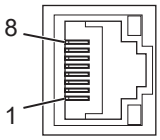
2-9. Socket Pin Assignment

USB Sockets



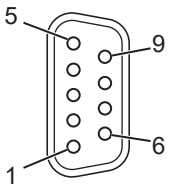
No.	Signal	No.	Signal
1	VBus	3	+Data (D+)
2	–Data (D–)	4	GND

LAN Socket



No.	Signal	No.	Signal
1	TD+	5	NC
2	TD–	6	RD–
3	RD+	7	NC
4	NC	8	NC

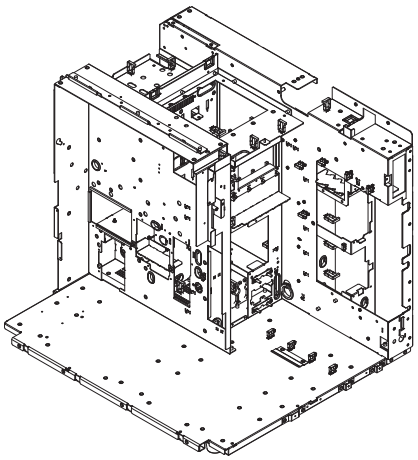
Serial Port



No.	Signal	No.	Signal
1	NC	6	DSR
2	RxD	7	RTS
3	TxD	8	CTS
4	DTR	9	NC
5	GND (SG)		

2-10. Board/Unit Description

2-10-1. CD-920W (CHASSIS UNIT)



Overview

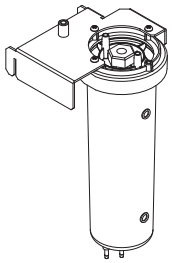
This is the chassis of the main unit.

The chassis unit consists of the chassis, electrical wiring and flow path piping.

Function

It provides a chassis structure for holding each component.

2-10-2. JQ-920W (ISO CHAMBER UNIT)



Overview

This is the chamber unit mainly for holding primed diluent from the reagent port inside the analyzer.

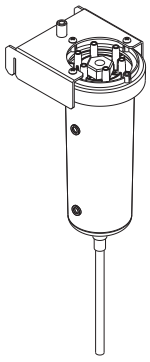
It consists of the mounting metal plate, CHAMBER ASSY, float sensor and piping tube.

Function

The chamber holds diluent aspirated from the reagent port with a capacity of approximately 150 mL.

Chamber capacity is detected by the float sensor.

2-10-3. JQ-921W (WASTE CHAMBER 1 UNIT)



Overview

This is the chamber unit mainly for holding waste fluid used through operation inside the analyzer.

It consists of the mounting metal plate, CHAMBER ASSY, float sensor and piping tube.

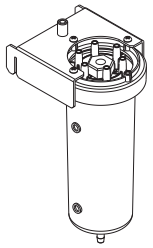
Function

The chamber temporarily holds waste fluid used through operation with a capacity of approximately 120 mL.

When operation is complete, liquid pressure expels waste fluid from the analyzer through the waste fluid port.

Chamber capacity is detected by the float sensor.

2-10-4. JQ-922W (WASTE CHAMBER 2 UNIT)



Overview

This is the chamber unit mainly for holding waste fluid used through operation inside the analyzer.

It consists of the mounting metal plate, CHAMBER ASSY, float sensor and piping tube.

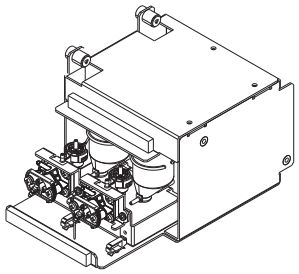
Function

The chamber temporarily holds waste fluid used through operation with a capacity of approximately 120 mL.

When operation is complete, negative pressure in the JQ-921W (WASTE CHAMBER1 UNIT) moves stored waste fluid to the JQ-921W.

Chamber capacity is detected by the float sensor.

2-10-5. MC-910W (CBC MEASURING UNIT)



Overview

This is the measuring unit mainly for measuring dispensed samples.

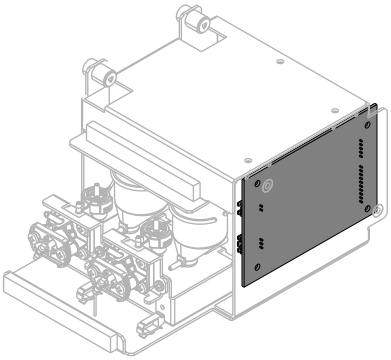
It is made up of a chassis, detection unit, insulating chamber, piping tube and UT-7286 (MEASURING BD).

Function

This unit transmits the blood cell pulse to the UT-7310 (ANALOG BD).

The control signal from the UT-7309 (MAIN BD) switches the internal flow path according to the operation mode. When a blood cell passes through a detection hole, the pulse signal is amplified and output according to its size.

2-10-5-1. UT-7286 (MEASURING BD)

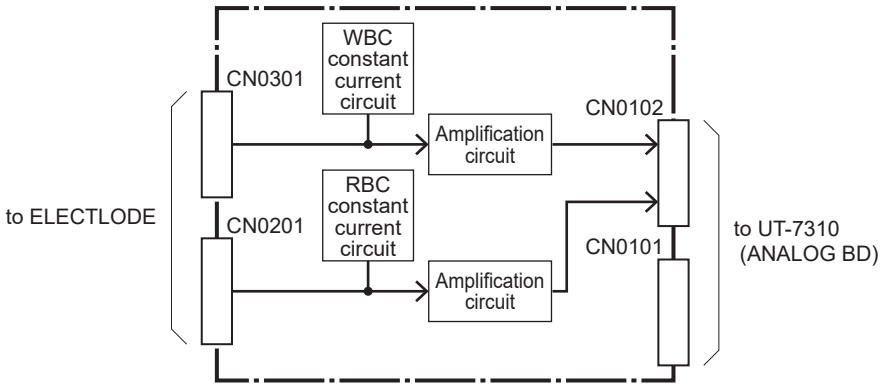


Overview

This board is installed in the MC-910W (CBC MEASURING UNIT) and captures electrode voltage fluctuations and test (CAL) pulse controlled by the UT-7309 (MAIN BD).

It consists of the following circuits.

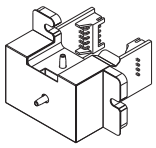
- Constant current circuit for detecting electrode voltage fluctuations
- Circuit for amplifying detection signals
- Circuit for enabling voltage for electrodes, test (CAL) pulse and removing clogs in the aperture cap



Function

- Detects voltage change at electrodes stably with constant current (1.217 mA), amplifies the minute changes in the voltage when the pressure pulse arrived and sends to UT-7310 (ANALOG BD).
- Amplifies test (CAL) pulse and sends to the UT-7310.

2-10-6. MH-910W (HGB MEASURING UNIT)



Overview

This unit performs HGB measurement on a diluted and dispensed sample.

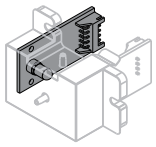
It consists of a test cartridge, UT-7289 (HGB/SS LED BD) and UT-7290 (HGB/SS AMP BD).

Function

The unit shines an LED on the sample in the test cartridge; light that penetrates the sample is received and converted to voltage by the UT-7290 (HGB/SS AMP BD). The voltage is transmitted to the UT-7310 (ANALOG BD).

A thermistor mounted on the UT-7289 (HGB/SS LED BD) transmits HGB LED temperature data to the UT-7310.

2-10-6-1. UT-7289 (HGB/SS LED BD)

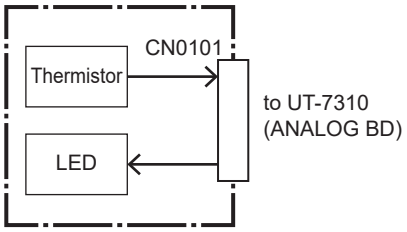


Overview

This board is mounted on the MH-910W (HGB MEASURING UNIT).

The LED on the board emits the HGB measurement light and a short sample check light. A board temperature signal is sent to the UT-7310 (ANALOG BD) via a thermistor on the board.

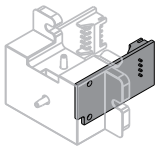
It consists of an LED for HGB measurements and short sample checks, and a thermistor.



Function

- The LED lights for HGB measurements and for short sample checks.
- It sends board temperature data.

2-10-6-2. UT-7290 (HGB/SS AMP BD)

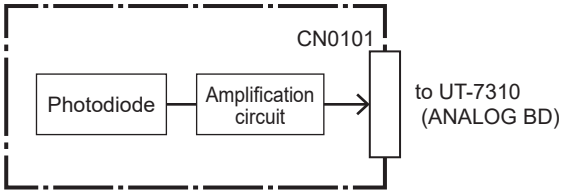


Overview

This board is mounted on the MH-910W (HGB MEASURING UNIT).

It converts the LED light for HGB measurements and for short sample checks into voltage and transmits the signal to the UT-7310 (ANALOG BD).

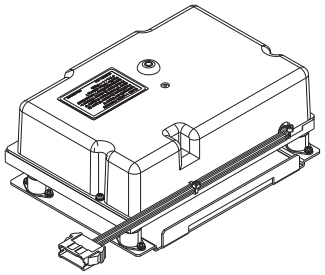
It consists of a photodiode for detecting light and an operational amplifier for amplifying the voltage.



Function

The board converts the HGB measurement LED light into voltage.

2-10-7. MO-910W (LASER OPTICAL UNIT)



Overview

This is the measuring unit mainly for measuring dispensed samples.

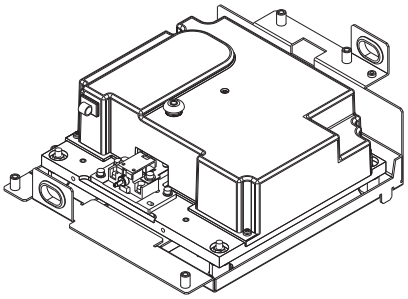
It consists of the flow cell unit, emitter, light receiving section, mechanism section, shading section, chassis and flow path.

Function

The unit emits a focused laser beam (λ=660nm) toward white blood cells passing through the flow cell unit and focuses scattered light on the focusing lens. Light is received by the 3 placed detectors.

3 types of voltage information according to the size and shape of white blood cells obtained from the 3 placed detectors are transmitted to the UT-7310 (ANALOG BD).

2-10-8. MO-920W (LASER OPTICAL UNIT (BLUE))



Overview

This is the measuring unit mainly for measuring dispensed samples.

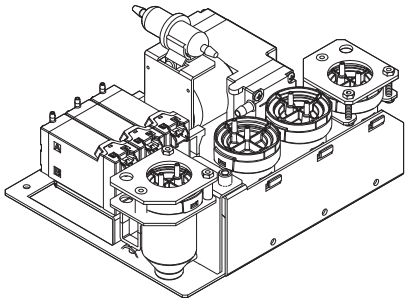
It consists of the flow cell unit, emitter, light receiving section, mechanism section, shading section, chassis and flow path.

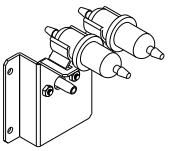
Function

The unit emits a focused laser beam (λ=488nm) toward blood cells passing through the flow cell unit and focuses scattered light and fluorescent scattered light on the focusing lens. Light is received by the 3 placed detectors.

3 types of voltage information according to the size and cell information of blood cells obtained from the 3 placed detectors are transmitted to the UT-7309 (MAIN BD).

2-10-9. MP-910W (PNEUMATIC UNIT)





Overview

This pneumatic unit supplies positive pressure and negative pressure to the analyzer.

It consists of the chassis, air compressor, air tank, overflow tank and relief valve (+69 kPa, –30 kPa).

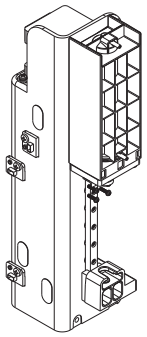
Function

This unit supplies pressure to the diluent tank, pressurizing the surface of the sample to move it or prime by negative pressure.

It supplies pressure to the diaphragm pump to move the diaphragm.

It supplies pressure to the waste chamber, pressurizing the surface of the sample to drain it or rinse by negative pressure.

2-10-10. MP-911W (ISO PUMP UNIT)



Overview

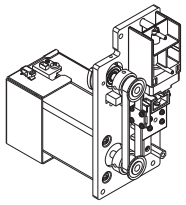
The primary purpose of the diluent pump unit is diluting various kinds of samples.

It consists of a vertical piston mechanism, a piston, a cylinder block, a stepping motor for driving it and a photo-sensor for detecting positions.

Function

- Aspirates and dispenses solutions in order to dilute and mix various samples
- Aspirates and dispenses cleaning solutions for things like cups and aspirates and dispenses detergent for cleaning

2-10-11. MP-912W (SAMPLE/RBC/RET PUMP UNIT)



Overview

The unit is used as a pump for aspirating and discharging whole blood and for discharging RBC samples and for discharging RET samples.

It consists of a vertical piston mechanism, pulleys and a belt for driving the piston, a piston, a cylinder block, a geared stepping motor for driving it and a photo-sensor for detecting positions.

Function

- SAMPLE PUMP UNIT

  Aspirates and discharges whole blood.

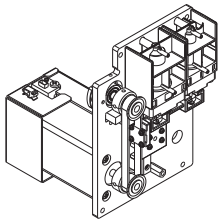
- RBC PUMP UNIT

  Discharges RBC samples.

- RET PUMP UNIT

  Discharges RET samples.

2-10-12. MP-913W (IWBC/OWBC PUMP UNIT)



Overview

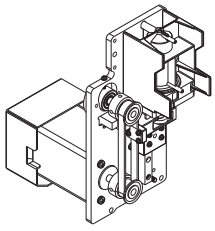
This unit is integrated with actuator and is used as a pump for discharging IWBC samples and OWBC samples.

It consists of a vertical piston mechanism, pulleys and a belt for driving the piston, a piston, a cylinder block, a geared stepping motor for driving it and a photo-sensor for detecting positions.

Function

- Discharges IWBC samples.
- Discharges OWBC samples.

2-10-13. MP-921W (FL PUMP UNIT)



Overview

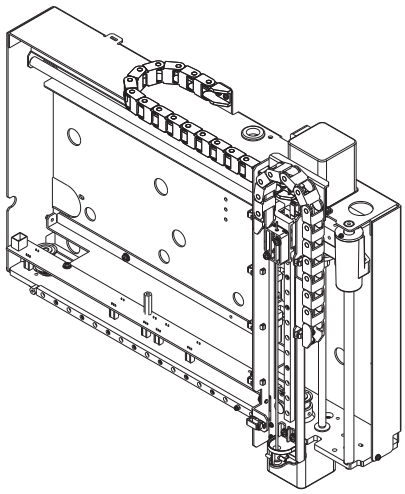
The primary purpose of the diluent and staining pump unit is diluting samples with staining reagent.

It consists of a vertical piston mechanism, pulleys and a belt for driving the piston, a piston, a cylinder block, a geared stepping motor for driving it and a photo-sensor for detecting positions.

Function

This unit aspirates and discharges staining reagent for diluting and stirring samples.

2-10-14. MS-910W (SAMPLER UNIT)



Overview

The unit is equipped with an actuator for driving the sampling nozzle up/down & left/right and is responsible for piercing various vacuum sample tubes → aspirating samples → rinsing around the sampling nozzle → dispensing to various measurement cups.

- Sampling nozzle vertical drive mechanism (also serves as sample tube piercing mechanism)

  Consists of a slide screw, slide block, guide shaft, stepping motor and photosensor for detecting position.

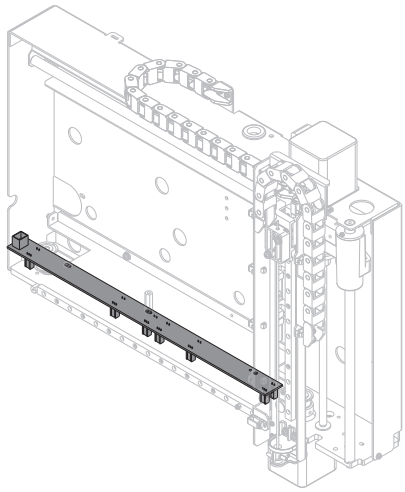
- Sampling nozzle horizontal drive mechanism

  Consists of drive pulleys and belt, linear guide, guide shaft, stepping motor and a BD (UT-7294-01) with a photo-sensor for detecting position.

Function

- Pierces sample tubes supplied from the autoloader and aspirates samples.
- Aspirates sample of assist tube, MiniCollect and vacuum sample tube supplied from the open loader.
- Rinses contamination around sampling nozzle after aspirating samples as needed.
- Dispenses aspirated samples into various measuring cups.

2-10-14-1. UT-7294-01 (SAMPLER SENSOR BD)

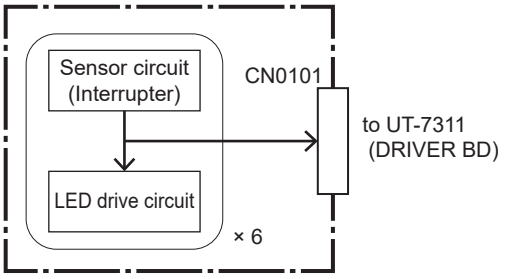


Overview

This board is mounted on the MS-910W (SAMPLER UNIT) with sensors positioning the left/right direction.

It monitors positions by the photo interrupters.

The monitoring status is transmitted to the UT-7309 (MAIN BD) through UT-7311 (DRIVER BD).



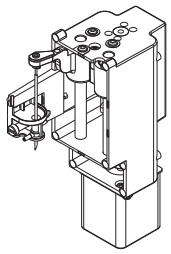
Function

The board positions sampling nozzles for moving the left/right direction of the sampling nozzles with six photo interrupters.

- Start point position sensor: Photo interrupter PD0101
- OWBC cup position sensor: Photo interrupter PD0102
- RBC cup position sensor: Photo interrupter PD0103
- IWBC cup position sensor: Photo interrupter PD0104
- Terminal position sensor: Photo interrupter PD0105
- RET cup position sensor: Photo interrupter PD0106

In addition, it turns on/off the LEDs mounted on each sensor according to its status.

2-10-15. MS-911W (OPEN AIR UNIT)



Overview

The unit is equipped with an actuator that drives the open air tube (release tube) up/down and is responsible for piercing the vacuum sample tube → releasing pressure in the sample tube → rinsing around the open air tube.

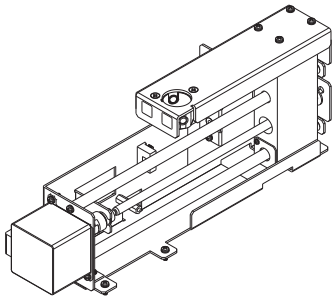
- Open air tube (release tube) up/down drive mechanism

  Consists of a slide screw, slide block, guide shaft, stepping motor and photosensor for detecting position.

Function

- Pierces and releases negative pressure in vacuum sample tubes supplied from the autoloader.
- Rinses contamination around sampling nozzle after aspirating samples.

2-10-16. MS-912W (OPEN LOADER UNIT)



Overview

This unit transports emergency samples and small blood samples.

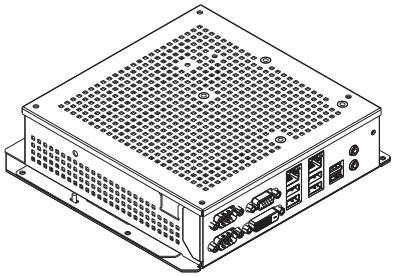
It consists of the chassis, slide unit, positioning sensor and sample type adapter.

Function

When the mode switching key on the screen is touched, it shifts to the open measurement mode and measurement of emergency samples and small blood samples in the containers begins.

Control signals from the UT-7311 (DRIVER BD) rotate the motor and move the adapter to the designated position.

2-10-17. PC-920W (DATA PROCESSING UNIT)



Overview

This unit is connected to the measurement control section to perform screen control and analyze measurement data.

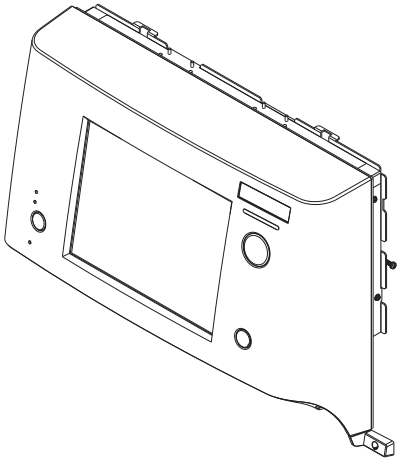
Main Component

Mother board	IT10-L2S-AX516-4GM-11
SSD	RN2S-040GP01JI-MEK92
OS	Windows 10 IoT Enterprise LTSC2019
SATA signal cable	SATA CABLE (BLACK) 200mm
SATA power cable	CABLE SATA POWER (200mm)
Power cable	HLR-04VF/5557-04R-210 (W280) red
Signal cable	PNIRR-08VF/RA-2011 (W115) black

Specifications

CPU	Intel Atom x5-E3940 (1.6GHz)
Memory	SK hynix/H5TC4G83EFR-RDA or equivalent
LVDS	× 1
SATA	Serial ATA Rev3.0 (6.0,3.0,1.5Gb/s) compliant
LAN	100Base-TX/10Base-T interface × 2
USB	USB2.0 × 4 USB3.0 × 2
Serial Port	RS232C × 2 ch
RGB	Analog RGB × 1 ch
Display	DVI-D × 1ch
Battery	CR14250SE FDK *UL Recognized Component UL File No. MH13421 (Category) BBCV2
SSD capacity	40 GB
RTC	Within ±60 seconds/month (25°C)

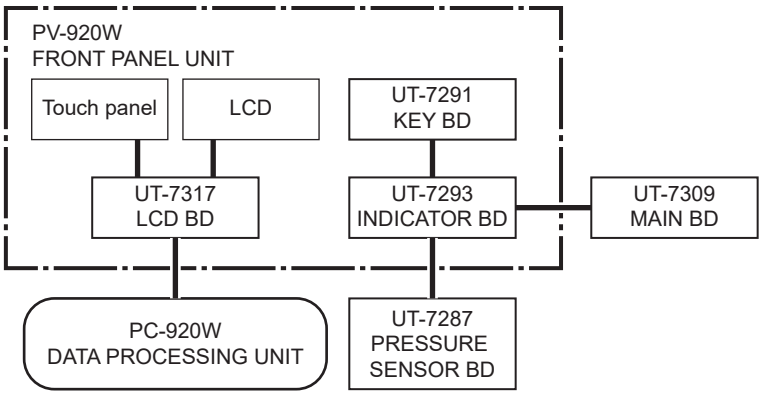
2-10-18. PV-920W (FRONT PANEL UNIT)



Overview

This unit displays the LCD screen, provides screen operation for the touch screen, and controls alarm sound output, key input, and illumination of the indicator and measurement switch.

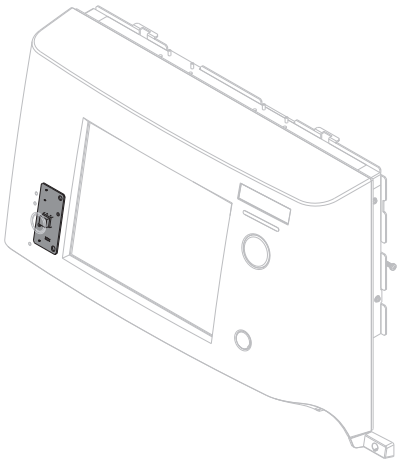
It consists of the front panel, LCD, touch panel, LCD BD (UT-7317), KEY BD (UT-7291) and INDICATOR BD (UT-7293).



Function

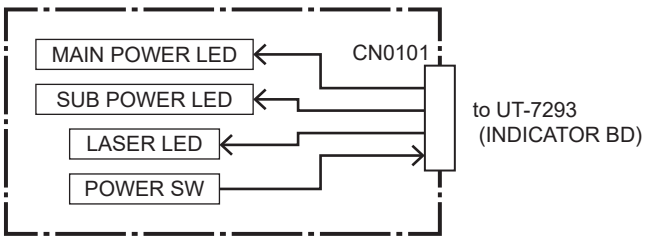
- Displays LCD by LVDS signals from the PC-920W (DATA PROCESSING UNIT).
- Transmits the input signals from the touch panel to the PC-920W.
- Supplies power from the UT-7287 (PRESSURE SENSOR BD), and outputs buzzer sound, indicates information by three colored LEDs, senses the power switch, measurement switch and reset switch, and turns on/off each LED by the control of the UT-7309 (MAIN BD).

2-10-18-1. UT-7291 (KEY BD)



Overview

This board is mounted on the PV-920W (FRONT PANEL UNIT), performs the LED display and detects switch pressing.



Function

- LED display

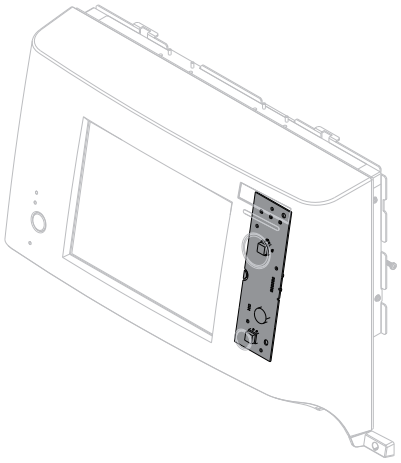
  Turns on the LEDs according to the state of the analyzer.

MAIN POWER LED	Main power supply lamp Lights when the main power supply switch is turned ON
SUB POWER LED	Power supply lamp Lights when the power supply switch is turned ON
LASER LED	Laser lamp Lights while the MO-910W is emitting laser

- Switch pressing detection

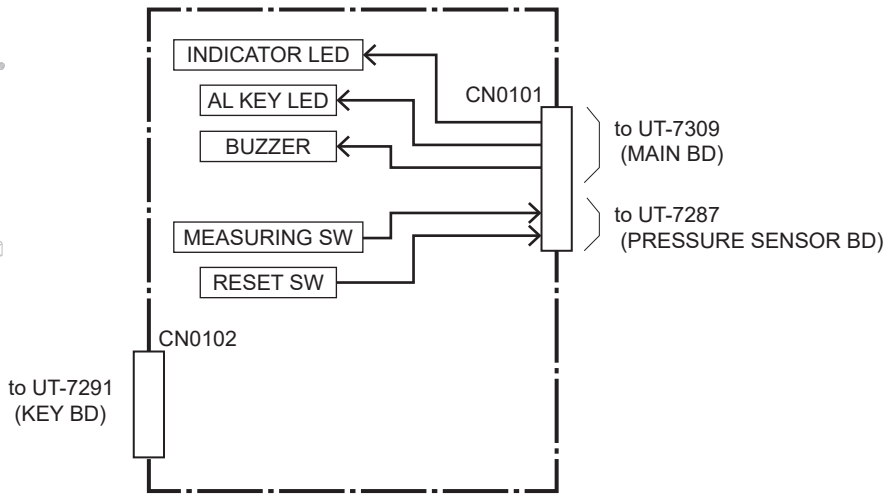
  Transmits the detection signal of pressing the POWER SW (power switch) to the UT-7309 (MAIN BD).

2-10-18-2. UT-7293 (INDICATOR BD)



Overview

This board is mounted on the PV-920W (FRONT PANEL UNIT), perform the LED display, outputs buzzer sound and detects switch pressing. In addition, it relays the UT-7291 (KEY BD).



Function

- LED display

  Turns on the LEDs according to the state of the analyzer.

INDICATOR LED	Status indicator Displays the status of the analyzer such as standby, normal operation, out of reagent or paused with error with the indicator color.
AL KEY LED	Measurement switch Lights during the measurement of the sample set in the rack.

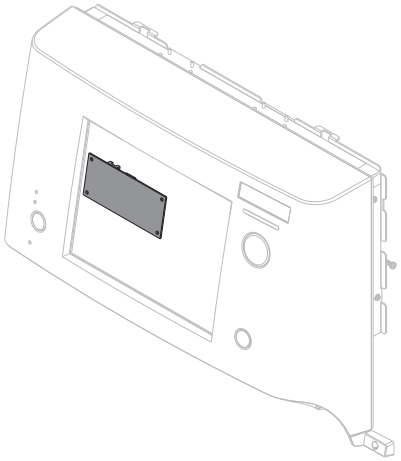
- Buzzer sound output

  Outputs the buzzer sounds according to the state of the analyzer.

- Switch pressing detection

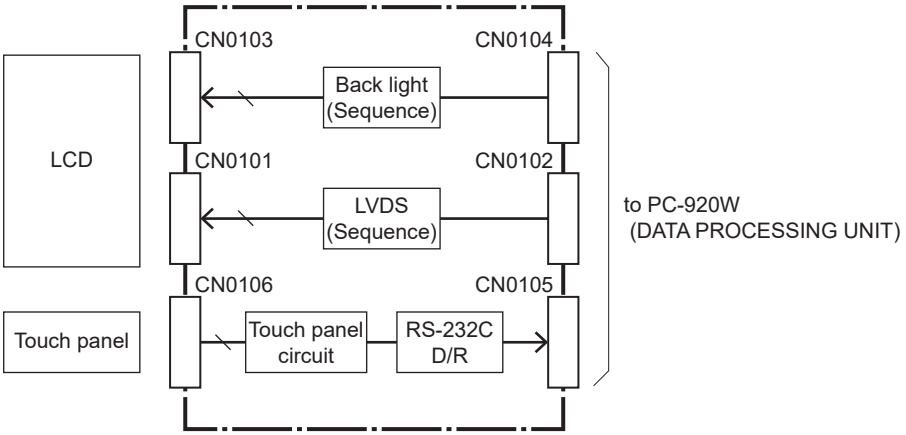
  Transmits the detection signal of pressing the MEASURING SW (measuring switch) and RESET SW (reset switch) to the UT-7309 MAIN BD.

2-10-18-3. UT-7317 (LCD BD)



Overview

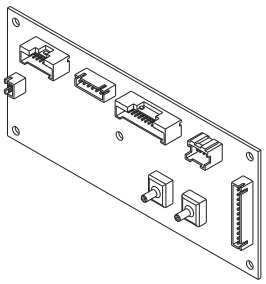
This board is mounted on the PV-920W (FRONT PANEL UNIT) and relays the LCD backlight signals, LVDS signals, touch panel signals to the PC-920W (DATA PROCESSING UNIT).



Function

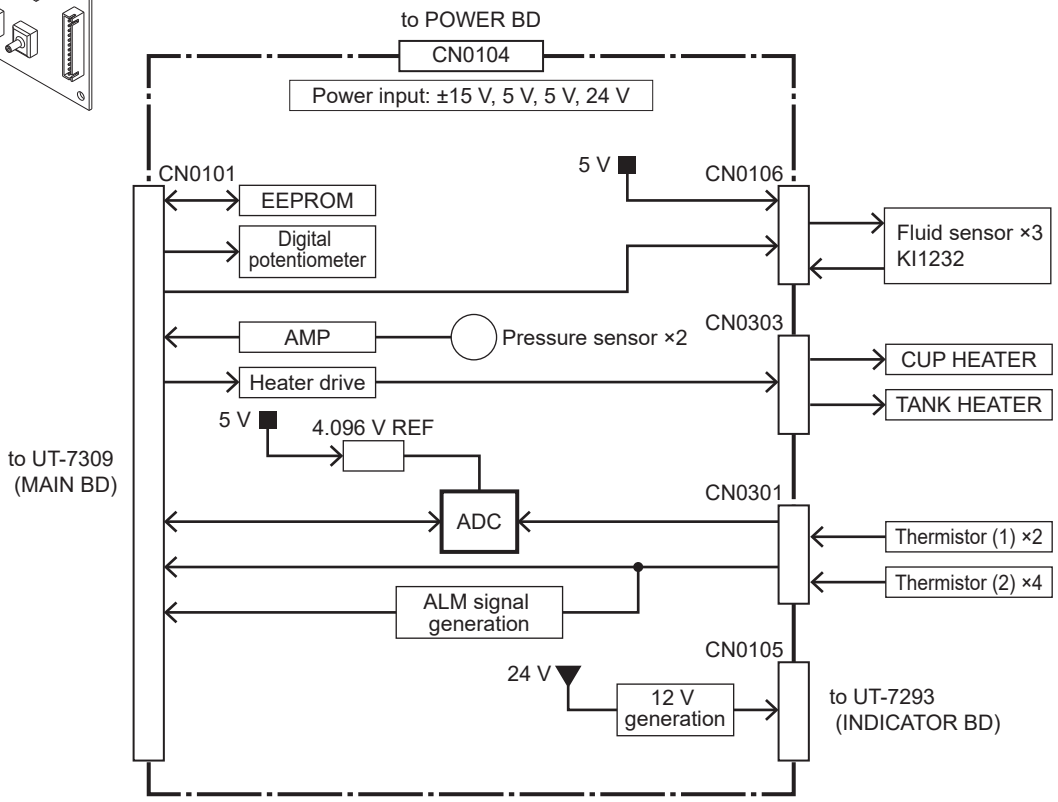
- Relays the LVDS signals and backlight signals transmitted from the PC-920W (DATA PROCESSING UNIT) to the LCD.
- Converts the position signal received from the touch panel of the PV-920W into the RS-232C and transmits to the PC-920W.

2-10-19. UT-7287 (PRESSURE SENSOR BD)



Overview

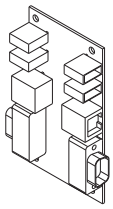
This board is connected to the UT-7309 (MAIN BD) and has a heater driver to detect pressure in the fluid path, monitor the liquid and each temperature inside the analyzer and control temperature inside the sample cup and tank.



Function

- Detects the pressure in the fluid path by the pressure sensor, amplifies the pressure and transmits to the UT-7309 (MAIN BD).
- Detects the detergent and two lysing reagents by the fluid sensor connected to this board and transmits to the UT-7309 (MAIN BD).
- Interfaces with the UT-7309 (MAIN BD) to control temperature inside the sample cup and tank, monitors temperature and drive the heater. Detects temperature abnormality and stops the heater.
- Monitors room temperature and HGB fluid temperature.
- Supplies 12V to the UT-7293 (INDICATOR BD).

2-10-20. UT-72881 (BACK PANEL BD)

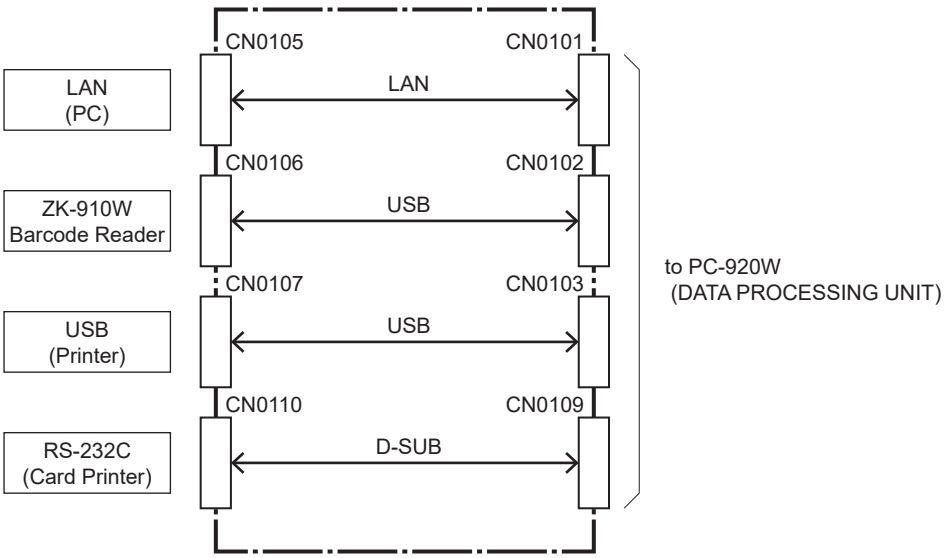


Overview

This is the relay board to connect the external connection devices.

This board relays the USB (2 ch), Ethernet (1 ch) and RS-232C (1 ch) to input and output data to the PC-920 (DATA PROCESSING UNIT) and connects with the inkjet printers, network devices such as HUB and external connection devices such as bar code readers and card printers.

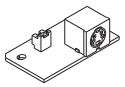
Two USB connectors, two LAN connectors and two D-SUB connectors are mounted on each channel and are connected straightly.



Function

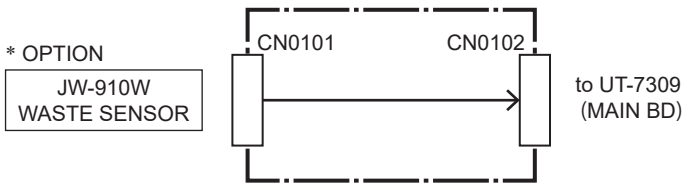
- Relays USB signal (2 ch).
- Relays Ethernet signal (10base-T, 100base-TX) (1 ch).
- Relays RS-232C (1 ch).

2-10-21. UT-7292 (CONNECTION BD)



Overview

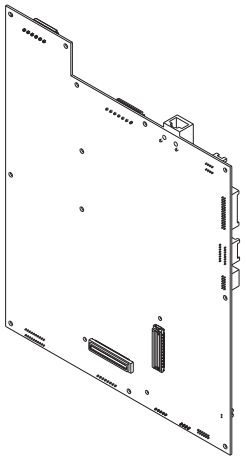
This board relays data between the UT-7309 (MAIN BD) and the waste sensor (JW-910W: optional).



Function

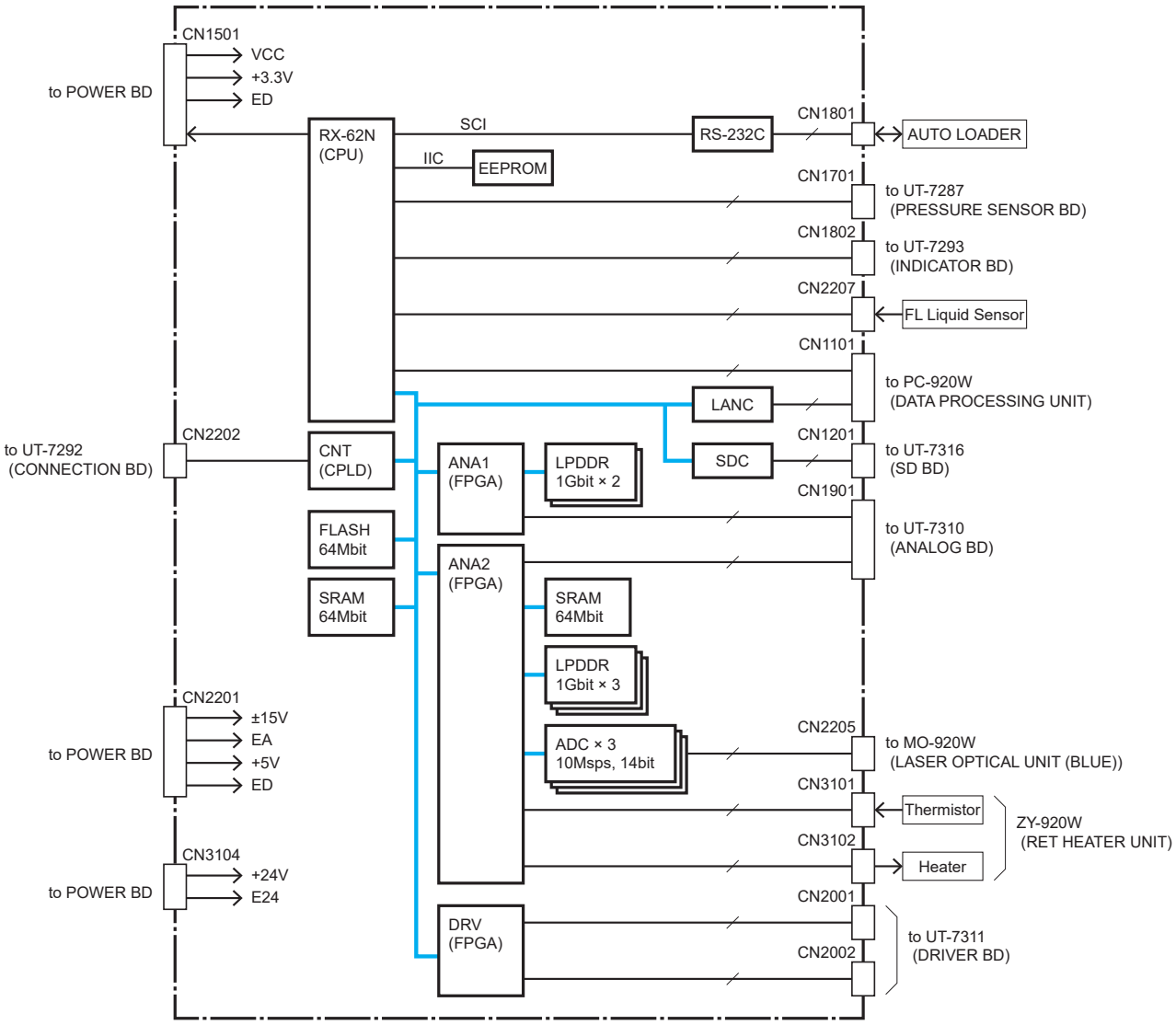
This board transmits ON/OFF signal of the level sensor installed in the waste tank to the UT-7309 (MAIN BD).

2-10-22. UT-7309 (MAIN BD)



Overview

This board is responsible for the main control. It controls actuator systems and display and processes measurement signals and external inputs and outputs by a program installed in flash memory.



Function

Program and memory

System program and FPGA data can be installed from SD card.

Unit control and sensing

This board controls motors responsible for mechanism of the following units, monitors the state of sensors and controls the electromagnetic valves and pneumatic source via the UT-7311 (DRIVER BD). Heater control and monitoring of temperature and fluid of the 5Diff system are performed via the UT-7287 (PRESSURE SENSOR BD). Heater control and monitoring of temperature and fluid of the RET system are performed by the board directly.

(1) MO-910W LASER OPTICAL UNIT

(2) MC-910W CBC MEASURING UNIT

(3) MH-910W HGB MEASURING UNIT

(4) JQ-920W ISO CHAMBER UNIT

(5) JQ-921W WASTE CHAMBER 1 UNIT

(6) JQ-922W WASTE CHAMBER 2 UNIT

(7) JW-910W waste sensor: optional

(8) MP-910W PNEUMATIC UNIT

(9) MP-911W ISO PUMP UNIT

(10) MP-912W SAM/RBC PUMP UNIT

(11) MP-913W IWBC/OWBC PUMP UNIT

(12) MS-910W SAMPLER UNIT

(13) MS-911W OPEN AIR UNIT

(14) MS-912W OPEN LOADER UNIT

(15) XP-910W PINCH VALVE UNIT

(16) ZY-910W TANK HEATER UNIT

(17) ZY-921W RET CUP HEATER UNIT

(18) MP-921W FL PUMP UNIT

(19) MO-920W LASER OPTICAL UNIT (BLUE)

(20) ZY-920W RET HEATER UNIT

Autoloader control

This board controls the autoloader via serial port connection. It also controls input processing of the status signals and output signals of power control.

Interface with GUI control section

LCD and touch panel are controlled by the PC-920W (DATA PROCESSING UNIT).

Communication between the board and the PC-920W is performed via Ethernet (100Base-TX/10Base-T).

LED and key input are monitored via the UT-7293 (INDICATOR BD) and the UT-7291 (KEY BD).

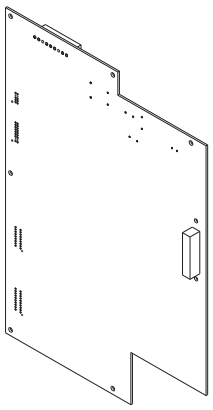
Analog control

This board controls A/D converter mounted on the UT-7310 (ANALOG BD) to obtain A/D conversion values from measurement data.

RET Analog control

This board controls A/D converter mounted on the board to obtain A/D conversion values from measurement data.

2-10-23. UT-7310 (ANALOG BD)

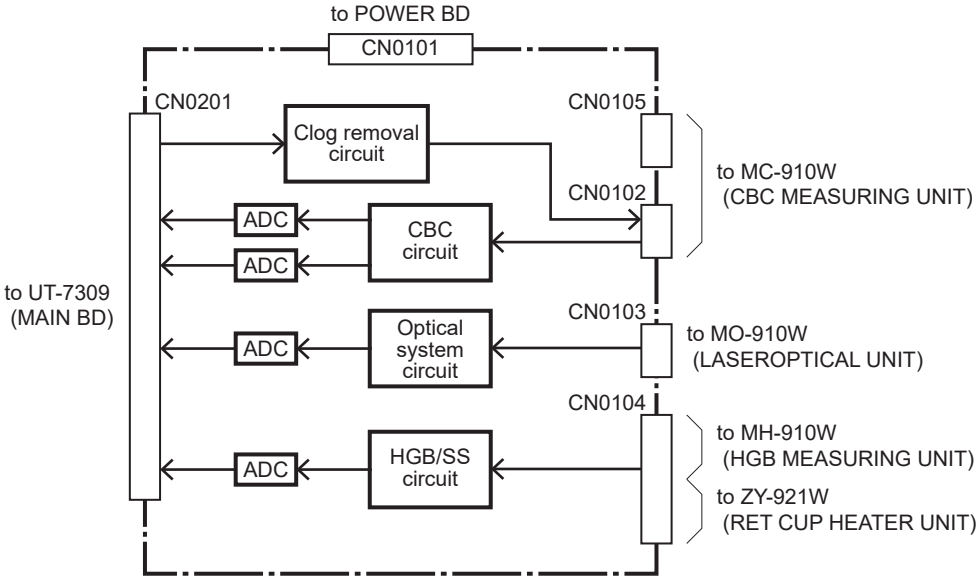


Overview

This board is responsible for importing analog data (CBC system, 5 part differential system)

This board imports data from the MC-910W (CBC MEASURING UNIT), MO-910W (LASER OPTICAL UNIT), MH-910W (HGB MEASURING UNIT) and ZY-921W (RET CUP HEATER UNIT), perform A/D conversion and transmits to the UT-7309 (MAIN BD).

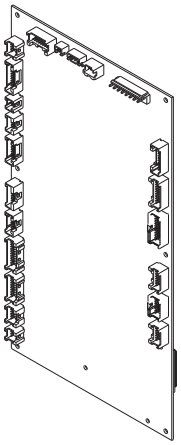
CBC system consists of the active filter, amplification circuit and AD converter. Optical system consists of the active filter, amplification circuit, peak hold circuit and AD converter.



Function

- Amplifies the blood cell pulse signals from the MC-910W (CBC MEASURING UNIT) and transmits the A/D converted values to the UT-7309 (MAIN BD).
- Amplifies the light scattered data from the MO-910W (LASER OPTICAL UNIT) and transmits the A/D converted values to the UT-7309.
- Amplifies the HGB voltage from the MH-910W (HGB MEASURING UNIT) and transmits the A/D converted values to the UT-7309.
- Amplifies the SS voltage from the ZY-921W (RET CUP HEATER UNIT) and transmits the A/D converted values to the UT-7309.
- Amplifies the removing clog signals from the UT-7309 and applies the removing clog voltage to the MC-910W.

2-10-24. UT-7311 (DRIVER BD)



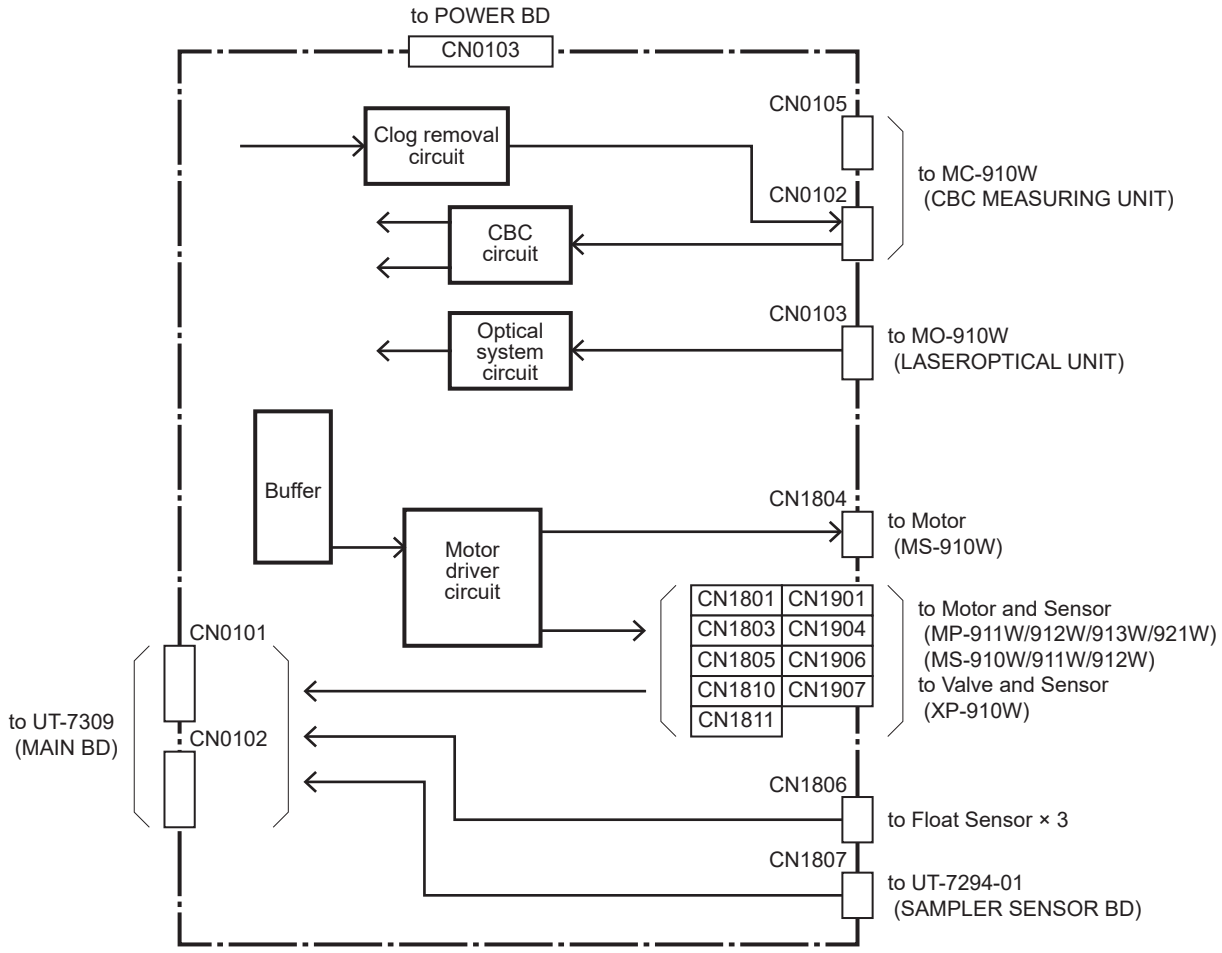
Overview

This board is responsible for driving the actuator system.

It drives the electromagnetic valve, stepping motor and pneumatic source.

It also relays the position sensor status, float sensor status and sensor status from the UT-7294-01 (SAMPLER SENSOR BD) to the UT-7309 (MAIN BD).

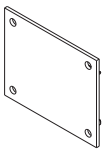
The actuator control signals from each actuator and reset signals from each motor driver is supplied from the UT-7309 and passes through the buffer and the control signals are transmitted to each driver circuit.



Function

- Drives bipolar stepping motor.
- Controls ON/OFF of the electromagnetic valve.
- Relays the position sensor status, float sensor status and sensor status from the UT-7294-01 (SAMPLER SENSOR BD) to the UT-7309 (MAIN BD).
- Controls ON/OFF of the pneumatic source.

2-10-25. UT-7316 (SD BD)

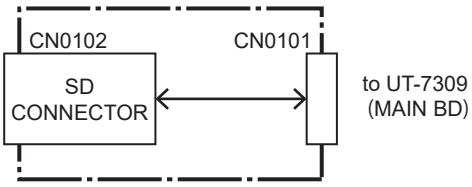


Overview

This board relays between the SD card and the UT-7309 (MAIN BD).

It imports the installation data (MAIN, GUI, AL and FPGA) from the SD card and transmits to the UT-7309 (MAIN BD). It can also save the sample data.

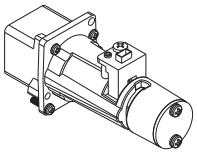
It consists of the SD card connector and the relay connector to the UT-7309.



Function

- Transmits data of the software kit QS-027W to the UT-7309 (MAIN BD).
- Saves the sample data in the SD card.

2-10-26. XP-910W (PINCH VALVE UNIT)



Overview

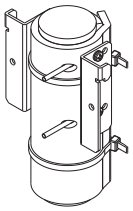
This unit controls the large amount of fluid and gas flow by opening and closing the φ4 inner diameter, φ6 outer diameter PharMed tubing with linear actuator motor equipped with clamper.

It consists of the base, linear actuator motor, clamper, spring for damper and photosensor for position detection.

Function

- Opens and closes path for aspirating diluent.
- Opens and closes rinse waste fluid path for SAMPLER UNIT and OPEN AIR UNIT.
- Opens and closes the path between the waste fluid chamber and waste fluid drain path.

2-10-27. ZY-910W (TANK HEATER UNIT)



Overview

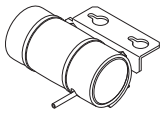
This unit heats the diluent and the 5-part diff lysing reagent drained from the TANK and maintains a constant temperature.

It consists of the chassis, detector, heater, piping SUS tube and the insulation.

Function

The unit activates the heater based on the temperature information from the temperature sensor. It changes the duty cycle ratio and perform feedback control to maintain the temperature of the chassis at 40 ± 1°C.

2-10-28. ZY-920W (RET HEATER UNIT)



Overview

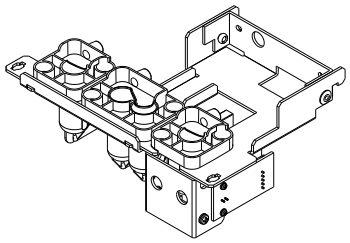
This unit accelerates staining reaction of stirred blood in the RET Cup and mixed samples of the reagent for staining.

It consists of the chassis, detector, heater, piping SUS tube and the insulation.

Function

The unit activates the heater based on the temperature information from the temperature sensor. It changes the duty cycle ratio and perform feedback control to maintain the temperature of the chassis at 40 ± 1°C.

2-10-29. ZY-921W (RET CUP HEATER UNIT)



Overview

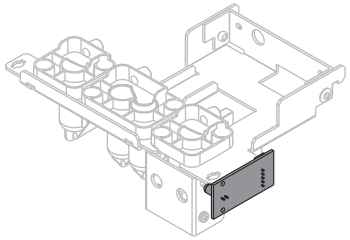
This unit maintains the reagent temperature in the CUP at measurement and detects short sample error of the samples.

It consists of the chassis, sample cup, temperature control mechanism, light measuring mechanism, insulation, UT-7289 (HGB/SS LED BD), UT-7290 (HGB/SS AMP BD) and filter.

Function

- The unit activates the heater based on the temperature information from the temperature sensor. It changes the duty cycle ratio and perform feedback control to maintain the temperature of the chassis at 40 ± 1°C.
- Transmits the voltage information according to its HGB concentration gained from the light measurement mechanism to the UT-7310 (ANALOG BD).
- Equipped with the filter in the drain path in each cup and traps foreign substances (rubber scrap).

2-10-29-1. UT-7289 (HGB/SS LED BD)

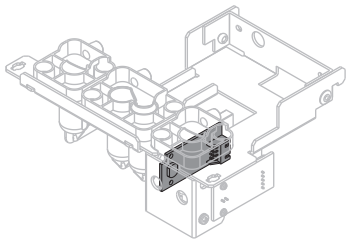


This board is mounted on the ZY-921W (RET CUP HEATER UNIT).

For more information, refer to “2-10-6-1. UT-7289 (HGB/SS LED BD)” .

Section 2-10-6-1 (p. 2-30)

2-10-29-2. UT-7290 (HGB/SS AMP BD)

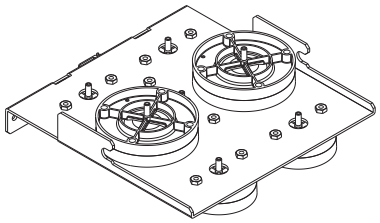


This board is mounted on the ZY-921W (RET CUP HEATER UNIT).

*For more information, refer to“2-10-6-2. UT-7290 (HGB/SS AMP BD)” .

Section 2-10-6-2 (p. 2-31)

2-10-30. DIAPHRAGM PUMP ASSY



Overview

This is the pneumatic driven diaphragm pump for transporting the liquid in the analyzer.

It consists of two lysing reagent pumps and three pumps for drawing the measuring samples.

The MP-910W (PNEUMATIC UNIT) supplies negative pressure and positive pressure to the diaphragm pump assy.

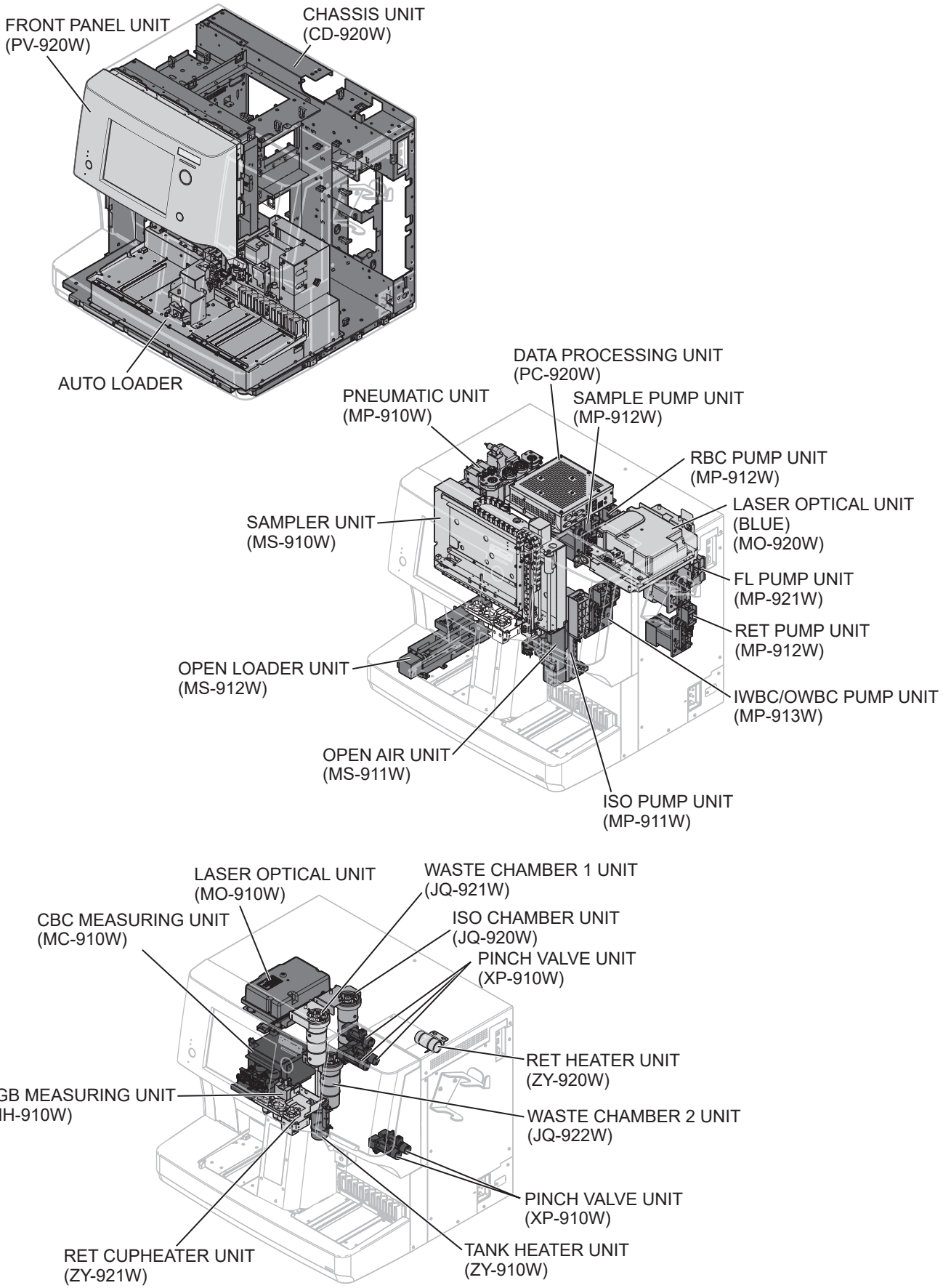
It moves fluid in the fluid path by switching the electromagnetic valve.

Function

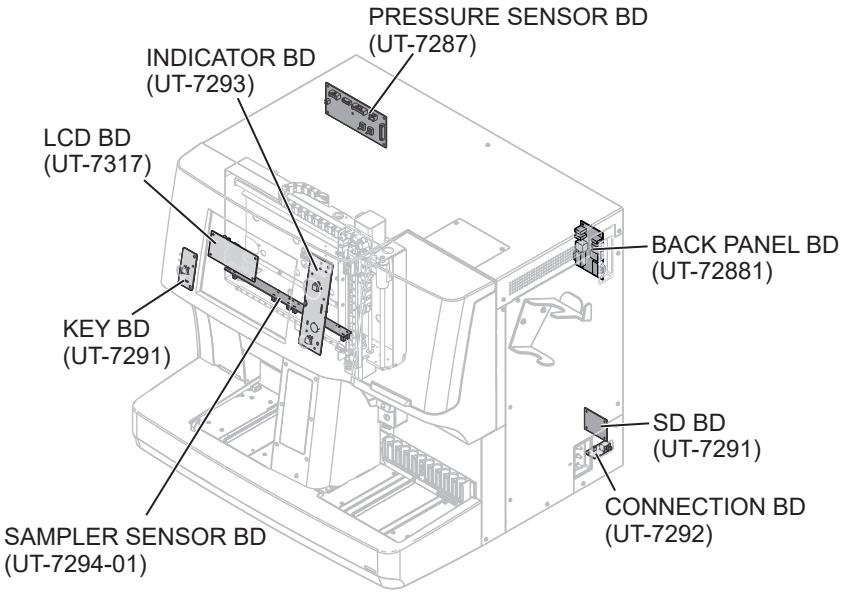
- Transports 5-part diff lysing reagent from the liquid port to the ZY-921W (RET CUP HEATER UNIT).
- Transports 3-part diff lysing reagent from the liquid port to the ZY-921W (RET CUP HEATER UNIT).
- Transports the samples for measuring the WBC/RBC from the ZY-921W (RET CUP HEATER UNIT) to the MC-910W (CBC MEASURING UNIT).
- Transports the samples for measuring the HGB from the ZY-921W (RET CUP HEATER UNIT) to the MH-910W (HGB MEASURING UNIT).
- Transports the samples for measuring the DIFF from the ZY-921W (RET CUP HEATER UNIT) to the MO-910W (LASER OPTICAL UNIT).
- Transports the samples for measuring the RET from the ZY-921W (RET CUP HEATER UNIT) to the MO-920W (LASER OPTICAL UNIT(BLUE)).

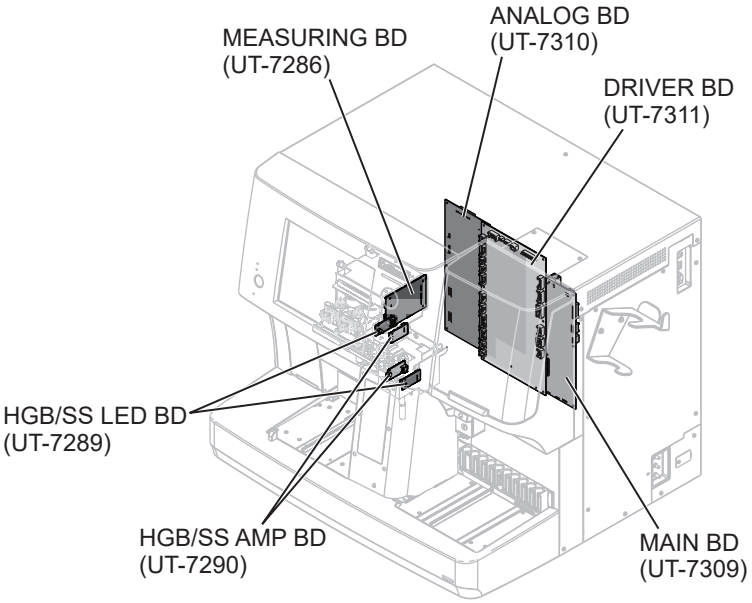
2-11. Units and Boards

2-11-1. Unit Location



2-11-2. Board Location





3 Troubleshooting

3-1. Check Procedure

When a problem arises, first check the state of the following.

- Are there any leaks,unusual noises, smells or smoke?
- Has a system error occurred?
- Has an alarm occurred?

Further, if a problem with measurement data has occurred, check the following.

- Perform a background measurement and see if the measurement data is under the control value.
- Measure a hematology control; is the measurement data within the assay value?
- Is the reproducibility (CV%) for at least 10 times within the specified value?

3-1-1. Checking the Measurement Environment and Sample Handling

Measurement Environment

It is very important when making measurements with a blood cell counter that the usage environment conditions are within their specified range. This is particularly true for temperature; if the diluent or lysing agent is cold, it impacts the measurement data of parameters like hemoglobin concentration, white blood cell count, and WBC classification, and it may result in a poor hemolyzation flag or sample error alarm.

<Operating Environment Conditions>

Ambient temperature: 15 to 30ºC (59 to 86ºF) (Analyzer and reagents)

Relative humidity: 30 to 85% (noncondensing)

Atmospheric pressure: 700 to 1060 hPa (Altitude: <3000 m)

In the winter, even if the air temperature in the lab meets the foregoing, the reagent may have cooled down overnight, so it may still be cold.

All due consideration must be given to controlling the temperature of the diluent to isolate it from cold air from the floor, such as putting the diluent on an insulating mat made of Styrofoam, or putting it on a simple heat-regulating device, such as a pet heater.

Notes on Handling Samples

- Samples stored in a refrigerator or samples stored for 12 hours or longer since being collected may be affected in terms of the WBC classification.
- If some samples are measured within 30 minutes of being collected, it may result in poor hemolyzation. In such cases, let them sit for at least 30 minutes before measuring them.
- If times elapses after collecting a blood sample, mix it carefully again immediately before measuring it.
- Be careful not to mix it too vigorously and cause foaming, as that will cause hemolysis.

- Do not attempt to measure aggregating or coagulated specimens as it may cause analyzer failure.
- Blood that has been stored for 1 day or longer under refrigeration should be returned to room temperature, then inverted and mixed thoroughly. However, when this is done, WBC classification cannot be done.

Notes on Preparing Pre-dilution Samples

Prepare samples carefully as the occurrence of abnormal data from pre-dilution analysis is extremely common due to the technique of collecting blood and diluting it.

Also, it is quite common to be unable to collect blood again for a pre-dilution analysis, so be very careful in the dilution process.

Special Samples

Be careful with samples that contain interfering substances, as they may affect the measured values.

Section 2-3 (p. 2-13)

3-2. Overview of Error Messages

If the analyzer detects an alarm, the alarm message appears on the window. The alarm message and their causes and their countermeasures are described in the tables on the following pages.

Error messages can be classified as measurement messages (Section 3-3) and analyzer messages (Section 3-4).

After solving the problem, check that no error messages are displayed and that the analyzer functions properly before use.

NOTE: Be careful when diagnosing a patient by the measurement results with an error message. The measurement results might not be correct because of analyzer error or sample error.

⚠ CAUTION

A measurement result with a message might not be correct because of analyzer error or sample error. Do not diagnosis the patient based on the result especially when "!" appears on the measurement result.

3-3. Measurement Messages

The measurement message indicates a measurement error.

To check the message, touch [Flag] on the Data Details window.

An identifier (such as ?, ! or *) is displayed related to the detected error.

Depending on the detected error, the measurement value of the related parameter might not be displayed.

Measurement messages are displayed here.

The following data identifiers are added to the parameter on the analyzer. The data identifiers for the measurement messages are "?" and "!".

Data Management and Setting Guide: "Viewing Flags" in Section 4

Classification	Data Identifier	Measurement Value	Description
Data cannot be analyzed	None	Related parameter measurement value not displayed	The data cannot be analyzed.
Measurement condition error detected	None	Related parameter measurement value not displayed	Measurement operation error is detected.
Data with low reliability (Error found during measurement)	?	Measurement value displayed	The analyzer condition is out of the specified range and the reliability of the data is low. The measurement value is the reference value.
Data with low reliability (Abnormal flag detected)	! *	Measurement value displayed	Abnormal flag is detected in the sample. The reliability of measured data is low because abnormal cells exist. If the WBC and PLT values are low, count them with a blood smear.
	C	Measurement value displayed	The reliability of measured data is low because PLT clumps are detected.
Out of normal range	H	Measurement value displayed	The measurement value is out of the upper and lower limits range set in the "Sample Type" in Settings.
	L		
Out of measuring range	None	"OVER" message displayed	The measurement value exceeds the measurable range.

3-3-1. Measurement Message List

Measurement Message	Cause	Countermeasure
HGB Circuit Message	LED OFF voltage is outside the range.	Follow instructions from '00162 HGB Circuit Abnormality' in "3-5-8. Circuit Related" (p. 3-24).
SS Circuit Message		Follow instructions from '00163 SS Circuit Abnormality' in "3-5-8. Circuit Related" (p. 3-24).
HGB LED Temp. Message	Temperature sensor cable is disconnected or sensor may be damaged.	Perform the following procedure. 1) Check the connection and cable of the applicable sensor. 2) Replace the applicable sensor. Section 7-3-13 (p. 7-58)
Diluent Temp. Message		
SS LED Temp. Message		
SS Cup Temp. Message		
Cup Temp. Message		
Cup Heater Temp. Message		
Tank Temp. Message		
Tank Heater Temp. Message		
Room Temp. Message		
WBC Noise [1] [2]	Detector is dirty or power environment is unstable.	Follow instructions from '21052 WBC noise' in "3-7. User Message [2xxxx]" (p. 3-35).
RBC Noise [1] [2]		Follow instructions from '21053 RBC noise' in "3-7. User Message [2xxxx]" (p. 3-35).
WBC Aperture Clog [1] [2]	Electrode voltage after measurement is outside the range.	Follow instructions from '21052 WBC noise' in "3-7. User Message [2xxxx]" (p. 3-35).
RBC Aperture Clog [1] [2]		Follow instructions from '21053 RBC noise' in "3-7. User Message [2xxxx]" (p. 3-35).

Measurement Message	Cause	Countermeasure
WBC Time-Series Message [1] [2]	Maximum value and minimum value in the time series is outside the range.	Perform the following operation and remeasure the sample with an error. 1) Remove clogs in the aperture cap. Section 7-2-3 (p. 7-10) 2) Clean protein. Section 7-2-2-2 (p. 7-6) 3) Clean the aperture cap. Section 7-6-1-9 (p. 7-113)
RBC Time-Series Message [1] [2]		
PLT Time-Series Message [1] [2]		
LaserKey Off	The laser key is OFF.	Change the laser output setting to [ON]. "Laser output" in Measurement Settings Section 8-1-15 (p. 8-14)
OpticalCount Message [1]	Unspecified operation during optical count	Clean the flow cell. Section 7-2-2-3 (p. 7-7)
OpticalCount Low [1]	Optical count is too low and WBC 5-part was not differentiated.	Make a blood smear and count it visually with a microscope.
Short Sample [1] [2]	Blood cannot be discharged in the IWBC cup, OWBC cup, RBC cup or RET cup.	Remeasure the sample.
Cup Temp. Low	The cup temperature during measurement is out of specified range.	Perform the following procedure and remeasure the sample with an error. 1) Locate the analyzer so that the venting hole is not blocked. 2) Keep the room temperature at 15 to 30°C (59 to 86°F) and remeasure the sample. 3) If this occurs frequently, check that the sensor is installed to the correct position. Section 7-3-13 (p. 7-58)
Cup Temp. High		
HGB Voltage High	LED ON voltage is outside the range.	Adjust the HGB voltage. Section 6-4 (p. 6-19)
HGB Voltage Low		Perform the following procedure and remeasure the sample with an error. 1) Keep the room temperature and diluent temperature at 15 to 30°C (59 to 86°F) and remeasure the sample. 2) If this occurs frequently adjust the HGB voltage. Section 6-4 (p. 6-19)
HGB LED Temp. Low	HGB LED temperature is outside the specified range.	
HGB LED Temp. High		
Diluent Temp. Low	HGB CAL temperature is outside the specified range.	Perform the following procedure and remeasure the sample with an error. 1) Keep the room temperature and diluent temperature at 15 to 30°C (59 to 86°F) and remeasure the sample. 2) If this occurs frequently, check that the sensor is installed to the correct position. Section 7-3-13 (p. 7-58)
Diluent Temp. High		

Measurement Message	Cause	Countermeasure
SS Voltage Low	SS voltage is outside the specified range.	Adjust the SS voltage. Section 6-4 (p. 6-19)
SS Voltage High		
SS LED Temp. Low	SS LED temperature is outside the range.	Perform the following procedure and remeasure the sample with an error. 1) Keep the room temperature and diluent temperature at 15 to 30°C (59 to 86°F). 2) If this occurs frequently, check that the sensor is installed to the correct position. Section 7-3-13 (p. 7-58)
SS LED Temp. High		
SS Cup Temp. Low	The OWBC cup temperature during SS measurement is outside of specified range.	
SS Cup Temp. High		
Cup Heater Temp. Low	The cup heater temperature during measurement is outside of specified range.	
Cup Heater Temp. High		
Tank Temp. Low	The tank temperature during measurement is outside of specified range.	
Tank Temp. High		
Tank Heater Temp. Low	The tank heater temperature during measurement is outside of specified range.	
Tank Heater Temp. High		
SD sensitivity drop [1]	Decrease in SD sensitivity	Perform optical adjustment from the Calibration window using the MEK-CAL. Section 5-1 (p. 5-2) When the SD sensitivity decreases so much that the optical adjustment cannot be performed or additional errors appear after the optical adjustment, the optical unit is suspected to be faulty.
Detected small particles [1]	Microscopic particles detected interfering with the PLT count	Small particles are detected on the scattergram. The following causes are suspected. 1) Sample-derived causes such as PLT clumps 2) Bubbles in the diluent Perform a measurement again. When the error appears on only the specific samples, 1 is suspected. Wait awhile and perform a measurement again. It can be a solution. When the error appears on the multiple samples, 2 is suspected. If the amount of diluent is small, replace the diluent bottle. Also, run the self-check and check the background noise.
Room Temp. Low	The chassis internal temperature during measurement is outside of specified range.	Perform the following procedure and remeasure the sample with an error. 1) Locate the analyzer so that the venting hole is not blocked. 2) Keep the room temperature at 15 to 30°C (59 to 86°F) and remeasure the sample. 3) If this occurs frequently, check that the sensor is installed to the correct position. Section 7-3-13 (p. 7-58)
Room Temp. High		
Ret OpticalCount Message	Unspecified operation during RET optical count	Remeasure the sample. If this occurs frequently, clean the RET flow cell. Section 7-2-2-5 (p. 7-9)
Ret Opt sensitivity drop	Decrease in optical sensitivity of reticulocytes	Clean the RET flow cell. Section 7-2-2-5 (p. 7-9)

Measurement Message	Cause	Countermeasure
Ret Bubble Message	When the parameters are CBC+DIFF+RET or CBC+RET, many bubbles are detected during measurement.	Remeasure the sample. If this occurs frequently, clean the RET flow cell. Section 7-2-2-5 (p. 7-9)
Ret Optical Count Low Message	RET optical count is too low and reticulocytes were not differentiated.	Make and check blood smears.
Ret Tank Temp. Low	The RET tank temperature during measurement is outside of specified range.	Perform the following procedure and remeasure the sample with an error. 1) Keep the room temperature at 15 to 30°C (59 to 86°F) and remeasure the sample. 2) If this occurs frequently, check that the sensor is installed to the correct position. Section 7-3-14 (p. 7-59)
Ret Tank Temp. High		
Ret LD Temp. Low	The RET laser temperature during measurement is outside of specified range.	
Ret LD Temp. High		
Ret MO Temp. Low	The RET unit internal temperature during measurement is outside of specified range.	
Ret MO Temp. High		
Ret Heater Temp. Low	The RET tank heater temperature during measurement is outside of specified range.	
Ret Heater Temp. High		

[1] The appropriate analyzer message is displayed on the Maintenance Log window.
Section 3-4 (p. 3-11)

[2] When this occurs during auto measurement, the sample is remeasured automatically, and the new measurement data is saved instead of the original data.

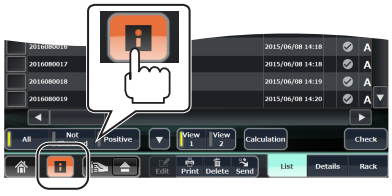
3-3-2. Assigning and Hiding Identifiers to the Parameters for Measurement Messages

Measurement Message	Identifier																															
	WBC	RBC	HGB	HCT	MCV	MCH	MCHC	RDW-CV/RDW-SD	PLT	PCT/MPV/PDW/P-LCR	NE	LY	MO	EO	BA	NE%	LY%	MO%	EO%	BA%	P-LCC	MentzerIndex	RDWI	IG/IG%	Band/Band%	Seg/Seg%	RET%	RET	IRF	LFR	MFR	HFR
HGB Circuit Message			–			–	–																									
SS Circuit Message	There are no assigned data identifiers or hidden parameters.																															
HGB LED Temp. Message			?																													
Diluent Temp. Message			?																													
SS LED Temp. Message	There are no assigned data identifiers or hidden parameters.																															
SS Cup Temp. Message																																
Cup Temp. Message											?	?	?			?	?	?							–	–	–						
Cup Heater Temp. Message	There are no assigned data identifiers or hidden parameters.																															
Tank Temp. Message																																
Tank Heater Temp. Message																																
Room Temp. Message																																
WBC Noise	–										–	–	–	–	–																	
RBC Noise		–		–	–		–	–	–	–											–	–	–									
WBC Aperture Clog	–										–	–	–	–	–																	
RBC Aperture Clog		–		–	–		–	–	–	–											–	–	–									
WBC Time-Series Message	–										–	–	–	–	–																	
RBC Time-Series Message		–		–	–		–	–														–	–									
PLT Time-Series Message									–	–											–											
LaserKey Off											–	–	–	–	–	–	–	–	–	–				–	–	–						
OpticalCount Message											?	?	?	?	?	?	?	?	?	?				–	–	–						
OpticalCount Low											–	–	–	–	–	–	–	–	–	–												
Short Sample	!		!								!	!	!	!	!	!	!	!	!	!				–	–	–						
Cup Temp. Low											?	?	?			?	?	?						–	–	–						
Cup Temp. High											?	?	?			?	?	?						–	–	–						
HGB Voltage High			!																													
HGB Voltage Low			?																													
HGB LED Temp. Low			?																													
HGB LED Temp. High			?																													
Diluent Temp. Low			?																													
Diluent Temp. High			?																													

Measurement Message	Identifier																														
	WBC	RBC	HGB	HCT	MCV	MCH	MCHC	RDW-CV/RDW-SD	PLT	PCT/MPV/PDW/P-LCR	NE	LY	MO	EO	BA	NE%	LY%	MO%	EO%	BA%	P-LCC	MentzerIndex	RDWI	IG/IG%	Band/Band%	Seg/Seg%	RET%	RET	IRF	LFR	MFR	HFR
SS Voltage Low	There are no assigned data identifiers or hidden parameters.																														
SS Voltage High																															
SS LED Temp. Low																															
SS LED Temp. High																															
SS Cup Temp. Low																															
SS Cup Temp. High																															
Cup Heater Temp. Low																															
Cup Heater Temp. High																															
Tank Temp. Low																															
Tank Temp. High																															
Tank Heater Temp. Low																															
Tank Heater Temp. High																															
SD sensitivity drop											–	–	–	–	–	–	–	–	–	–				–	–	–						
Detected small particles									*	*											–											
Room Temp. Low	There are no assigned data identifiers or hidden parameters.																														
Room Temp. High																															
Ret OpticalCount Message																											?	?	?	?	?	?
Ret OpticalCount Low Message																											–	–	–	–	–	–
Short Sample (detected in RET measurement side)																											!	!	!	!	!	!
Ret Opt sensitivity drop																											–	–	–	–	–	–
Ret Bubble Message																											*	*	*	*	*	*
Ret Tank Temp. Message																											?	?	?	?	?	?
Ret Tank Temp. Low																											?	?	?	?	?	?
Ret Tank Temp. High																											?	?	?	?	?	?

Measurement values with "–" are hidden parameters.

3-4. Analyzer Messages



If an error is detected during measurement, the Maintenance Log window appears and the buzzer sounds.

The buzzer sound can be canceled.
Section 8-1-4 (p. 8-4)

The Maintenance Log window displays a message of the analyzer error and the countermeasures.

- A message right after detection appears in red (unread message status).
- When the message is touched and the details and countermeasures are checked, the message is displayed in white (read message status).

Date
Displays the date and time of the error.

Code
Displays the error code.

Log Name
Displays the error name.

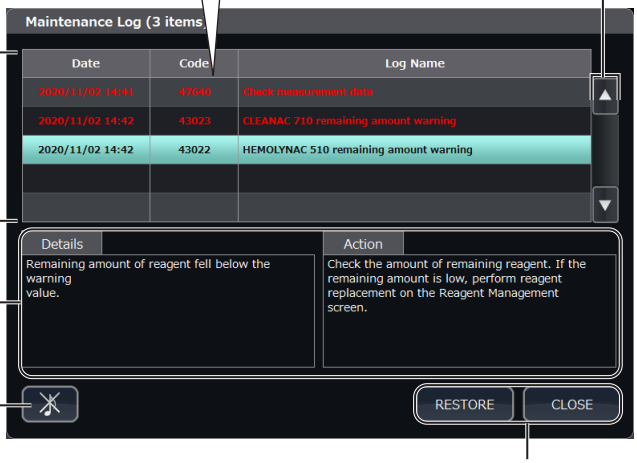
Date	Code	Log Name
2020/11/02 14:41	47640	Check measurement data
2020/11/02 14:42	43023	CLEANAC 710 remaining amount warning
2020/11/02 14:42	43022	HEMOLYNAC 510 remaining amount warning

Touch [▲] or [▼] to scroll the list vertically.

Displays a list of messages.
To check the details of the message and the countermeasure, touch to select the message.

Displays the details and countermeasures for the selected message.

Stops the buzzer sound.



[RESTORE]: Restores operation depending on the error status.
[CLOSE]: Closes the Maintenance Log window.

For messages with low priority listed in the “User Information [4xxxx] (P.3-41), [ℹ] on the lower left may become orange without opening the Maintenance Log window. In this case, touch [ℹ] to open the Maintenance Log window.

3-4-1. Restoring Operation

The analyzer can be restored to the normal condition in the following procedure.

1 Select the error message on the Maintenance Log window and display the details and countermeasures.

2 Perform the displayed countermeasure.

Some messages require the countermeasure on other menu such as on the Reagents window.

3 Touch [RESTORE] on the Maintenance Log window.

Canceling Restoring Operation

The restoring operation can be canceled in the following procedure.

1 Touch [CANCEL] on the Maintenance Log window.

NOTE: This operation can be performed with “Technical User”.

2 The displayed error message is considered as completing the restoration, and the Maintenance Log window is closed.

NOTE: Performing this operation means to cancel the restoring procedure, so you need to fully understand the state of the analyzer before this operation. This may damage the analyzer.

3-4-2. Identification Code

The numbers of analyzer messages are classified according severity, as follows.

Example: 23003 Diluent priming error

Digits 2 to 5 are consecutive numbers.

The 1st digit indicates the severity of the message.

- 0: Serious (unrecoverable) — Service Message (0xxxx)
- 1: Serious (recoverable) — Service Message (1xxxx)
- 2: Moderately serious (operation stop) — User Message (2xxxx)
- 3: None
- 4: Low severity — User Information (4xxxx)
- 5: Log

First Digit	Category	Status	Process	Preferred Method	Indicator	Information Screen	Restore Operation
0	Service Message	Unrecov-erable	Stop system immediately	Stop system	Red	Open	Not possible
1	Service Message	Recover-able	Stop system immediately	Operate analyzer again after resolving problem	Red	Open	Required
2	User Message	Recover-able	Stop (During measurement, process up to a juncture)	Device operates again after resolving problem	Orange	Open	Required
3	—	—	—	—	—	—	—
4	User Information	Operable	Normal operation	Handle according to user judgment	Green	None	Required
5	Log	Operable	Normal operation	None	No change	None	Unnecessary

3-5. Service Message [0xxxx]

When the service message [0xxxx] is detected, the status indicator lights. Also, the Information screen opens automatically.

NOTE: As the service message [0xxxx] indicates a serious error, it is unrecoverable.

Code	Error	Cause	Countermeasures or Recovery Operation
00001	Open Voltage Operation Error	Control error for air pressure source condition	Touch [RESTORE] to initialize the drive part of the analyzer. The analyzer restarts. • If the problem is not resolved by restarting, check that the air compressor is working and that there are no leaks in the flow circuit. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00002	Air Opening Error	During air opening operation, pressure is outside the range.	Touch [RESTORE] to initialize the drive part of the analyzer. In the electromagnetic valve tab, open 15A and 15B, and check the pressure in the AD sensor tab. • If pressure is outside the range indicated to the left, collapse or clog in the delivery tube, clog in the electromagnetic valve, or pressure sensor malfunction is suspected. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00003	ISO Chamber Positive Pressure Error	During ISO chamber pressurization, pressure is outside the range.	Touch [RESTORE] to initialize the drive part of the analyzer. In the electromagnetic valve tab, operate the compressor, open 13A, and check the ISO chamber pressure in the AD sensor tab. • If pressure is more than 80.04 kPa, sticking in the positive pressure relief valve or collapse or clog in the fluid path is suspected. • If pressure is less than 57.96 kPa, fluid path leak is suspected. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

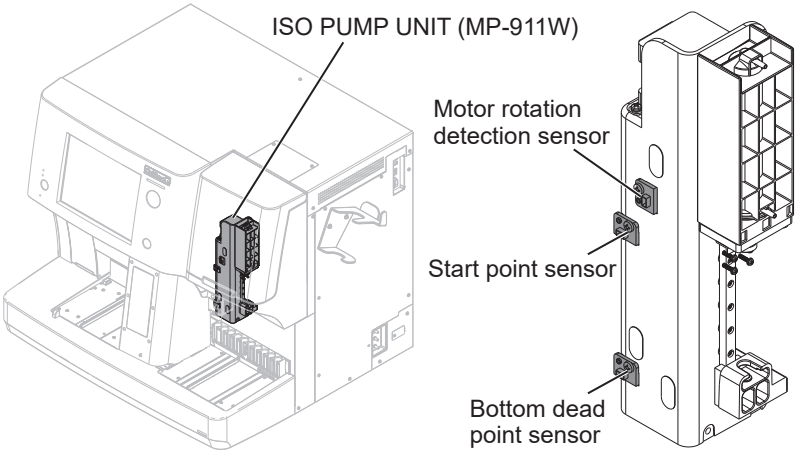
Code	Error	Cause	Countermeasures or Recovery Operation
00004	ISO Chamber Negative Pressure Error	During ISO chamber depressurization, pressure is outside the range.	Touch [RESTORE] to initialize the drive part of the analyzer. Replace the negative pressure relief valve. If it is not improved after replacement, perform and check the following: • If analyzer internal draining status can be checked, perform the leak check. • If analyzer internal draining status cannot be checked, check whether the tubes of the MP-910W and JQ-920W are removed, crushed or not. If the problem is found, repair the target part. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00005	WC1 Positive Pressure Error	During WC1 pressurization, pressure is outside the range.	Touch [RESTORE] to initialize the drive part of the analyzer. In the electromagnetic valve tab, operate the compressor, open 14A, and check the waste chamber pressure in the AD sensor tab. • If pressure is more than 80.04 kPa, sticking in the positive pressure relief valve or collapse or clog in the fluid path is suspected. • If pressure is less than 57.96 kPa, fluid path leak is suspected. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00006	WC1 Negative Pressure Error	During WC1 depressurization, pressure is outside the range.	Touch [RESTORE] to initialize the drive part of the analyzer. Replace the negative pressure relief valve. If it is not improved after replacement, perform and check the following: • If analyzer internal draining status can be checked, perform the leak check. • If analyzer internal draining status cannot be checked, check whether the tubes of the MP-910W and JQ-921W are removed, crushed or not. If the problem is found, repair the target part. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

3-5-1. MP-911W ISO Pump Unit Related

Up and down movement of the MP-911W ISO pump unit is detected by the following 3 sensors.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point sensor
- Bottom dead point sensor
- Motor rotation detection sensor



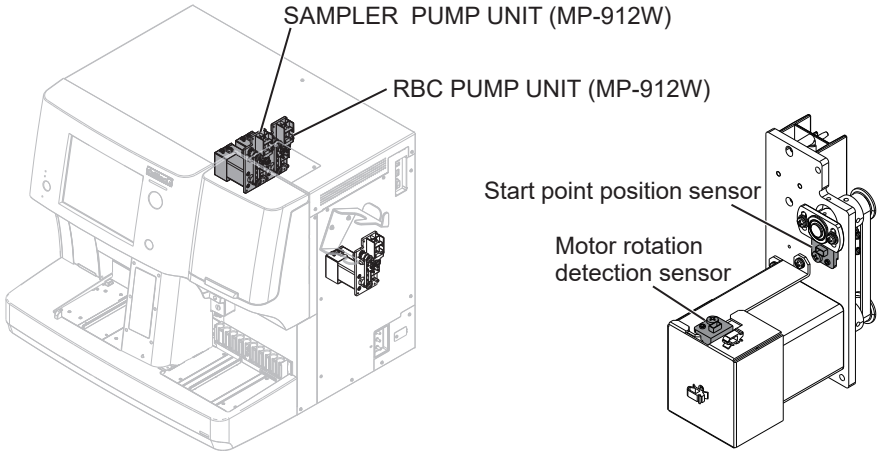
Code	Error	Cause	Countermeasures or Recovery Operation
00010	Diluter Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-911W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00011	Diluter Operation Error	Pump full stroke did not reach the bottom dead point sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-911W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00012	Diluter Base Position Error	• At the start of pump operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	
00013	Diluter End Position Error	• At the end of pump operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	

3-5-2. MP-912W SAM/RBC Pump Unit Related

Up and down movement of the MP-912W SAM/RBC pump unit is detected by the following 2 sensors.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point position sensor
- Motor rotation detection sensor



Code	Error	Cause	Countermeasures or Recovery Operation
00020	Sample Pump Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-912W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00022	Sample Pump Base Position Error	• At the start of pump operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-912W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

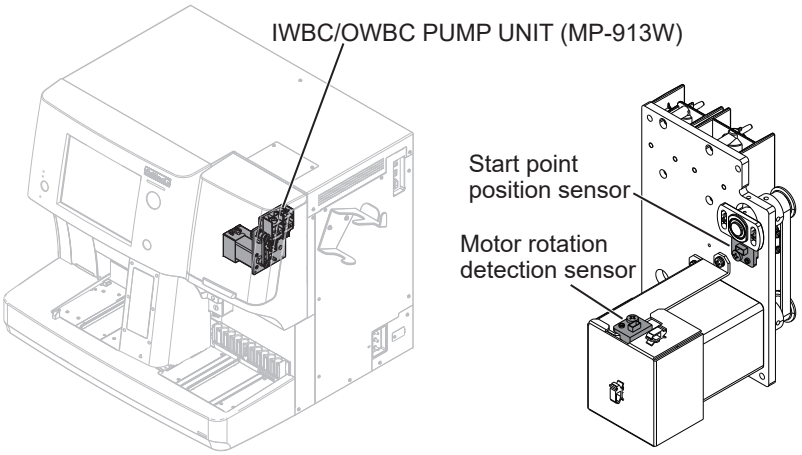
Code	Error	Cause	Countermeasures or Recovery Operation
00030	RBC Pump Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-912W (inner side), and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00032	RBC Pump Base Position Error	• At the start of pump operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-912W (inner side), and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

3-5-3. MP-913W IWBC/OWBC Pump Unit Related

Up and down movement of the MP-913W IWBC/OWBC pump unit is detected by the following 2 sensors.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point position sensor
- Motor rotation detection sensor



Code	Error	Cause	Countermeasures or Recovery Operation
00040	WBC Pump Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-913W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00042	WBC Pump Base Position Error	• At the start of pump operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-913W (front/near side), and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

3-5-4. MS-910W Sampler Unit Related

Left-right movement of the MP-910W sampler unit is detected by the following 6 sensors.

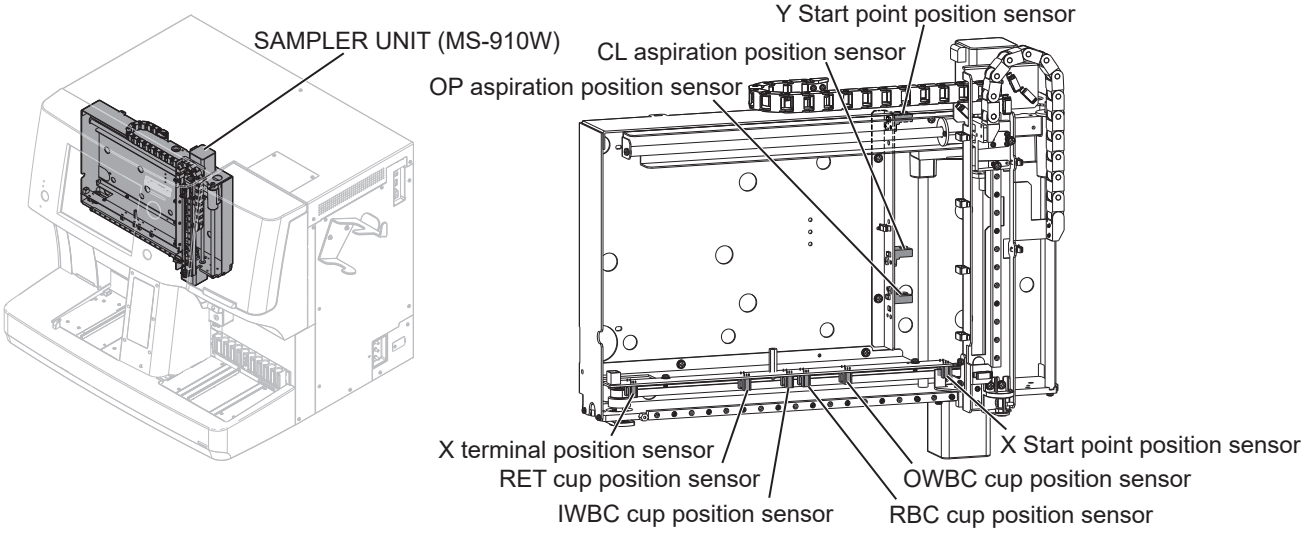
The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point position sensor
- OWBC cup position sensor
- RBC cup position sensor
- IWBC cup position sensor
- Terminal position sensor
- RET cup position sensor

Up and down movement is detected by the following 3 sensors.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point position sensor
- OP aspiration position sensor
- CL aspiration position sensor



Code	Error	Cause	Countermeasures or Recovery Operation
00050	X Sampler Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves and there is no short from crossover or fluid drops, check the distribution wires of the UT-7294 SAMPLER SENSOR BD, replace the MP-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

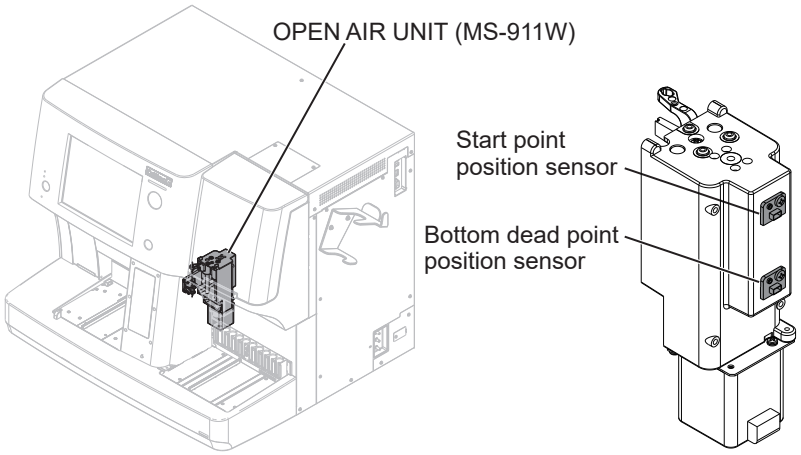
Code	Error	Cause	Countermeasures or Recovery Operation
00051	X Sampler Operation Error	Movement of the sensor to the OP position did not reach the OP sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. Check the distribution wires of the UT-7294 SAMPLER SENSOR BD, replace the MS-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00052	X Sampler Base Position Error	At the start of sampler movement, the sensor which should be ON is OFF. Sensor was not detected or pump position is incorrect.	Touch [RESTORE] to initialize the drive part of the analyzer. Check the distribution wires of the UT-7294 SAMPLER SENSOR BD, replace the MS-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00053	X Sampler End Position Error	• At the end of sampler operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	Touch [RESTORE] to initialize the drive part of the analyzer. Check the distribution wires of the UT-7294 SAMPLER SENSOR BD, replace the MS-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00060	Y Sampler Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MS-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00061	Y Sampler Operation Error	Movement of the sensor did not reach the sensor within the specified operating time (sensor timeout).	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MS-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00062	Y Sampler Base Position Error	• At the start of sampler movement, the sensor which should be ON is OFF • Sensor did not detect it or pump position is incorrect	
00063	Y Sampler End Position Error	• At the end of sampler operation, the sensor which should be ON is OFF • Sensor did not detect it or pump position is incorrect	

3-5-5. MS-911W Open Air Unit Related

Up and down movement of the MS-911W open air unit is detected by the following 2 sensors.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point position sensor
- Bottom dead point position sensor



Code	Error	Cause	Countermeasures or Recovery Operation
00070	Venting Needle Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout)	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MS-911W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00071	Venting Needle Operation Error	Full stroke did not reach the bottom dead point sensor	Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MS-911W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00072	Venting Needle Base Position Error	• At the start of venting needle operation, the sensor which should be ON is OFF • Sensor did not detect it or pump position is incorrect	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the MS-911W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

Code	Error	Cause	Countermeasures or Recovery Operation
00073	Venting Needle End Position Error	• At the end of venting needle operation, the sensor which should be ON is OFF • Sensor did not detect it or pump position is incorrect	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MS-911W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

3-5-6. Pinch Valve Related

The pinch valve is composed of the following.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Moving part to clamp the phamed tube
- Motor
- Motor position sensor

Code	Error	Cause	Countermeasures or Recovery Operation
00090	PV1 Initialize Error	• Error in valve closing operation (initialization operation) • Sensor did not detect it or valve position is incorrect (sensor timeout)	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the XP-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00100	PV2 Initialize Error		
00110	PV3 Initialize Error		
00120	PV4 Initialize Error		
00130	PV5 Initialize Error		
00091	PV1 Close Operation Error	• Error in valve closing operation • Sensor did not detect it or valve position is incorrect (sensor timeout)	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the XP-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00101	PV2 Close Operation Error		
00111	PV3 Close Operation Error		
00121	PV4 Close Operation Error		
00131	PV5 Close Operation Error		
00092	PV1 Open Operation Error	• Error in valve opening operation • Sensor did not detect it or valve position is incorrect (sensor timeout)	Touch [RESTORE] to initialize the drive part of the analyzer. Check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the XP-910W, and replace the Driver BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00102	PV2 Open Operation Error		
00112	PV3 Open Operation Error		
00122	PV4 Open Operation Error		
00132	PV5 Open Operation Error		

3-5-7. Thermistor Related

Code	Error	Cause	Countermeasures or Recovery Operation
00140	Thermistor Abnormality (Cup)	• Thermistor failure • Distribution wire problem • Problem in the IC circuit (AD converter) on the board	Touch [RESTORE] to initialize the drive part of the analyzer. Check the connector of the corresponding thermistor. Check the connector of the UT-7287 PRESSURE SENSOR BD. Check the connector of the UT-7309 MAIN BD. If these actions do not solve the problem, replace the thermistor, replace the PRESSURE SENSOR BD, and replace the MAIN BD in that order. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured. For the details of the location of each thermistor, refer to "7-3-14. Checking the Sensors Inside the Analyzer". Section 7-3-14 (p. 7-59)
00141	Thermistor Abnormality (Cup Heater)		
00142	Thermistor Abnormality (Tank)		
00143	Thermistor Abnormality (Tank Heater)		
00144	Thermistor abnormality (HGB temperature sensor)		
00145	Thermistor abnormality (SS temperature sensor)		
00146	Thermistor abnormality (chassis internal temperature sensor)		
00156	Thermistor abnormality (HGB diluent temperature sensor)		

3-5-8. Circuit Related

Code	Error	Cause	Countermeasures or Recovery Operation
00160	CBC Circuit Abnormality	Circuit inspection result out of range (WBC, RBC, MCV, W-ELE, R-ELE)	Touch [RESTORE] to initialize the drive part of the analyzer. In System Settings, check the measurement conditions (sensitivity, threshold). Check the MC-910W CBC MEASURING UNIT wires. Check the ANALOG BD wires. If these actions do not solve the problem, replace the UT-7286 MEASURING BD and UT-7310 ANALOG BD in that order. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00161	DIFF Circuit Abnormality	Circuit inspection result out of range (TOC)	Touch [RESTORE] to initialize the drive part of the analyzer. In System Settings, check the measurement conditions (FS, FL, SD sensitivity, and FS threshold). Check the ANALOG BD wires. If there is a problem, replace the UT-7310 ANALOG BD. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

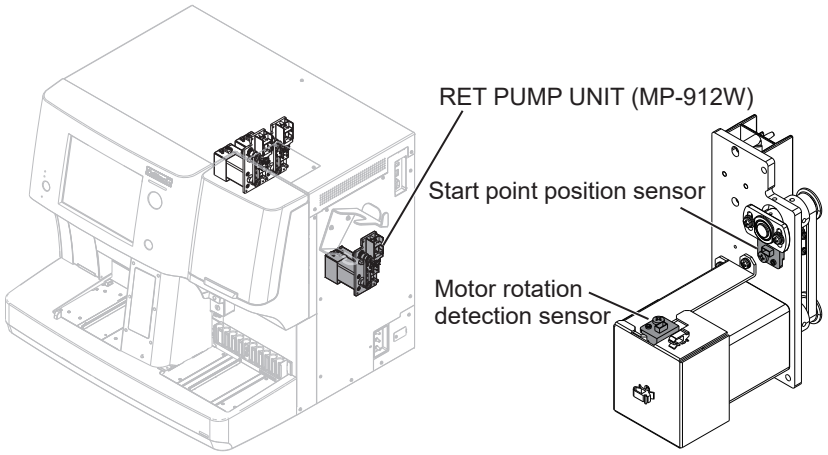
Code	Error	Cause	Countermeasures or Recovery Operation
00162	HGB Circuit Abnormality	• HGB LED OFF voltage outside the range • AD circuit abnormality • LED circuit abnormality • AMP circuit abnormality	Touch [RESTORE] to initialize the drive part of the analyzer. Check the MH-910W HGB measuring unit wires. Check the ANALOG BD wires. If there is a problem, replace the MH-910W. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00163	SS Circuit Abnormality	• SS LED OFF voltage outside the range • AD circuit abnormality • LED circuit abnormality • AMP circuit abnormality	Touch [RESTORE] to initialize the drive part of the analyzer. Check the ZY-921W cup heater unit wires. Check the ANALOG BD wires. If there is a problem, replace the ZY-921W. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00164	RET Circuit Abnormality	Circuit inspection result out of range (BTOC)	Touch [RESTORE] to initialize the drive part of the analyzer. In System Settings, check the measurement conditions (FSC, FL525, FL650, Gain, and FSC threshold). Check the MAIN BD wires. If there is a problem, replace the UT-7309 MAIN BD. If the problem is not solved, replace the MO-920W. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.

3-5-9. MP-912W RET Pump Unit Related

Up and down movement of the predilution cylinder of the MP-912W RET pump unit is detected by the following 2 sensors.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point position sensor
- Motor rotation detection sensor



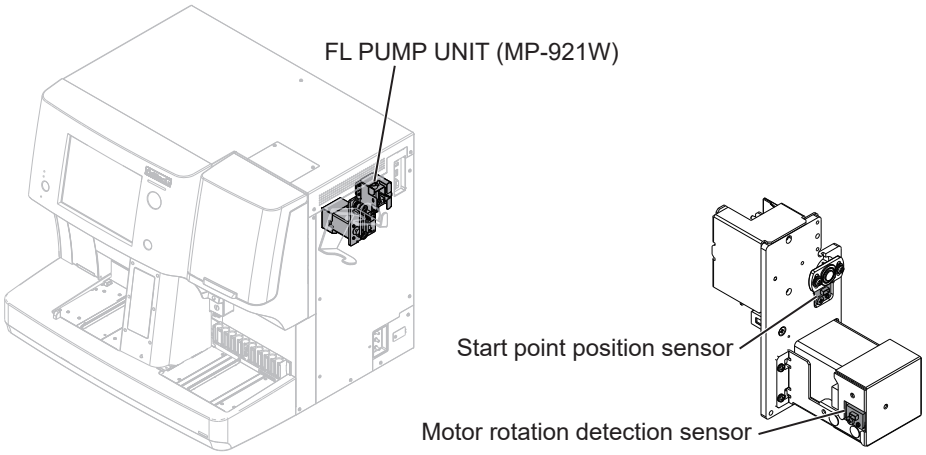
Code	Error	Cause	Countermeasures or Recovery Operation
00170	RET Pump Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout)	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-912W, and replace the UT-7311 DRIVER BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00172	RET Base Position Error	• At the start of pump operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	

3-5-10. MP-921W FL Pump Unit Related

Up and down movement of the predilution cylinder of the MP-921W FL pump unit is detected by the following 2 sensors.

The sensor plate that moves with the motor reaches the sensor slit part and interception of sensor light is detected.

- Start point position sensor
- Motor rotation detection sensor



Code	Error	Cause	Countermeasures or Recovery Operation
00180	FL Pump Initialize Error	Initialization movement did not reach the start point sensor (sensor timeout)	Touch [RESTORE] to initialize the drive part of the analyzer. • If the motor does not move, check the motor cable. • If the motor moves, check the photo sensor. If there is no short from crossover or fluid drops, replace the sensor, replace the MP-920W, and replace the UT-7311 DRIVER BD in that order until the problem is solved. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00182	FL Base Position Error	• At the start of pump operation, the sensor which should be ON is OFF. • Sensor was not detected or pump position is incorrect.	

3-5-11. RET Thermistor Related

Code	Error	Cause	Countermeasures or Recovery Operation
00190	Thermistor Abnormality (RET tank)	• Thermistor failure • Distribution wire problem • Problem in the IC circuit (AD converter) on the board	Touch [RESTORE] to initialize the drive part of the analyzer. Check the connector of the corresponding thermistor. Check the connector of the UT-7309 MAIN BD. If these actions do not solve the problem, replace the thermistor and replace the MAIN BD in that order. **Touch [RESTORE] to do the following operation.** Initialize the analyzer actuator, and eject the rack which is being measured.
00191	Thermistor Abnormality (RET tank heater)		
00192	Thermistor Abnormality (RET LD)		Touch [RESTORE] to initialize the drive part of the analyzer. Check the connector of the corresponding thermistor. Check the connector of the UT-7309 MAIN BD. If these actions do not solve the problem, replace the thermistor, replace the MAIN BD, and replace the MO-920W in that order. **Touch [RESTORE] to do the following operation.** Initialize the analyzer actuator, and eject the rack which is being measured. For the details of the location of the RET thermistor, refer to “7-3-14. Checking the Sensors Inside the Analyzer”. Section 7-3-14 (p. 7-59)
00193	Thermistor Abnormality (in RET MO)		

3-5-12. Leak Check Related

Code	Error	Cause	Countermeasures or Recovery Operation
00200	Leak detected	Abnormality detected during leak check	Touch [RESTORE] to initialize the drive part of the analyzer. For details, refer to the Technical Reference Manual. Check the fluid path that was judged abnormal. NOTE: Run [Maintenance] > [Service] > [Main] > [Leak Check] and if there is a problem with the fluid path, an error between 00200 and 00355 will occur. Responses to each error are described in the Technical Reference Manual. After the problem is solved, do the leak check. **Touch [RESTORE] to do the following operation.** • Put the analyzer actuator on standby.
00201	Leak detected		
00202	Electromagnetic valve operation error		
00203	Electromagnetic valve operation error		
00210	Kink detected		
00211	Leak detected		
00212	Leak detected		
00213	Electromagnetic valve operation error		
00220	Kink detected		
00221	Leak detected		
00225	Kink detected		
00226	Leak detected		
00227	Electromagnetic valve operation error		
00230	Leak detected		
00240	Kink detected		
00241	Leak detected		
00242	Kink detected		
00243	Kink detected		
00244	Kink detected		
00245	Kink detected		
00246	Kink detected		
00247	Kink detected		
00251	Kink detected		
00252	Leak detected		
00261	Kink detected		
00262	Leak detected		
00271	Kink detected		
00272	Leak detected		
00273	Leak detected		
00281	Kink detected		
00282	Leak detected		
00291	Kink detected		
00292	Leak detected		
00293	Leak detected		
00294	Leak detected		
00295	Kink detected		

Code	Error	Cause	Countermeasures or Recovery Operation
00300	Kink detected	Abnormality detected during leak check	Touch [RESTORE] to initialize the drive part of the analyzer. For details, refer to the Technical Reference Manual. Check the fluid path that was judged abnormal. NOTE: Run [Maintenance] > [Service] > [Main] > [Leak Check] and if there is a problem with the fluid path, an error between 00200 and 00355 will occur. Responses to each error are described in the Technical Reference Manual. After the problem is solved, do the leak check. **Touch [RESTORE] to do the following operation.** • Put the analyzer actuator on standby.
00301	Kink detected		
00302	Kink detected		
00310	Kink detected		
00311	Kink detected		
00312	Kink detected		
00313	Kink detected		
00314	Kink detected		
00320	Kink detected		
00321	Leak detected		
00322	Leak detected		
00323	Leak detected		
00324	Kink detected		
00325	Kink detected		
00326	Kink detected		
00327	Kink detected		
00350	Press source unit: (−) press sensor: atmospheric pressure		
00351	Press source unit: (+) press sensor: atmospheric press		
00352	Press source unit: (−) press sensor: (−) press applied		
00353	Press source unit: (+) press sensor: (−) press applied		
00354	Press source unit: (−) press sensor: (+) press applied		
00355	Press source unit: (+) press sensor: (+) press applied		

3-5-13. Needle Position Adjustment Related

Code	Error	Cause	Countermeasures or Recovery Operation
00400	Sampler start point adjustment position error	[Pierced] key was touched when the sampler was not in unpierced position	Touch [RESTORE] to initialize the drive part of the analyzer. Section 7-3-12 (p. 7-57) Touch the [Not Pierced] key. When the sampler moves to the not pierced position, touch the [Pierced] key. **Touch [RESTORE] to do the following operation.** • Put the analyzer actuator on standby.
00401	Sampler open adjustment position error		
00402	X-direction open adjustment value out of range	Outside the setting range (95 to 105) for manual measurement position (lateral)	Touch [RESTORE] to return the analyzer to standby. Enter a value within the setting range of 95 to 105. **Touch [RESTORE] to do the following operation.** • The indicator lamp lights green.
00403	Y-direction open adjustment value out of range	Outside the setting range (95 to 105) for manual measurement position (toward the inside)	
00404	AL start point adjustment position error	[Pierced] key was touched when the sampler was not in unpierced position	Touch [RESTORE] to initialize the drive part of the analyzer. Touch the [Not Pierced] key. When the sampler moves to the not pierced position, touch the [Pierced] key. **Touch [RESTORE] to do the following operation.** • Put the analyzer actuator on standby.
00405	Pressure release needle position error	[Pierced] key was touched when the venting needle was not in pierced position	

3-5-14. Other

Code	Error	Cause	Countermeasures or Recovery Operation
00500	Internal communication loss	Communication with measuring part lost and number of retries exceeded	Touch [RESTORE] to initialize the drive part of the analyzer. Check LAN wiring between PC-920W DATA PROCESSING UNIT and UT-7309 MAIN BD. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00600	WBC MCB Error	MCB error	Touch [RESTORE] to initialize the drive part of the analyzer. Restart the analyzer. If this does not solve the problem, replace the UT-7310 ANALOG BD. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00601	RBC MCB Error		Restart the analyzer. If this does not solve the problem, replace the UT-7310 ANALOG BD. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and eject the rack which is being measured.
00602	RET MCB Error		

Code	Error	Cause	Countermeasures or Recovery Operation
01000 01001	System error	System error	Touch [RESTORE] to return the analyzer to standby. Restart the analyzer. **Touch [RESTORE] to do the following operation.** • The indicator lamp lights green.
08000	Autoloader Continuous Operation Detected	Autoloader power interruption detected	Touch [RESTORE] to initialize the drive part of the analyzer. Turn the analyzer power off, check the autoloader connection wires, and restart the analyzer. If this does not solve the problem, replace the cable, autoloader, and MAIN BD. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator

3-6. User Message [1xxxx]

When the service message [1xxxx] is detected, the status indicator lights. Also, the Information screen opens automatically.

NOTE: Although the service message [1xxxx] indicates a serious error, it is recoverable.

Code	Error	Cause	Countermeasures or Recovery Operation
10000	IWBC Cup Draining Error	• IWBC cup draining completion was not detected. • During cup draining, the WC1 pressure was not greater than the specified value.	Touch [RESTORE] to drain the cup again. Check the overflow tray. Wipe it if there is fluid. Check for clog in the IWBC cup drain outlet and filter. Check for clog or break in the drain fluid path. Check for clog in electromagnetic valve 28. After removing clog, do cleaning. **Touch [RESTORE] to do the following operation.** • Drain the cup. Eject the rack which is being measured.
10001	RBC Cup Draining Error	• RBC cup draining completion was not detected. • During cup draining, the WC1 pressure was not greater than the specified value.	Touch [RESTORE] to drain the cup again. Check the overflow tray. Wipe it if there is fluid. Check for clog in the RBC cup drain outlet. Check for clog or break in the drain fluid path. Check for clog in electromagnetic valve 28. After removing clog, do cleaning. **Touch [RESTORE] to do the following operation.** • Drain the cup. Eject the rack which is being measured.
10002	OWBC Cup Draining Error	• OWBC cup draining completion was not detected. • During cup draining, the WC1 pressure was not greater than the specified value.	Touch [RESTORE] to drain the cup again. Check the overflow tray. Wipe it if there is fluid. Check for clog in the OWBC cup drain outlet. Check for clog or break in the drain fluid path. Check for clog in electromagnetic valve 29. After removing clog, do cleaning. **Touch [RESTORE] to do the following operation.** • Drain the cup. Eject the rack which is being measured.
10003	RET Cup Draining Error	• RET cup draining completion was not detected. • During cup draining, the WC1 pressure was not greater than the specified value.	Touch [RESTORE] to drain the cup again. Check the overflow tray. Wipe it if there is fluid. Check for clog in the RET cup drain outlet. Check for clog or break in the drain fluid path. Check for clog in electromagnetic valve 30. After removing clog, do cleaning. **Touch [RESTORE] to do the following operation.** • Drain the cup. Eject the rack which is being measured.

Code	Error	Cause	Countermeasures or Recovery Operation
10100	Instrument emergency stop	RESET button was touched during operation and the analyzer stopped.	Touch [RESTORE] to return the analyzer to measurement condition. **Touch [RESTORE] to do the following operation.** • When measuring or cleaning: Do cleaning, initialize the analyzer actuator, and eject the rack which is being measured. • When not measuring or cleaning: Initialize the analyzer actuator.
10150	Temperature Upper Limit Error (Cup)	Temperature sensor on the cup is outside the range.	Touch [RESTORE] to return the analyzer to standby. If there is a temperature sensor abnormality, replace the board. If there is a temperature sensor cable wire break, replace the cable. **Touch [RESTORE] to do the following operation.** • When measuring or cleaning: Eject the rack which is being measured, drain the waste chambers and clean. • When not measuring or cleaning: Eject the rack which is being measured and drain the waste chambers.
10151	Temperature increase error (cup heater)	Temperature sensor on the cup heater is outside the range.	
10152	Temperature Upper Limit Error (Tank)	Temperature sensor on the tank is outside the specified range.	
10153	Temperature increase error (tank heater)	Temperature sensor on the tank heater is outside the range.	
10190	Temperature Upper Limit Error (RET tank)	Temperature sensor on the RET tank is outside the specified range.	
10191	Temperature increase error (RET tank heater)	Temperature sensor on the RET tank heater is outside the range.	
11000	Waste Chamber 1 Full	WC1 full condition detected	Touch [RESTORE] to drain the waste chamber again. Check for clog or break in the drain fluid path.
11001	Waste Chamber 2 Full	WC2 full condition detected	After removing the clog, do cleaning. **Touch [RESTORE] to do the following operation.** • Eject the rack which is being measured, drain the waste chambers and clean.
18000	Mixing cover off	Mixing cover is detached.	Attach the mixing cover. Touch [RESTORE] to return the analyzer to measurement condition. **Touch [RESTORE] to do the following operation.** • When measuring or cleaning: Do cleaning, initialize the analyzer actuator, and eject the rack which is being measured. • When not measuring or cleaning: Initialize the analyzer actuator.

3-7. User Message [2xxxx]

When a user message [2xxxx] is detected, the status indicator lights in orange. Also, the Information screen opens automatically.

NOTE: A user message [2xxxx] indicates an error of moderate severity and it stops operation.

Code	Error	Cause	Countermeasures or Recovery Operation
21000	Unexpected shutdown occurred	Without touching the power switch, the analyzer shut down due to power interruption or other reason.	Touch [RESTORE] to initialize the drive part of the analyzer. Do cleaning if power interruption during measurement or cleaning is suspected. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator, and eject the rack.
21050	WBC Detection Hole Clog	WBC aperture cap clog is detected.	Touch [RESTORE] to do cleaning. If this does not solve the problem, do protein cleaning and the clean the aperture cap according to Section 6 and follow the procedure to clean the aperture cap. **Touch [RESTORE] to do the following operation.** • Do cleaning and initialize the analyzer actuator.
21051	RBC Detection Hole Clog	RBC aperture cap clog is detected.	
21052	WBC noise	WBC measurement noise is detected.	
21053	RBC noise	RBC measurement noise is detected.	
21054	Short Sample	Short sample is suspected.	Touch [RESTORE] to initialize the drive part of the analyzer. Measure the sample in whole blood mode. If the problem is not solved, measure the sample in predilution mode.
21055	Multiple samples without work orders were detected	Multiple samples without work orders were detected and the analyzer stopped measurement.	Touch [RESTORE] to initialize the drive part of the analyzer. Check whether there are work orders on the Order window. To measure samples without work orders, set [Action if order failure] to [Default order] on the System window.
21110	Analyzer internal draining status	Analyzer internal draining operation was done and the analyzer fluid path was drained.	After moving or storing the analyzer, touch [RESTORE] to do initial priming. **Touch [RESTORE] to do the following operation.** • Initial priming
21200	Maintenance part replacement status	The fluid path of the affected part was drained during [Replace Sampling Needle], [Replace Venting Needle] or [Replace Filter] operation.	Follow the procedure in Section 6 to complete replacement of the parts, then touch [RESTORE]. **Touch [RESTORE] to do the following operation.** • Prime the fluid path of the related maintenance parts.
21800	Autoloader No Response (ACK)	Autoloader communication error was occurred.	Touch [RESTORE] to initialize the drive part of the analyzer. Manually remove any rack from inside the autoloader. Confirm that the autoloader operates normally. Section 7-3-10 (p. 7-43) **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator. • Stop measurement operation.
21801	Autoloader No Response (Order Response)	Autoloader communication error was occurred.	

Code	Error	Cause	Countermeasures or Recovery Operation
23000	HEMOLYNAC 310 priming error	Out of the HEMOLYNAC•310 lysing reagent was detected.	Touch [RESTORE] to return the analyzer to standby. Replace the reagent. **Touch [RESTORE] to do the following operation.** • The indicator lamp lights green.
23001	HEMOLYNAC 510 priming error	Out of the HEMOLYNAC•510 lysing reagent was detected.	
23002	CLEANAC 710 priming error	Out of the CLEANAC•710 detergent was detected.	
23003	ISOTONAC 3/4 priming error	Out of the ISOTONAC•3/4 diluent was detected.	
23004	Reticulonac priming error	Out of the Reticulonac stain was detected.	
23030	Waste Bottle Full	The JW-910W waste fluid sensor (option) detected waste container full.	Touch [RESTORE] to return the analyzer to standby. Replace the waste container. **Touch [RESTORE] to do the following operation.** • The indicator lamp lights green.
23031	Waste bottle replacement period	Waste fluid amount was exceeded warning value.	
26100	Self check not done	• After login, measurement was started without self check. • More than 24 hours are elapsed between self check and measurement start.	Touch [RESTORE] to return the analyzer to standby. Do self check. **Touch [RESTORE] to do the following operation.** • The indicator lamp lights green.
27000	Consumable Parts (Sampling Needle)	Sampling needle was used more than 18,000 times.	Touch [RESTORE] to return the analyzer to standby. Follow the procedure in Section 6 to replace the part. **Touch [RESTORE] to do the following operation.** • The indicator lamp lights green.
27001	Consumable Parts (Venting Needle)	Venting needle was used more than 18,000 times.	
27002	Consumable Parts (Filter)	Filter was used more than 18,000 times.	
28001	AL Detection Sensor Error (BU)	The following sensors in the barcode reader unit detected abnormalities at the same time: • No sampling tube detected sensor, sampling tube release sensor	Touch [RESTORE] to initialize the drive part of the analyzer. Manually remove any rack from inside the autoloader. Check the detection status of the related sensor. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and release the rack.
28002	AL Detection Sensor Error (AU)	The following sensors in the agitator unit detected abnormalities at the same time: • Agitator rotate down, agitator rotate up • Agitator arm up, agitator arm down	
28003	AL Detection Sensor Error (FU)	The following sensors in the feed unit detected abnormalities at the same time: • Feed axle tab eject/tab return • Feed conveyor position 1, 2, 3, 4, 5, 6, end point	

Code	Error	Cause	Countermeasures or Recovery Operation
28004	AL Detection Sensor Error (GU)	The following sensors in the pierce guide unit detected abnormalities at the same time: • Pierce guide fixed/release	Touch [RESTORE] to initialize the drive part of the analyzer. Manually remove any rack from inside the autoloader. Check the detection status of the related sensor. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and release the rack.
28005	AL Detection Sensor Error (TU)	The following sensors in the terminal unit detected abnormalities at the same time: • Rack eject tab eject/tab return	
28010	Tube check arm ascend failure	The following sensors did not detect the operation: • Sampling tube release	Touch [RESTORE] to initialize the drive part of the analyzer. Manually remove any rack from inside the autoloader. Check the detection status of the related sensor. Check the operation of the related mechanism. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and release the rack.
28011	Agitator grip open failure	The following sensors did not detect the operation: • Agitator grip release	
28012	Agitator arm descent failure	The following sensors did not detect the operation: • Agitator arm lowering	
28013	Agitator grip down failure	The following sensors did not detect the operation: • Agitator rotating down	
28014	Blood sample tube failed to release from pierce guide	The following sensors did not detect the operation: • Pierce guide release	
28015	Discharge tab return failure	The following sensors did not detect the operation: • Rack eject tab return	
28016	Feed conveyor tab return failure	The following sensors did not detect the operation: • Feed axle tab return operation	
28017	Feed conveyor failed to go to start position	The following sensors did not detect the operation: • Feed conveyor position 1	
28021	Agitator arm ascend failure	The following sensors did not detect the operation: • Agitator arm raising	Touch [RESTORE] to initialize the drive part of the analyzer. Manually remove any rack from inside the autoloader. Check the detection status of the related sensor. Check the operation of the related mechanism. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and release the rack.
28022	Agitator grip up failure	The following sensors did not detect the operation: • Agitator raising	
28023	Failure of pierce guide to hold sample tube	The following sensors did not detect the operation: • Pierce guide fixed	
28025	Feed tab eject failure	The following sensors did not detect the operation: • FEED axle tab out	
28026	Feed conveyor failed to move to start position	The following sensors did not detect the operation: • Feed conveyor position 2, 3, 4, 5, 6, end point	

<table>
<tr><th>Code</th><th>Error</th><th>Cause</th><th>Countermeasures or Recovery Operation</th></tr>
<tr><td>28027</td><td>Agitator grip grip failure</td><td>The following sensors did not detect the operation:
• Agitator grip release</td><td>Touch [RESTORE] to initialize the drive part of the analyzer.
Manually remove any rack from inside the autoloader.
Check the detection status of the related sensor.
Check the operation of the related mechanism.
Touch [RESTORE] to do the following operation.
• Initialize the analyzer actuator and release the rack.</td></tr>
<tr><td>28040</td><td>Feed conveyor error (measurement/handling divergence)</td><td>The following transport position information did not match in the check before transport operation:
• Sensor detection position (measurement)
• Control recognition position (management)</td><td rowspan="2">Touch [RESTORE] to initialize the drive part of the analyzer.
Manually remove any rack from inside the autoloader.
Check the feed conveyor position 1, 2, 3, 4, 5, 6, end point sensor detection status.
Check the operation of the feed unit.
Touch [RESTORE] to do the following operation.
• Initialize the analyzer actuator and release the rack.</td></tr>
<tr><td>28041</td><td>Feed conveyor error (measurement/target divergence)</td><td>The following conveyor position information did not match in the check after conveyor operation:
• Sensor detection position (measurement)
• Conveyor target position (target)</td></tr>
<tr><td>28042</td><td>Feed conveyor abnormality (target out of control)</td><td>A conveyor target position outside the conveyor range was set.</td><td>Touch [RESTORE] to initialize the drive part of the analyzer.
Manually remove any rack from inside the autoloader.
Restart the analyzer.
Touch [RESTORE] to do the following operation.
• Initialize the analyzer actuator and release the rack.</td></tr>
<tr><td>28050</td><td>Autoloader BCR Abnormality (Device)</td><td rowspan="2">An error occurred in the barcode reader on the autoloader.</td><td rowspan="4">Touch [RESTORE] to initialize the drive part of the analyzer.
Manually remove any rack from inside the autoloader.
Confirm that the autoloader operates normally.
Section 7-3-10 (p. 7-43)
Touch [RESTORE] to do the following operation.
• Initialize the analyzer actuator and release the rack.</td></tr>
<tr><td>28051</td><td>Autoloader BCR Abnormality (No Response)</td></tr>
<tr><td>28100</td><td>Autoloader Abnormality (WDT)</td><td rowspan="2">An error occurred in the autoloader.</td></tr>
<tr><td>28101</td><td>Autoloader Abnormality (Device)</td></tr>
</table>

Code	Error	Cause	Countermeasures or Recovery Operation
28900	AL unexpected catch	System error	Touch [RESTORE] to return the analyzer to standby. Restart the analyzer. **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator and release the rack.
28901			
28902			
28903			
28904			
28905			
28906			
28907			
28908			
28909			
28910			
28911			
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28914			
28915			
28916			
28917			
28918			

3-8. User Message [3xxxx]

When a user message [3xxxx] is detected, the status indicator lights in orange.

Also, the Information screen opens automatically.

When recovering, it resumes operation.

Code	Error	Cause	Countermeasures or Recovery Operation
31001	Self check stopped	The self check was stopped.	Touch [RESTORE] to initialize the drive part of the analyzer. Run the self check again. Section 7-2-6 (p. 7-13) **Touch [RESTORE] to do the following operation.** • Initialize the analyzer actuator.
38010	Feed conveyor entrance full	Rack on the conveyor line does not return to the autoloader entrance.	Remove the rack from the autoloader entrance. Touch [RESTORE] to restart measurement. **Touch [RESTORE] to do the following operation.** • For the full rack, retry operation to return a suspended rack, then restart measurement operation.
38011	Feed conveyor exit full	Rack on the conveyor line does not exit from the autoloader exit.	Remove the rack from the autoloader exit. Touch [RESTORE] to restart measurement. **Touch [RESTORE] to do the following operation.** • For the full rack, retry operation to eject a suspended rack, then restart measurement operation.
38012	Check feed conveyor exit	A foreign object (other than the rack) may be in the autoloader exit.	Check that there is no foreign object in the autoloader exit. Touch [RESTORE] to restart measurement. **Touch [RESTORE] to do the following operation.** • Stop measurement operation.
38020	Check feed conveyor entrance	Possibility that a rack or other object was manually inserted into the conveyor line from the autoloader entrance side.	Check there is no rack or foreign object in the conveyor line. If there is a rack or foreign object in the conveyor line, remove it. Touch [RESTORE] to restart measurement. **Touch [RESTORE] to do the following operation.** • Restart measurement operation.
38021	Check feed conveyor exit	Possibility that a rack or other object was manually inserted into the conveyor line from the autoloader exit side.	Check there is no rack or foreign object in the conveyor line. If there is a rack or foreign object in the conveyor line, remove it. Touch [RESTORE] to restart measurement. **Touch [RESTORE] to do the following operation.** • Restart measurement operation.
38022	Rack could not be conveyed	• Feed conveyor operated but the rack was not held. • Feed conveyor (conveyor first time) was done but the incoming sensor continually detected it.	Put the remaining rack in the autoloader entrance again. Touch [RESTORE] to restart measurement. **Touch [RESTORE] to do the following operation.** • If there is a rack which is being auto measured, restart measurement.

3-9. User Information [4xxxx]

User Information [4xxxx] error only aims to inform to the user and no operation is performed along with restoring operation. Marking errors as read is only performed.

Code	Error	Cause	Countermeasures or Recovery Operation
40390	HEMOLYNAC 310 remaining	At the start of leak check, the fluid sensor detected fluid	• When the analyzer has not been drained: Use the RESET switch to stop the leak check. Drain the analyzer then restart the leak check. • When the analyzer has been drained: The fluid sensor incorrectly recognized fluid drops as remaining fluid. The leak check can continue.
40391	HEMOLYNAC 510 remaining		
40392	CLEANAC 710 remaining		
43010	Reagent Expiration (ISOTONAC 3/4)	• Attempted to register expired reagent • Registered reagent exceeded the expiration period	Replace with reagent which is within the expiration period and register it.
43011	Reagent Expiration (HEMOLYNAC 310)		
43012	Reagent Expiration (HEMOLYNAC 510)		
43013	Reagent Expiration (CLEANAC 710)		
43014	Reagent Expiration (Reticulonac)		
43020	ISOTONAC 3/4 remaining amount warning	Remaining reagent is dropped below the warning level.	Check the remaining reagent level. If necessary, replace it with new reagent and register it.
43021	HEMOLYNAC 310 remaining amount warning		
43022	HEMOLYNAC 510 remaining amount warning		
43023	CLEANAC 710 remaining amount warning		
43024	Reticulonac remaining amount warning		
44000	HGB Diluent temperature low	Diluent temperature is low.	Keep the room temperature at 15 to 30°C (59 to 86°F). If there is a temperature sensor abnormality, replace the board. If there is a temperature sensor cable wire break, replace the cable.
44001	HGB Diluent temperature high	Diluent temperature is high.	
44002	HGB LED temperature low	Room temperature is low.	
44003	HGB LED temperature high	Room temperature is high.	
44004	SS LED temperature low	Room temperature is low.	
44005	SS LED temperature high	Room temperature is high.	
44006	Chassis internal temperature low	Chassis temperature is low.	
44007	Chassis internal temperature high	Chassis temperature is high.	
44010	RET LD temperature low	RET laser temperature is low.	
44011	RET LD temperature high	RET laser temperature is high.	
44012	RET MO temperature low	RET unit internal temperature is low.	
44013	RET MO temperature high	RET unit internal temperature is high.	

Code	Error	Cause	Countermeasures or Recovery Operation
46300	Protein cleaning period	More than 25 days since the last protein cleaning. (Cleaning must be done within 35 days after the last protein cleaning.)	Do protein cleaning. • Section 7-2-2-2 (p. 7-6) • Advanced Settings Section 8-1-18 (p. 8-16)
46802	Order request failure	Connection timed out.	Check the settings of the IP address and the ports. Section 8-1-12 (p. 8-12) And check the network environment. Section 7-3-9 (p. 7-42)
46803	Order request failure	Acceptance timed out.	
46805	Order request failure	Connection failed.	Try to communicate with the inspection system again. If an error occurs frequently, check the network environment.
46806	Order request failure	Acceptance failed.	
46832	Order reception failure	Connection timed out.	Check the settings of the IP address and the ports. Section 8-1-11 (p. 8-10) And check the network environment. Section 7-3-9 (p. 7-42)
46835	Order reception failure	Connection failed.	Try to communicate with the inspection system again. If an error occurs frequently, check the network environment.
46836	Order reception failure	Acceptance failed.	
46837	Order reception failure	Error in received message	Recived message from the inspection system has an error. Try to communicate with the inspection system again.
46862	Measurement results sending failure	Connection timed out.	Check the settings of the IP address and the ports. Section 8-1-12 (p. 8-12) And check the network environment. Section 7-3-9 (p. 7-42)
46863	Measurement results sending failure	Acceptance timed out.	
46865	Measurement results sending failure	Connection failed.	Try to communicate with the inspection system again. If an error occurs frequently, check the network environment.
46866	Measurement results sending failure	Acceptance failed.	
47000	Part Replacement Period (Sampling Needle)	Part used more times than the maximum number of safe uses.	Replace the sampling needle and reset the operation history. Section 7-5-1-2 (p. 7-84) Section 7-5-1-8 (p. 7-105)
47001	Part Replacement Period (Venting Needle)		Replace the venting needle and reset the operation history. Section 7-5-1-3 (p. 7-91) Section 7-5-1-8 (p. 7-105)
47002	Part Replacement Period (Filter)		Replace the filter and reset the operation history. Section 7-5-1-4 (p. 7-94) Section 7-5-1-8 (p. 7-105)
47003	HGB Voltage Drop	Blank time LED ON voltage is less than the specified value.	Readjust the HGB voltage sensitivity.
47004	HGB Voltage Increase	Blank time LED ON voltage is more than the specified value.	

Code	Error	Cause	Countermeasures or Recovery Operation
47005	SS Voltage Drop	Blank time LED ON voltage is less than the specified value.	Readjust the SS voltage sensitivity.
47006	SS Voltage Increase	Blank time LED ON voltage is more than the specified value.	
47007	Background increase	Background measurement value exceeds specifications of the analyzer.	Redo background measurement. If this error occurs frequently, do cleaning. Section 7-2-2 (p. 7-5)
47610	Check measurement data	[WBC Noise] message is in measurement results.	Check the measurement message and take the countermeasure. Section 3-3 (p. 3-4)
47611	Check measurement data	[WBC Aperture Clog] message is in measurement results.	
47612	Check measurement data	[WBC Time-Series Message] is in measurement results.	
47620	Check measurement data	[RBC Noise] message is in measurement results.	
47621	Check measurement data	[RBC Aperture Clog] message is in measurement results.	
47622	Check measurement data	[RBC Time-Series Message] is in measurement results.	
47623	Check measurement data	[PLT Time-Series Message] is in measurement results.	
47624	Check measurement data	[Detected small particles] message is in measurement results.	
47630	Check measurement data	[Short Sample] message is in measurement results.	
47640	Check measurement data	[OpticalCount Message] is in measurement results.	
47641	Check measurement data	[OpticalCount Low] message is in measurement results.	
47642	Check measurement data	[SD sensitivity drop] message is in measurement results.	
47880	Check measurement data	[Ret OpticalCount Message] is in measurement results.	Check the measurement data and perform a measurement again. If an error occurs frequently, clean the RET flow cell. Section 7-2-2-5 (p. 7-9)
47881	Check measurement data	[Short Sample] message is in measurement results.	Short sample is suspected. Check the measurement data and perform a measurement again.
47882	Check measurement data	[Ret Opt sensitivity drop] message is in measurement results.	Check the measurement data and perform a measurement again. If an error occurs frequently, clean the RET flow cell. Section 7-2-2-5 (p. 7-9)
47883	Check measurement data	[Ret Bubble Message] is in measurement results.	
47884	Check measurement data	[Ret Optical Count Low Message] is in measurement results.	Classification cannot be done as RET optical count is low.
48000	No rack	Rack could not be detected when auto measurement started.	Position the rack and restart auto measurement.

Code	Error	Cause	Countermeasures or Recovery Operation
48030	Check sampling tube	A sampling tube may be remaining inside the analyzer because it was inside the agitator during auto measurement before an analyzer power interruption.	Check if there is a sample tube remaining in the agitator unit. If there is a sample tube in the agitator unit, shut down the analyzer, remove the mixing cover, and manually remove the tube. 1) Turn off the analyzer. 2) Remove the mixing cover. 3) Manually remove the tube and restore the mixing cover.
48100	Sample tube barcode reading abnormality	The barcode on the sample tube cannot be read (except the barcode undetected).	If the barcode on the sample tube cannot be read, the measurement cannot be performed following the system setting. If the sample tube is not measured, check the barcode and remeasure the sample. When this occurs frequently check the following points. • Barcode specification is supported by the analyzer. • Barcode sample ID is 20 digits.
48101	Sample tube barcode multiple readings	Several barcode are detected when the barcode on the sample tube is read.	If the several barcode are read from the sample tube, the measurement cannot be performed following the system setting. If the sample tube is not measured, check the barcode and remeasure the sample.
48110	Rack barcode reading abnormality	The barcode on the rack cannot be read (except the barcode undetected).	If the barcode on the rack is not read, the sample tubes in the rack cannot be measured. Check if the barcode on the rack is not diry or peeled off and remeasure the sample. When this occurs frequently check the following points. • There are scratches or dirt on the rack bar code label. • Rack bar code label is peeling off.

3-10. Troubleshooting

The following tables list troubles and their causes and countermeasures.

After doing the countermeasure and after the trouble disappears, confirm that the analyzer operates normally then restart the analyzer.

No	Problem	Possible Cause	Countermeasures or Recovery Operation
1	• Power does not turn on. • Power was lost during operation. (Main power lamp does not light.)	Main power is turned off on the rear panel of the analyzer.	Turn on the main power on the rear panel of the analyzer. After the main power lamp lights, press the power switch on the front panel of the analyzer. If the power shuts off during operation, a blood sample may remain in the analyzer. Therefore, clean the inside of the analyzer after the power is restored. Section 7-2-2 (p. 7-5)
		Power cord is disconnected.	Check that the power cord is securely connected and turn on the power. If the power shuts off during operation, a blood sample may remain in the analyzer. Therefore, clean the inside of the analyzer after the power is restored. Section 7-2-2 (p. 7-5)
2	• Noise during measurement. • High background noise.	Bad grounding	Check that the ground wire is securely connected.
		Nearby device is generating noise.	Connect the noise generating device to a separate power outlet.
		Noise from the power source line	Connect the analyzer to a different power outlet.
		The front cover is open and noise is affecting the measurement unit.	Close the front cover.
		Diluent is dirty.	Replace the diluent.
		Filter is dirty.	Filter is dirty Replace the filter. Section 7-5-1-4 (p. 7-94)
		Sample cup is dirty.	Do protein cleaning. Section 7-2-2-2 (p. 7-6)
		Aperture cap is dirty.	• Remove clogs in the fluid path. Section 7-2-3 (p. 7-10) • Do protein cleaning. Section 7-2-2-2 (p. 7-6) • If protein cleaning does not improve the problem, clean the aperture cap. Section 7-6-1-9 (p. 7-113)
		Poor contact of external electrode	Securely connect the external electrode.
		Inside fluid path is dirty.	Clean the fluid path. Section 7-2-2 (p. 7-5)
			Do protein cleaning. Section 7-2-2-2 (p. 7-6)

No	Problem	Possible Cause	Countermeasures or Recovery Operation
3	Bad reproducibility of cell count values.	Sample stirring is insufficient.	Carefully agitate the sample tube, being careful to preventing bubbles.
		Sample cup is dirty.	Do protein cleaning. Section 7-2-2-2 (p. 7-6)
		Aperture cap is dirty.	• Remove clogs in the fluid path. Section 7-2-3 (p. 7-10) • Do protein cleaning. Section 7-2-2-2 (p. 7-6) • If protein cleaning does not improve the problem, clean the aperture cap. Section 7-6-1-9 (p. 7-113)
		High background noise	See the second countermeasure above on this page.
4	Water leaks from inside the analyzer.	Solenoid valve is clogged.	Check the electromagnetic valve. Section 7-8-2 (p. 7-121)
		Filter is clogged.	Replace the filter. Section 7-5-1-4 (p. 7-94)
5	HGB reproducibility is bad.	HGB cell is durty.	Do protein cleaning. Section 7-2-2-2 (p. 7-6)
6	Cannot print from printer.	No recording paper	Load recording paper.
		Paper jam	Remove the jammed paper.
		Abnormality in electrical circuit	Press the RESET switch (⁄⁄). If it does not return to the correct operation, turn off the power, wait 10 seconds, and turn the power on again.
7	Actual touched position on touch panel does not match displayed touch position. The touch screen keys do not function.	Touch panel needs adjustment.	Adjust the touch screen. Section 7-3-8 (p. 7-41)
8	Date and time incorrect.	Setting error	Correctly set the date and time. Data Management and Setting Guide: Section 5 “System Settings”
9	After correcting the time, it turns back to the incorrect time again.	Internal battery lifetime expired	Replace the DATA PROCESSING UNIT (PC-920W). Section 4-4-3 (p. 4-18)
10	• WBC distributions extend outside their areas on the scattergram. • Frequent WBC flags.	• Bubbles in the flow cell unit • Clog in flow cell unit • Inappropriate sensitivity for the WBC 5-part differential	Do cleaning of the flow cell. Section 7-2-2-3 (p. 7-7) On the calibration screen, adjust the sensitivity. Section 6-4 (p. 6-19) If the symptom is not improved after cleaning the flow cell and adjusting the sensitivity, replace the LASER OPTICAL UNIT (MO-910W). Section 4-4-19 (p. 4-60)

4 Disassembly and Assembly

(Contents continued on next page.)

4-1. Before You Begin

4-1-1. Cautions and Notes

⚠ CAUTION

- Before disassembling, be sure to turn off the power switch.
- Disconnect the power cord and the connection cables.

NOTE
- Before disassembling, perform “4-2. Disassembly Preparation” (p. 4-5) and make sure that the analyzer is turned off.
- Screw looseness or forgetting to fasten screws may cause bad condition of the radio wave, so be sure to tighten the screws.
- After assembling the analyzer, inspect the analyzer according to the check items on the maintenance check sheet at the end of the book.

4-1-2. Required Tools

- Anti-static bench mat
- Anti-static wrist strap
- Flat-blade screwdriver (insulated type, 1.4 mm)
- Phillips screwdriver (insulated type, for M2, M3 and M4 screws)
- Torque driver
- Allen wrench or hexagon keys
- Hexagon socket driver
- Box screw driver (5.0 mm, 5.5 mm, 7mm and 11mm)
- Tweezers
- Short Phillips screwdriver (option)
- Allen wrench or hexagon keys for adjusting the MO-920W (1.5 mm, 2.5 mm)

4-1-2-1. Tightening Torque

To prevent loosening, damage or deformation of screws, tighten the screw with the specified torque.

The following table shows the rated value for each screw.

Nominal Diameter	Standard Torque (N•cm)	Tightening Torque (N•cm)
M2	18.6	15.7 to 20.6
M2.3	29.4	24.5 to 33.3
M2.5	36.7	31.4 to 41.9
M2.6	41.2	36.3 to 47.0
M3	65.7	55.9 to 75.5
M4	152.9	130.3 to 174.4
M5	307.7	263.6 to 351.8
M6	521.4	445.9 to 595.8

Depending on where the screw is used, a different torque may be specified. Use the specified torque.

4-2. Disassembly Preparation

The following procedures absolutely must be performed prior to disassembling the analyzer.

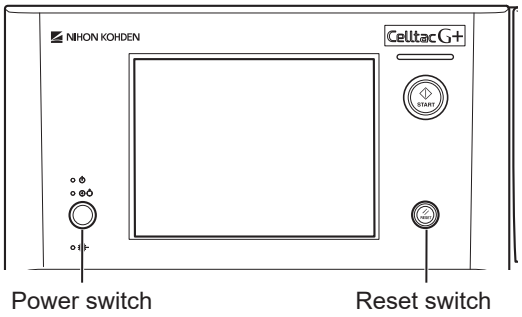
1 Run protein cleaning.

Section 7-2-2-2 (p. 7-6)

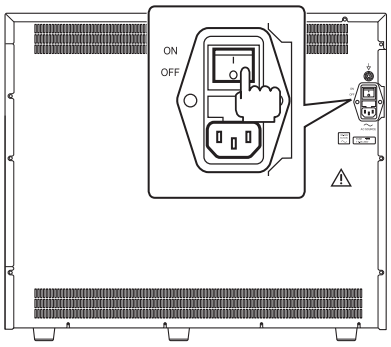
2 Execute internal draining.

Section 7-2-5 (p. 7-12)

3 Press and hold the Reset button and press the power switch to shut down the analyzer.



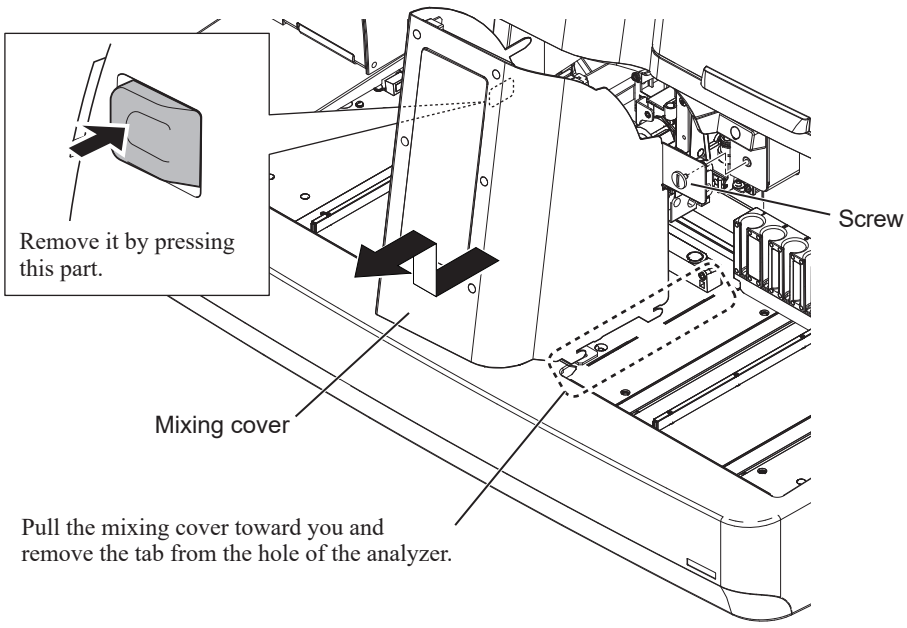
4 Turn off the Main power switch on the rear panel of the analyzer (to ◯) and disconnect the power cord from the wall AC outlet.



4-3. Removing the Exterior

4-3-1. Removing the Mixing Cover

1 Loosen the screw on the front panel of the main unit and remove the mixing cover.



4-3-2. Removing the Front Cover

Preparation

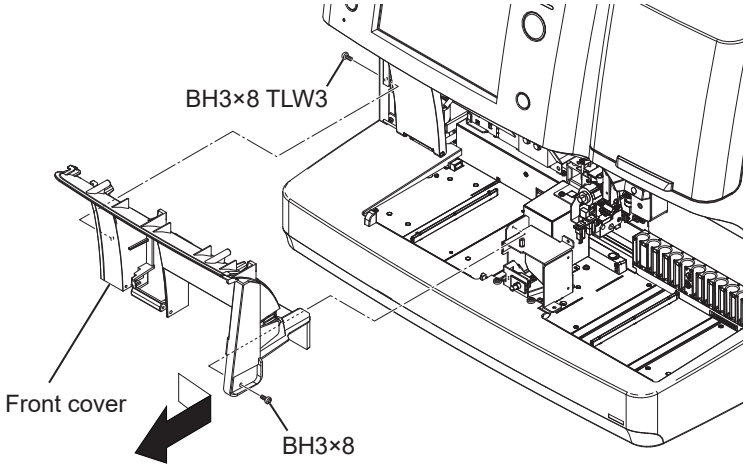
1 Remove the mixing cover.

Section 4-3-1 (p. 4-6)

Procedures

1 Remove the BH3×8 TLW3 screw and BH3×8 screw.

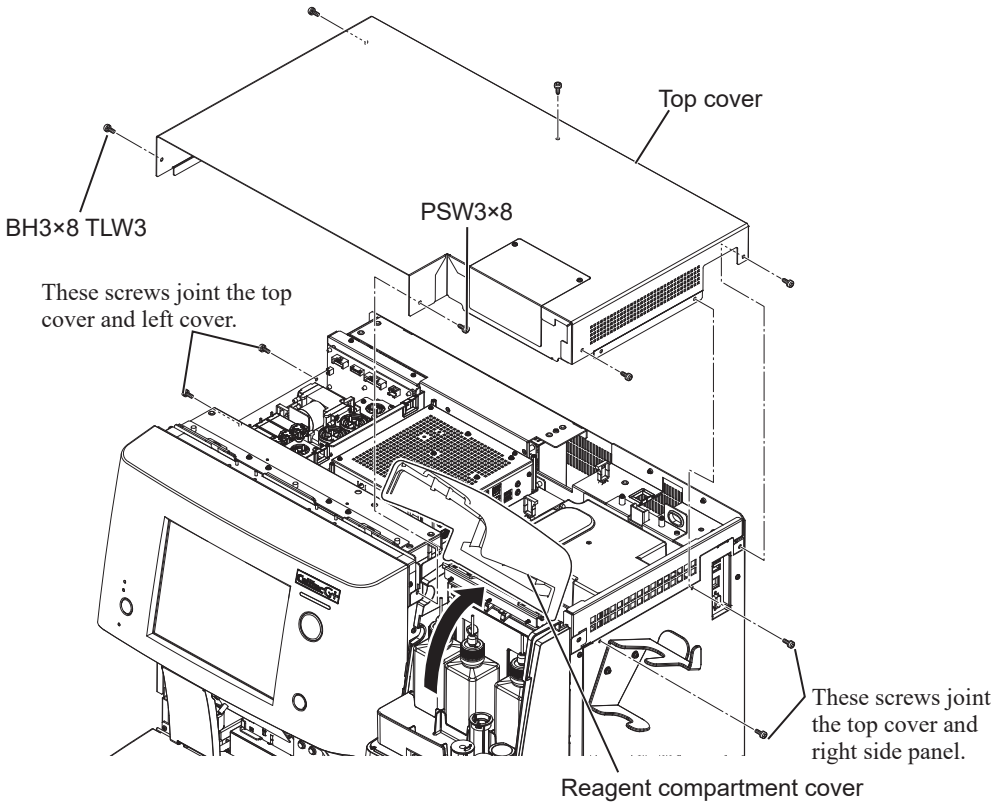
2 Hold the right side of the front cover, move it a little to the right and pull it towards you to remove the front cover.



4-3-3. Removing the Top Cover

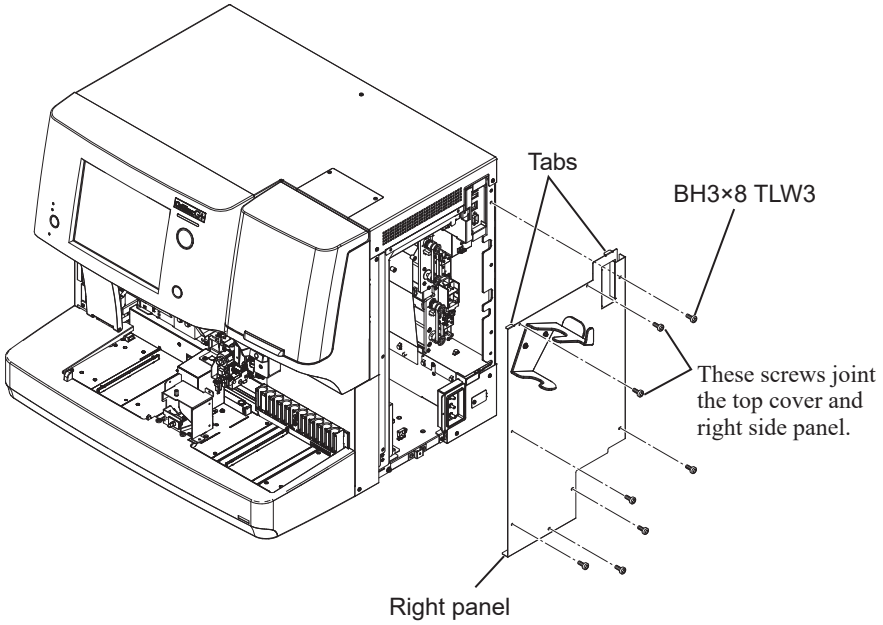
1 Open the reagent compartment cover in the direction of the arrow.

2 Remove the nine BH3×8 TLW3 screws and one PSW3×8 screw and remove the top cover.



4-3-4. Removing the Right Panel

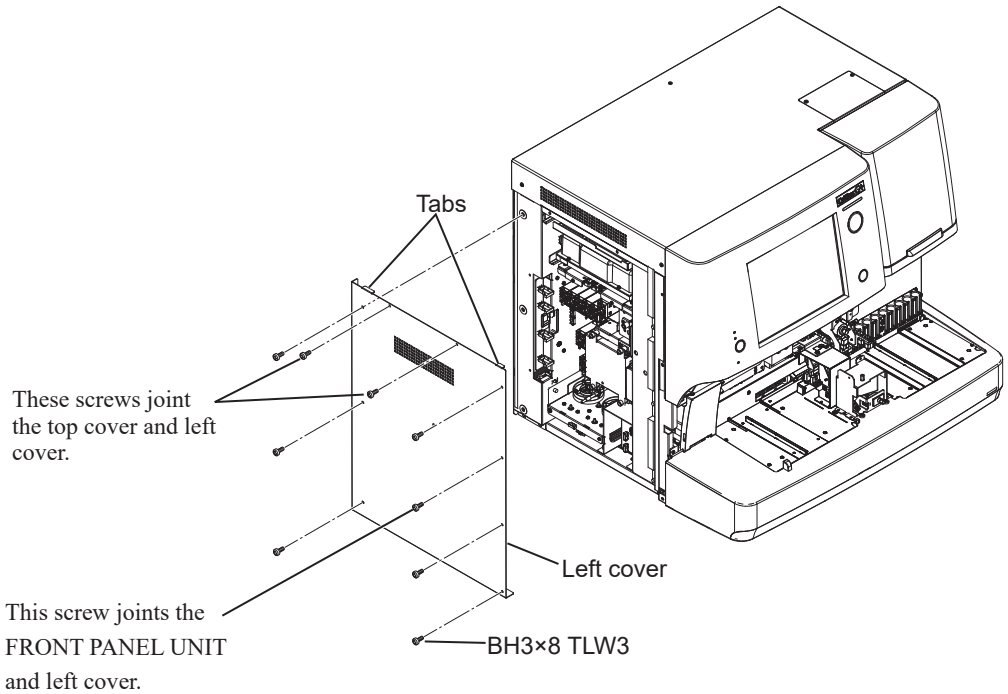
1 Remove the eight BH3×8 TLW3 screws and remove the right panel.



NOTE: Do not drop the right panel while removing the screws.

4-3-5. Removing the Left Cover

1 Remove the nine BH3×8 TLW3 screws and remove the left cover.



NOTE: Do not drop the left cover while removing the screws.

4-3-6. Removing the Rear Panel

Preparation

1 Remove the top cover, right panel and left cover.

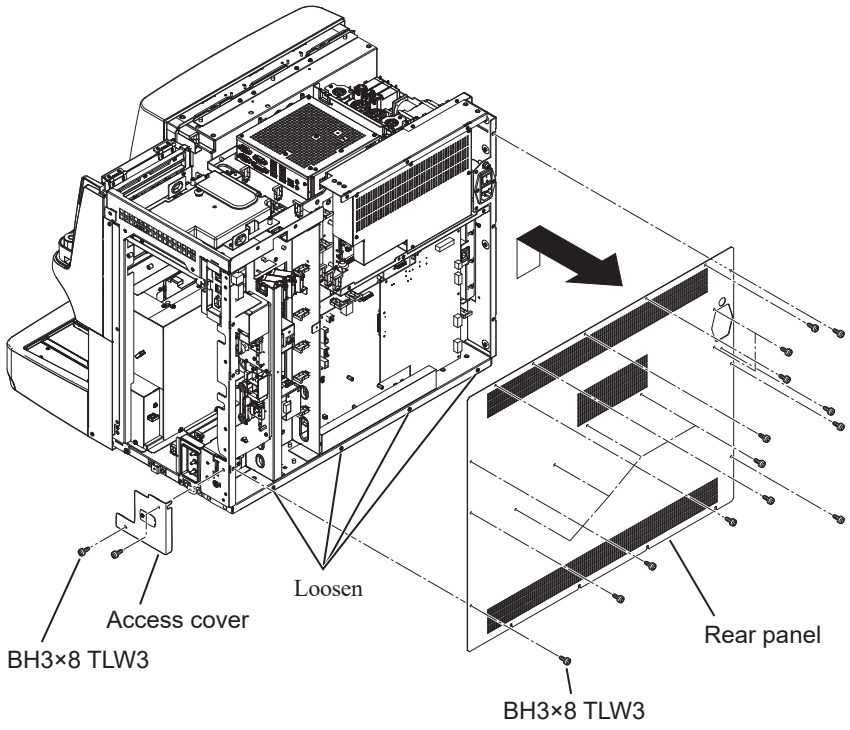
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)

Procedures

1 Remove the two BH3×8 TLW3 screws and remove the access cover.

2 Loosen the four BH3×8 TLW3 screws at the lower side of the rear panel and remove the eighteen BH3×8 TLW3 screws.

3 Remove the rear panel by pulling it slightly upward and sliding it toward you.



4-3-7. Opening the Front Panel Unit

Preparation

1 Remove the mixing cover and front cover.

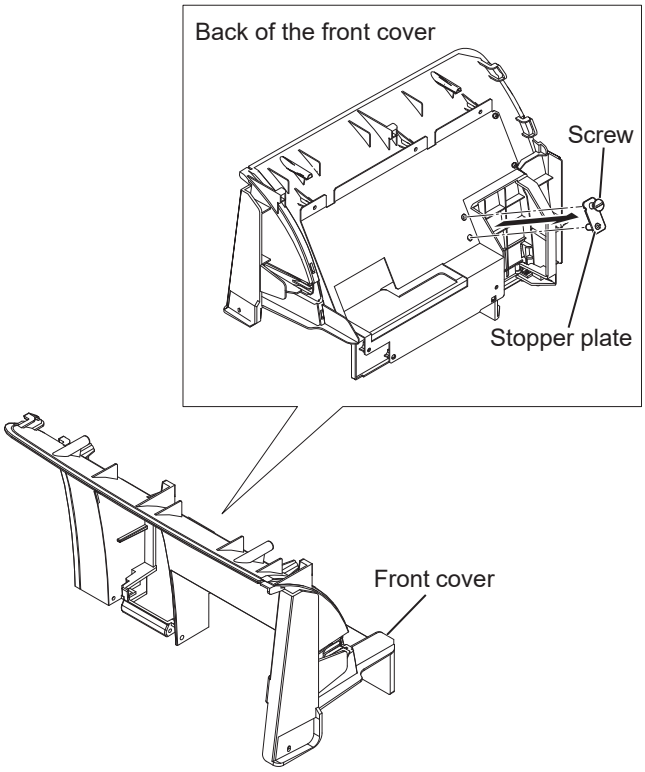
- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)

2 Remove the top cover.

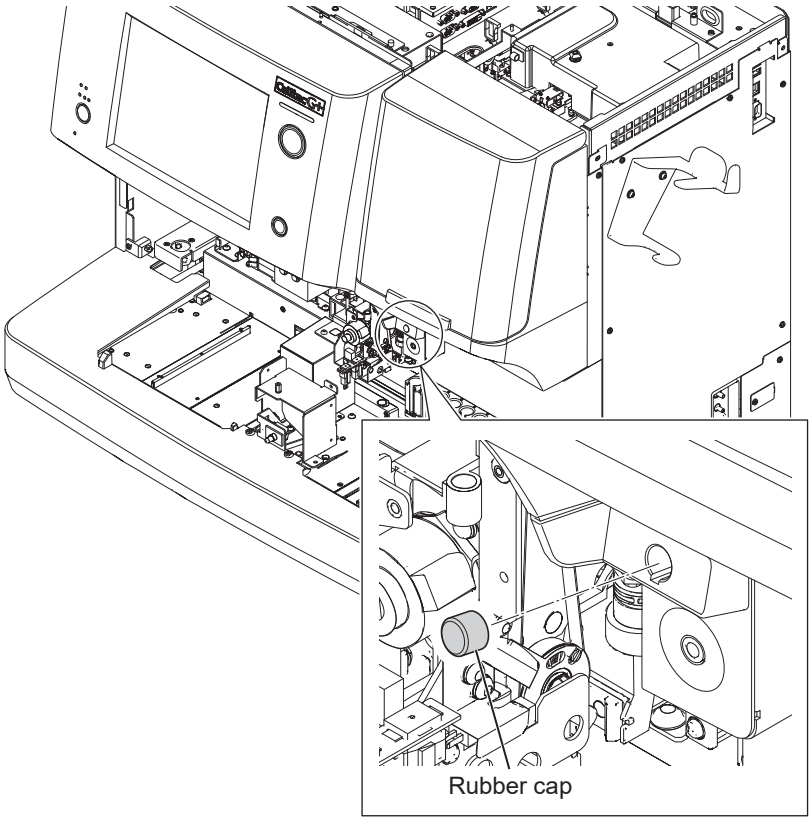
Section 4-3-3 (p. 4-7)

Procedures

1 Loosen the screw from the rear of the removed front cover and remove the stopper plate.



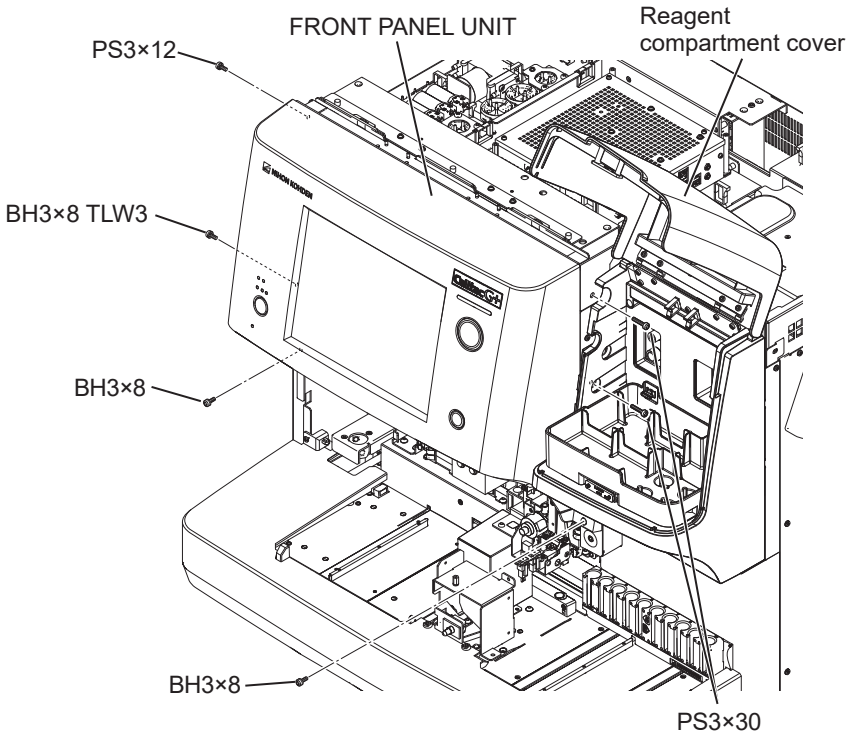
2 Remove the rubber cap.



3 Open the reagent compartment cover and remove the two PS3×30 screws on the reagent compartment side.

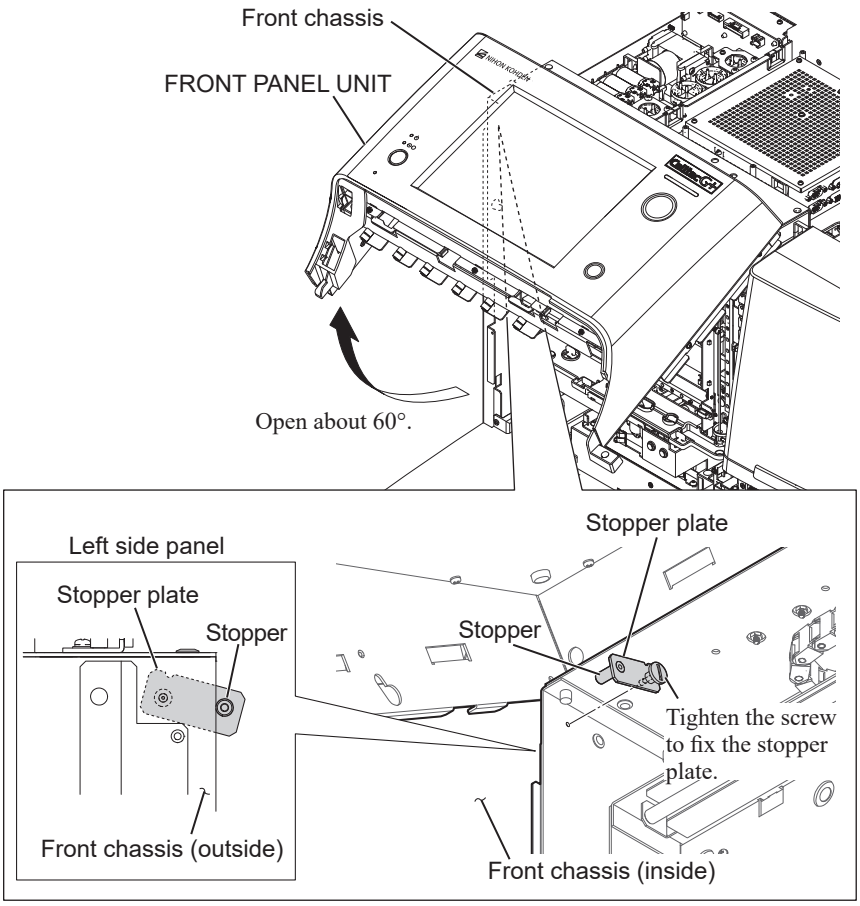
The two screws on the reagent compartment side can easily be removed by using the provided short Phillips screwdriver (option).

4 Remove the two BH3×8 screws, one BH3×8 TLW3 screw and one PS3×12 screw which secure the FRONT PANEL UNIT.

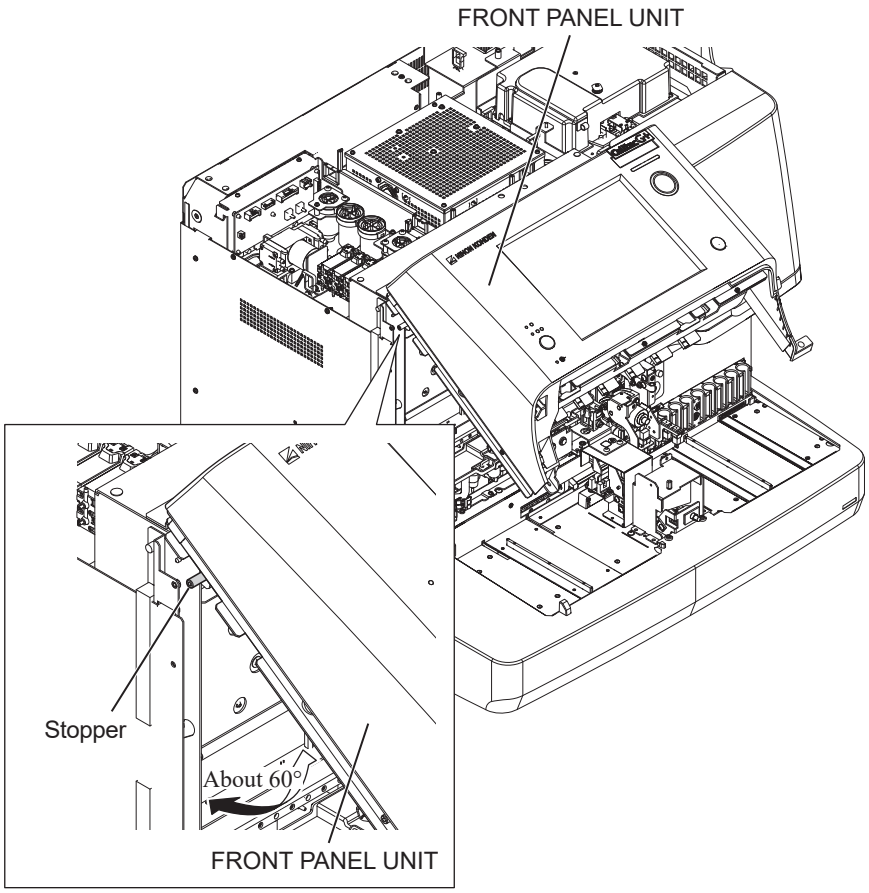


5 Open the FRONT PANEL UNIT about 60° and attach the stopper plate removed in the step **1** to the inside of the front chassis by tightening the screws.

NOTE
- When attaching the stopper plate, attach it while supporting the FRONT PANEL UNIT with hand so that it does not close.
- Do not open the FRONT PANEL UNIT 90° or more. This may damage the analyzer.
- Fix the stopper plate so that stopper section sets outside of the front chassis.

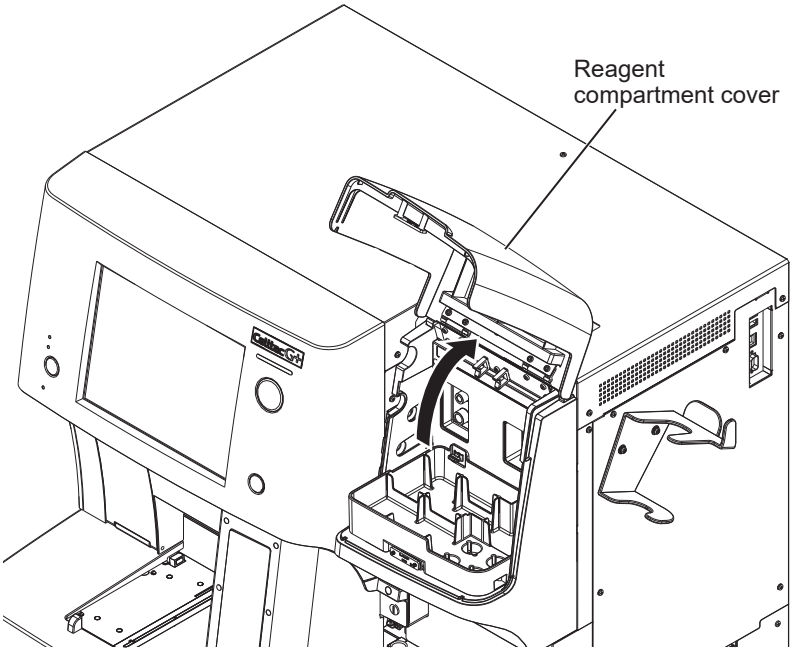


6 Hook the FRONT PANEL UNIT on the stopper of the stopper plate so that it keeps opened about 60°.

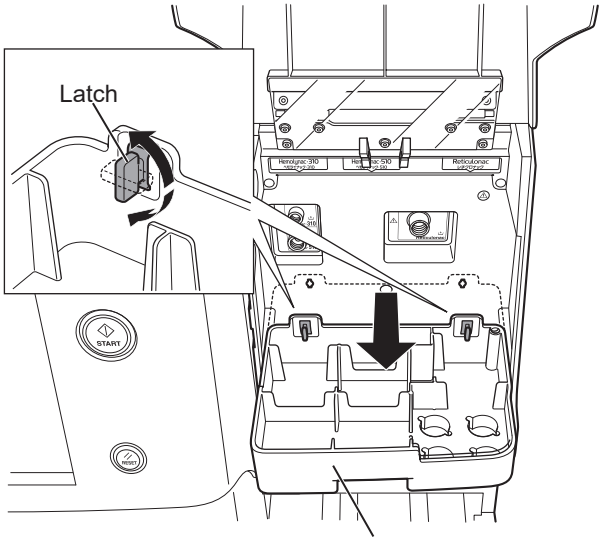


4-3-8. Removing the Reagent Tray

1 Open the reagent compartment cover.



2 Turn the two latches 90° which secure the reagent tray and remove the tray.



Pull the tray forward and lift up the tray to remove it.

4-4. Removing the Units

4-4-1. Removing the Board Hold Plate

Preparation

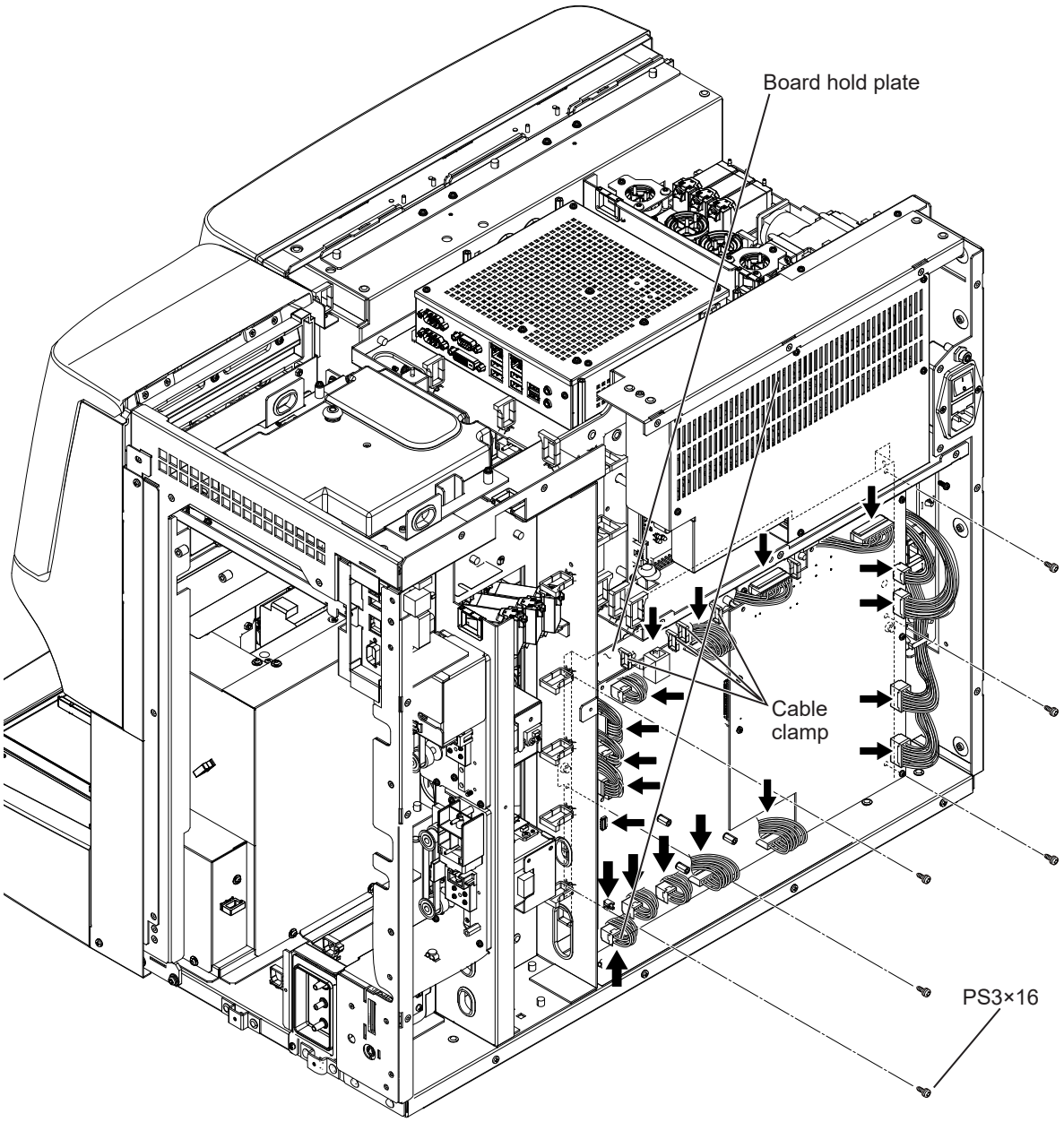
1 Remove the top cover, right panel, left cover and rear panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

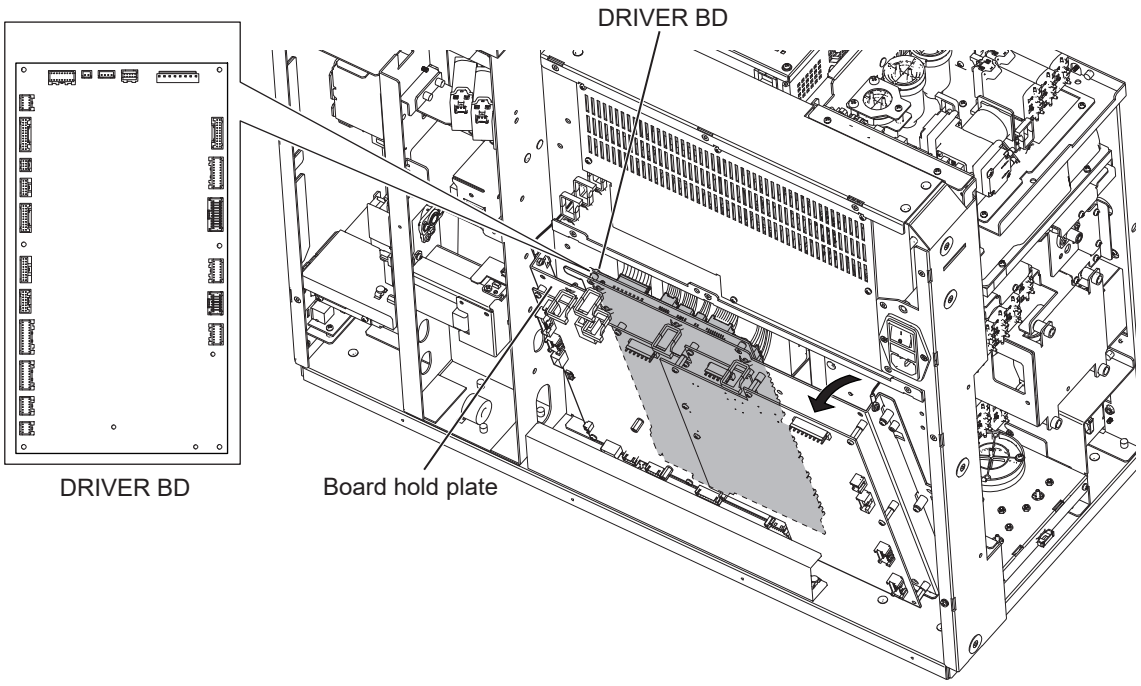
Procedures

1 Unlock the five cable clamps and disconnect nineteen cable connectors from the board (indicated by the arrows).

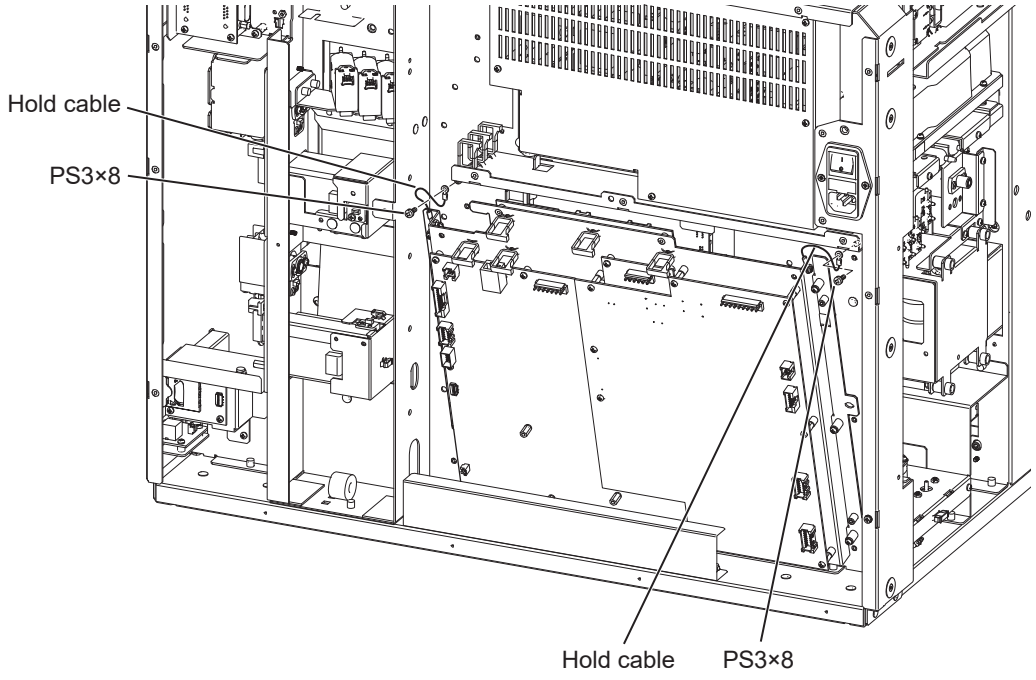
2 Remove the six PS3×16 screws from the board hold plate and disconnect the board hold plate.



3 Pull down the upper part of the board hold plate toward you. Disconnect all cable connectors from the DRIVER BD.



4 Remove the two PS3×8 screws which secures the hold cable connecting the board hold plate and the chassis, and remove the board hold plate.



Assembly

Assemble the board hold plate by following the disassembly procedure in reverse.

NOTE • Do not connect the connectors incorrectly.

• Do not trap the cables.

4-4-2. Removing the 2H317W Switching Power Supply

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

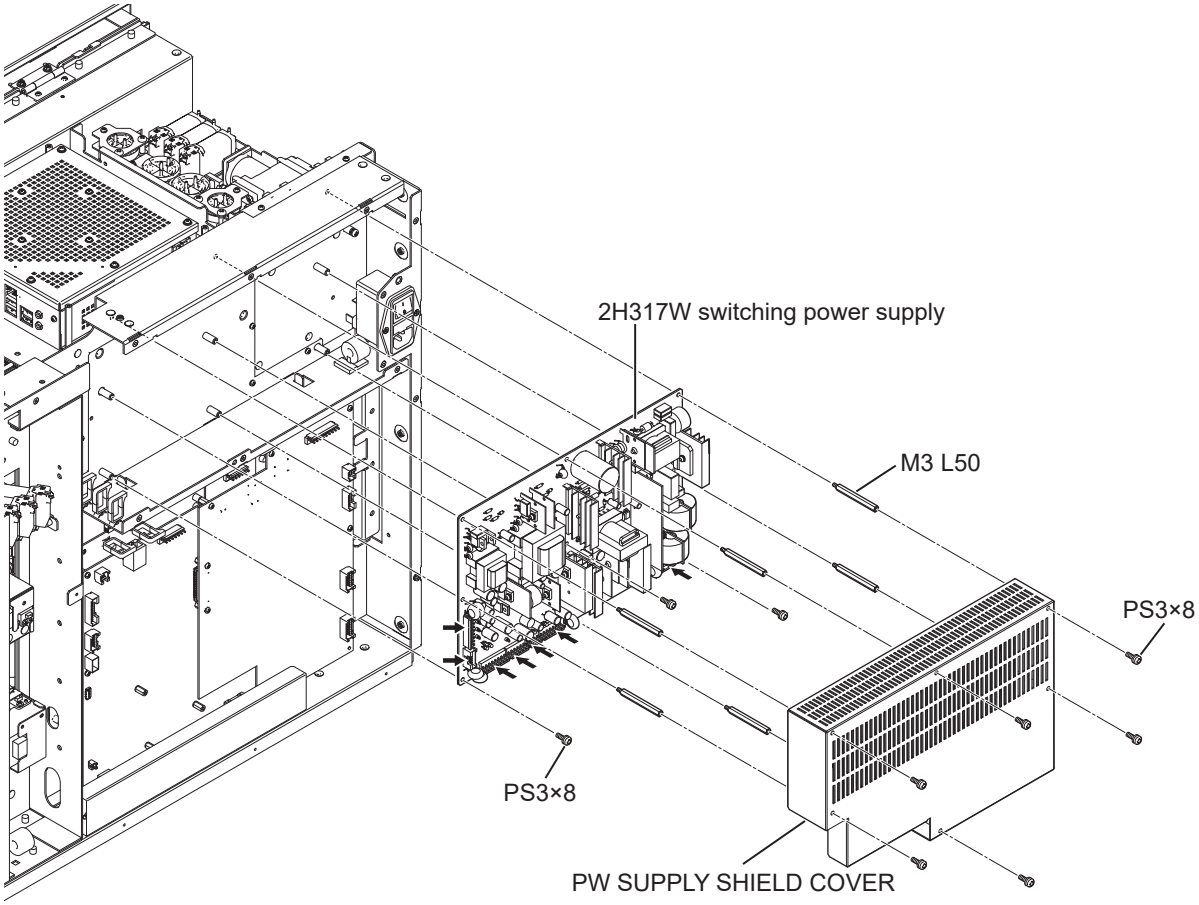
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

Procedures

1 Remove the six PS3×8 screws and remove the PW SUPPLY SHIELD COVER.

2 Remove the six M3 L50 spacer bolts and three PS3×8 screws. Disconnect the seven cable connectors and remove the 2H317W switching power supply.

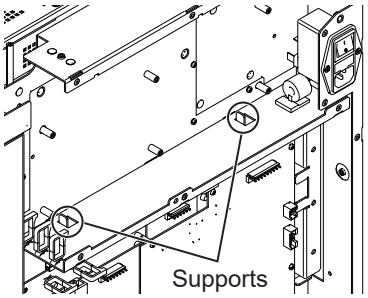
3 Disconnect the seven cable connectors and remove the 2H317W switching power supply.



Assembly

Assemble the 2H317W switching power supply by following the disassembly procedure in reverse.

NOTE: Install the switching power supply by placing it on the following supports.



4-4-3. Removing the DATA PROCESSING UNIT (PC-920W)

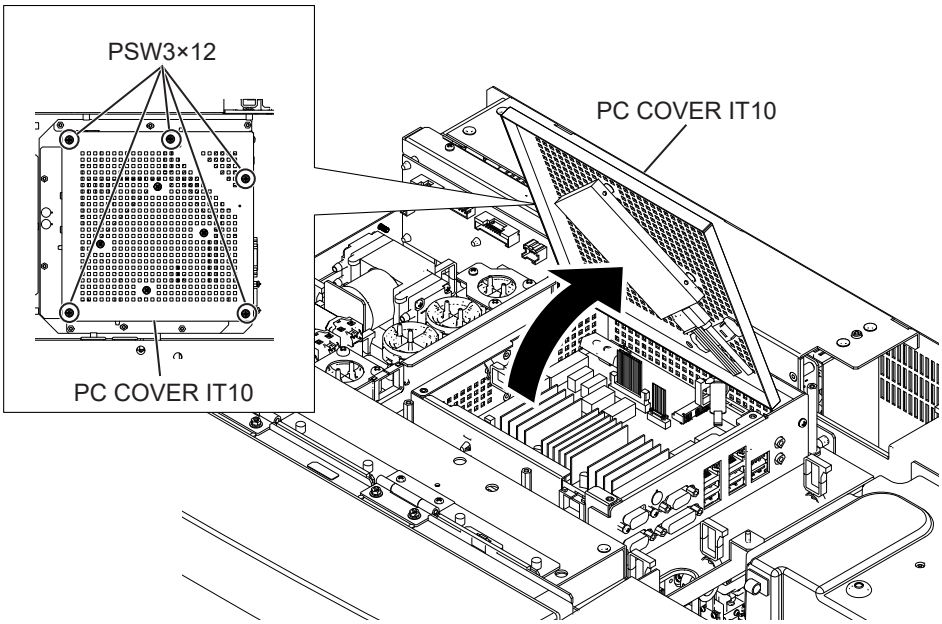
Preparation

1 Remove the top cover.

Section 4-3-3 (p. 4-7)

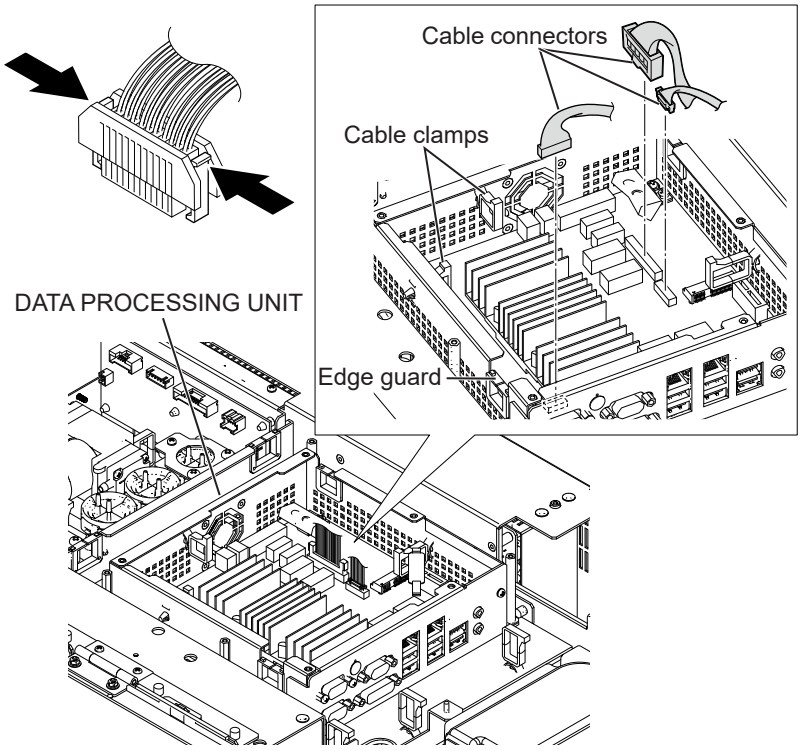
Procedures

1 Remove the five PSW3×12 screws and open and remove the PC COVER IT10 in the direction of the arrow.



2 Disconnect the three cable connectors which connect the DATA PROCESSING UNIT to the FRONT PANEL UNIT.

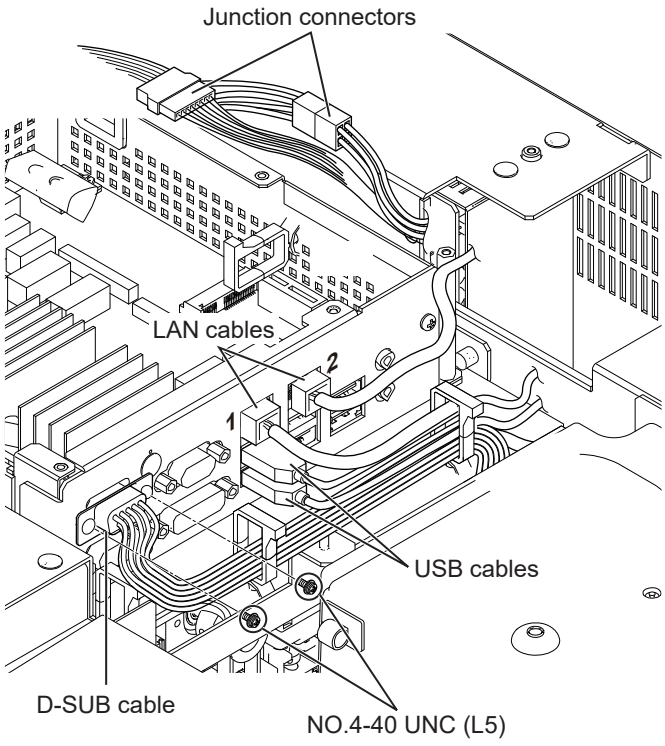
3 Unlock the two cable clamps and disconnect the cables from the edge guard.



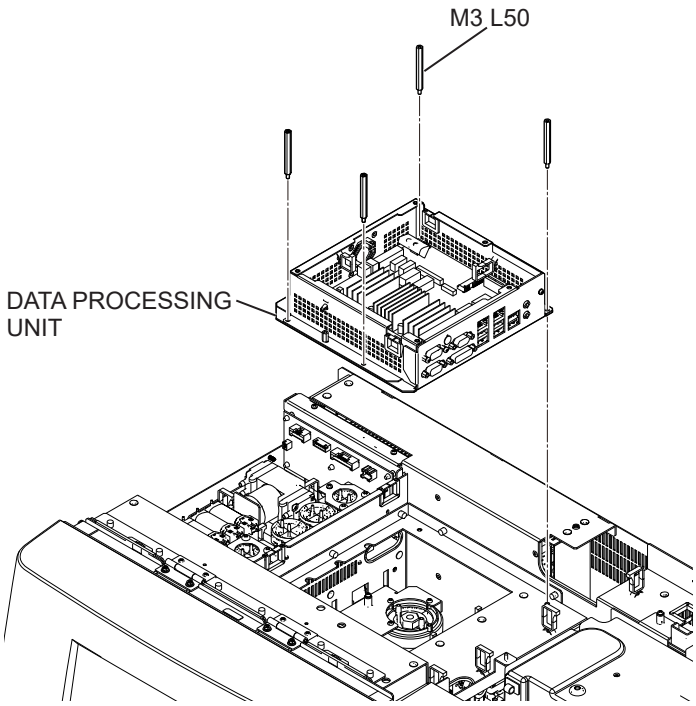
4 Disconnect the two junction connectors which are connected to the analyzer.

5 Remove the two NO.4-40 UNC (L5) screws and disconnect all the cables from the D-SUB, LAN and USB connectors.

NOTE: Before removing the cables, check the correct cable connection position not to connect the cables to the wrong position.



6 Remove the four M3 L50 spacer bolts and remove the DATA PROCESSING UNIT.



Assembly

Assemble the PC-920W DATA PROCESSING UNIT by following the disassembly procedure in reverse.

NOTE • Do not connect the cables to the wrong position.

• Do not trap the cables.

When replacing the PC-920W DATA PROCESSING UNIT, upgrade the software using a QS-027W software kit.

4-4-4. Removing the FRONT PANEL UNIT (PV-920W)

Preparation

1 Remove the mixing cover, front cover and top cover.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)

2 Disconnect the three cables which connect the DATA PROCESSING UNIT to the FRONT PANEL UNIT from the DATA PROCESSING UNIT.

Section 4-4-3 (p. 4-18) step **1** to step **3**

Procedures

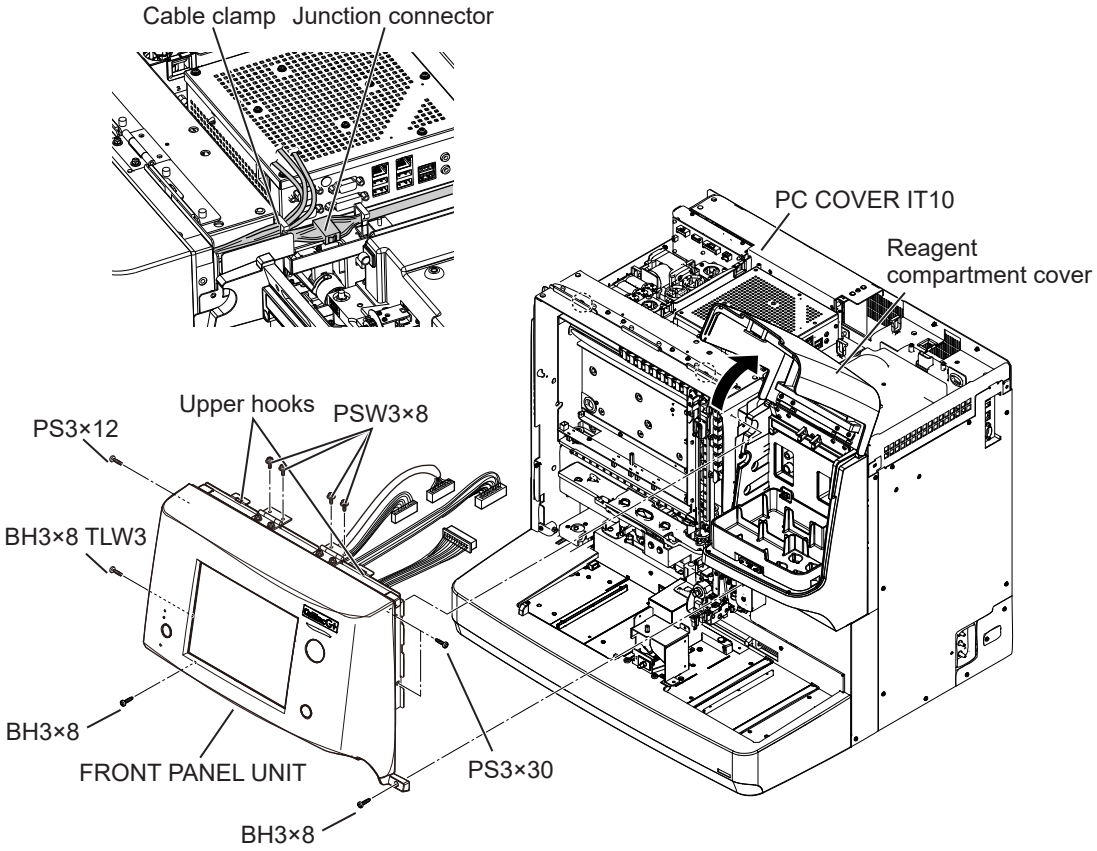
1 Disconnect the junction connector which connects to the analyzer and disconnect the four cables from the cable clamps.

2 Open the reagent compartment cover and remove the two PSW3×30 screws on the reagent compartment side.

The two screws on the reagent compartment side can easily be removed by using the provided short Phillips screwdriver (option).

3 Remove the two BH3×8 screws, one BH3×8 TLW3 screw,one PS3×12 screw and four PSW3×8 screws which secure the FRONT PANEL UNIT.

4 Pull the bottom of the FRONT PANEL UNIT toward you, slightly lift up the FRONT PANE UNIT to unlock the two upper hooks and remove the FRONT PANEL UNIT.



Assembly

Assemble the PV-920W FRONT PANEL UNIT by following the disassembly procedure in reverse.

4-4-5. Removing the AUTOLOADER

Preparation

1 Open the FRONT PANEL UNIT.

Section 4-3-7 (p. 4-10)

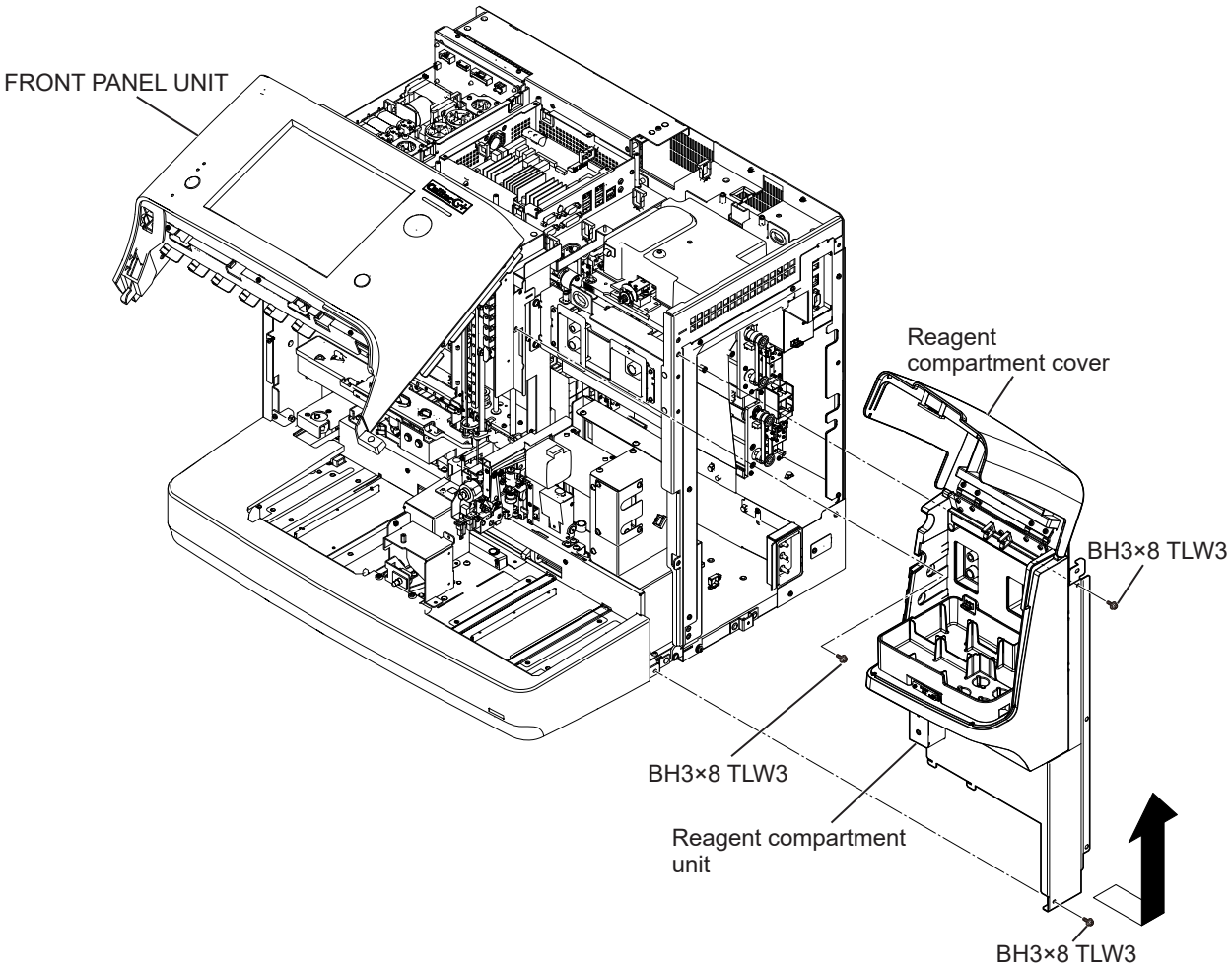
2 Remove the mixing cover, front cover, top cover and right panel.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)

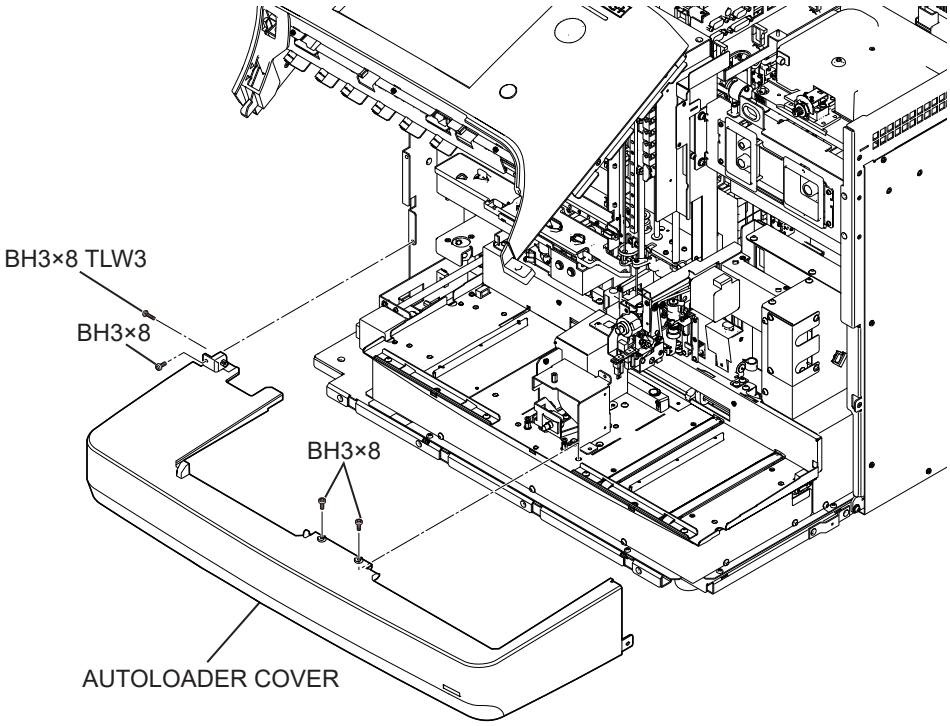
Procedures

1 Open the reagent compartment cover and remove the three BH3×8 TLW3 screws.

2 Remove the reagent compartment unit in the direction of the arrow.

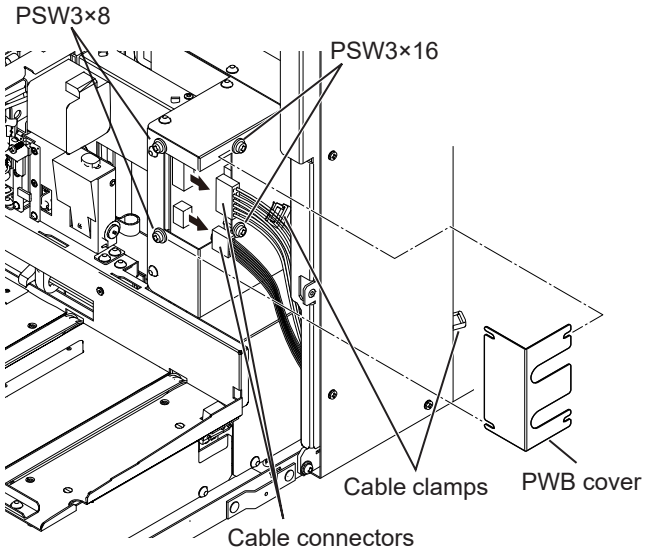


3 Remove the three BH3×8 screws, one BH3×8 TLW3 screw which secure the AUTOLOADER and pull the AUTOLOADER COVER toward you to remove it.

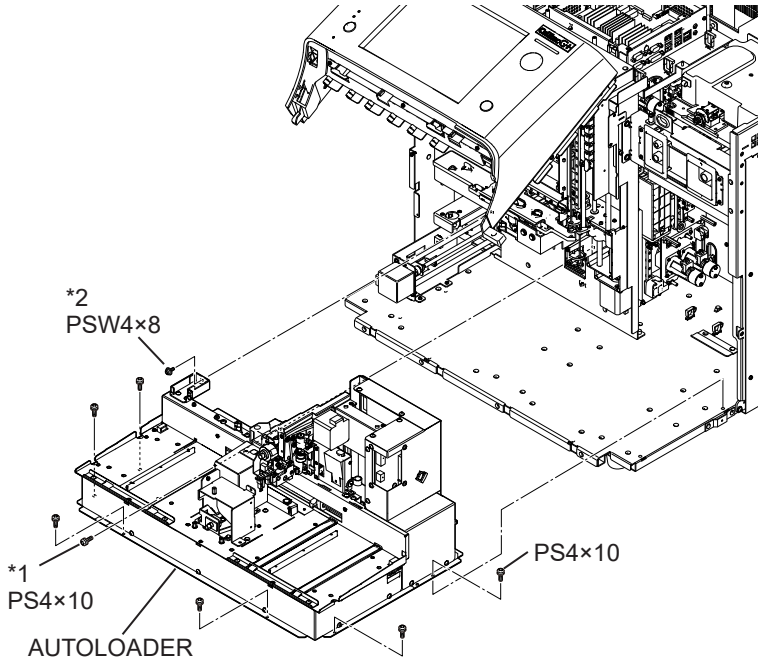


4 Loosen the two PSW3×8 screws and two PSW3×16 screws and remove the PWB cover.

5 Unlock the two cable clamps and disconnect the two cable connectors.



6 Remove the PSW4×8 screw and seven PS4×10 screws and remove the AUTOLOADER.



Assembly

Assemble the AUTOLOADER by following the disassembly procedure in reverse.

NOTE • First, fix the *1 and *2 screws in this order.

• Check that the sampling needle is not descended.

When replacing the AUTO LOADER, upgrade the software using a QS-027W software kit.

Checking the Sampling Needle Position

After assembling the AUTOLOADER, check the position of sampling needle.

Section 6-3-1 (p. 6-7)

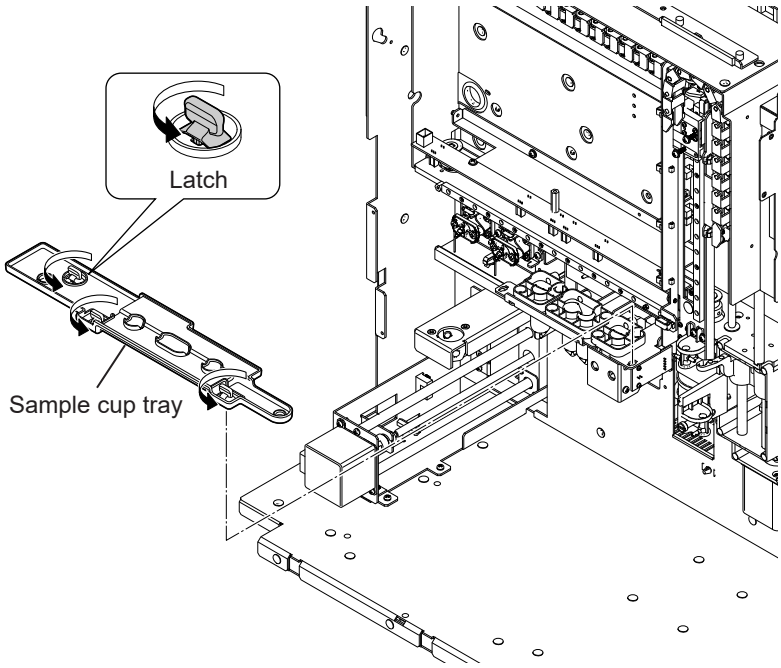
4-4-6. Removing the SAMPLER UNIT (MS-910W)

Preparation

1 Remove the mixing cover, front cover, top cover, right panel, FRONT PANEL UNIT and AUTOLOADER.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-4-4 (p. 4-20)
- Section 4-4-5 (p. 4-22)

2 Turn the three latches counter-clockwise and remove the sample cup tray.

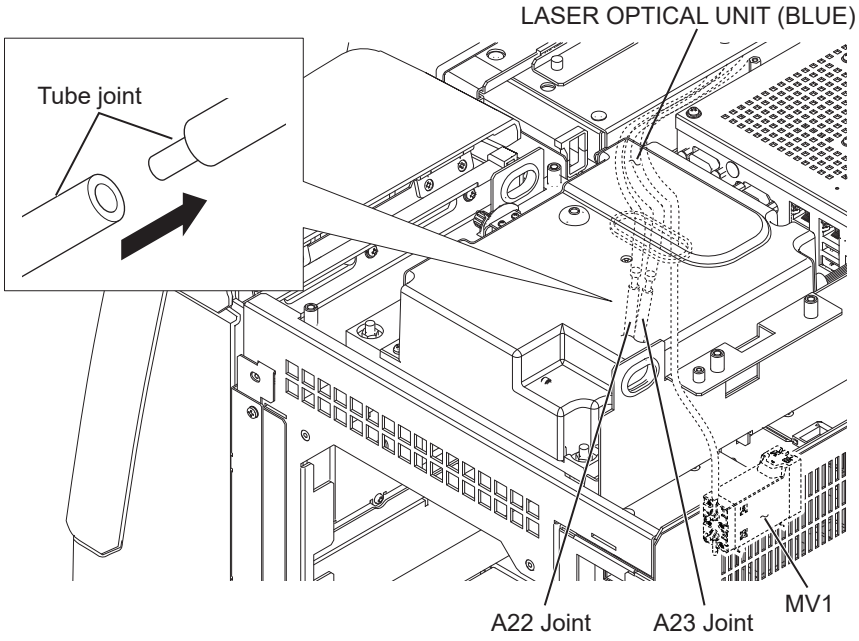


3 Set the LASER OPTICAL UNIT (BLUE) to the position for operation.

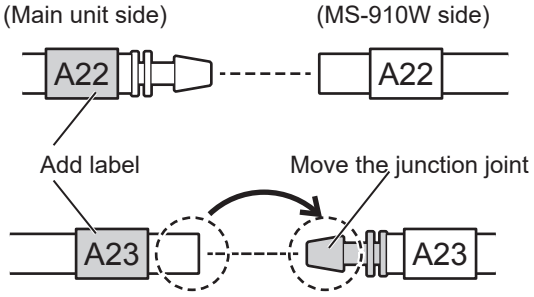
Section 4-4-9 (p. 4-39)

Procedures

1. Remove the tube from port 1 of MV1 on the right side panel.
2. Remove the tubes from the A22 and A23 tube joints.



NOTE
- When replacing the unit, disconnect the tubes by referring to the figure below. The tube joint is not provided with the unit.
- The analyzer cannot function properly when the tube piping is incorrect. When reconnecting the tube, check that the tube marking matches the piping list. (See Technical Reference Manual: Section 2 “Tube List”)
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.



When remove the tube from the extension joint, remove the A22 tube on the MS-910W side and remove the A23 tube on the main unit side.

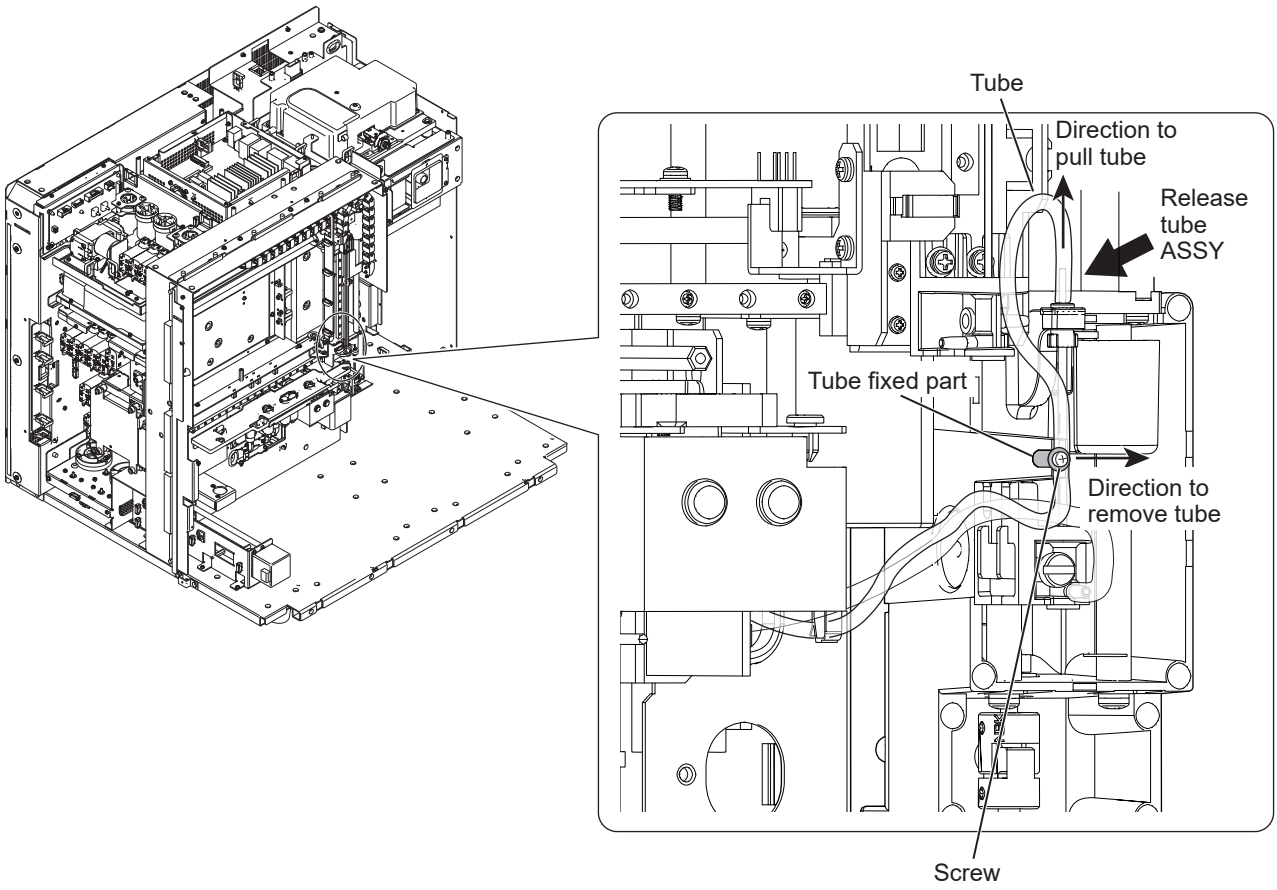
3 Remove the tubes.

1) Loosen the screw in the figure and remove the tube from the tube fixed part.

2) Pull out the tube from the release tube ASSY.

NOTE • When assembling, secure the tubes so that they will not be deformed or bent. Operate the SAMPLER UNIT and OPEN AIR UNIT to check that there is no interference with them.

• When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.



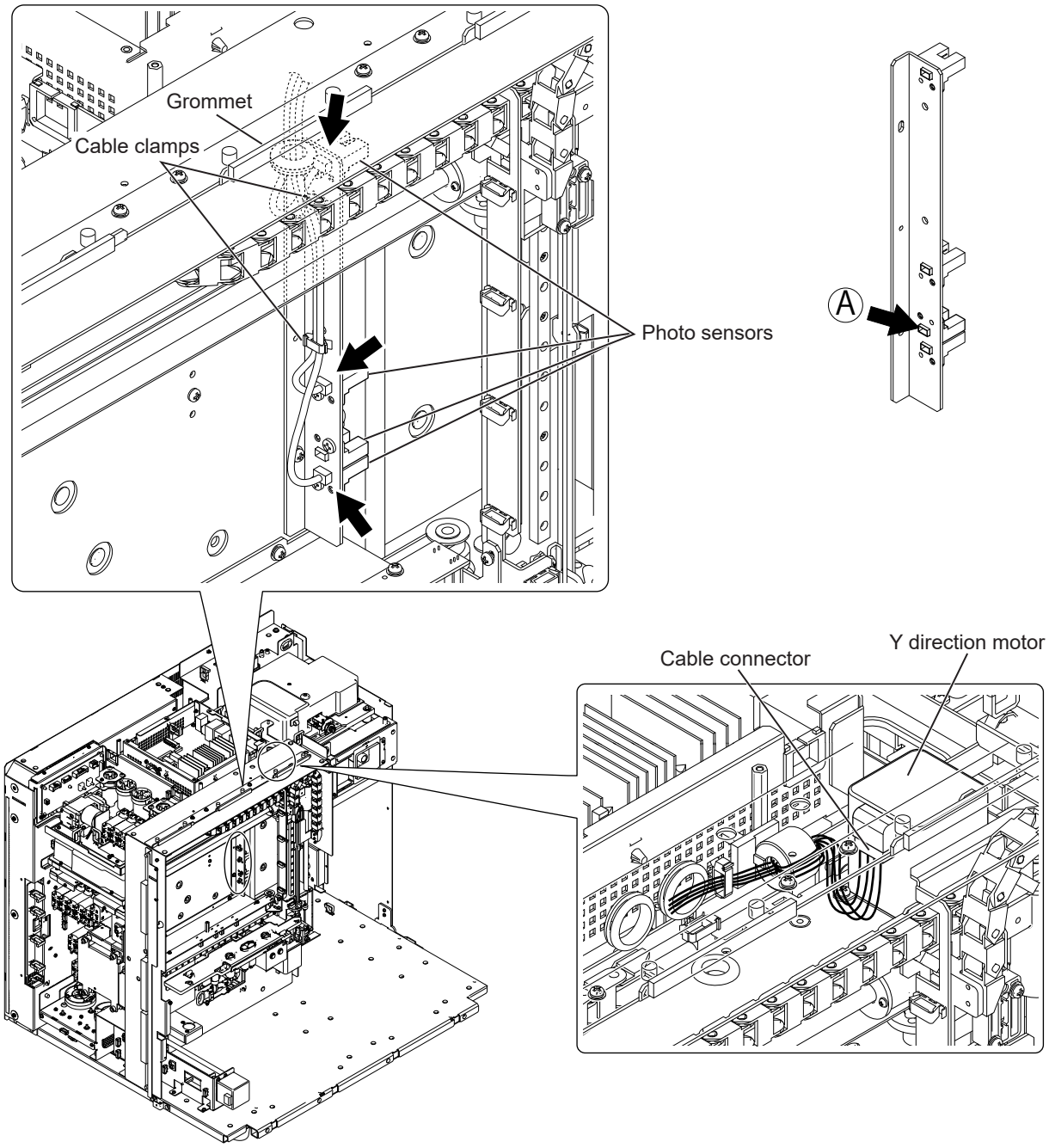
4 **Remove the PHOTO SENSOR cables.**

1) Unlock the cable clamp and disconnect the three cable connectors (indicated by the arrows).

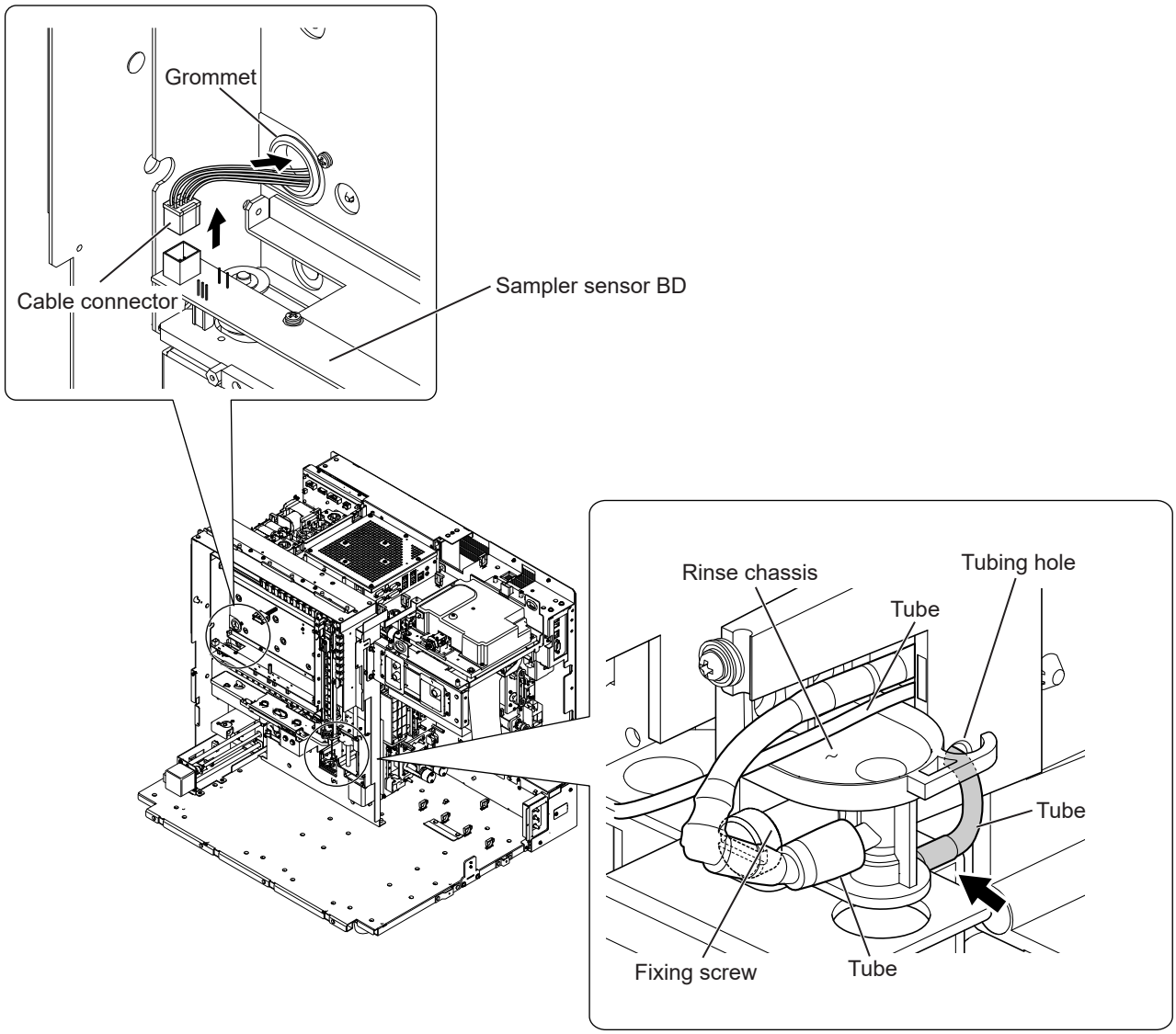
2) Pull up each cable and pull the cables out from the grommet.

5 Disconnect the cable connector of the Y direction motor.

NOTE: When assembling, check that there is no looseness or slack in the cables. Also, operate the SAMPLER UNIT and check that there is space of 10 mm or more between the SAMPLER UNIT and cables.
When assembling, connect the cables correctly. Do not use the sensor indicated by (A).



6 Disconnect the cable connector from the sampler sensor BD.
Push the connector into the grommet.



7 **Remove the rinse chassis and tubes.**

1) Remove the fixing screw and slide the rinse chassis toward you.

2) Remove the tube (indicated by the arrow) and push the tube into the tubing hole.

NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

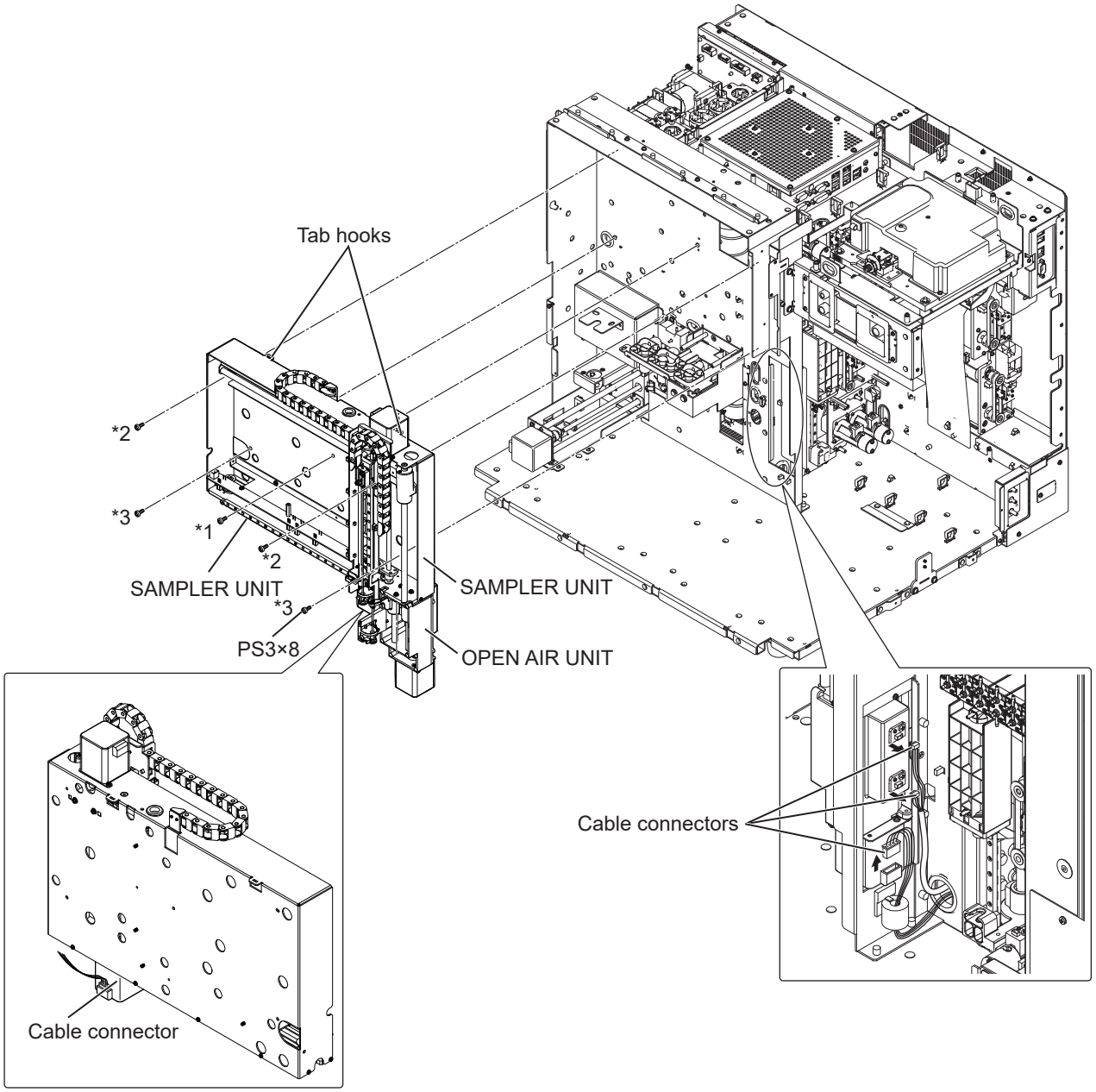
8 Disconnect the OPEN AIR UNIT cable connectors.

1) Disconnect the three cable connectors (indicated by the arrows) from the rear of the OPEN AIR UNIT before removing the SAMPLER UNIT.

9 Remove the SAMPLER UNIT.

1) Remove the five PS3×8 screws which secure the SAMPLER UNIT.

2) Lift up the SAMPLER UNIT about 5 mm to clear the two tab hooks at the top.



NOTE: The cable is connected to the motor at the rear lower right of the SAMPLER UNIT. Slowly pull the SAMPLER UNIT toward you not to pull the cable.

3) Slowly slide the SAMPLER UNIT toward you and disconnect the cable connector at the rear of the SAMPLER UNIT.

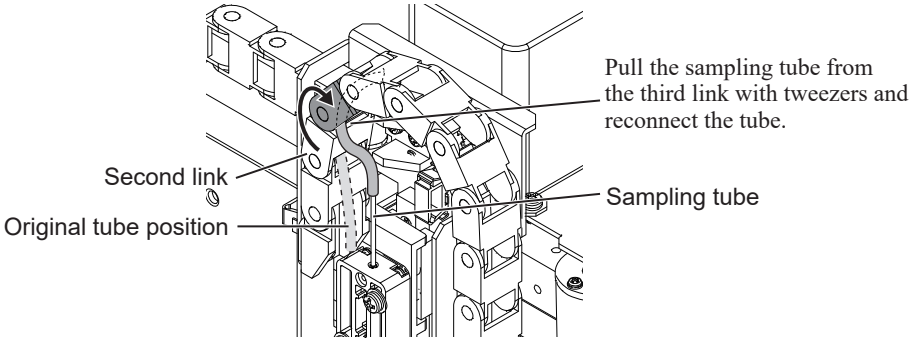
4) Remove the OPEN AIR UNIT.

Section 4-4-7 (p. 4-33)

Assembly

Assemble the SAMPLER UNIT (MS-910W) by following the disassembly procedure in reverse.

NOTE
- Do not trap the tubes or cables.
- Fix the *1, *2, *3 screws in this order.
- When replacing the SAMPLER UNIT, use the Rev. AF or later of the SAMPLER SENSOR BD because the SAMPLER SENSOR BD is different.
- When replacing the SAMPLER UNIT, pull the sampling tube from the third link with tweezers and reconnect the tube.



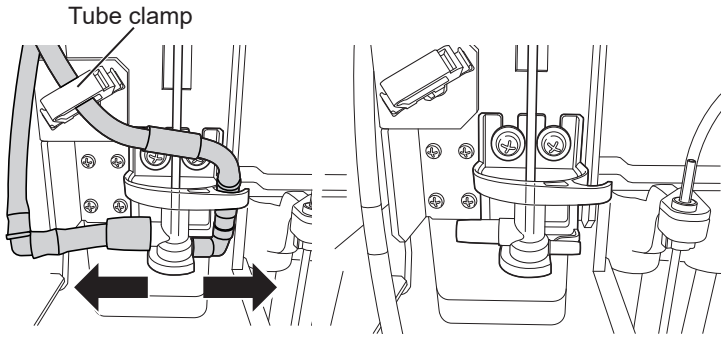
Checking the Sampling Needle Position

After assembling the SAMPLER UNIT (MS-910W), check the position of sampling needle.

Section 6-3 (p. 6-7)

4-4-6-1. Replacement of the Rinse Chassis (Sampling Needle)

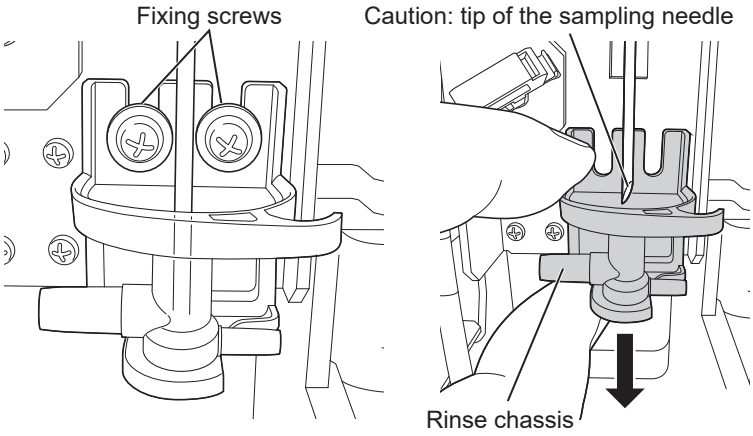
1 Unlock the tube clamp and remove the two tubes connected to the rinse chassis.



2 Remove the two fixing screws and remove the rinse chassis by pulling it down from the sampling needle.

NOTE • Some Spacers can be used on the back of the rinse chassis. In that case, the spacers are reused, so be careful not to lose the spacers when removing the rinse chassis.

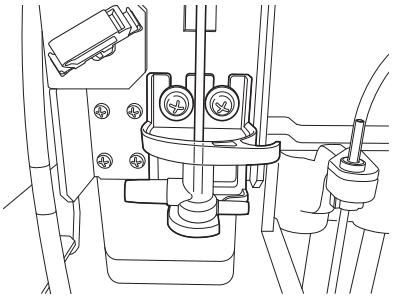
• The tip of the sampling needle is very sharp, so be careful not to get injured.



3 Attach the new rinse chassis.

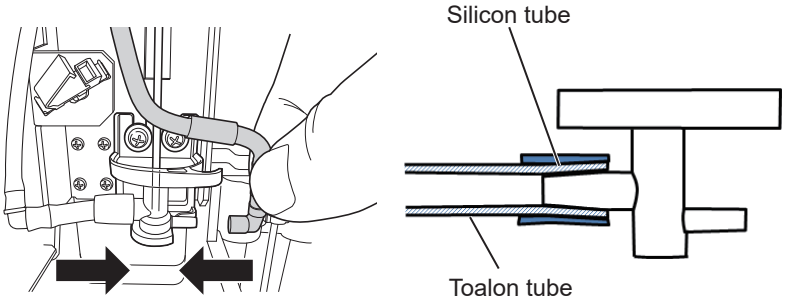
NOTE • When some spacers are used, use the same spacers with the new rinse chassis.

• Be careful not to damage the rinse chassis by the tip of the sampling needle.

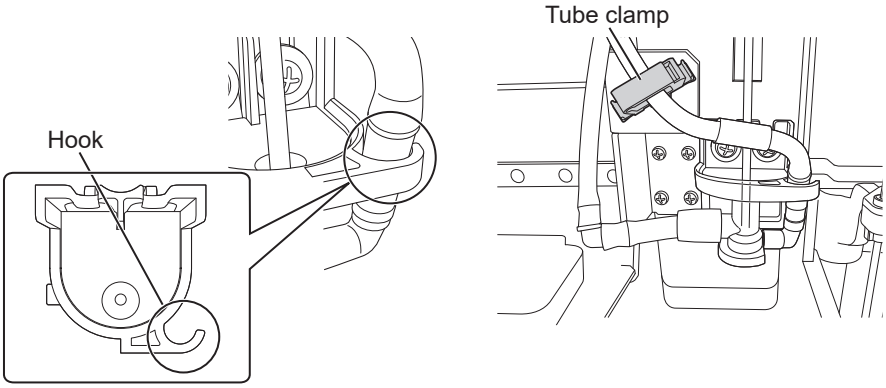


4 Connect the two tubes to the rinse chassis.

NOTE
- Align the edge of the toalon tube and that of the silicon tube and connect them to the port to the end firmly.
- Make sure that the toalon tube is inserted to the end firmly.
- If the connection is not firm, fluid leakage, contamination or pressure error may occur.



5 Hook the right tube and lock the tube with the tube clamp.



4-4-7. Removing the OPEN AIR UNIT (MS-911W)

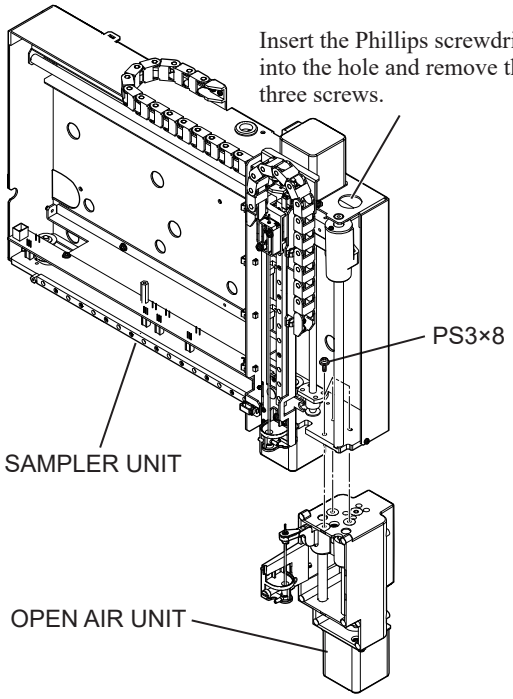
Preparation

1 Remove the mixing cover, front cover, top cover, right panel, AUTOLOADER and SAMPLER UNIT.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-4-5 (p. 4-22)
- Section 4-4-6 (p. 4-25)

Procedures

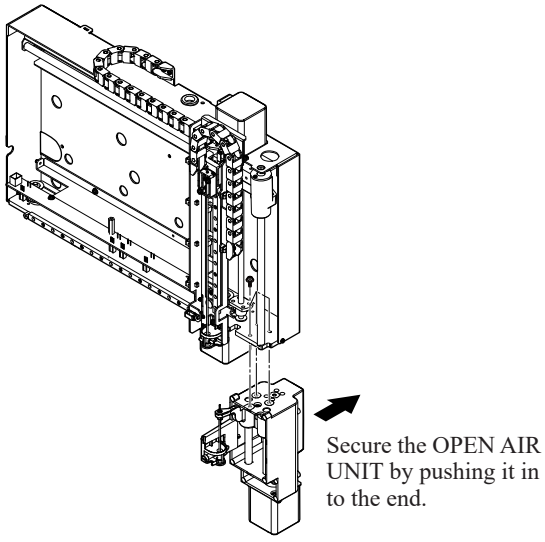
1 Insert the Phillips screwdriver into the hole at the top of the SAMPLER UNIT, remove the three screws which secure the SAMPLER UNIT and remove the OPEN AIR UNIT.



Assembly

Assembly the MS-911W OPEN AIR UNIT by following the disassembly procedure in reverse.

NOTE: Secure the OPEN AIR UNIT by pushing it in to the end.



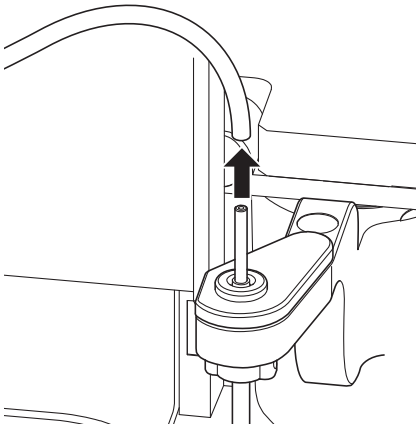
Checking the Sampling Needle Position

After assembling the OPEN AIR UNIT (MS-911W), check the position of sampling needle.

Section 6-3 (p. 6-7)

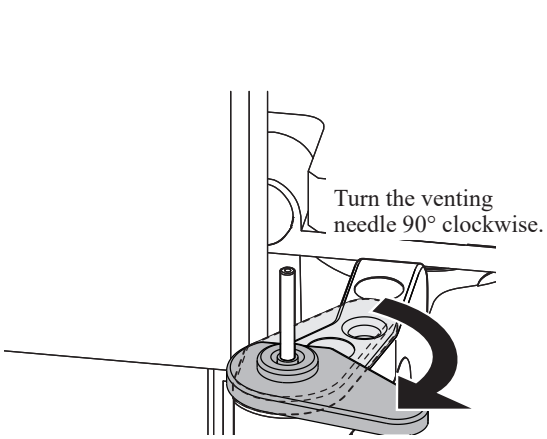
4-4-7-1. Replacement of the Rinse Chassis (Venting Needle)

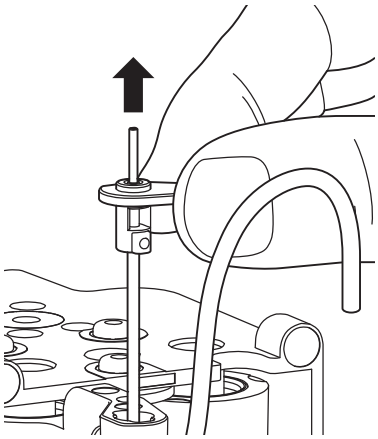
1 Remove the tube from the top of the venting needle.



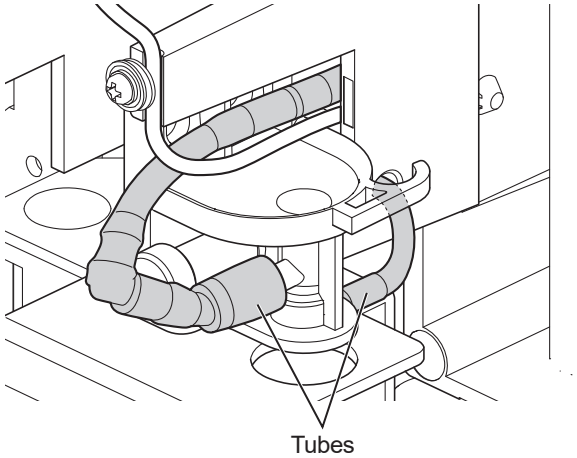
2 Turn the venting needle 90° clockwise and remove the venting needle by pulling it up.

NOTE: The tip of the venting needle is very sharp, so be careful not to get injured.

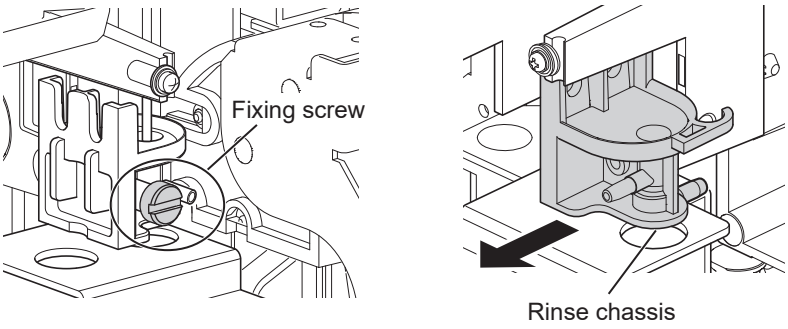




3 Disconnect the two tubes from the rinse chassis.

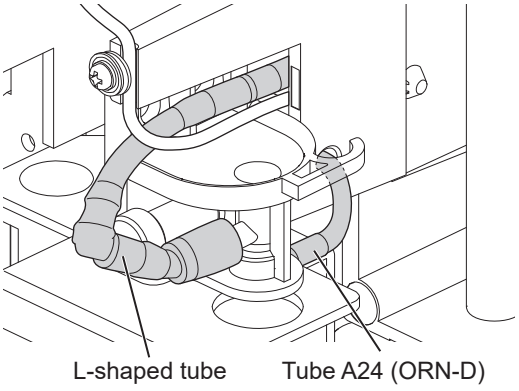


4 Remove the fixing screw and remove the rinse chassis by sliding it toward you.



5 Attach the new rinse chassis and secure it with the fixing screw.

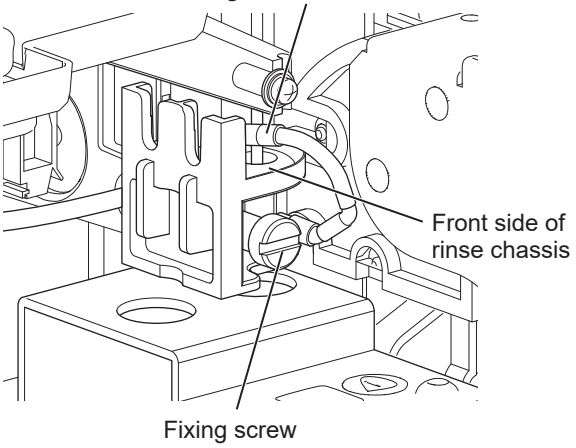
6 Connect the L-shaped tube and the tube A24 (ORN-D) to the rinse chassis.



7 Adjust the position of the junction joint connected to the L-shaped tube as shown below by pulling the tube back.

Junction joint

Adjust the position so that the junction joint is located at the front side of the rinse chassis and above the fixing screw.



8 Attach the venting needle and tube for venting needle.

NOTE: Be careful not to damage the rinse chassis by the tip of the sampling needle.

4-4-8. Removing the ISO PUMP UNIT (MP-911W)

Preparation

1 Remove the right panel.

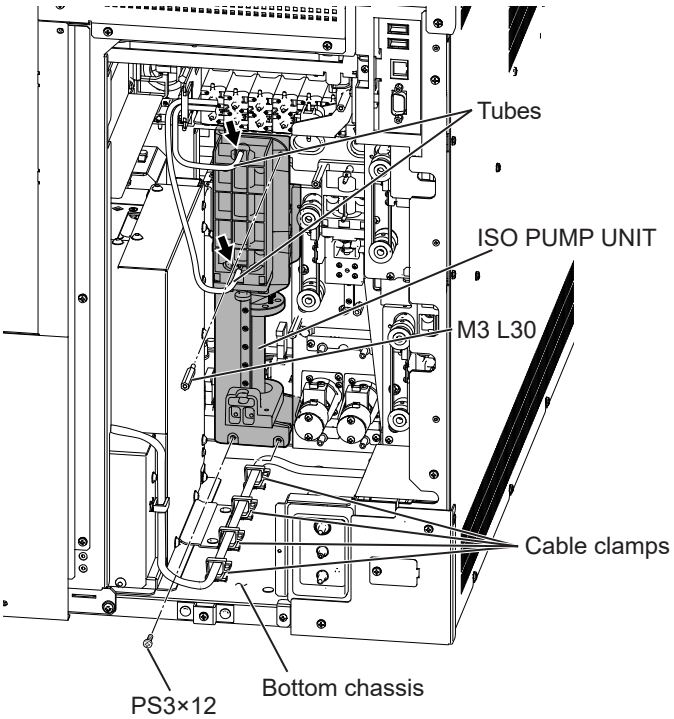
Section 4-3-4 (p. 4-8)

Procedures

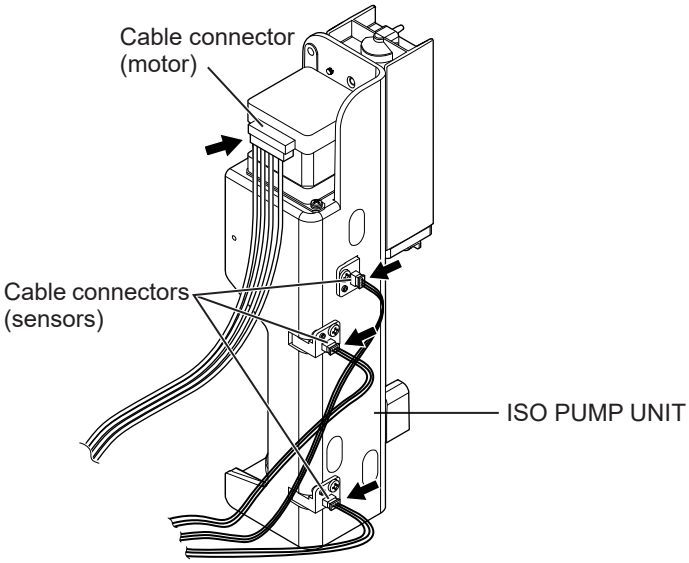
1 Unlock the four cable clamps mounted on the bottom chassis and remove the cables.

2 Remove the two tubes (indicated by the arrows), remove the two PS3×12 screws and one M3 L30 spacer bolt and slide the ISO PUMP UNIT toward you.

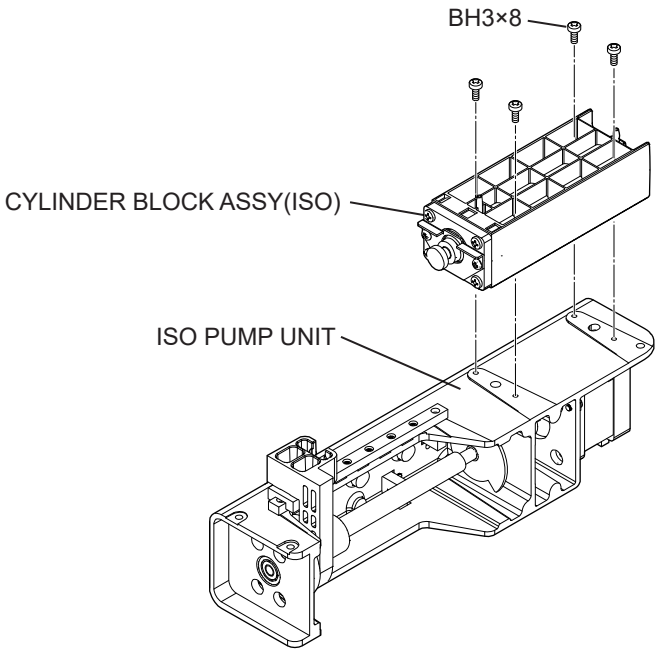
NOTE: Do not break the tube connection part when removing the tube.



3 Disconnect the three cable connectors for the sensors and the cable connector for the motor and remove the ISO PUMP UNIT.



4 Remove the four BH3×8 screws and remove the CYLINDER BLOCK ASSY(ISO).



Assembly

Assemble the ISO PUMP UNIT (MP-911W) by following the disassembly procedure in reverse.

NOTE
- Store the ISO PUMP UNIT by placing with the CYLINDER BLOCK facing upward. The unit falling over may cause damage.
- When assembling, match the cable color and cable connector marking label color. The marking label is attached near the cable connector as a guide.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

4-4-9. Removing the SAMPLE/RBC PUMP UNIT (MP-912W)

NOTE: The SAMPLE PUMP UNIT and RBC PUMP UNIT can be removed in this section. Either of them can be removed by the same procedure.

Preparation

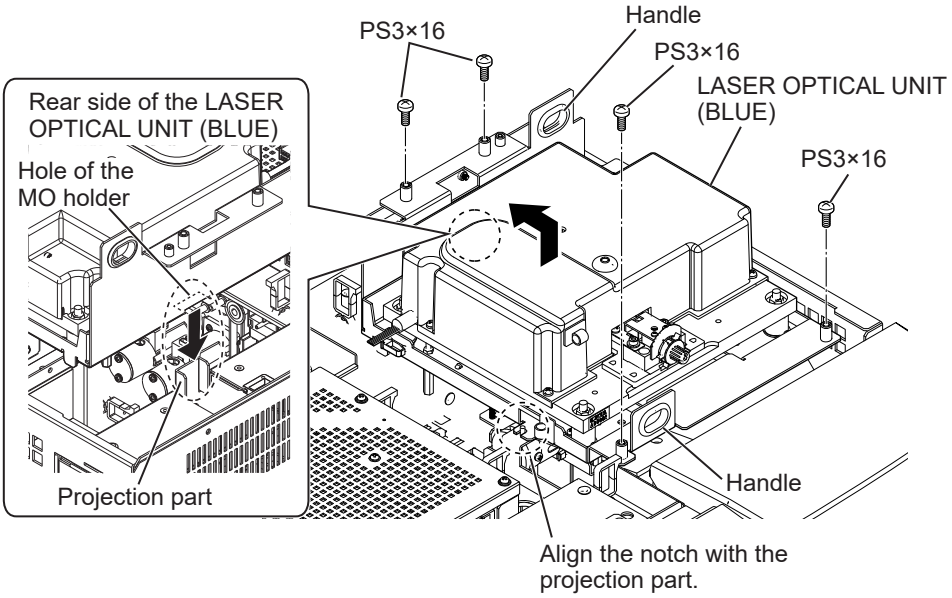
1 Remove the top cover and right panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)

2 Set the LASER OPTICAL UNIT (BLUE) to the position for operation.

1) Remove the four PS3×16 screws.

2) Lift up the LASER OPTICAL UNIT (BLUE) and align the hole and notch at the bottom of the MO holder with the projection part of the chassis.



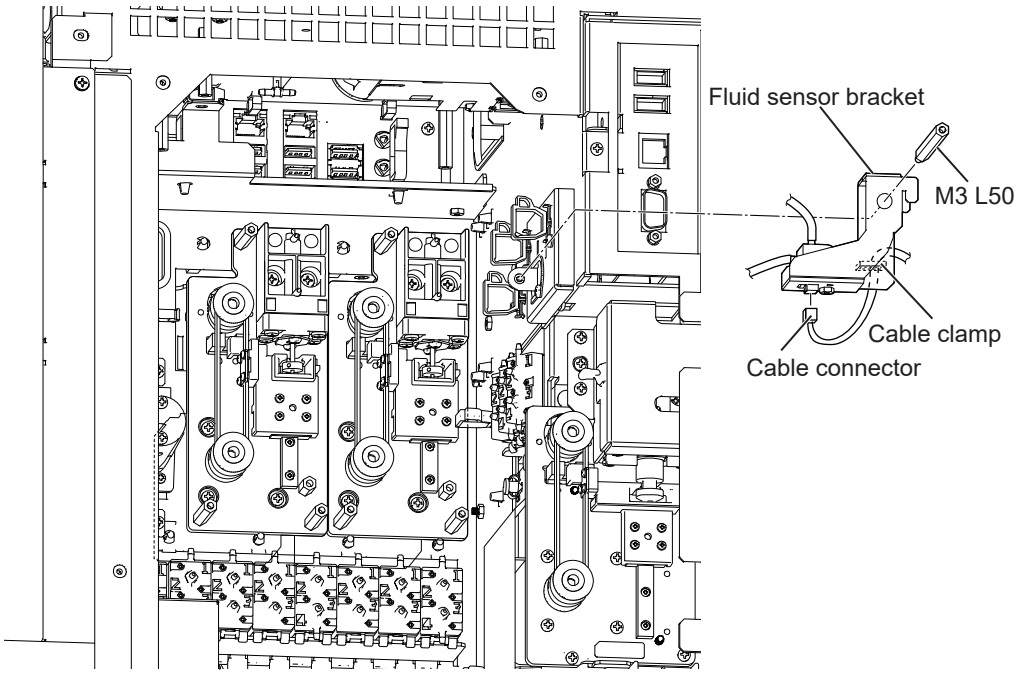
3 Move the position of the fluid sensor bracket.

1) Remove the M3 L50 spacer bolt and remove the fluid sensor bracket by lifting it up.

2) Disconnect the cable connector of the sensor bracket and remove the cable from the cable clamp.

3) Keep the fluid sensor bracket in the air and move the bracket position not to become the hindrance of operation.

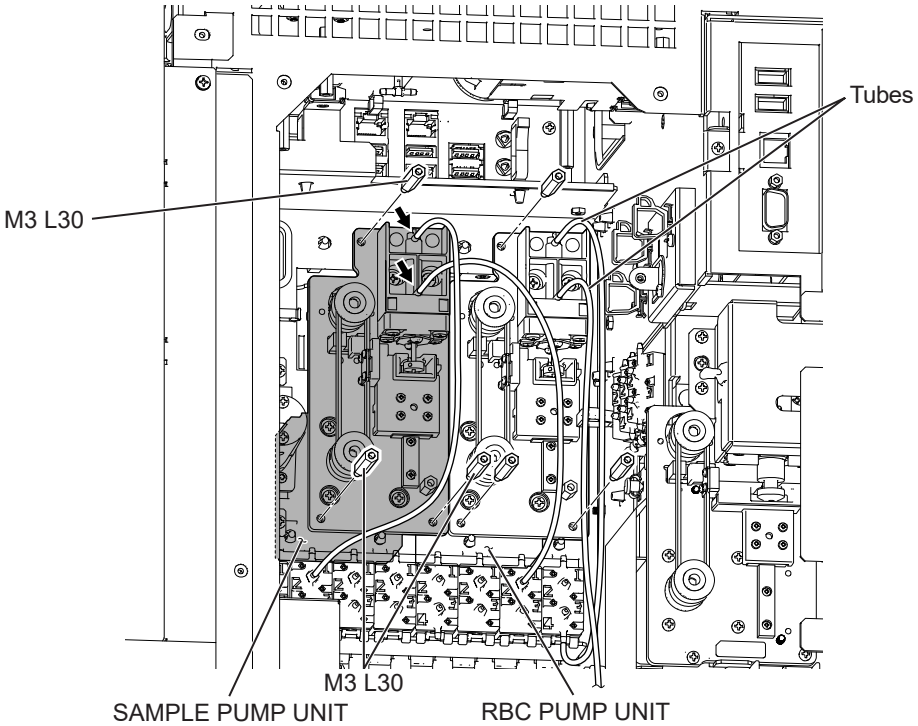
NOTE: Do not disconnect or trap the tube.



Procedures

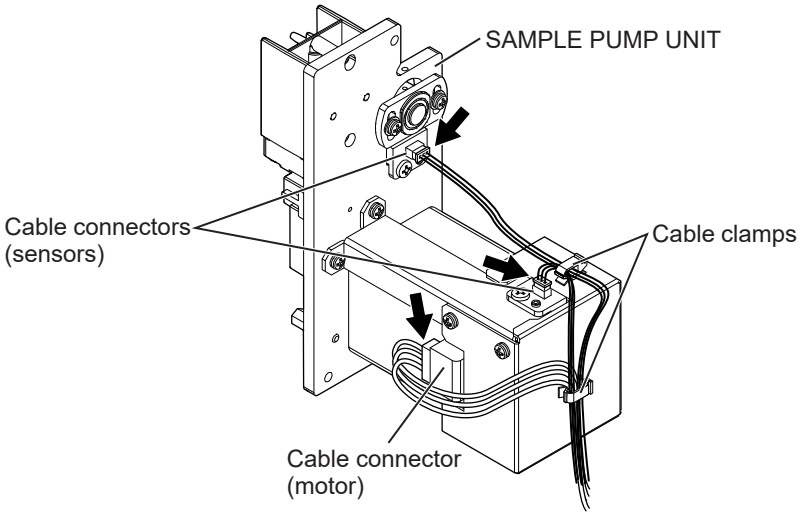
1 Remove the two tubes indicated by the arrow and three M3 L30 spacer bolts and slide the SAMPLE PUMP UNIT toward you.

NOTE: Do not break the tube connection part when removing the tube.

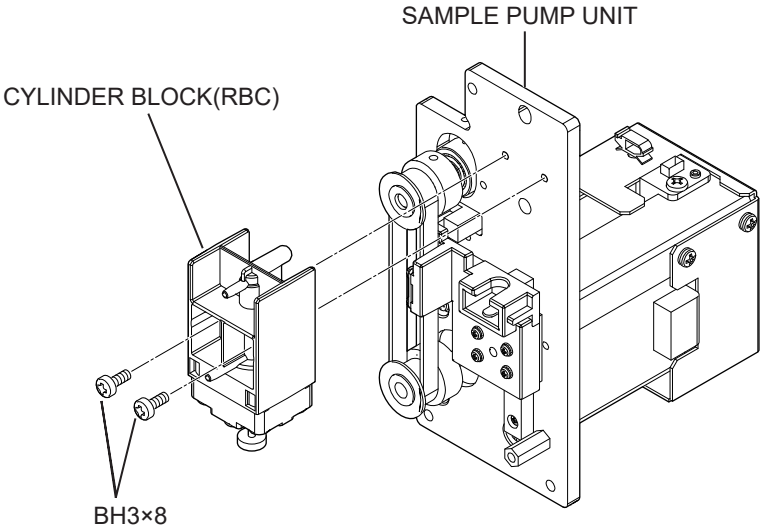


2 Disconnect the two cable connectors for the sensors and the cable connector for the motor.

3 Remove the cables from the cable clamps and remove the SAMPLE PUMP UNIT.



4 Remove the two BH3×8 screws and remove the CYLINDER BLOCK (RBC).



5 Remove the RBC PUMP UNIT in the same procedure.

Assembly

Assemble the SAMPLE/RBC PUMP UNIT (MP-912W) by following the disassembly procedure in reverse.

NOTE
- When assembling, match the cable color and cable connector marking label color. The marking label is attached near the cable connector as a guide.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

4-4-10. Removing the RET PUMP UNIT (MP-912W)

Preparation

1 Remove the right panel.

Section 4-3-4 (p. 4-8)

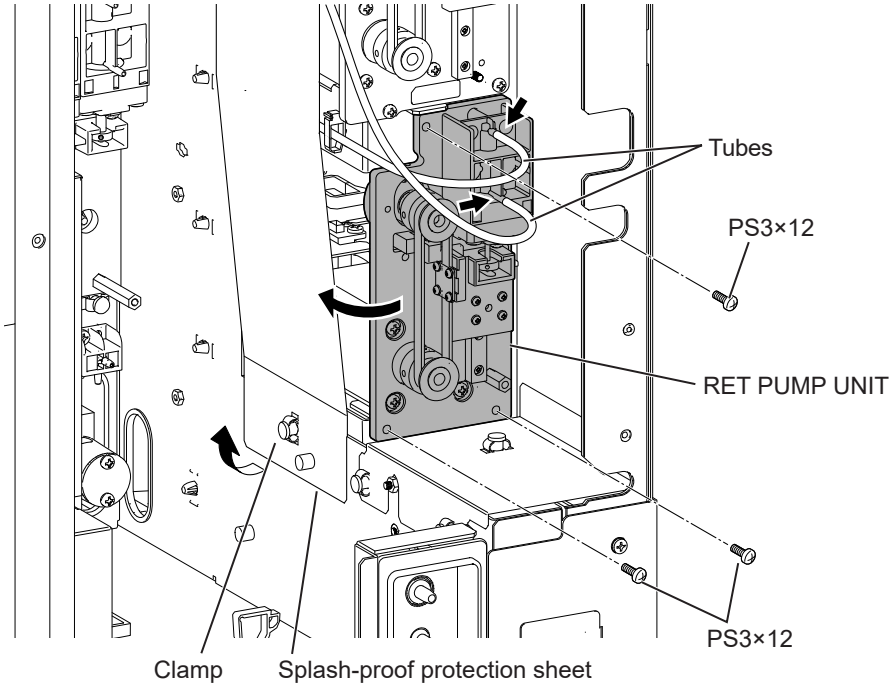
Procedures

1 Remove the two tubes and three PS3×12 screws.

NOTE: Do not break the tube connection part when removing the tube.

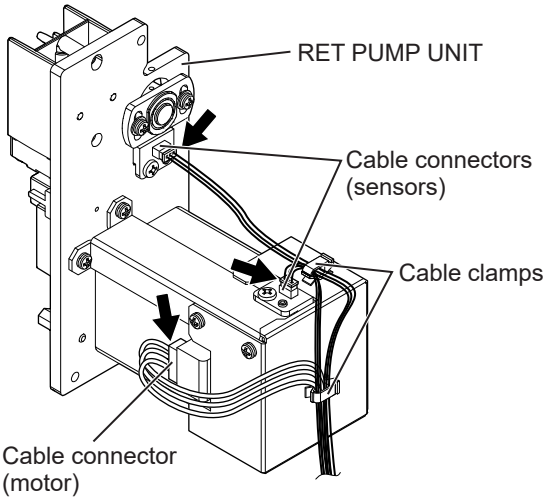
2 Unlock the clamp and turn over the splash-proof protection sheet.

3 Slide the RET PUMP UNIT to the left.

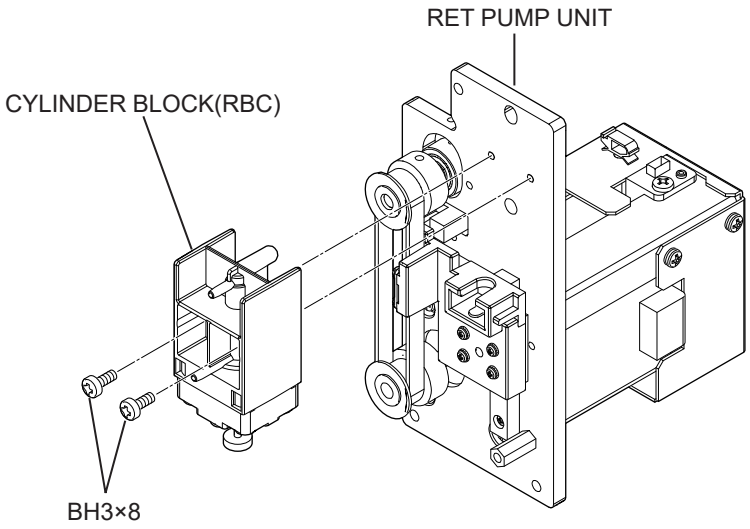


4 Disconnect the two cable connectors for the sensors and the cable connector for the motor.

5 Remove the cables from the cable clamps and remove the RET PUMP UNIT.



6 Remove the two BH3×8 screws and remove the CYLINDER BLOCK (RBC).



Assembly

Assemble the RET PUMP UNIT (MP-912W) by following the disassembly procedure in reverse.

NOTE
- When assembling, match the cable color and cable connector marking label color. The marking label is attached near the cable connector as a guide.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.
- When replacing the RET PUMP UNIT, remove the connector labels from the old RET PUMP UNIT and attach them to the connector of the new RET PUMP UNIT.

4-4-11. Removing the IWBC/OWBC PUMP UNIT (MP-913W)

Preparation

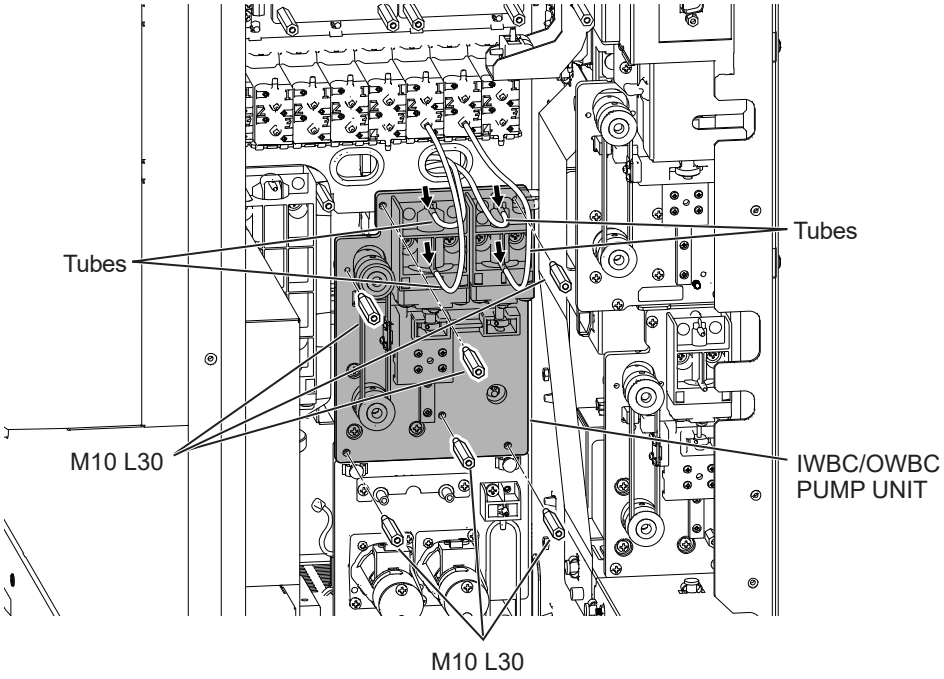
1 Remove the right panel.

Section 4-3-4 (p. 4-8)

Procedures

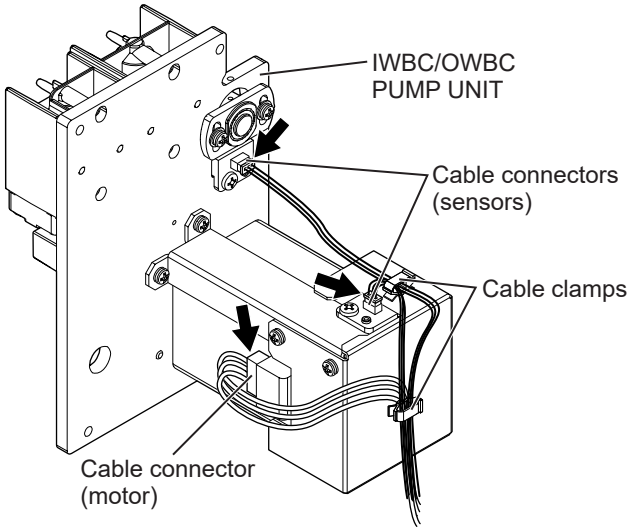
1 Remove the four tubes (indicated by the arrows) and six M10 L30 spacer bolts, and slide the IWBC/OWBC PUMP UNIT toward you.

NOTE: Do not break the tube connection part when removing the tube.

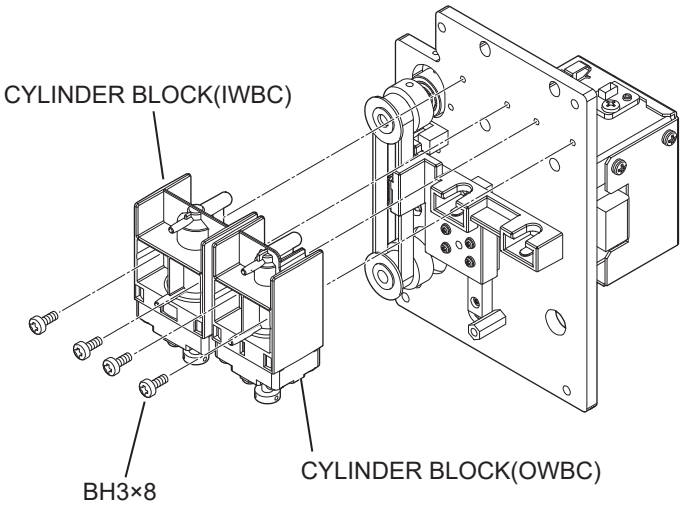


2 Disconnect the two cable connectors for the sensors and the cable connector for the motor.

3 Remove the cables from the cable clamps and remove the IWBC/OWBC PUMP UNIT.



4 Remove the four BH3×8 screws and remove the CYLINDER BLOCK (IWBC) and CYLINDER BLOCK (OWBC).



Assembly

Assemble the IWBC/OWBC PUMP UNIT (MP-913W) by following the disassembly procedure in reverse.

NOTE
- When assembling, match the cable color and cable connector marking label color. The marking label is attached near the cable connector as a guide.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

4-4-12. Removing the FL PUMP UNIT (MP-921W)

Preparation

1 Remove the right panel.

Section 4-3-4 (p. 4-8)

2 Move the position of the fluid sensor bracket.

Section 4-4-9 (p. 4-39)
Preparation **3**

Procedures

1 Twist the latch and remove the light-proof metal.

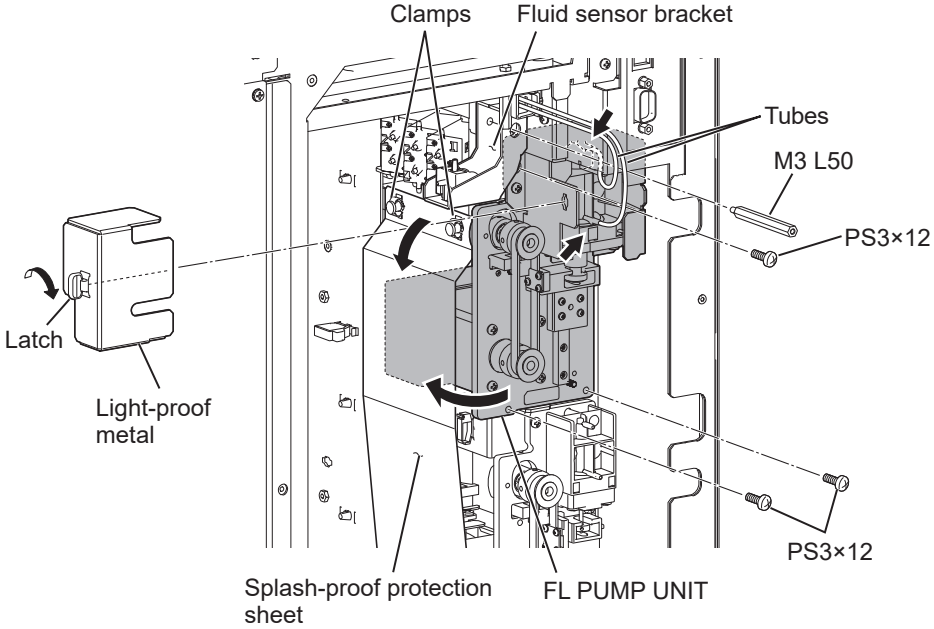
2 Remove the the two tubes and three PS3×12 screws.

NOTE • When removing the tube, fluid in the cylinder may be leaked. Put a waste cloth under the cylinder and wipe off the fluid.

• Do not break the tube connection part when removing the tube.

3 Remove the two clamps and turn over the splash-proof protection sheet.

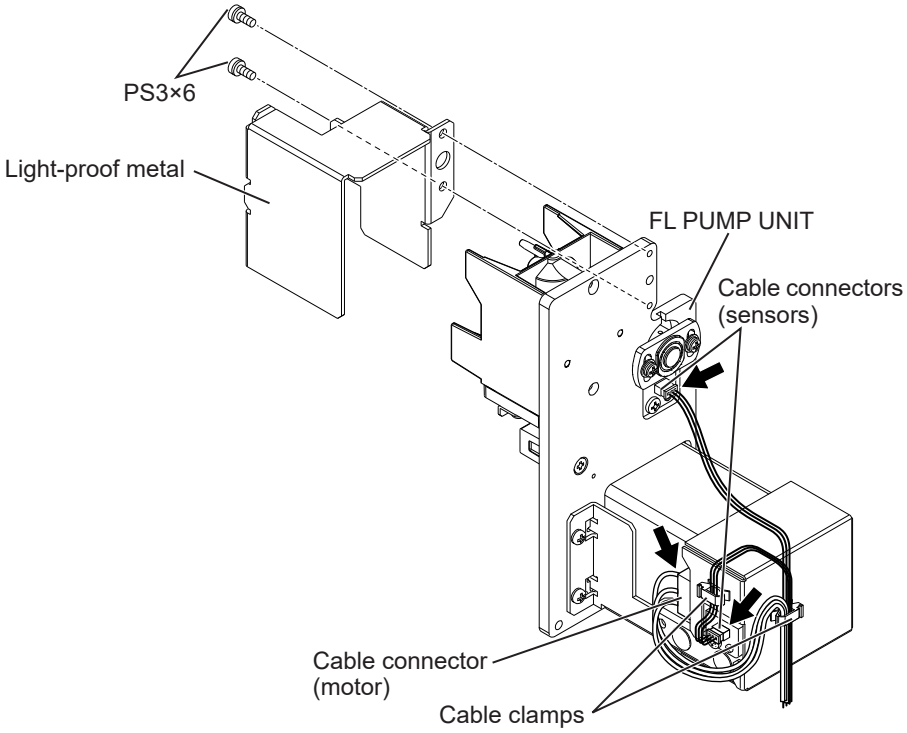
4 Slide the FL PUMP UNIT to the left.



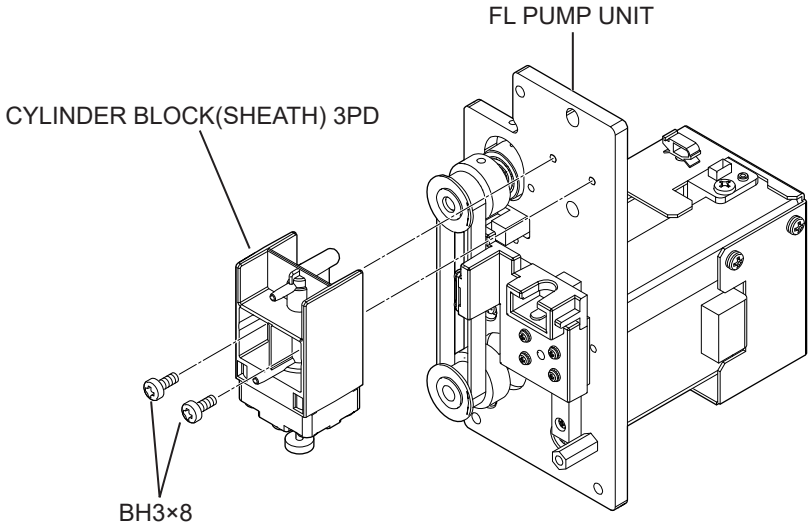
5 Disconnect the two cable connectors for the sensors and the cable connector for the motor.

6 Remove the cables from the cable clamps and remove the FL PUMP UNIT.

7 Remove the two PS3×6 screws and remove the light-proof metal.



8 Remove the two PS3×8 screws and remove the CYLINDER BLOCK.



Assembly

Assemble the FLPUMP UNIT (MP-921W) by following the disassembly procedure in reverse.

NOTE
- When assembling, match the cable color and cable connector marking label color. The marking label is attached near the cable connector as a guide.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.
- When replacing the FL PUMP UNIT, remove the connector labels from the old FL PUMP UNIT and attach them to the connector of the new FL PUMP UNIT.

4-4-13. Removing the PINCH VALVE UNIT (XP-910W)

4-4-13-1. Removing the PINCH VALVE UNIT: PV1 to PV3

NOTE: In this section, PV1, PV2 and PV3 can be removed. Either of them can be removed by the same procedure.

Preparation

1 Remove the right panel.

Section 4-3-4 (p. 4-8)

2 Set the LASER OPTICAL UNIT (BLUE) to the position for operation.

Section 4-4-9 (p. 4-39)
Preparation **2**

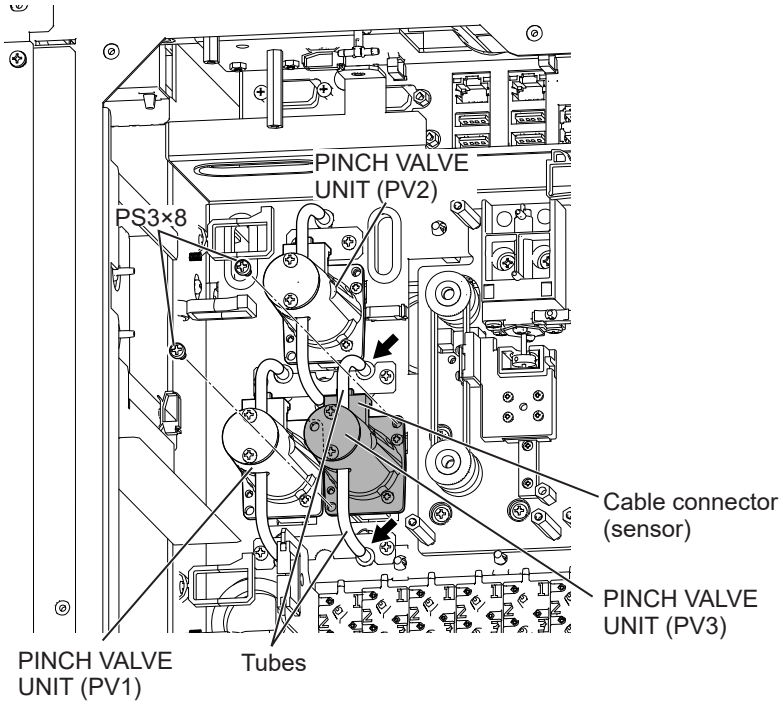
3 Move the position of the fluid sensor bracket.

Section 4-4-9 (p. 4-39)
Preparation **3**

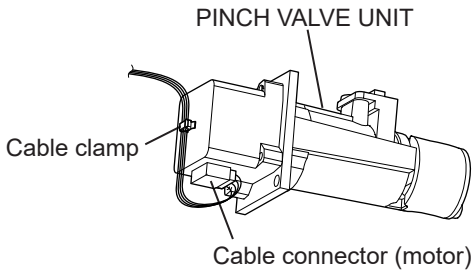
Procedures

1 Disconnect the two tubes indicated by the arrows and remove the two PS3×8 screws.

2 Disconnect the cable connector for the sensor and slightly slide the PINCH VALVE UNIT (PV3) toward you.



3 Disconnect the cable connector for the motor, remove the cable from the cable clamp and remove the PINCH VALVE UNIT (PV3).



4 Remove the PINCH VALVE UNIT (PV1) and PINCH VALVE UNIT (PV2) in the same procedure.

Assembly

Assemble the PINCH VALVE UNIT by following the disassembly procedure in reverse.

NOTE
- When assembling, match the cable color and cable connector marking label color. The marking label is attached near the cable connector as a guide.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.
- When assembling the PINCH VALVE UNIT, check that the cable connector is secured by the cable clamp. Pinching of the cable may occur.

4-4-13-2. Removing the PINCH VALVE UNIT: PV4 and PV5

NOTE: In this section, PV4 and PV5 can be removed. Either of them can be removed by the same procedure.

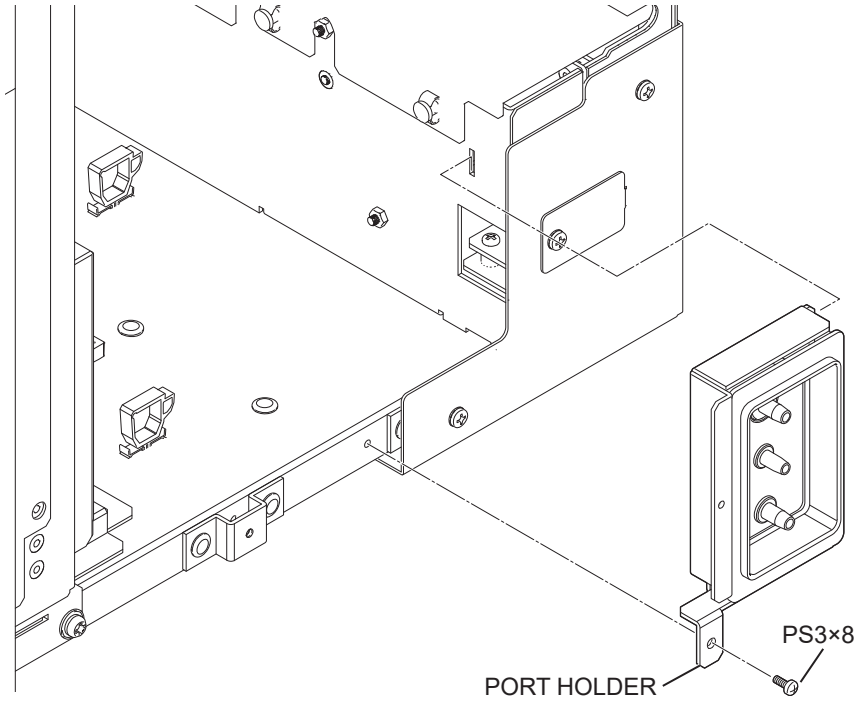
Preparation

1 Remove the right panel.

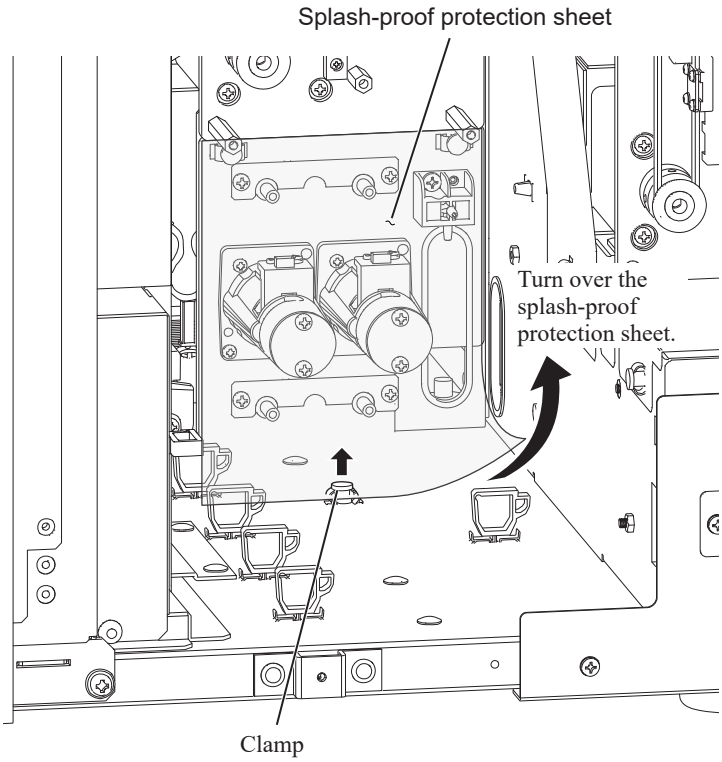
Section 4-3-4 (p. 4-8)

Procedures

1 Remove the PS3×8 screw and slide the PORT HOLDER slightly to the left and remove the PORT HOLDER by pulling it toward you.

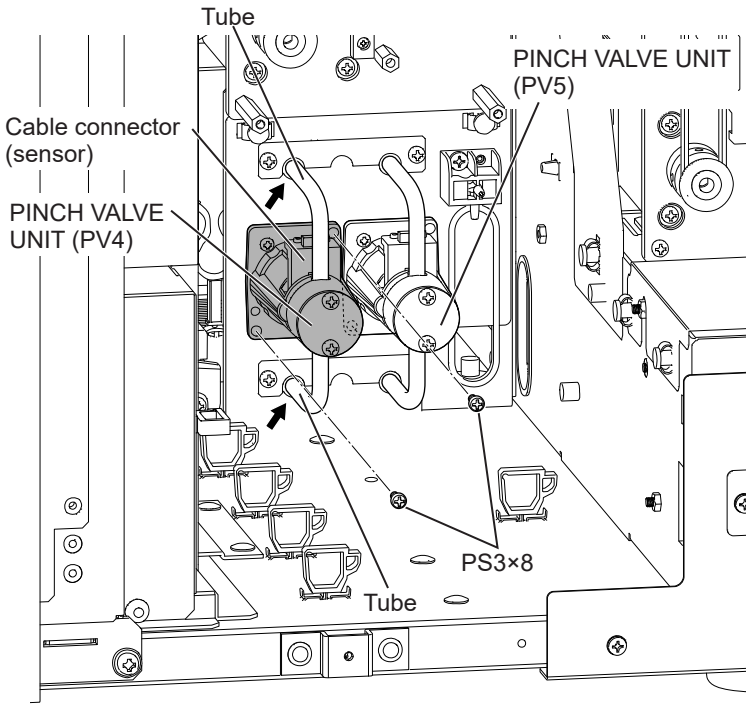


2 Remove the clamp and turn over the splash-proof protection sheet.

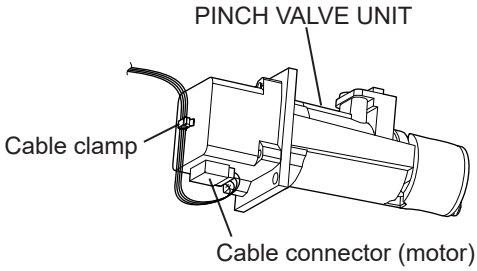


3 Remove the two tubes indicated by the arrows and remove the two PS3×8 screws.

4 Disconnect the cable connector for the sensor and slightly slide the PINCH VALVE UNIT (PV4) toward you.



5 Disconnect the cable connector for the motor, remove the cable from the cable clamp and remove the PINCH VALVE UNIT (PV4).



6 Remove the PINCH VALVE UNIT (PV5) in the same procedure.

Assembly

Assemble the PINCH VALVE UNIT by following the disassembly procedure in reverse.

NOTE
- When assembling, match the cable color and cable connector marking label color. The marking label is attached near the cable connector as a guide.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.
- When assembling the PINCH VALVE UNIT, check that the cable connector is secured by the cable clamp. Pinching of the cable may occur.

4-4-14. Removing the RET CUP HEATER UNIT (ZY-921W)

Preparation

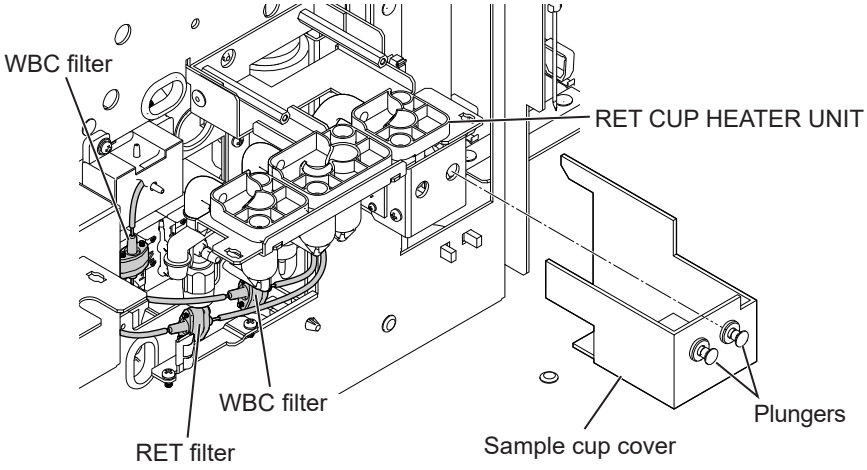
1 Remove the mixing cover, front cover, top cover, right panel, FRONT PANEL UNIT and AUTOLOADER.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-4-4 (p. 4-20)
- Section 4-4-5 (p. 4-22)

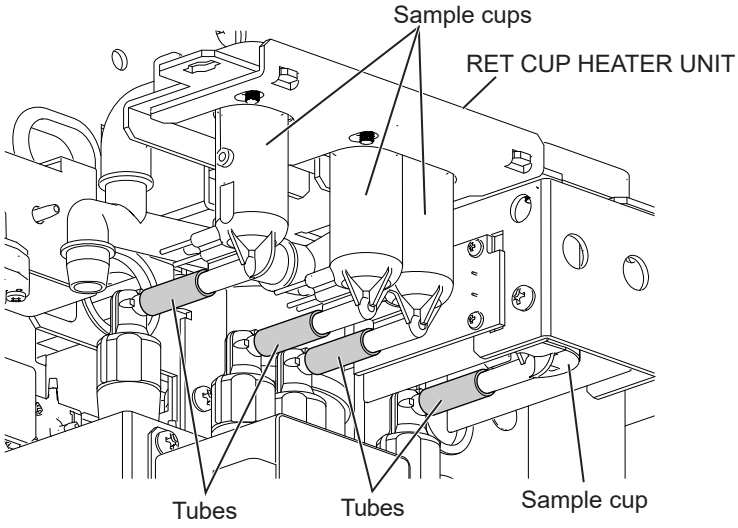
Procedures

1 Pull the two plungers toward you and remove the sample cup cover.

2 Remove the two WBC filters and RET filter.

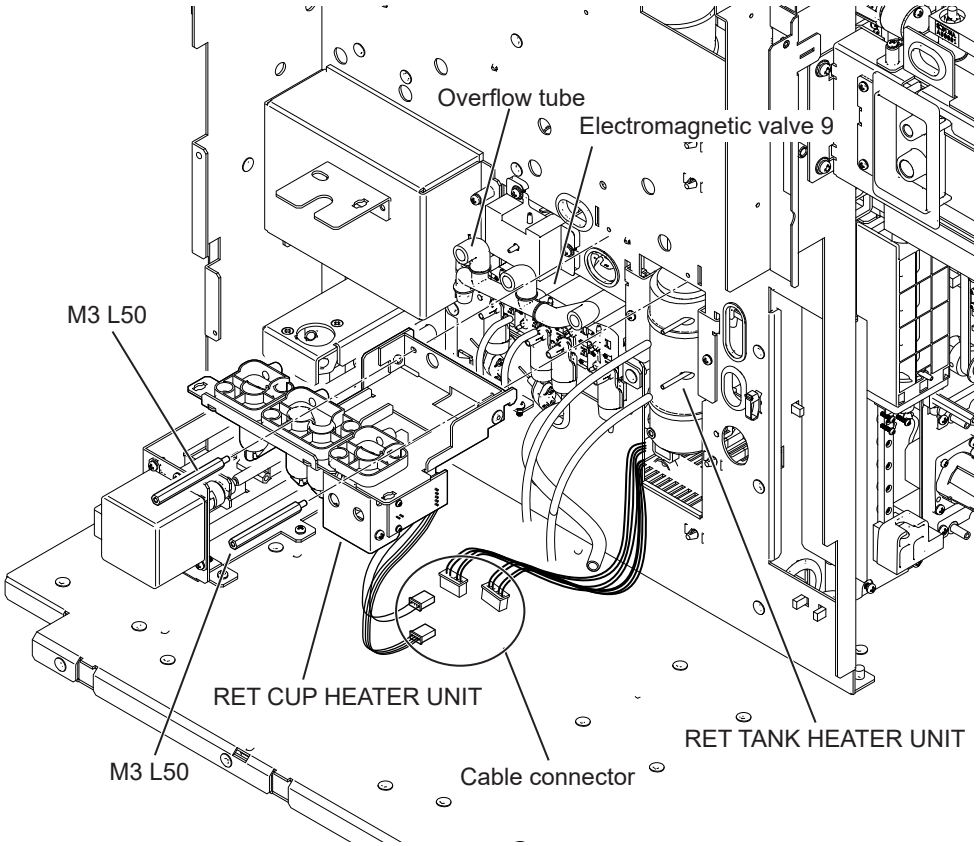


3 Remove the four tubes from the sample cups.



4 Remove the two M3 L50 spacer bolts and disconnect the two cable connectors.

5 Slide the RET CUP HEATER UNIT toward you, remove the tubes and remove the RET CUP HEATER UNIT.



Assembly

Assemble the RET CUP HEATER UNIT by following the disassembly procedure in reverse.

Adjustment

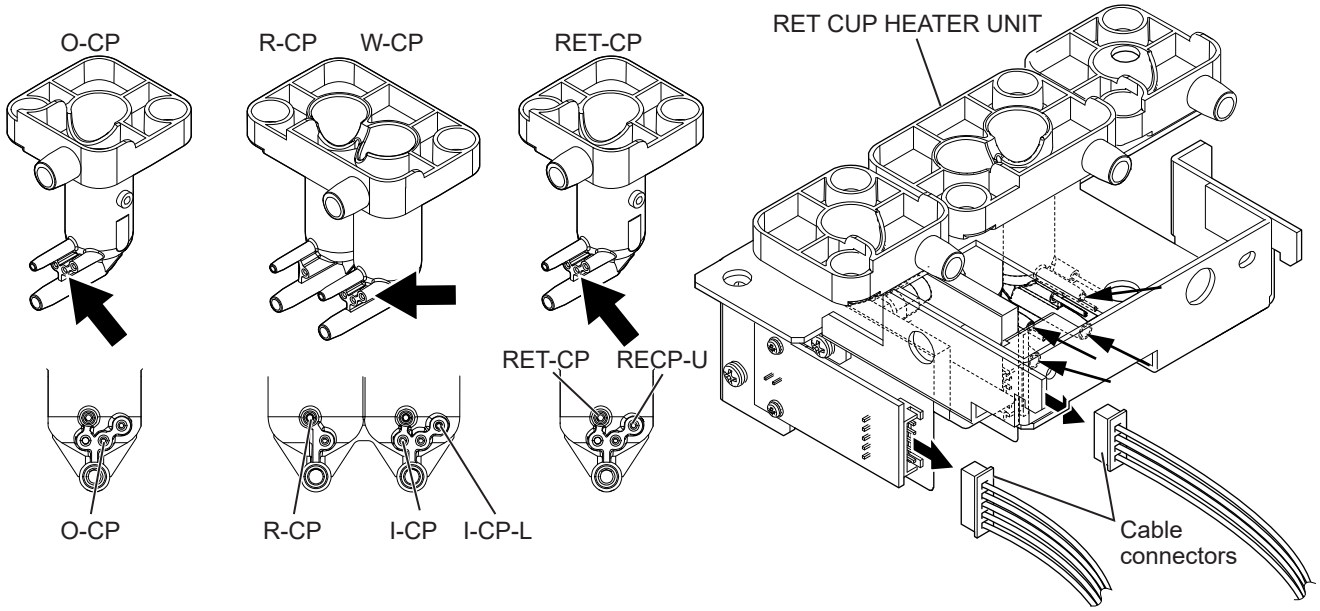
After assembling the RET CUP HEATER UNIT, adjust the gain.

Section 6-4 (p. 6-19)

4-4-14-1. Removing the Tubes

1. Remove the two tubes connected to the TANK HEATER UNIT.
   Tubes: “TH-O-U” “TH-O-D” (remove from the TANK HEATER side)
2. Remove the tube connected to the MV9-2. (remove from the MV side)
3. Remove the three overflow tubes from the RET CUP HEATER UNIT.
4. Remove the tube connected to the OWBC CUP and MV20-2.
   Tube: “O-CP” (remove from the CUP side)
5. Remove the tube connected to the RBC CUP and MV3-2.
   Tube: “R-CP” (remove from the CUP side)
6. Remove the tube connected to the IWBC CUP and MV27-3.
   Tube: “I-CP-L” (remove from the CUP side)
7. Remove the tube connected to the IWBC CUP and MV3-3.
   Tube: “I-CP” (remove from the CUP side)
8. Remove the tube connected to the RET CUP and MV34-4.
   Tube: “RET-CP” (remove from the CUP side)
9. Remove the tube connected to the RET CUP and MV32-2.
   Tube: “RECP-U” (remove from the CUP side)

The RET CUP HEATER UNIT (code No.: RP-ZY921W) is provided with all tubes connected.



Assembly

Assemble the RET CUP HEATER UNIT by following the disassembly procedure in reverse.

NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

4-4-15. Removing the TANK HEATER UNIT (ZY-910W)

Preparation

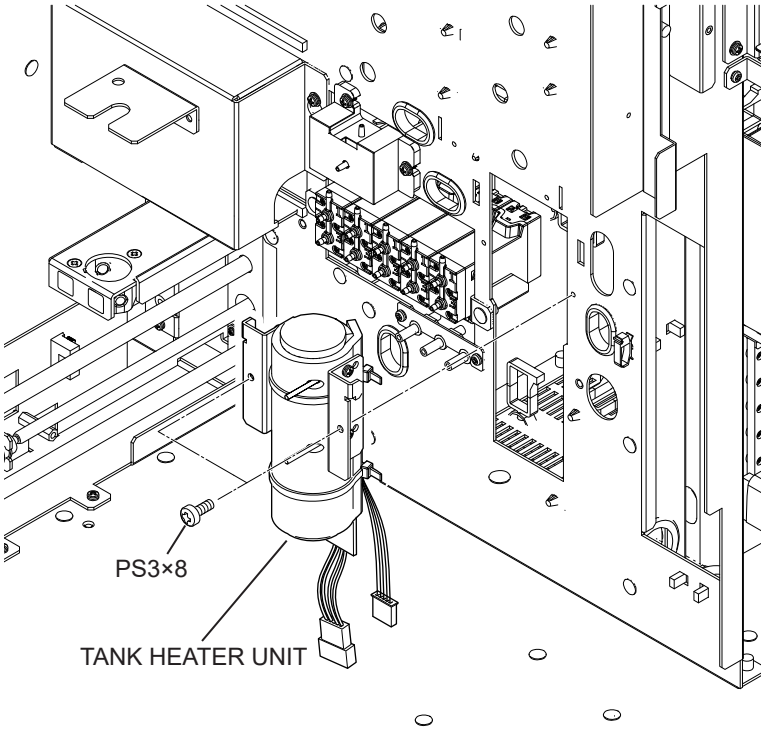
1 Remove the mixing cover, front cover, top cover, right panel, AUTOLOADER, FRONT PANEL UNIT, SAMPLER UNIT, OPEN AIR UNIT and RET CUP HEATER UNIT.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-4-4 (p. 4-20)
- Section 4-4-5 (p. 4-22)
- Section 4-4-6 (p. 4-25)
- Section 4-4-7 (p. 4-33)
- Section 4-4-14 (p. 4-52)

Procedures

1 Remove the two PS3×8 screws.

2 Slide the TANK HEATER UNIT toward you, remove the four tubes, disconnect the two cable connectors, and remove the TANK HEATER UNIT.



Assembly

Assemble the TANK HEATER UNIT by following the disassembly procedure in reverse.

NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

4-4-16. Removing the RET HEATER UNIT (ZY-920W)

Preparation

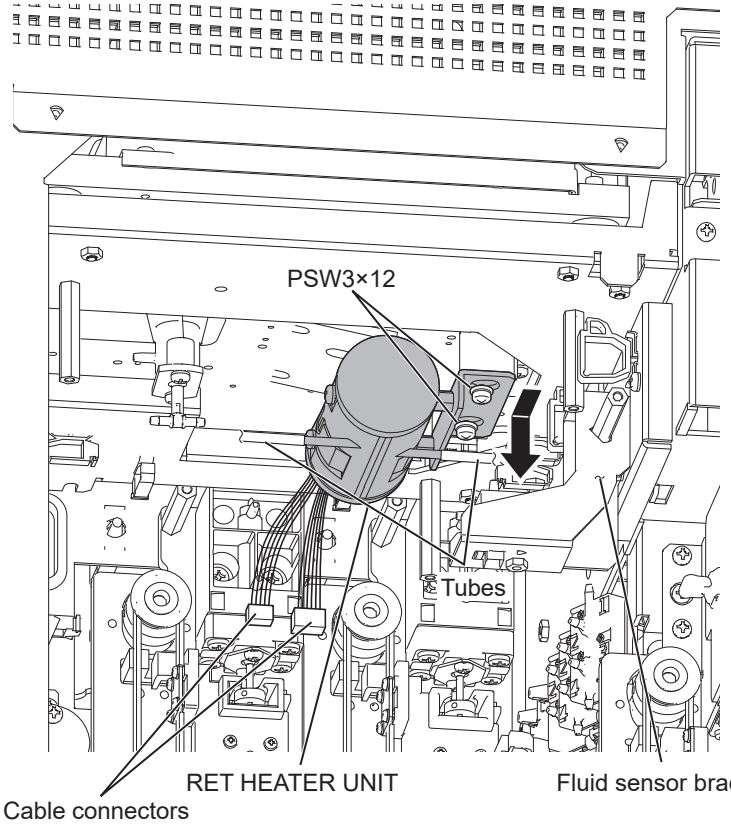
1 Remove the right panel.

Section 4-3-4 (p. 4-8)

Procedures

1 Disconnect the two tubes and two cable connectors.

2 Loosen the two PSW3×12 screws, slide the RET HEATER UNIT behind you and remove the RET HEATER UNIT downward.



You can remove the RET HEATER UNIT easily by moving the position of the fluid sensor bracket. (refer to 4-4-9 (p. 4-39) Preparation 3)

4-4-17. Removing the HGB MEASURING UNIT (MH-910W)

Preparation

1 Remove the mixing cover, front cover and sample cup tray.

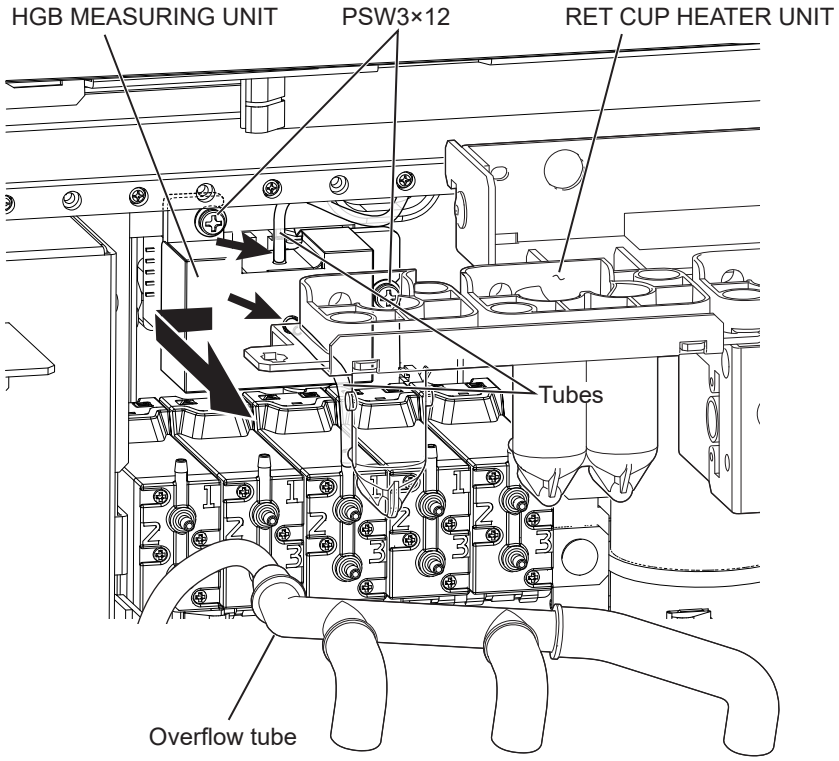
- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-4-6 (p. 4-25) Preparation **2**

Procedures

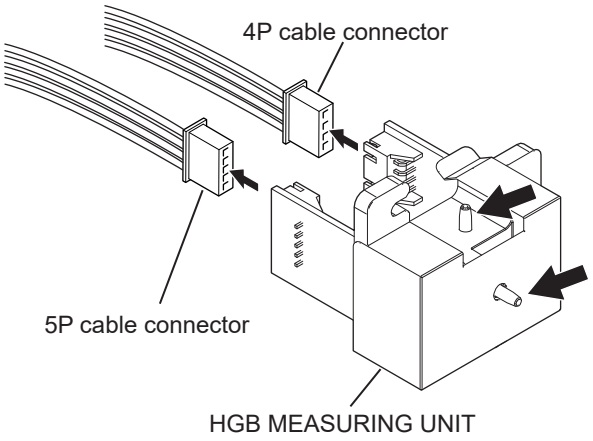
1 Disconnect the overflow tube from the RET CUP HEATER UNIT.

2 Disconnect the two tubes indicated by the arrows and loosen the two PSW3×12 screws.

3 Move the HGB MEASURING UNIT to the left and slide it toward you.



4 Disconnect the two cable connectors and remove the HGB MEASURING UNIT.



Assembly

Assemble the HGB MEASURING UNIT by following the disassembly procedure in reverse.

NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

Adjustment

After assembling the HGB MEASURING UNIT, adjust the gain.

Section 6-4 (p. 6-19)

4-4-18. Removing the PNEUMATIC UNIT (MP-910W)

Preparation

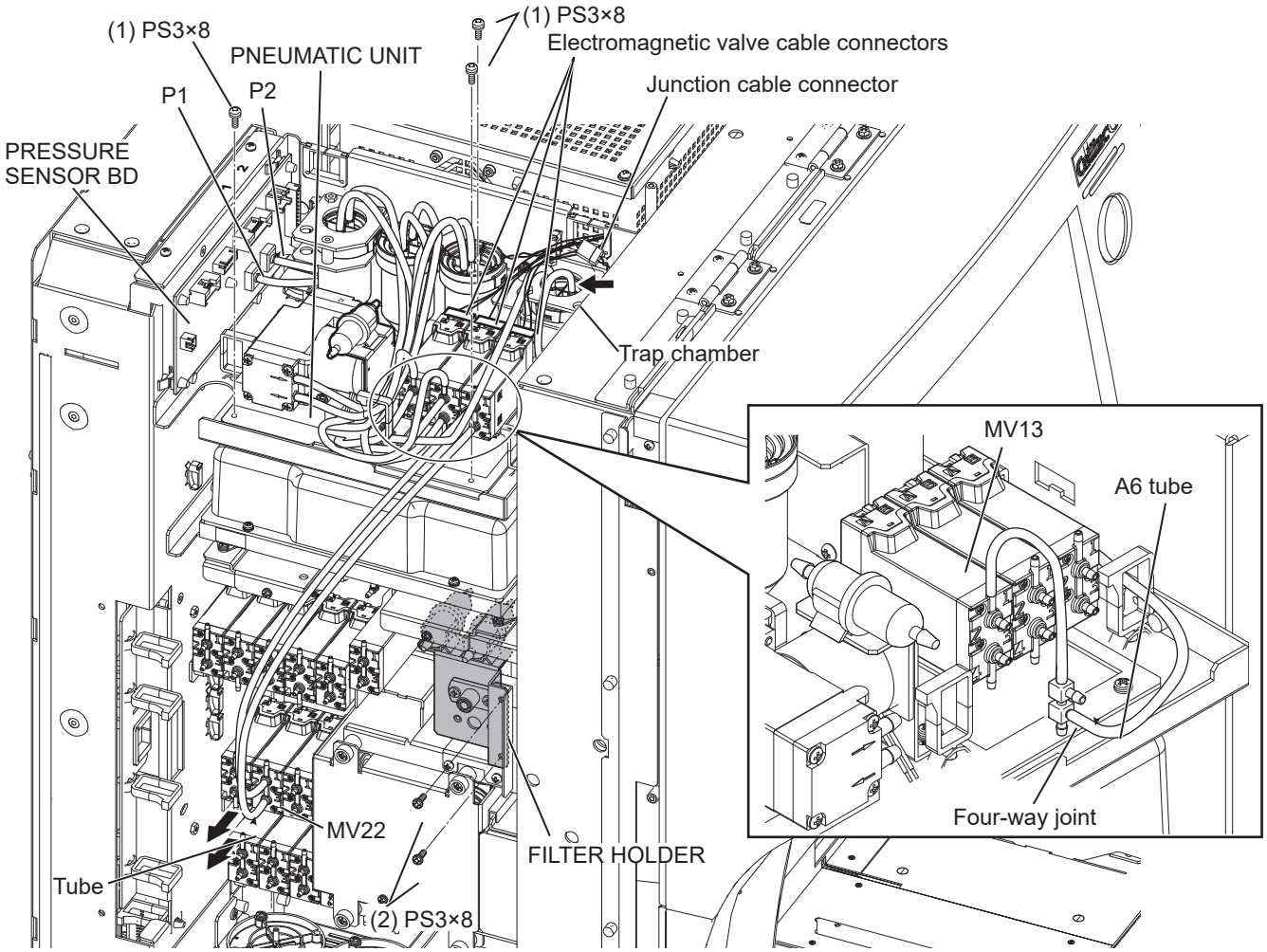
1. Remove the left cover and top cover.

   - Section 4-3-3 (p. 4-7)
   - Section 4-3-5 (p. 4-8)

Procedures

1. Disconnect the two tubes from port 2 and port 3 of MV22. (Labels “22-2” and “22-3”)
2. Disconnect the two PRESSURE SENSOR BD tubes from P1 and P2 ports. (Labels “P1” and “P2”)
3. Disconnect the TRC tube from the upper part of the Trap chamber. (Label “TRC”)
4. Disconnect the A6 tube from the four-way joint. (Label “A6”)
5. Disconnect the three cable connectors for the electromagnetic valves and one junction cable connector.
6. Remove the three (1) PS3×8 screws of the PNEUMATIC UNIT.

7 Remove the two (2) PS3×8 screws which secure the FILTER HOLDER, remove the FILTER HOLDER and remove the PNEUMATIC UNIT.



Assembly

Assemble the PNEUMATIC UNIT by following the disassembly procedure in reverse.

NOTE • Do not fold the tubes.

• When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

4-4-19. Removing the LASER OPTICAL UNIT (MO-910W)

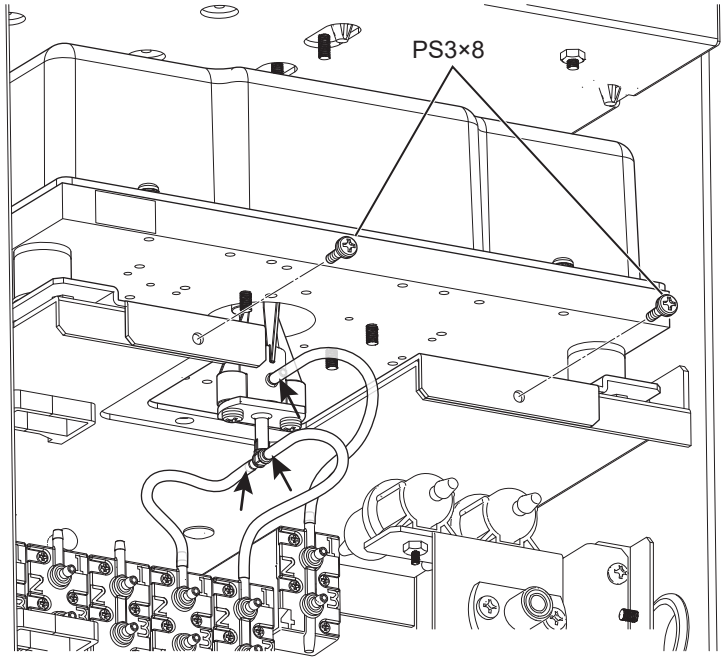
Preparation

1 Remove the left cover.

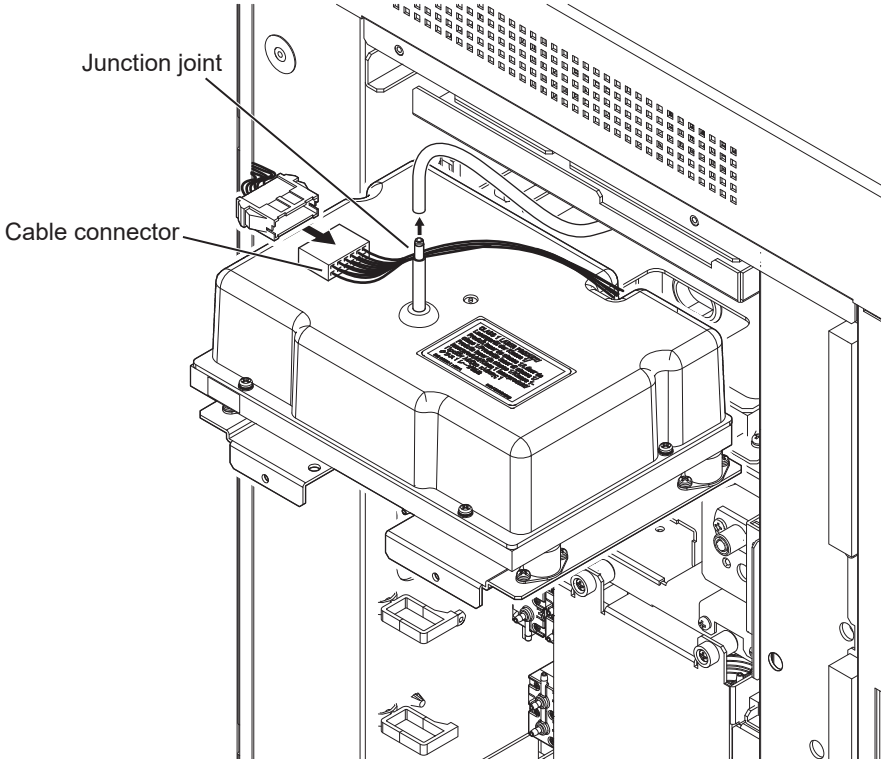
Section 4-3-5 (p. 4-8)

Procedures

1 Disconnect the three tubes (indicated by the arrows), remove the two PS3×8 screws and slide the LASER OPTICAL UNIT toward you.



2 Disconnect the tube from the junction joint on the upper part of the LASER OPTICAL UNIT, disconnect the cable connector and remove the LASER OPTICAL UNIT.



Assembly

Assemble the LASER OPTICAL UNIT by following the disassembly procedure in reverse.

NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

Adjustment

After assembling the LASER OPTICAL UNIT, adjust the gain.

Section 6-4 (p. 6-19)

4-4-20. Removing the LASER OPTICAL UNIT (BLUE) (MO-920W)

Preparation

1 Remove the top cover and right panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)

Procedures

1 Remove the tube from the tube clamp.

2 Disconnect the tube from the upper side of the LASER OPTICAL UNIT (BLUE) from the junction joint.

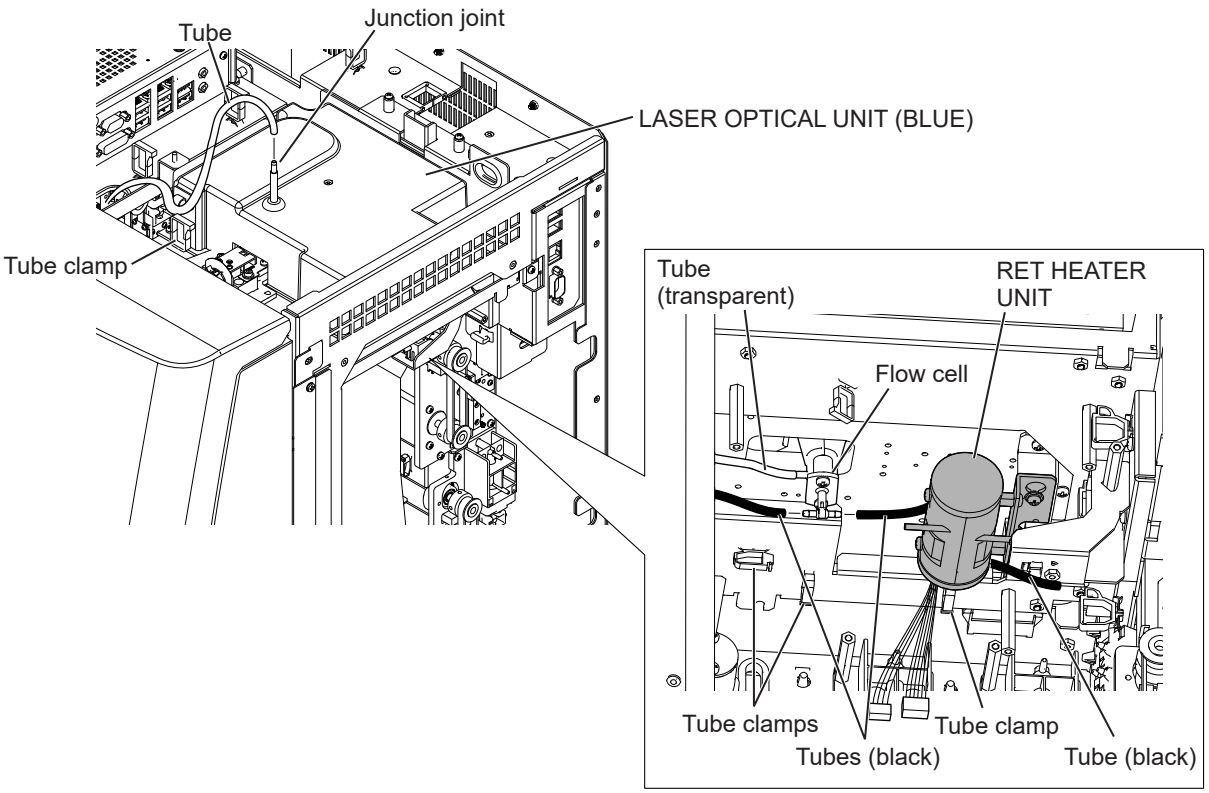
3 Disconnect the black tube connected to the flow cell and sensor.

NOTE
- Do not remove the transparent tube here. Remove the transparent tube from the MV 34-1 side.
- Do not apply excessive force to the flow cell part when disconnecting the black tube from the flow cell.

4 Disconnect all the cables and harnesses connected to the LASER OPTICAL UNIT (BLUE).

5 Remove all the tubes from the tube clamps at the bottom of the LASER OPTICAL UNIT (BLUE).

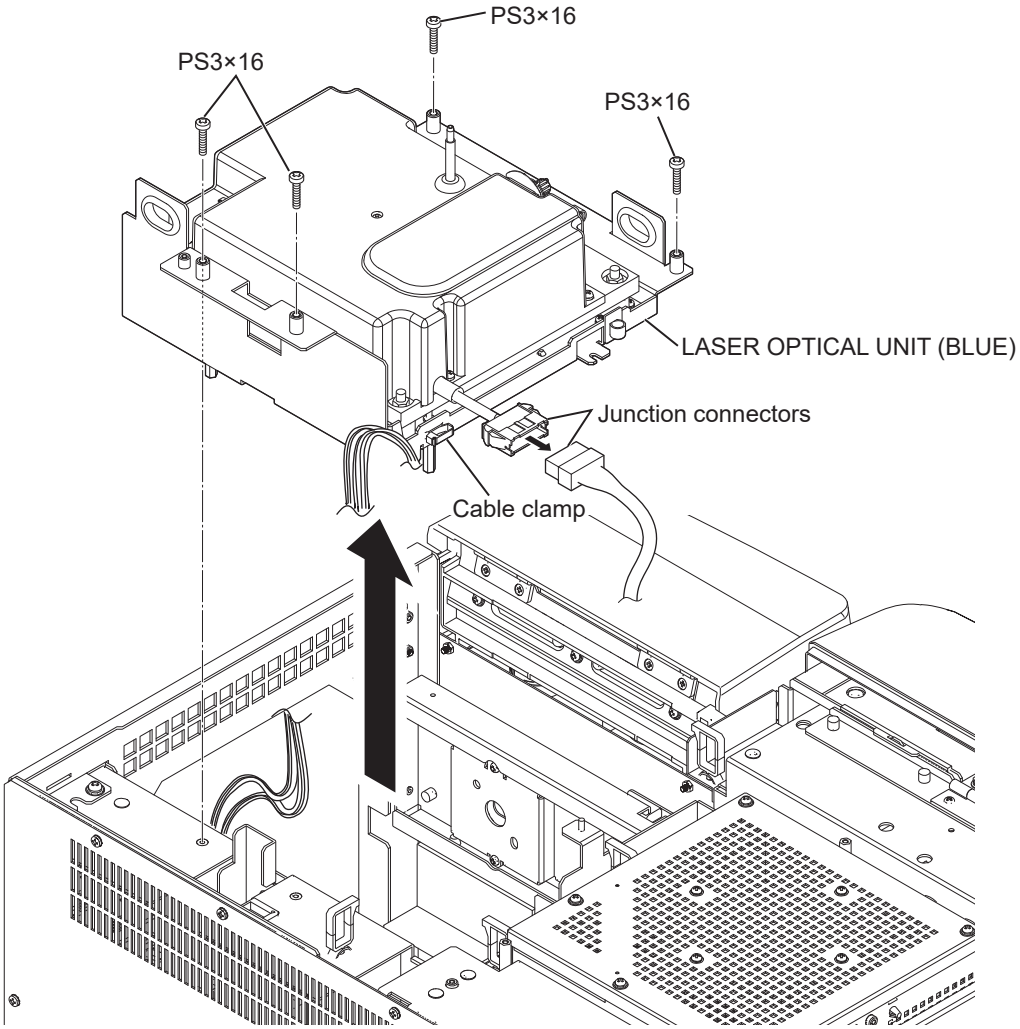
6 Disconnect all the cables connected to the LASER OPTICAL UNIT (BLUE).



7 Disconnect the cables from the tube clamp.

8 Disconnect the junction connector.

9 Remove the four PS3×16 screws and remove the LASER OPTICAL UNIT (BLUE).



Assembly

Assemble the LASER OPTICAL UNIT (BLUE) by following the disassembly procedure in reverse.

NOTE
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.
- When replacing the LASER OPTICAL UNIT (BLUE), remove and reuse the RET HEATER UNIT.

Adjustment

After assembling the LASER OPTICAL UNIT (BLUE), adjust the RET optical sensitivity.

Section 6-6 (p. 6-22)

4-4-21. Removing the CBC MEASURING UNIT (MC-910W)

Preparation

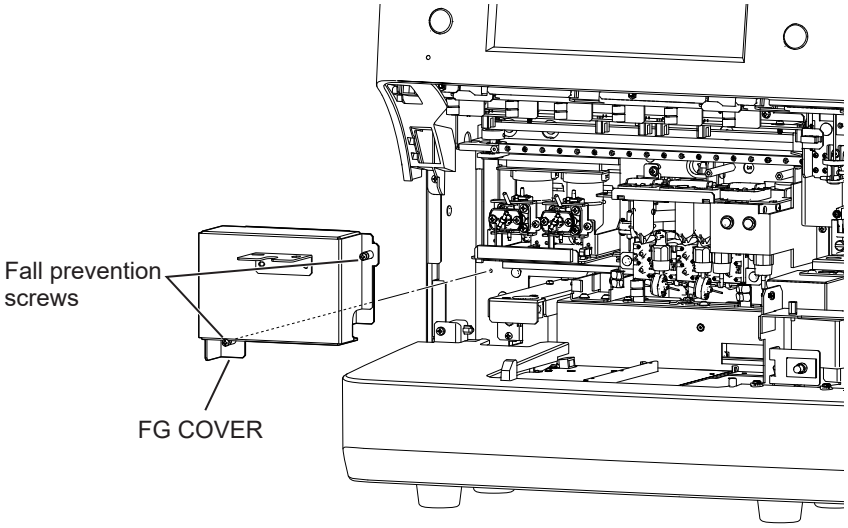
1 Remove the mixing cover, front cover, left cover and sample cup tray.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-5 (p. 4-8)
- Section 4-4-6 (p. 4-25) Preparation **2**

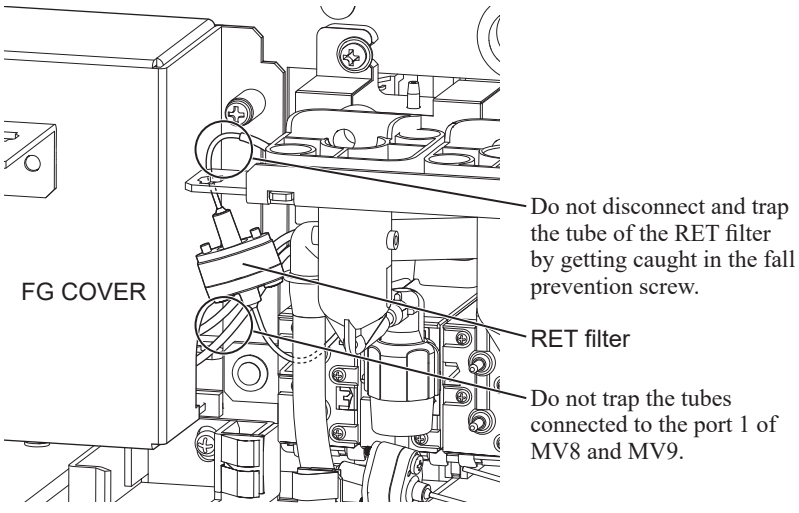
Procedures

1 Loosen the two fall prevention screws, and remove the FG COVER by moving it upward and sliding it toward you.

If the FG cover is hard to remove, loosen the washers on the rear of the screws and loosen the screws more.



NOTE: When removing or attaching the FG cover, cover the RET filter with fingers so that the RET filter is not trapped.



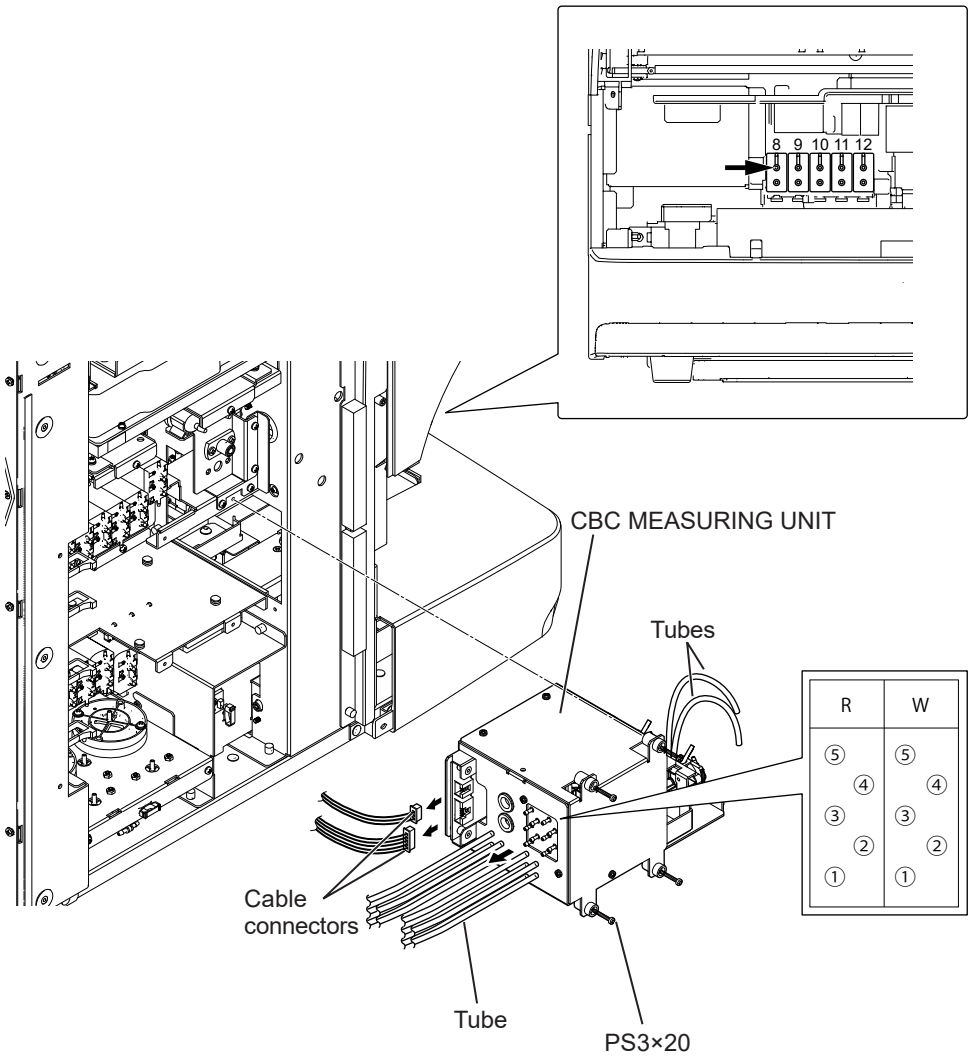
2 Disconnect the W-1 to W-5 and R-1 to R-5 tubes from the rear of the CBC MEASURING UNIT.

3 On the left side, disconnect the tubes of port 2 and port 3 of MV21.

4 On the front side, disconnect the tubes of port 1 of MV8 and port 1 of MV9.

5 Remove the four PS3×20 screws evenly and slide the CBC MEASURING UNIT toward you.

6 Disconnect the two cable connectors and remove the CBC MEASURING UNIT.



Assembly

Assemble the CBC MEASURING UNIT by following the disassembly procedure in reverse.

NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

4-4-22. Removing the DETECTOR BLOCK ASSY (WBC) and (RBC)

Preparation

1 Remove the mixing cover, front cover, left cover and sample cup tray.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-5 (p. 4-8)
- Section 4-4-6 (p. 4-25) Preparation **2**

2 Remove the FG COVER.

Section 4-4-21 (p. 4-64) Preparation **1**

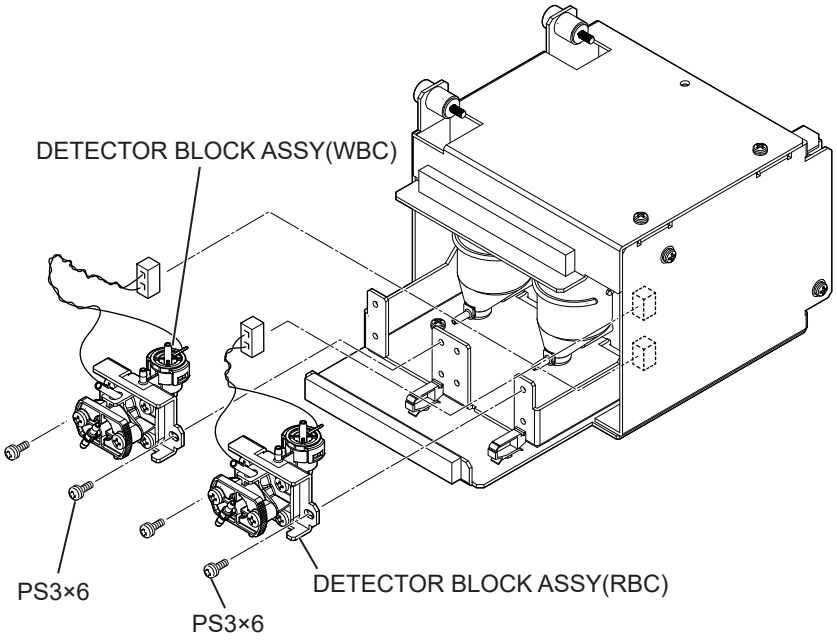
Procedures

1 Disconnect the cable connector of the DETECTOR BLOCK ASSY (RBC).

2 Disconnect the tube, remove the two PS3×6 screws and remove the DETECTOR BLOCK ASSY (RBC).

3 Disconnect the cable connector of the DETECTOR BLOCK ASSY (WBC).

4 Disconnect the tube, remove the two PS3×6 screws and remove the DETECTOR BLOCK ASSY (WBC).



NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

Assembly

Assemble the DETECTOR BLOCK ASSY (WBC) and (RBC) by following the disassembly procedure in reverse.

NOTE
- Do not fold or trap the tubes.
- Evenly tighten the four PS3x20 screws which secure the CBC MEASURING UNIT. Keep even tension on all the screws by tightening each screw a little bit then moving to the next screw.

4-4-23. Removing the DIAPHRAGM PUMP ASSY

Preparation

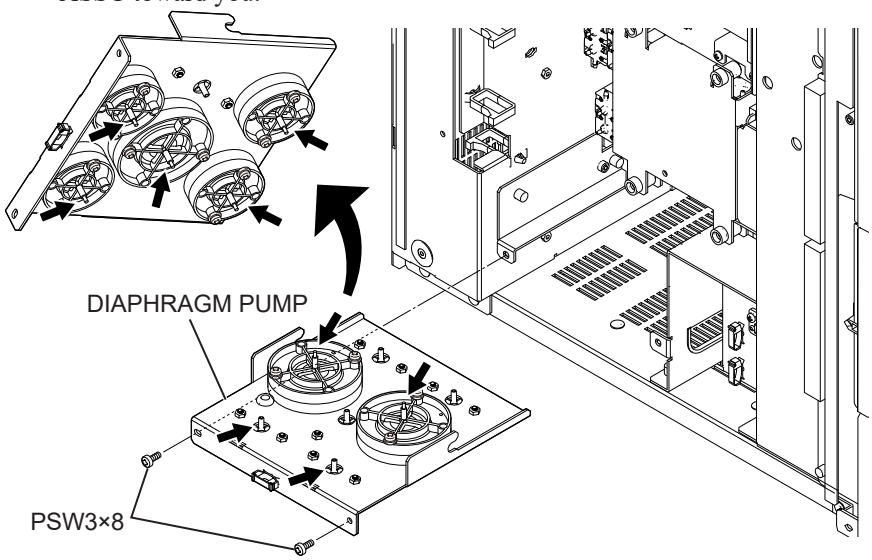
1 Remove the left cover.

Section 4-3-5 (p. 4-8)

Preparation

1 Remove the nine tubes (22-1, 23-2, 23-3, 24-1, 25-1, 26-1, 27-1, 31-1, 31-3) indicated by the arrow.

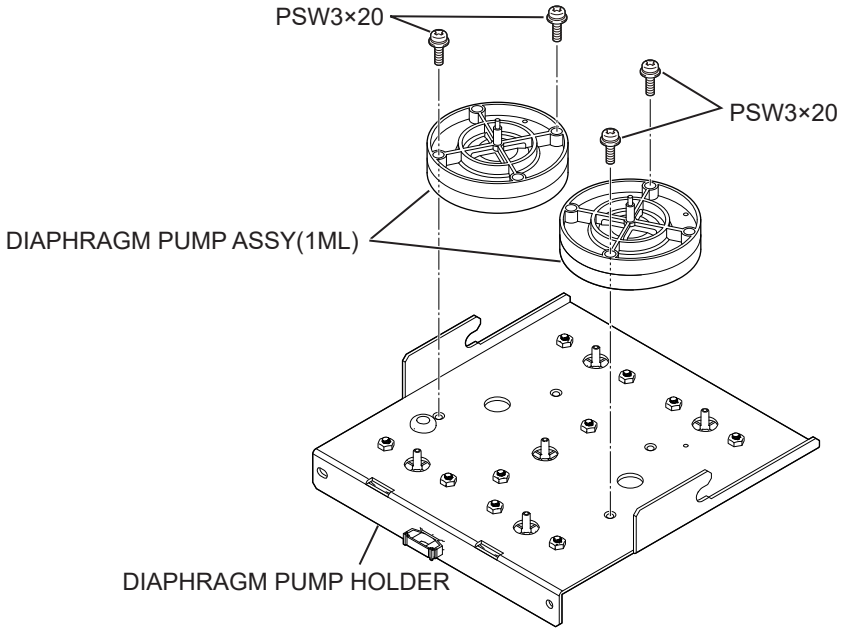
2 Remove the two PSW3×8 screws and slide the DIAPHRAGM PUMP ASSY toward you.



NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

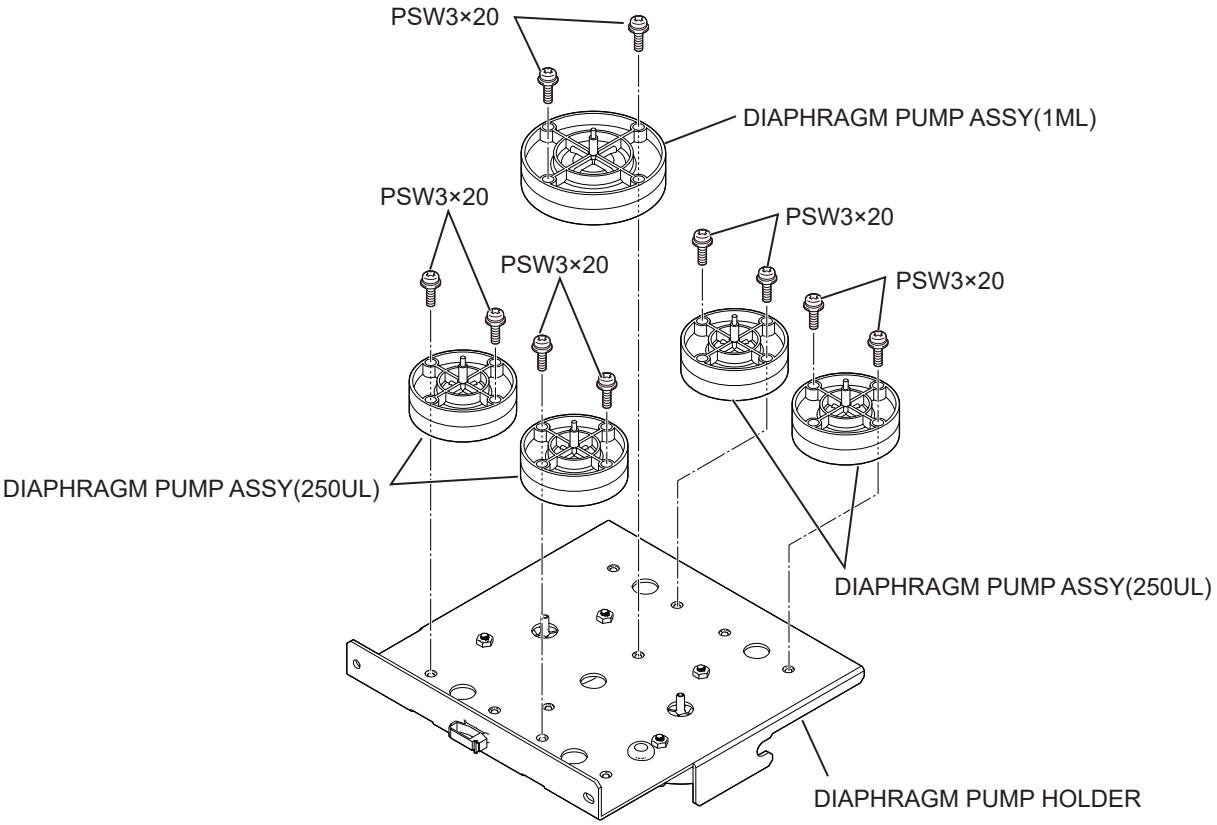
3 Disconnect the tubes from the DIAPHRAGM PUMP ASSY (1ML) to be replaced, remove the two PSW3×20 screws and remove the DIAPHRAGM PUMP ASSY (1ML).

NOTE: Three DIAPHRAGM PUMP ASSY (1ML) are mounted on the both sides of the DIAPHRAGM PUMP HOLDER in total. Either of them can be removed by the same procedure.



4 Disconnect the tubes from the DIAPHRAGM PUMP ASSY (250UL) to be replaced, remove the two PSW3×20 screws and remove the the DIAPHRAGM PUMP ASSY (250UL).

NOTE: Four DIAPHRAGM PUMP ASSY (250UL) are mounted on the rear side of the DIAPHRAGM PUMP HOLDER. Either of them can be removed by the same procedure.



Assembly

Assemble the DIAPHRAGM PUMP ASSY by following the disassembly procedure in reverse.

NOTE: Do not fold or trap the tubes.

4-4-24. Removing the ISO CHAMBER UNIT (JQ-920W)

Preparation

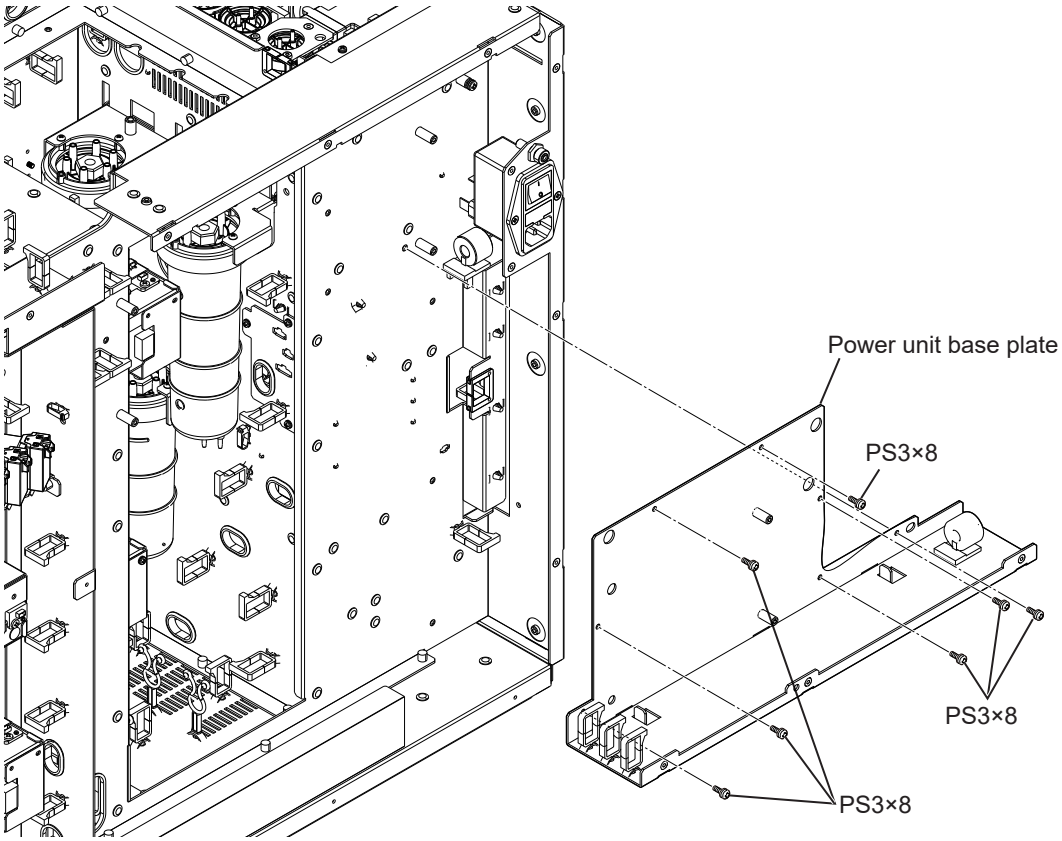
1 Remove the mixing cover, front cover, top cover, right panel, left cover and rear panel.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

2 Remove the board hold plate, switching power supply and DATA PROCESSING UNIT.

- Section 4-4-1 (p. 4-15)
- Section 4-4-2 (p. 4-17)
- Section 4-4-3 (p. 4-18)

3 Remove the seven PS3×8 screws and remove the power unit base plate.



Preparation

1 On the left side, disconnect the tubes from the following parts:

- Port 2 and port 3 of MV16
- Port 1 of MV17
- Port 1 of MV18
- Port 2 of MV19

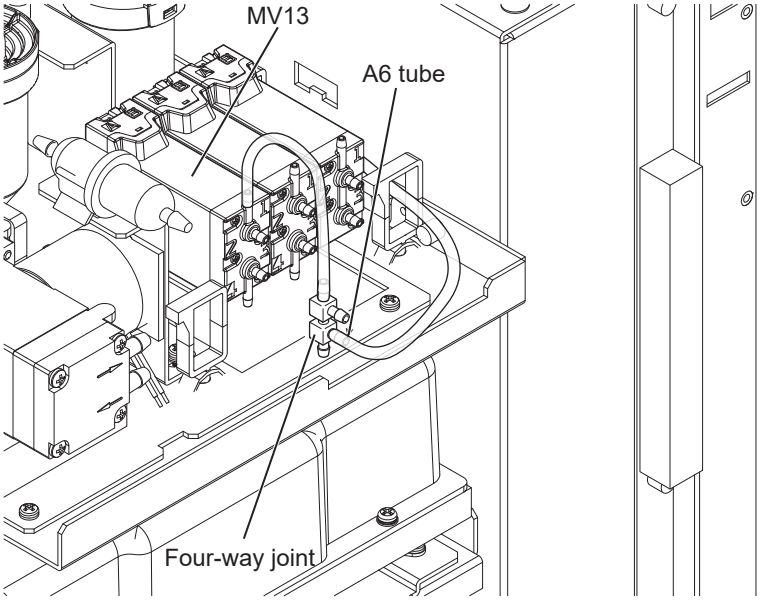
2 On the front side, disconnect the tubes from the following parts:

- Port 3 of MV10
- Port 3 of MV12

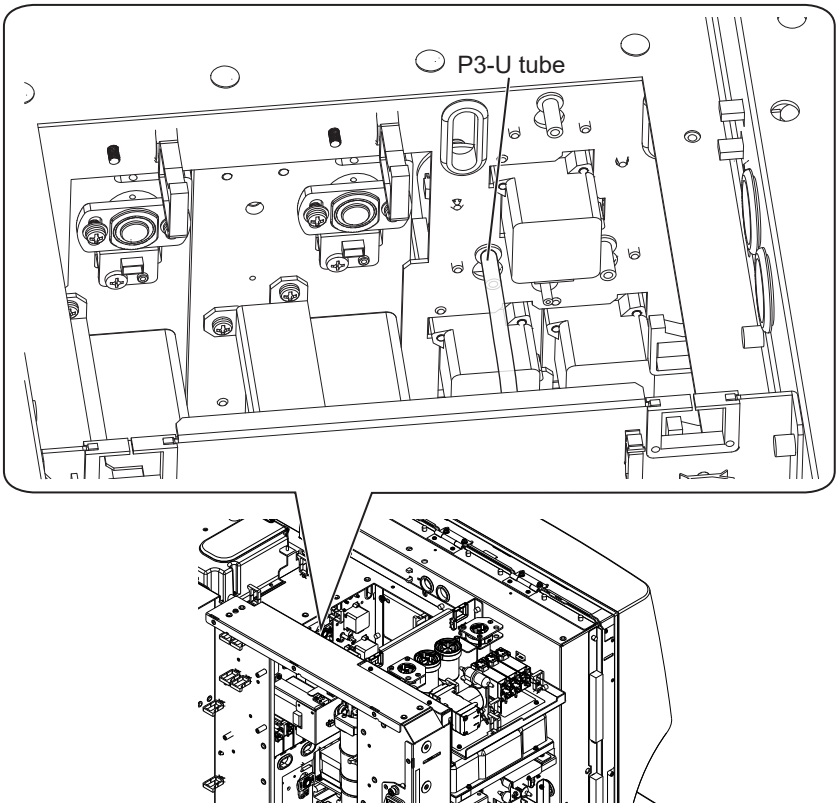
3 On the right side, disconnect the tubes from the following parts:

- Port 4 of MV4
- Port 1 of MV5
- Port 1 of MV6
- Port 2 of MV7
- Port 2 of MV34
- Port 2 of MV35

4 Disconnect the A6 tube from the four-way joint. (Label “A6”)

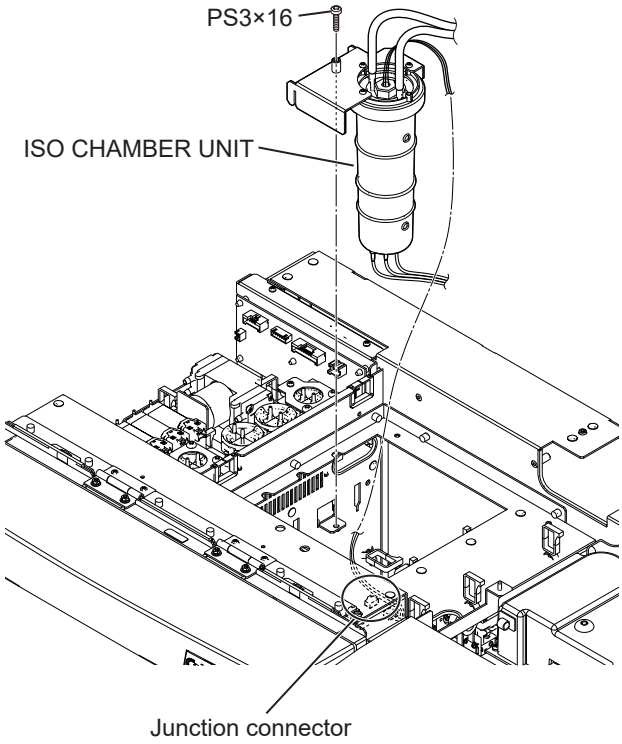


5 Disconnect the P3-U tube. (Label “P3-U”)



6 Disconnect the cable connector from the junction connector.

7 Loosen the PS3×16 screw and pull up the ISO CHAMBER UNIT carefully to prevent the screw from falling.



NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

Assembly

Assemble the ISO CHAMBER UNIT (JQ-920W) by following the disassembly procedure in reverse.

NOTE: Do not fold or trap the tubes.

4-4-25. Removing the WASTE CHAMBER 1 UNIT (JQ-921W)

Preparation

1 Remove the mixing cover, front cover, top cover, right panel, left cover and rear panel.

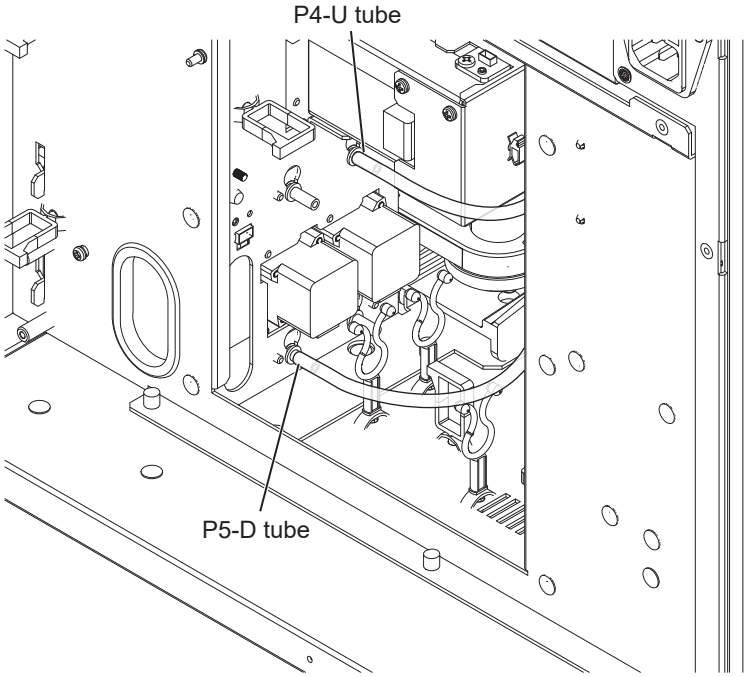
- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

2 Remove the board hold plate and DATA PROCESSING UNIT.

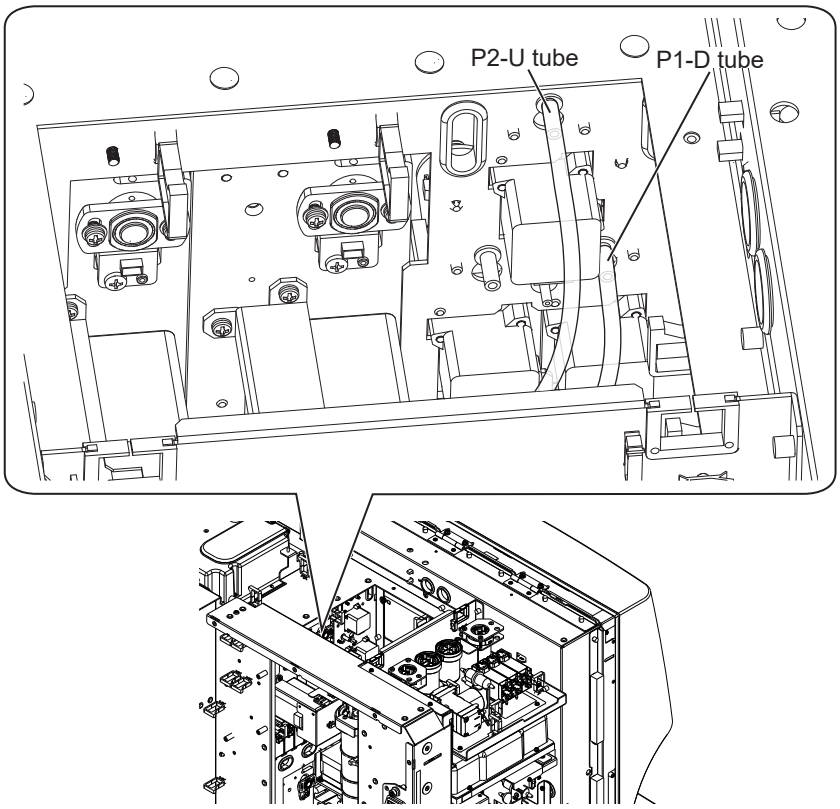
- Section 4-4-1 (p. 4-15)
- Section 4-4-3 (p. 4-18)

Procedures

1 Remove the P4-U and P5-D tubes on the rear side. (Label “P4-U”,“P5-D”)



2 Remove the P1-D and P2-U tubes. (Label “P1-D”,“P2-U”)

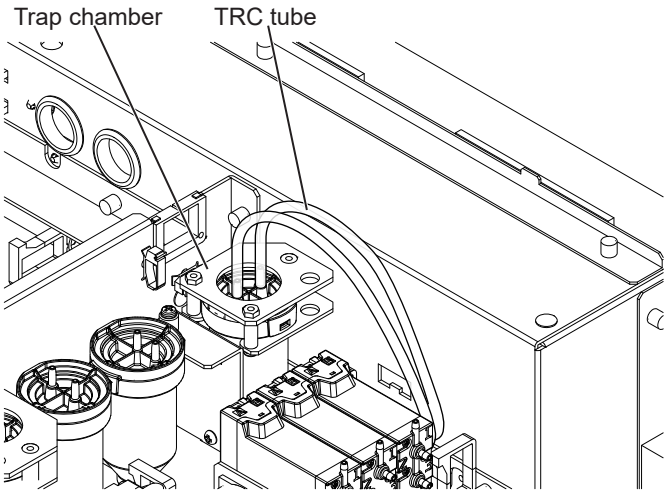


3 On the left side, remove the tubes from the following parts:

- Port 1 and port 4 of MV28
- Port 1 of MV29
- Port 3 of MV30

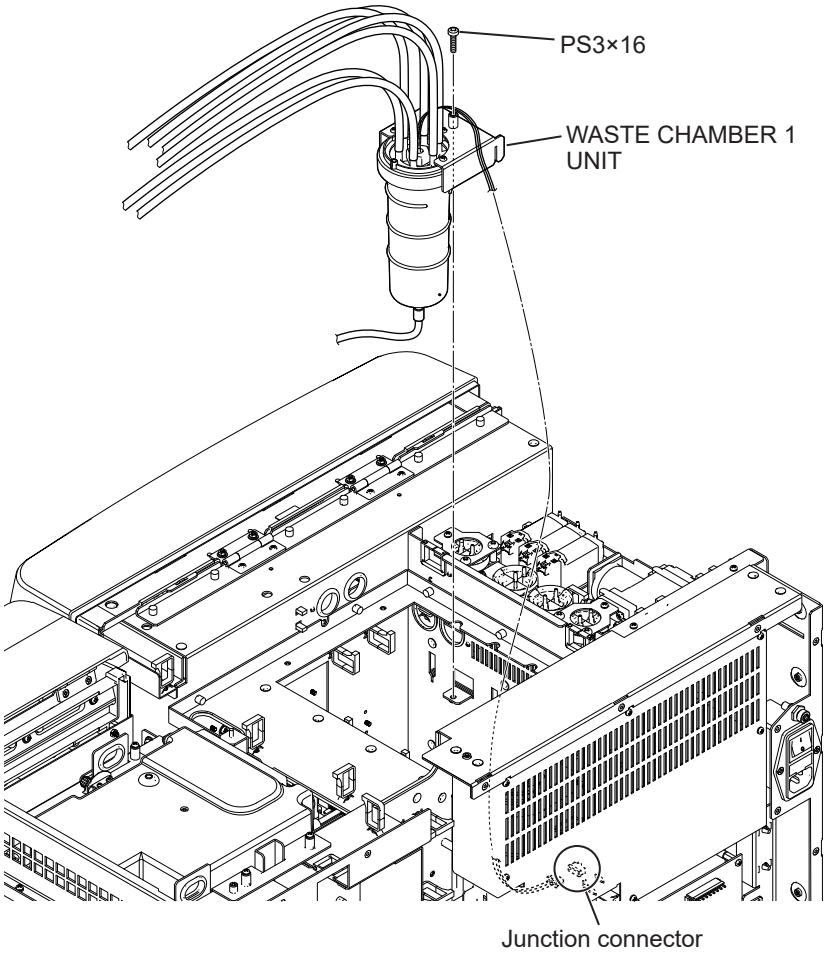
4 On the front side, disconnect the tube from port 2 of MV12.

5 Disconnect the TRC tube from the Trap chamber. (Label “TRC”)



6 Disconnect the junction connector.

7 Loosen the PS3×16 screw and pull up the WASTE CHAMBER 1 UNIT carefully to prevent the screw from falling.



NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

Assembly

Assemble the WASTE CHAMBER 1 UNIT (JQ-921W) by following the disassembly procedure in reverse.

NOTE: Do not fold or trap the tubes.

4-4-26. Removing the WASTE CHAMBER 2 UNIT (JQ-922W)

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

2 Remove the board hold plate and DATA PROCESSING UNIT.

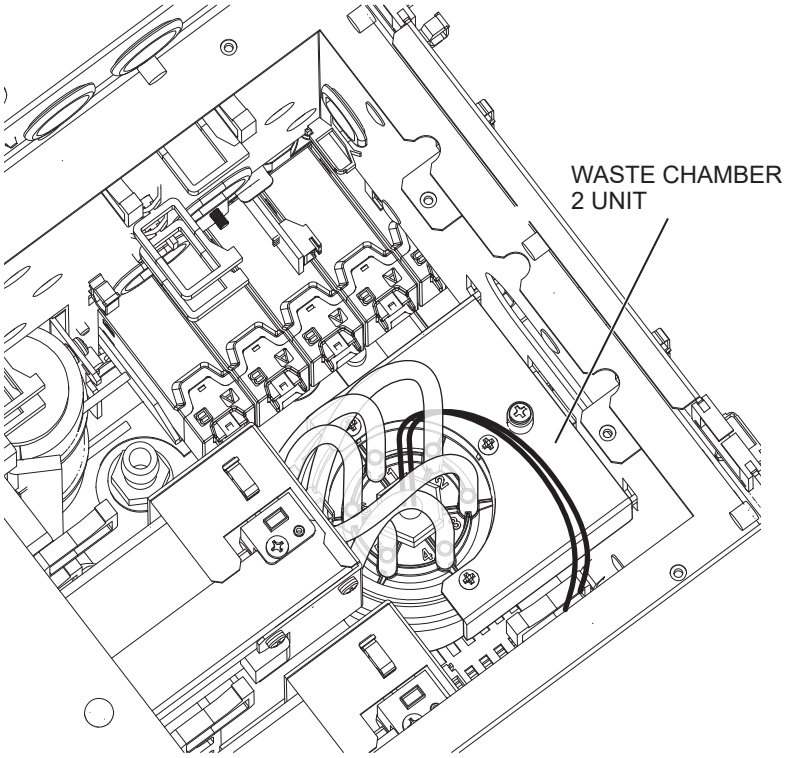
- Section 4-4-1 (p. 4-15)
- Section 4-4-3 (p. 4-18)

3 Remove the ISO CHAMBER UNIT.

Section 4-4-24 (p. 4-69)

4 Remove the WASTE CHAMBER 1 UNIT.

Section 4-4-25 (p. 4-72)

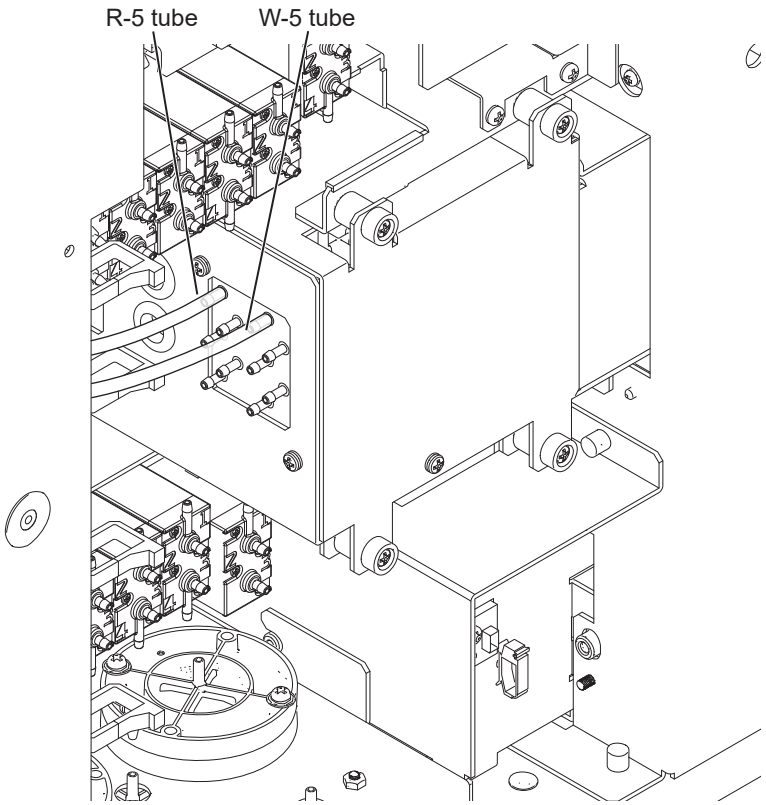


Procedures

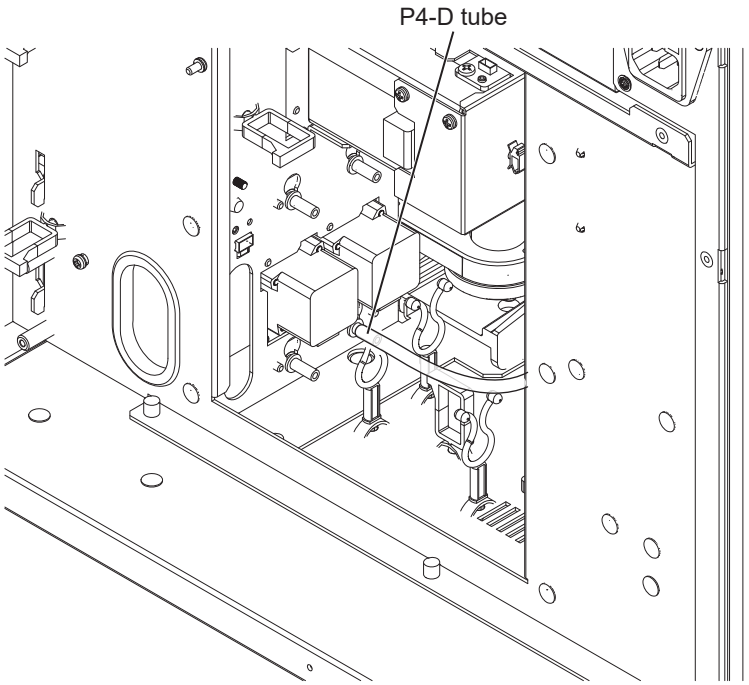
1 On the left side, remove the tubes from the following parts:

- Port 4 of MV17
- Port 4 of MV19
- Port 1 of MV23
- Port 4 of MV29
- Port 2 of MV30

2 Disconnect the W-5 and R-5 tubes from the rear of the CBC MEASURING UNIT.



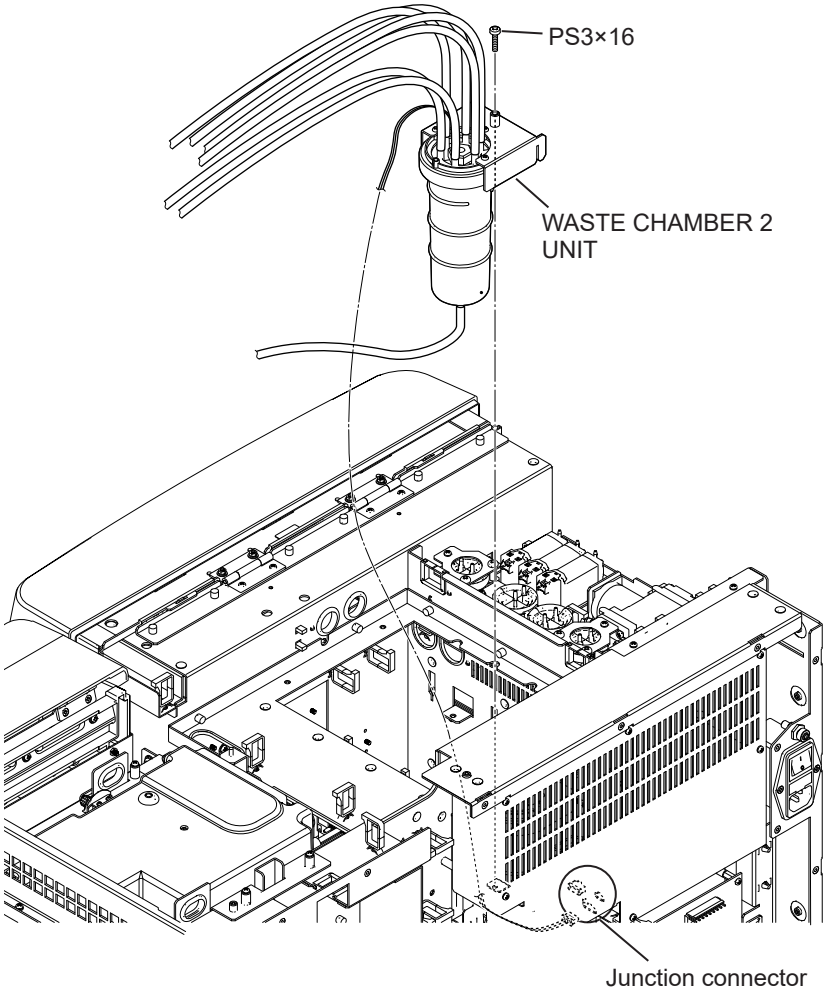
3 Disconnect the P4-D tube from the rear side. (Label “P4-D”)



4 Disconnect the tube from port 3 of MV32 on the right side.

5 Disconnect the junction connector.

6 Loosen the PS3×16 screw and pull up the WASTE CHAMBER 2 UNIT carefully to prevent the screw from falling.



NOTE: When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.

Assembly

Assemble the WASTE CHAMBER 2 UNIT (JQ-922W) by following the disassembly procedure in reverse.

NOTE: Do not fold or trap the tubes.

4-4-27. Removing the OPEN LOADER UNIT (MS-912W)

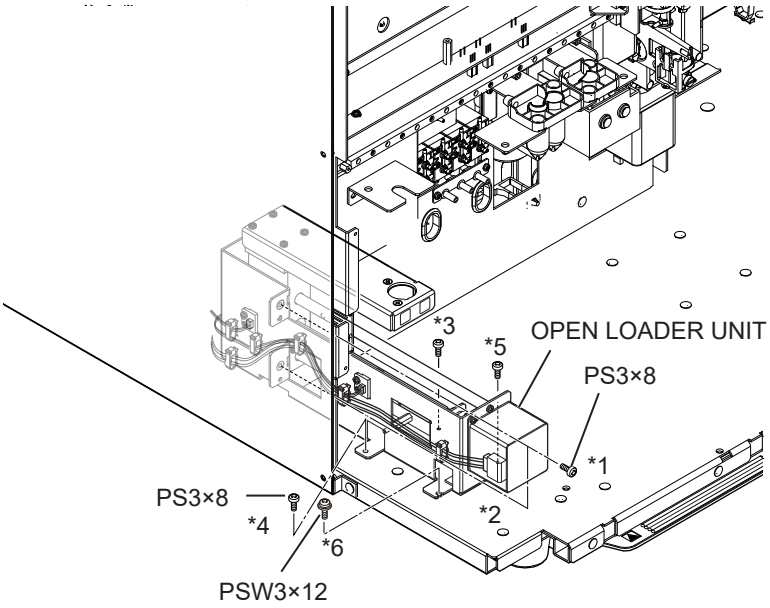
Preparation

1 Remove the mixing cover, front cover and AUTOLOADER COVER.

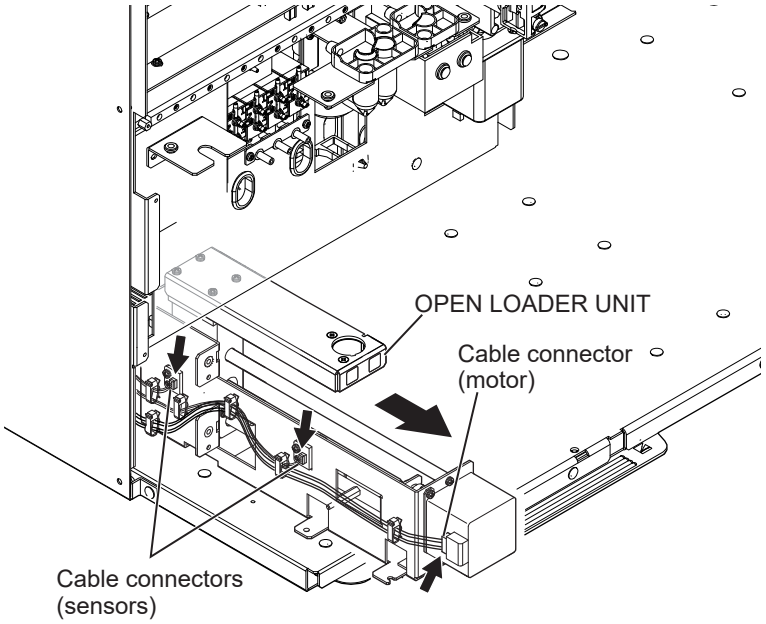
- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-4-5 (p. 4-22) Step **1** to **3**

Procedures

1 Remove the five PS3×8 screws and the PSW3×12 screw, and slide the OPEN LOADER UNIT toward you.



2 Disconnect the two cable connectors for the sensors and the cable connector for the motor, and remove the OPEN LOADER UNIT.



Assembly

Assemble the MS-912W OPEN LOADER UNIT by following the disassembly procedure in reverse.

NOTE • First, fix the *1, *2, *3, *4, *5 and *6 screws in this order.

• Do not trap the cables.

Checking the Sampling Needle Position

After assembling the OPEN LOADER UNIT (MS-912W), check the position of sampling needle.

Section 6-3-2 (p. 6-13)

4-5. Removing the Fluid Sensor (CL, H3, H5, RET)

4-5-1. Removing the Fluid Sensor (CL)

Preparation

1 Remove the right panel.

Section 4-3-4 (p. 4-8)

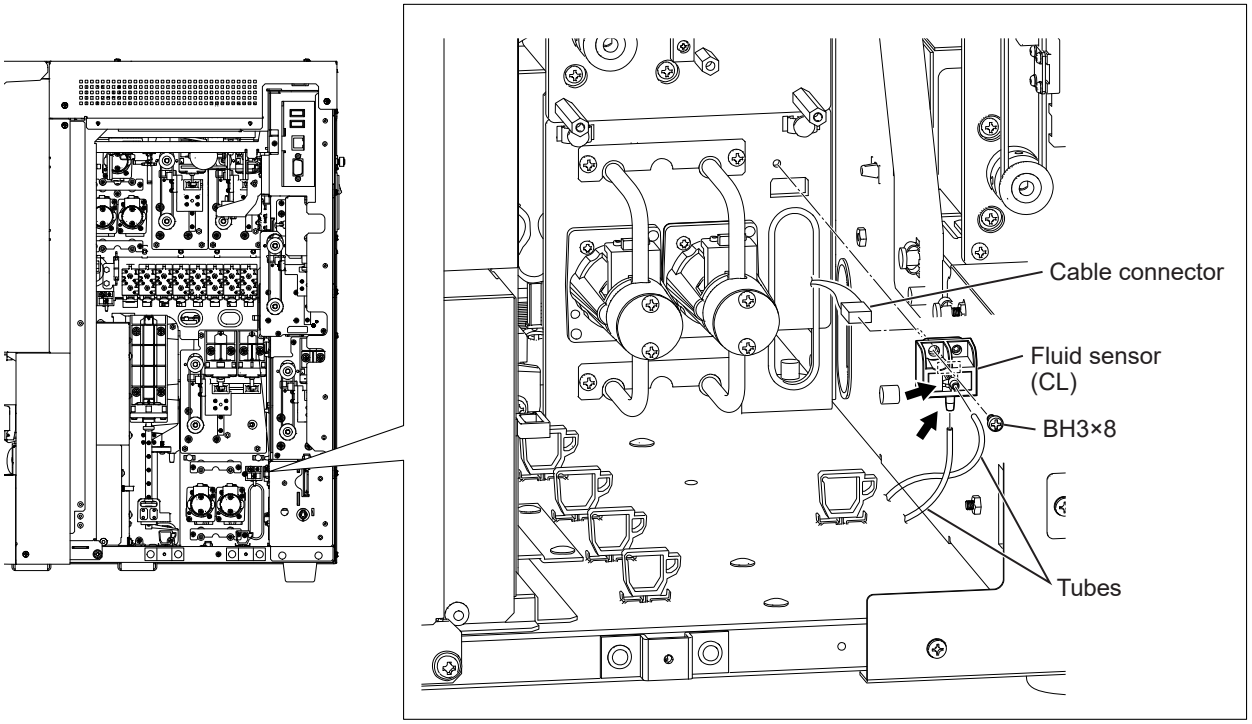
2 Remove the PORT HOLDER and splash-proof protection sheet.

Section 4-4-13-2 (p. 4-25) step 1 and step 2

Procedures

1 Disconnect the two tubes and one cable connector.

2 Remove the BH3×8 screw and remove the fluid sensor (CL).



Assembly

Assemble the fluid sensor (CL) by following the disassembly procedure in reverse.

NOTE: Attach the fluid sensor and then connect the tubes.

Adjustment

After assembling the fluid sensor (CL), adjust the gain.

Section 6-4 (p. 6-19)

4-5-2. Removing the Fluid Sensor (H3, H5)

NOTE: In this section, the fluid sensor (H3, H5) can be removed. Either of them can be removed by the same procedure.

Preparation

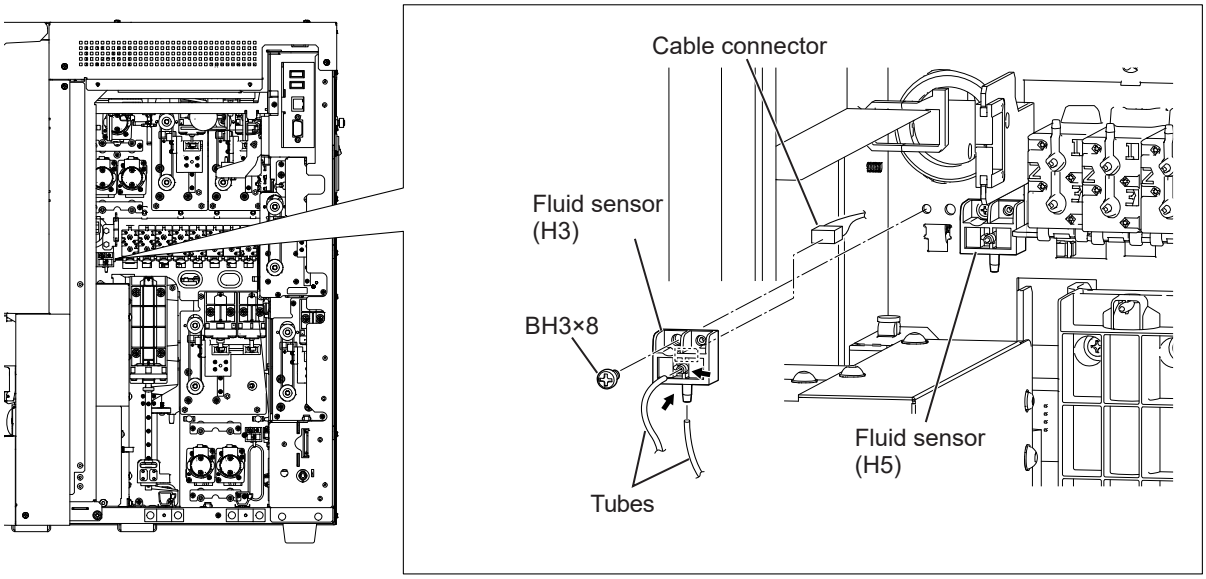
1 Remove the right panel.

Section 4-3-4 (p. 4-8)

Procedures

1 Disconnect the two tubes and one cable connector.

2 Remove the BH3×8 screw and remove the fluid sensor (H3).



3 Remove the fluid sensor (H5) in the same procedure.

Assembly

Assemble the fluid sensor (H3, H5) by following the disassembly procedure in reverse.

NOTE: Attach the fluid sensor and then connect the tubes.

Adjustment

After assembling the fluid sensor (H3, H5), adjust the gain.

Section 6-4 (p. 6-19)

4-5-3. Removing the Fluid Sensor (RET)

Preparation

1. Remove the right panel.

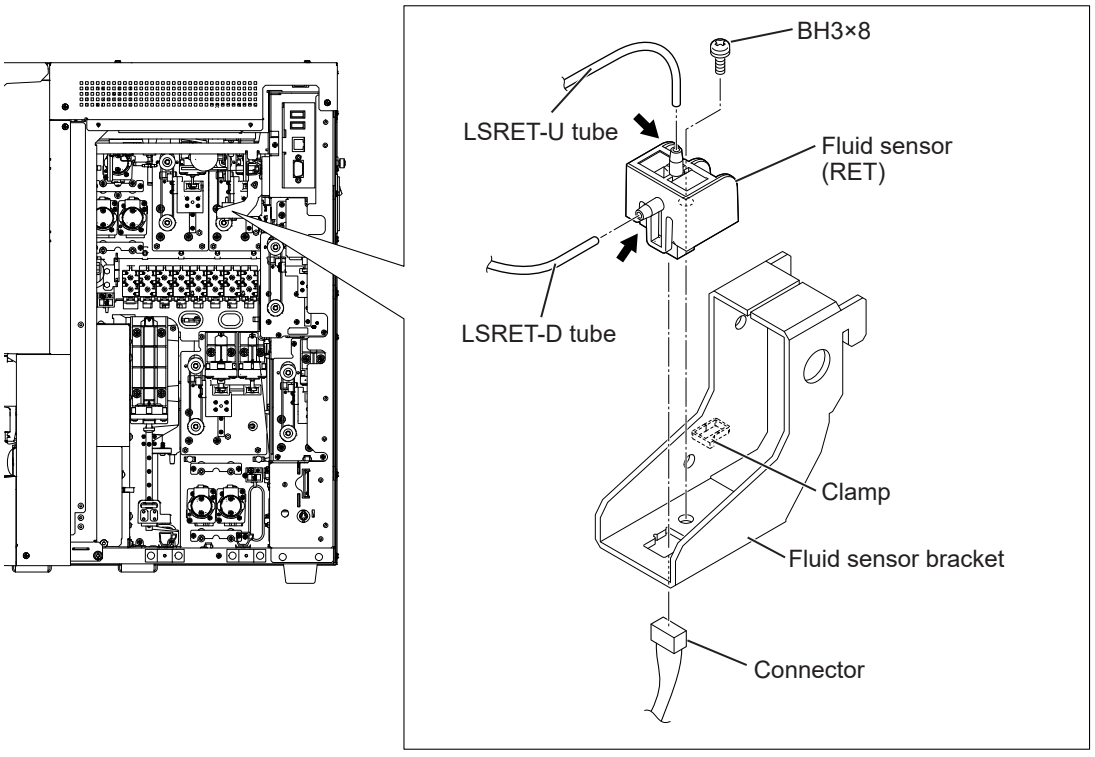
   Section 4-3-4 (p. 4-8)

2. Remove the fluid sensor bracket.

   Section 4-4-9 (p. 4-39) Preparation **3** 1)

Procedures

1. Disconnect the two tubes.
2. Disconnect the cable connector and remove the cable from the cable connector.
3. Remove the BH3×8 screw and remove the fluid sensor (RET).



Assembly

Assemble the fluid sensor (RET) by following the disassembly procedure in reverse.

NOTE: Connect the LSRET-U tube and LSRET-D tube in the correct position.

Adjustment

After assembling the fluid sensor (RET), adjust the gain.

Section 6-4 (p. 6-19)

4-6. Removing the Boards

4-6-1. Removing the ANALOG BD (UT-7310)

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

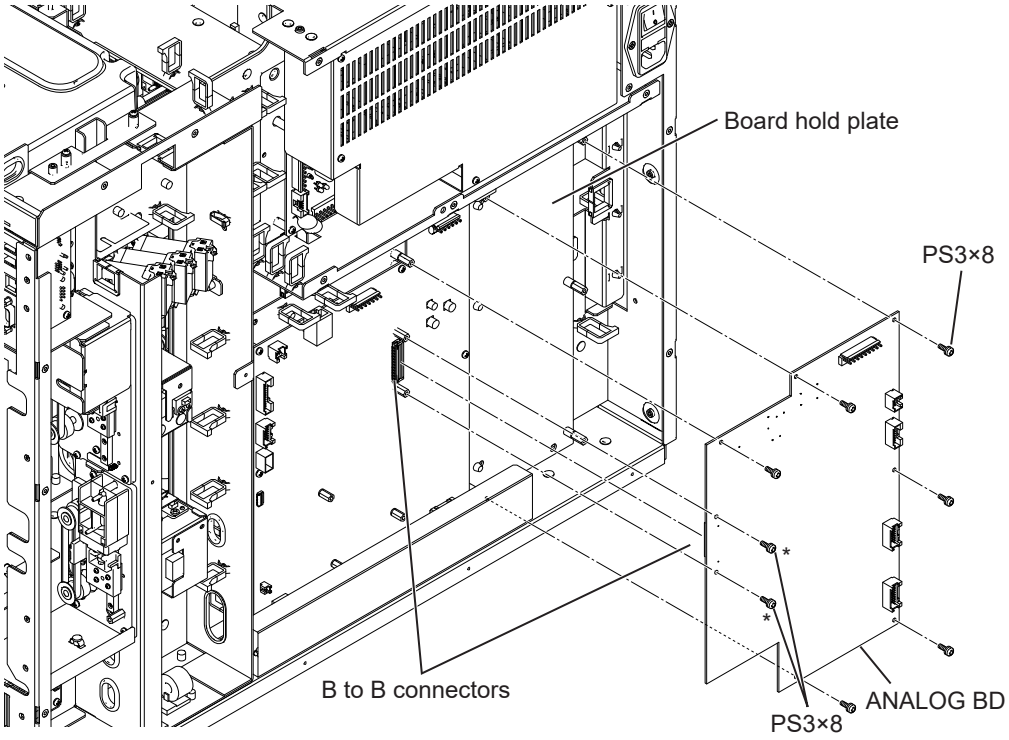
Procedures

1 Disconnect all cable connectors connected to the ANALOG BD (UT-7310).

2 Remove the eight PS3×8 screws and remove the ANALOG BD (UT-7310) from the board hold plate.

Assembly

Assemble the ANALOG BD (UT-7310) by following the disassembly procedure in reverse.



Adjustment

Assemble the ANALOG BD (UT-7310) by following the disassembly procedure in reverse.

NOTE: Fix the two PS3×8 screws shown with the * symbol first.

4-6-2. Removing the DRIVER BD (UT-7311)

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

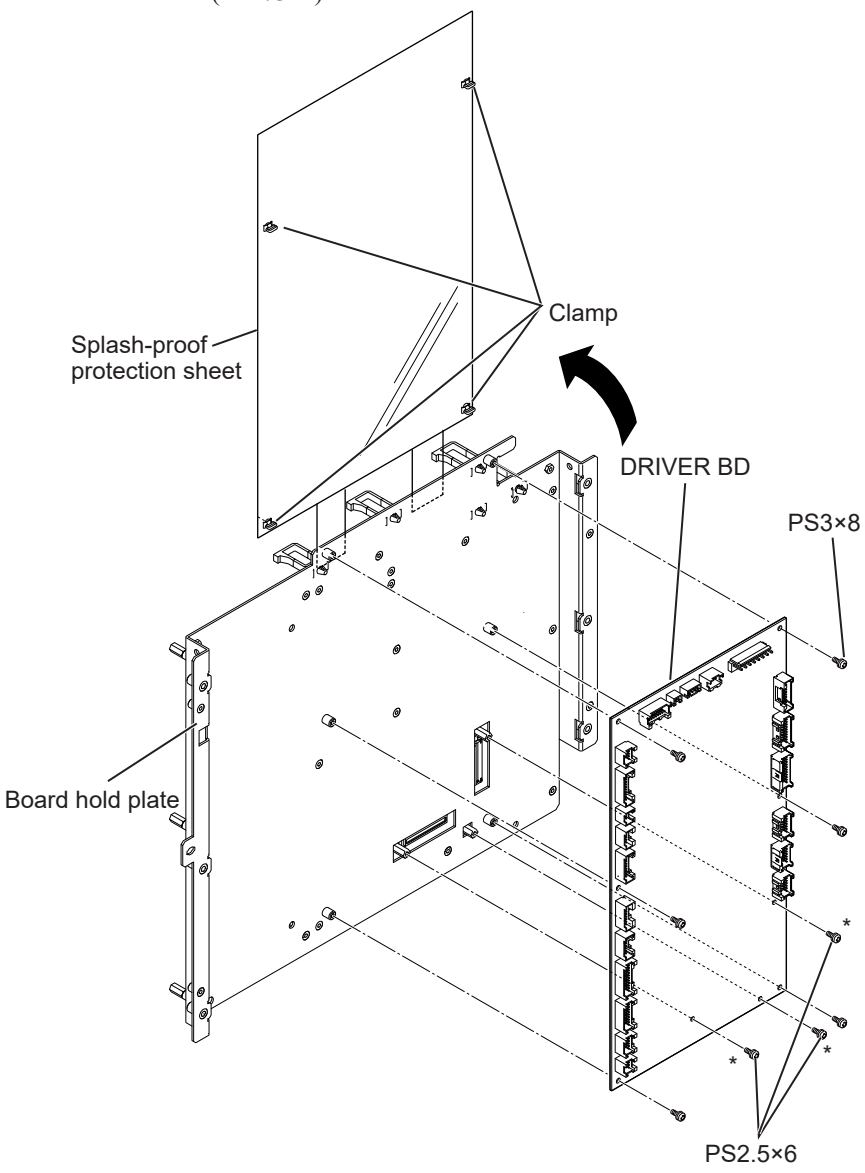
2 Remove the board hold plate.

Section 4-4-1 (p. 4-15)

Procedures

1 Unlock the four clamps and turn over the splash-proof protection sheet.

2 Remove the six PS3×8 screws and three PS2.5×6 screws and remove the DRIVER BD (UT-7311).



Assembly

Assemble the DRIVER BD (UT-7311) by following the disassembly procedure in reverse.

NOTE: Fix the three PS2.5×6 screws shown with the * symbol first.

4-6-3. Removing the MAIN BD (UT-7309)

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

2 Remove the board hold plate.

Section 4-4-1 (p. 4-15)

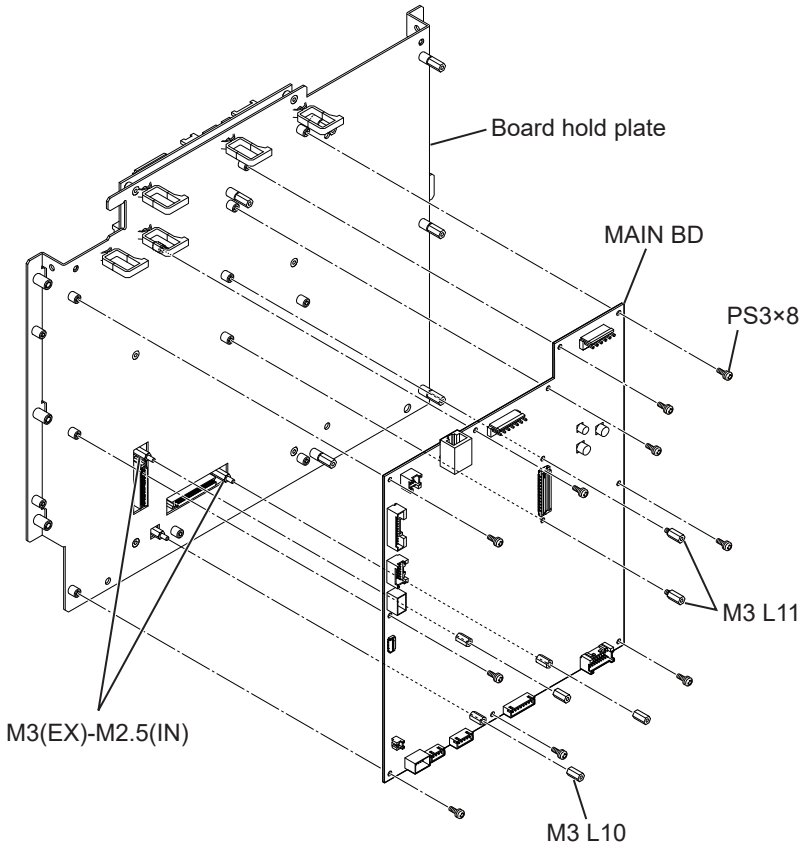
3 Remove the ANALOG BD (UT-7310) and DRIVER BD (UT-7311).

- Section 4-6-1 (p. 4-83)
- Section 4-6-2 (p. 4-84)

Procedures

1 Remove the ten PS3×8 screws and two M3 L11 spacer bolts, then remove the MAIN BD (UT-7309).

2 Remove the three M3 L10 spacer nuts and three SW3 spring washers, then remove the three M3 (EX) - M2.5 (IN) SPACER BOLTS from the MAIN BD (UT-7309).



Assembly

Assemble the MAIN BD (UT-7309) by following the disassembly procedure in reverse.

When replacing the MAIN BD (UT-7309), upgrade the software using a QS-027W software kit.

4-6-4. Removing the SD CARD BD (UT-7316)

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

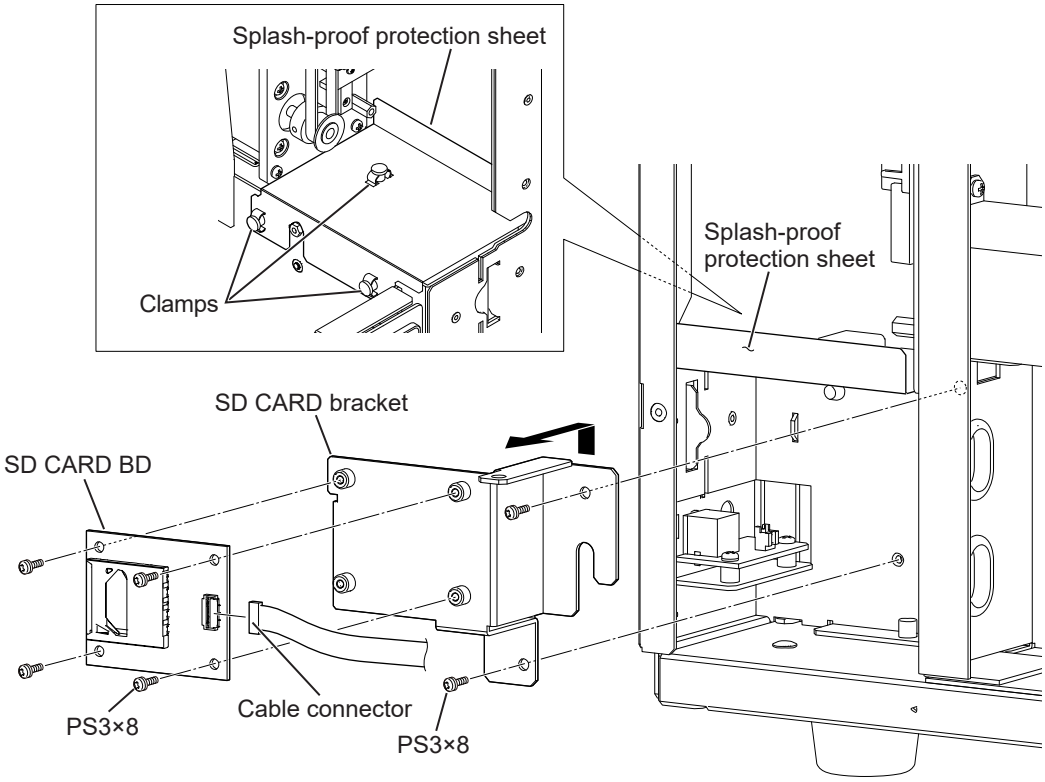
Procedures

1 Disconnect the cable connector.

2 Unlock the three clamps and remove the splash-proof protection sheet.

3 Remove the two PS3×8 screws and remove the SD CARD bracket in the direction of the arrow.

4 Remove the four PS3×8 screws and remove the SD CARD BD (UT-7316).



Assembly

Assemble the SD CARD BD (UT-7316) by following the disassembly procedure in reverse.

4-6-5. Removing the BACK PANEL BD (UT-72881)

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

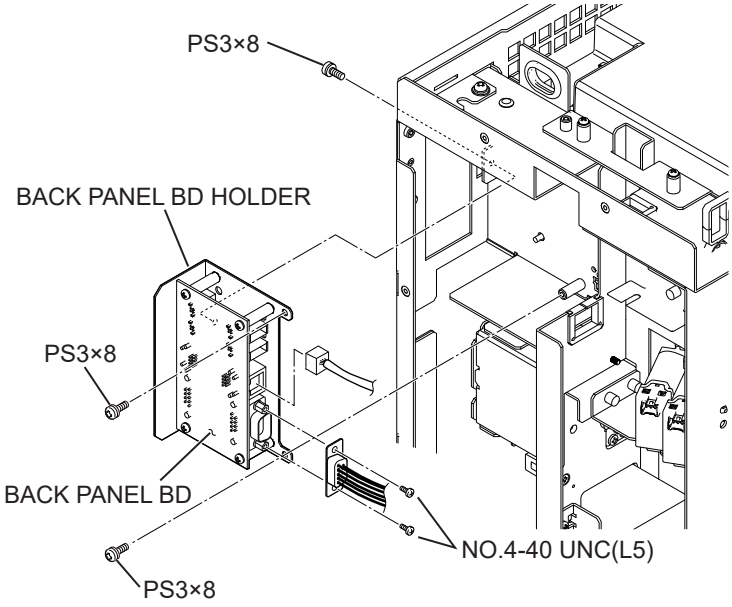
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

Procedures

1 Remove the three PS3×8 screws and remove the BACK PANEL BD HOLDER.

2 Remove the two NO.4-40 UNC (L5) screws and disconnect all the cables from the D-SUB, LAN and USB connectors.

NOTE: Check the correct connection position of the USB cable before disconnecting not to connect the cable to the wrong position.



Assembly

Assemble the BACK PANEL BD (UT-72881) by following the disassembly procedure in reverse.

4-6-6. Removing the CONNECTION BD (UT-7292)

Preparation

1 Remove the top cover, right panel, left cover and rear panel.

- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)
- Section 4-3-5 (p. 4-8)
- Section 4-3-6 (p. 4-9)

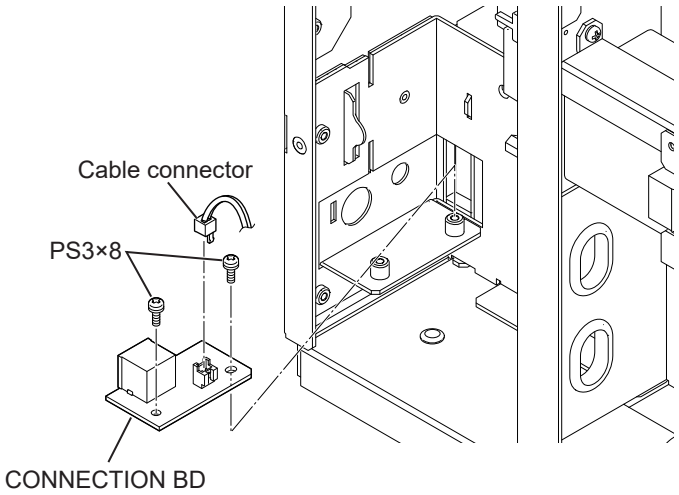
2 Remove the SD CARD BD (UT-7316).

Section 4-6-4 (p. 4-86)

Procedures

1 Disconnect the cable connector.

2 Remove the two PS3×8 screws and remove the CONNECTION BD (UT-7292).



Assembly

Assemble the CONNECTION BD (UT-7292) by following the disassembly procedure in reverse.

4-6-7. Removing the PRESSURE SENSOR BD (UT-7287)

Preparation

1 Remove the top cover.

Section 4-3-3 (p. 4-7)

Procedures

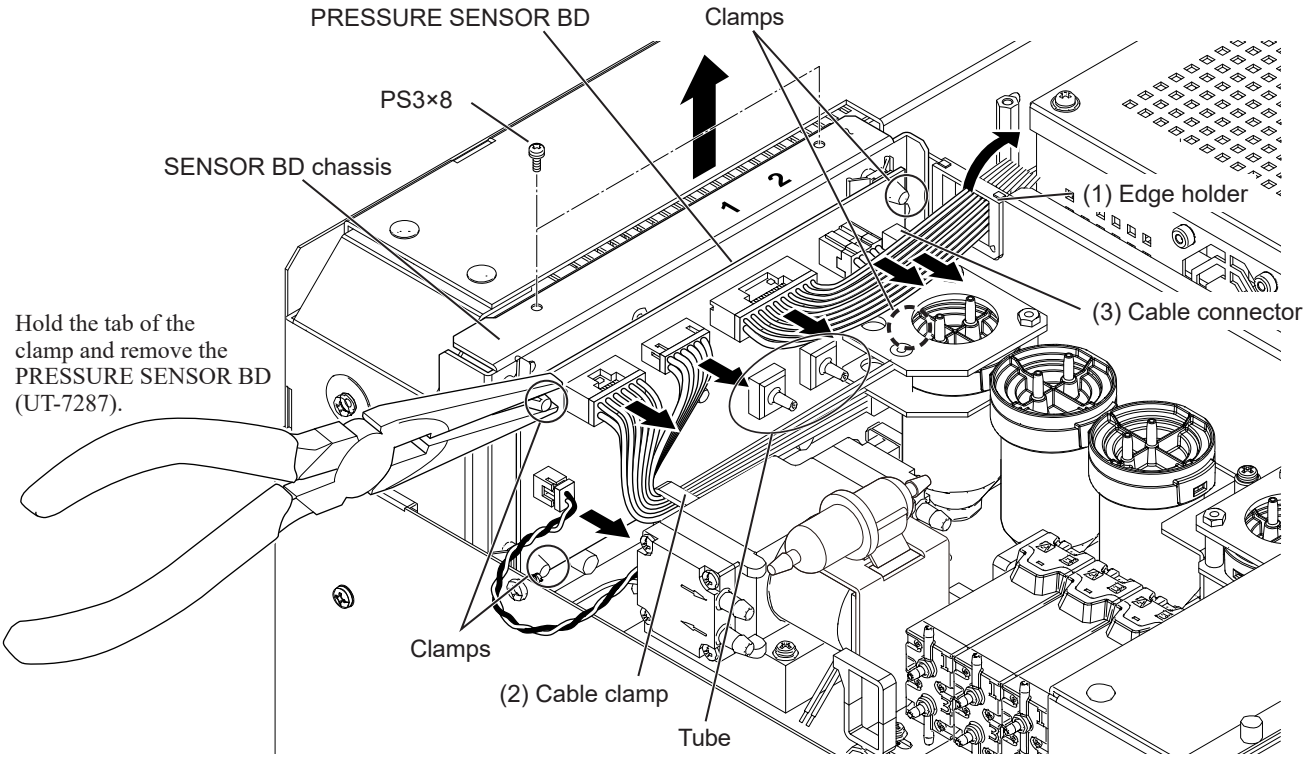
1 Remove the five cable connectors except the (3) cable connector.

2 Remove the two PS3×8 screws.

3 Remove the cable from the (1) edge holder and remove the cable from the (2) cable clamp.

4 Lift up the SENSOR BD chassis together with the PRESSURE SENSOR BD and remove the two tubes and (3) cable connector.

5 Unlock the four clamps with needle-nose pliers or a similar tool and remove the PRESSURE SENSOR BD (UT-7287).

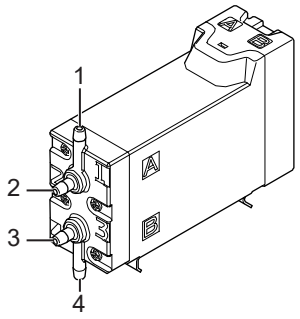
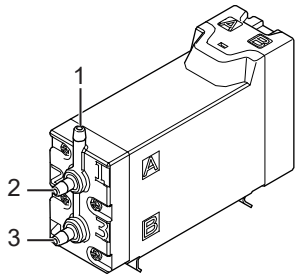


Assembly

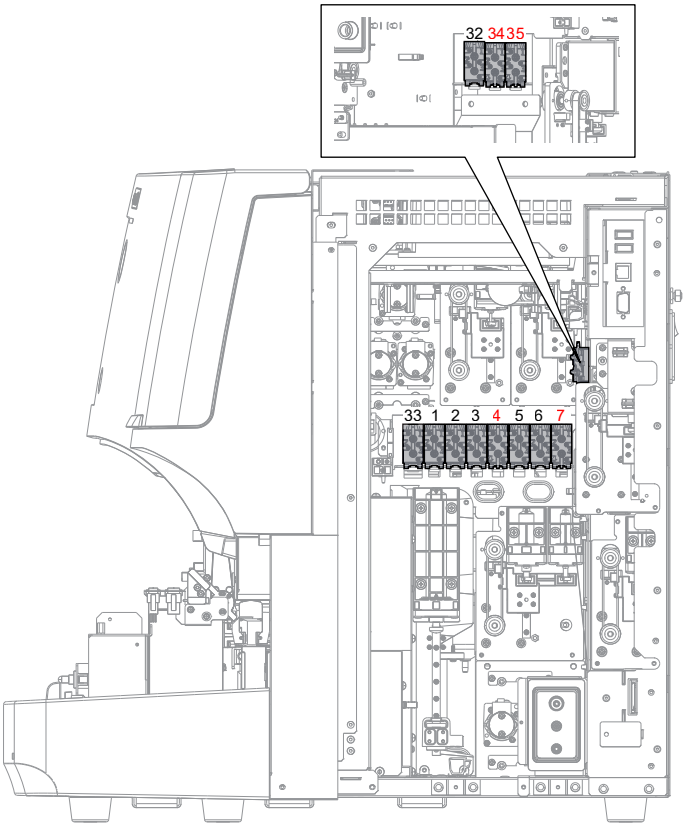
Assemble the PRESSURE SENSOR BD (UT-7287) by following the disassembly procedure in reverse.

4-7. Electromagnetic Valves

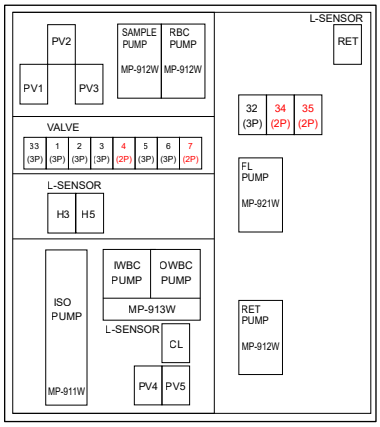
The following electromagnetic valves are used by the analyzer.

2-way Valve (2P) RP-9000057721	3-way Valve (3P) RP-9000057722
	

Right Side Panel

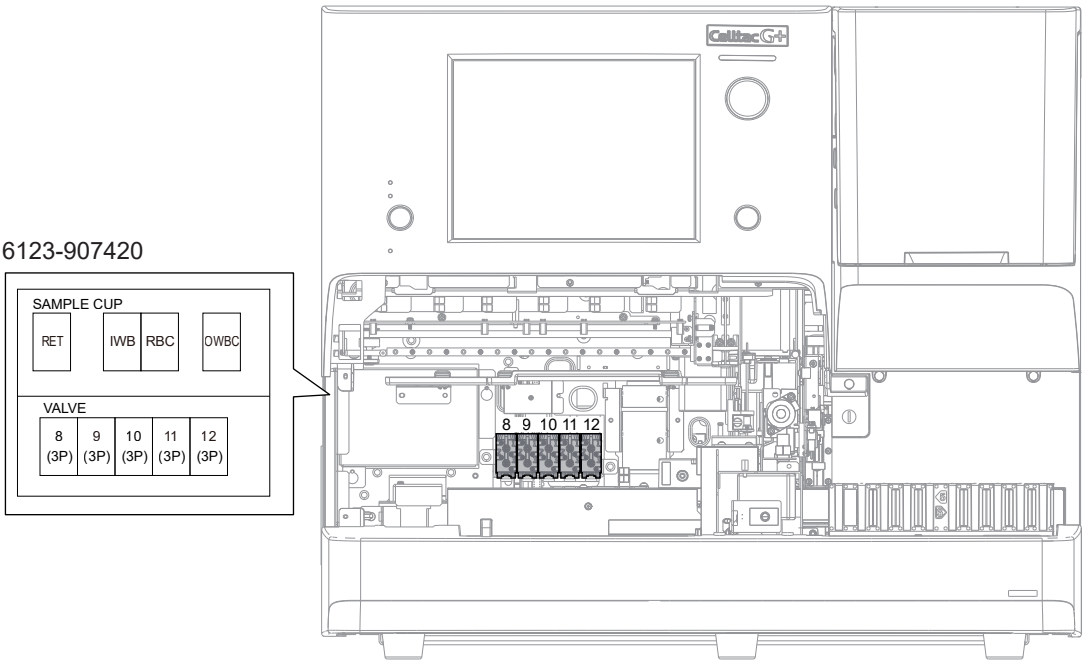


6123-907423

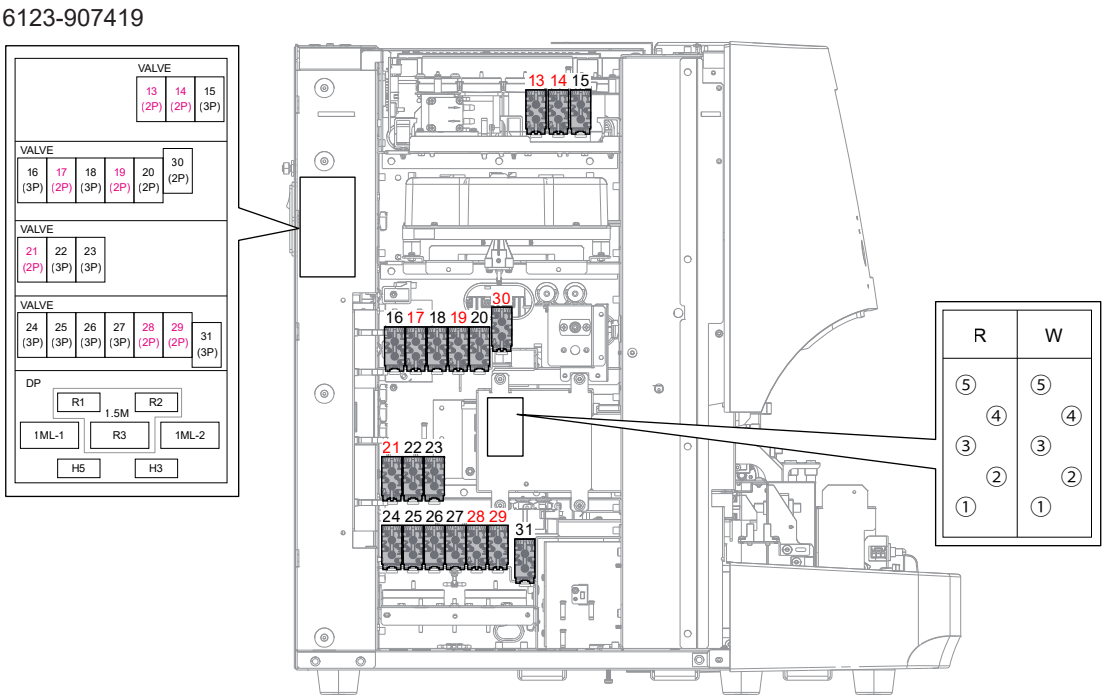


The label is attached on the rear side of the right panel.

Front Panel



Left Side Panel

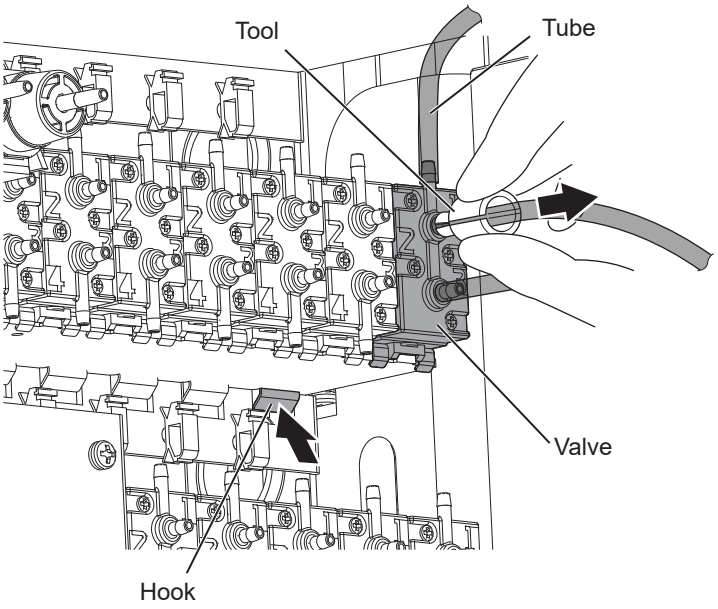


4-7-1. Removing the Electromagnetic Valves

NOTE
- When disconnecting the tube from the electromagnetic valves, use the tube removal jig (repair part No.: RP-9000061774) or the tube removal jig included in the electromagnetic valve maintenance set (repair part No.: RPK-9000061776).

Section 7-8-2-2 (p. 7-123)

- Electromagnetic Valves are fixed with hooks in the analyzer. When removing the electromagnetic valves, lift up the hooks with flathead screwdriver or equivalent and slide the electromagnetic valves toward you.
- When connecting the tube, insert it to the end firmly. If the connection is not firm, fluid leakage, contamination or pressure error may occur.



4-7-1-1. Removing the MV1 to 7, 33 Electromagnetic Valves

Preparation

1 Remove the right panel.

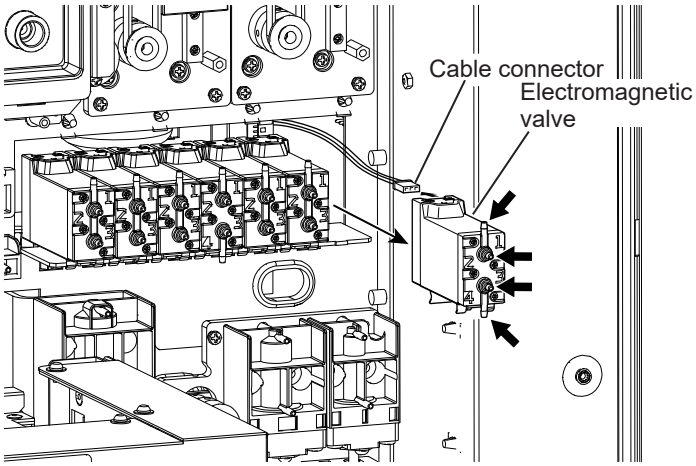
Section 4-3-4 (p. 4-8)

Procedures

1 Disconnect the tube from the electromagnetic valve with specified jig.

2 Lift up the hook with flathead screwdriver or equivalent and slide the electromagnetic valve toward you.

3 Disconnect the connector at the rear.



4-7-1-2. Removing the MV8 to 12 Electromagnetic Valves

Preparation

1 Remove the mixing cover, front cover, top cover and right panel.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-4 (p. 4-8)

2 Remove the FRONT PANEL UNIT, AUTOLOADER, SAMPLER UNIT and RET CUP HEATER UNIT.

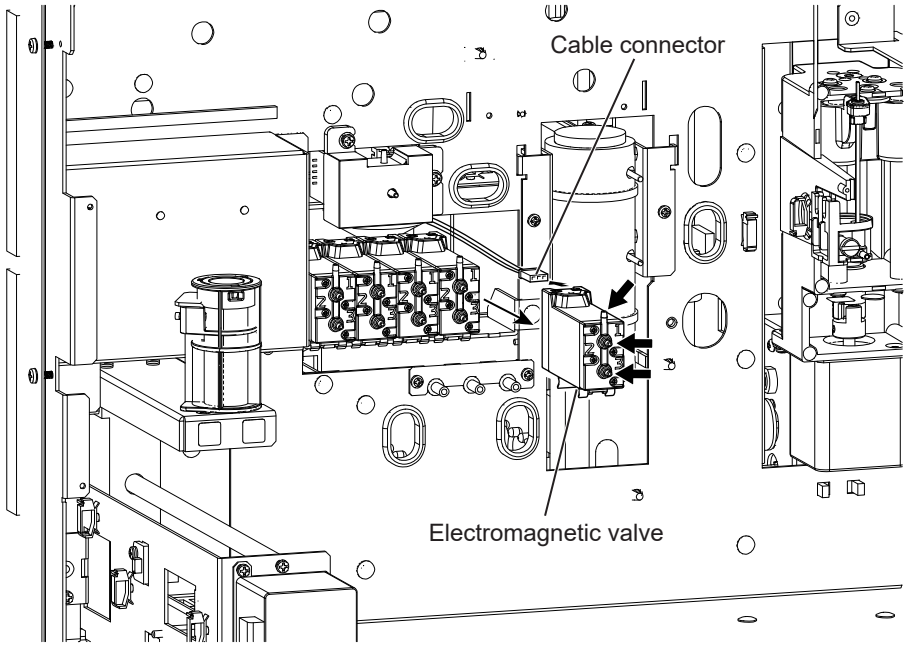
- Section 4-4-4 (p. 4-20)
- Section 4-4-5 (p. 4-22)
- Section 4-4-6 (p. 4-25)
- Section 4-4-14 (p. 4-52)

Procedures

1 Disconnect the tube from the electromagnetic valve with specified jig.

2 Lift up the hook with flathead screwdriver or equivalent and slide the electromagnetic valve toward you.

3 Disconnect the connector at the rear.



4-7-1-3. Removing the MV13 to 15 Electromagnetic Valves

Preparation

1 Remove the top cover.

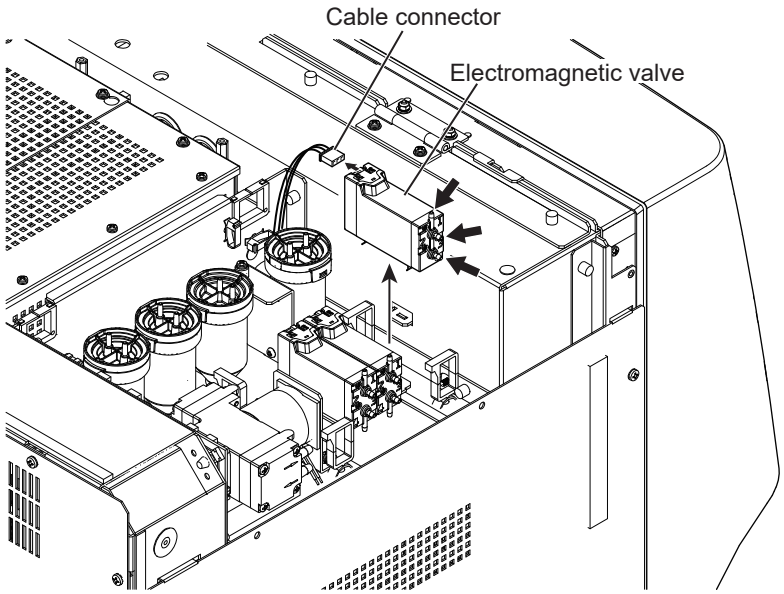
Section 4-3-3 (p. 4-7)

Procedures

1 Disconnect the tube from the electromagnetic valve with specified jig.

2 Lift up the hook with flathead screwdriver or equivalent and slide the electromagnetic valve toward you.

3 Disconnect the connector at the rear.



4-7-1-4. Removing the MV16 to 31 Electromagnetic Valves

Preparation

1 Remove the left cover.

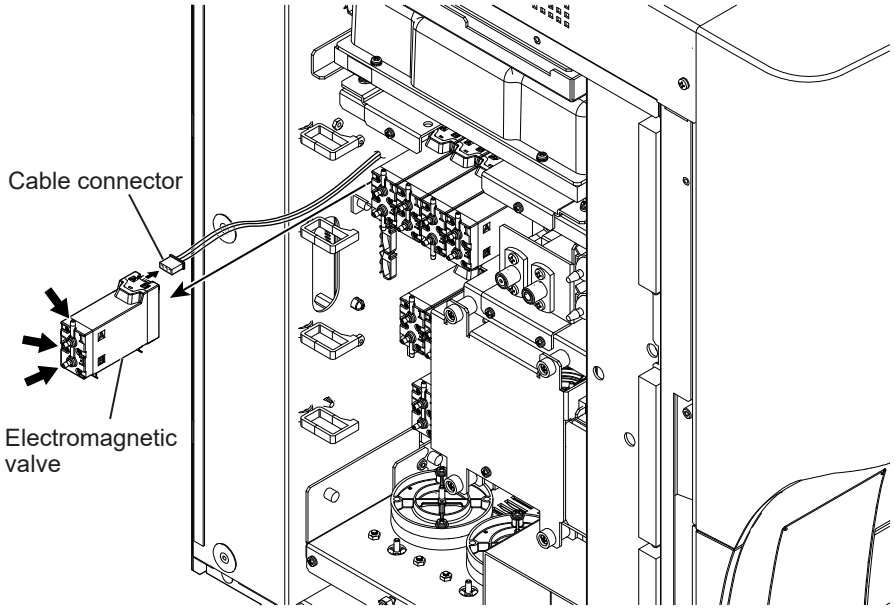
Section 4-3-5 (p. 4-8)

Procedures

1 Disconnect the tube from the electromagnetic valve with specified jig.

2 Lift up the hook with flathead screwdriver or equivalent and slide the electromagnetic valve toward you.

3 Disconnect the connector at the rear.



4-7-1-5. Removing the MV32, 34, 35 Electromagnetic Valves

Preparation

1 Remove the right panel.

Section 4-3-4 (p. 4-8)

2 Remove the fluid sensor bracket.

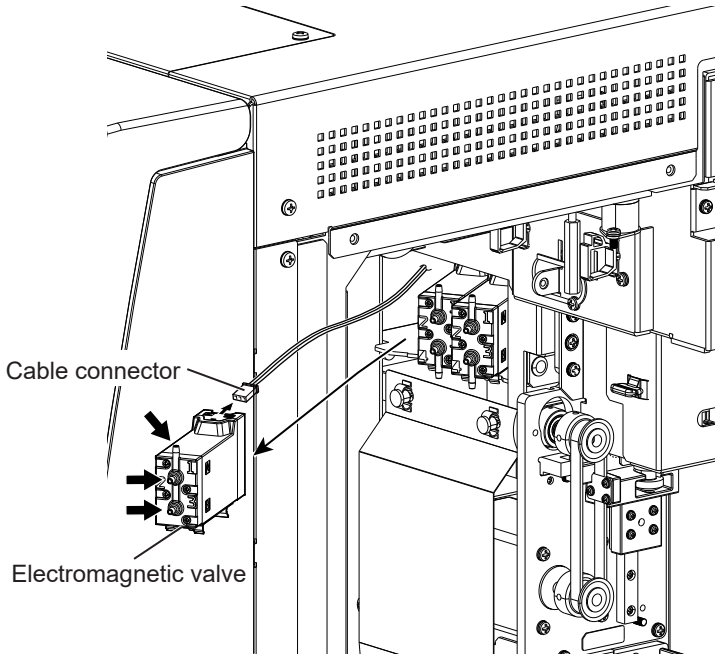
Section 4-4-9 (p. 4-39) Preparation **3** 1)

Procedures

1 Disconnect the tube from the electromagnetic valve with specified jig.

2 Lift up the hook with flathead screwdriver or equivalent and slide the electromagnetic valve toward you.

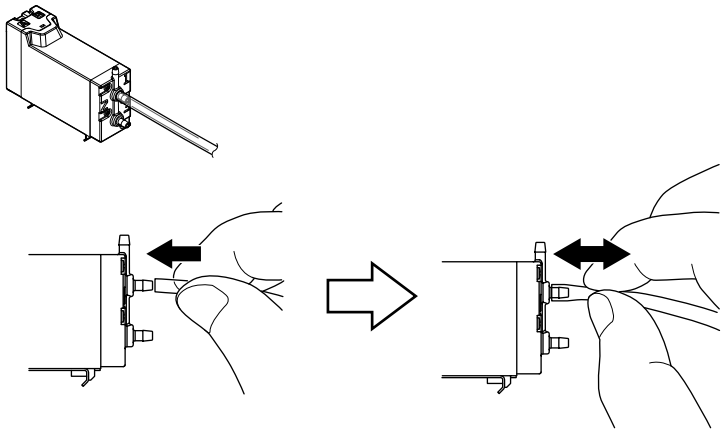
3 Disconnect the connector at the rear.

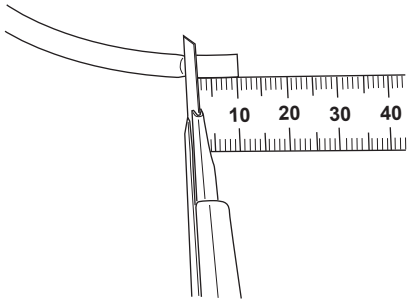


4-7-2. Reconnecting the TOALON Tube

NOTE: Push tubes firmly all the way in when connecting them. Failure to connect them properly may result in problems like fluid leaks, contamination, pressure loss or the like.

After connecting a tube, pull on it several times as shown in the diagram to check whether it comes off easily.

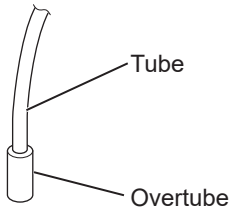




If it does come off easily, the tube may be deteriorating.

Cut 10 mm or so off the tip with a box cutter or the like and try connecting it again.

NOTE: If it has an overtube, take care not to cut them together.



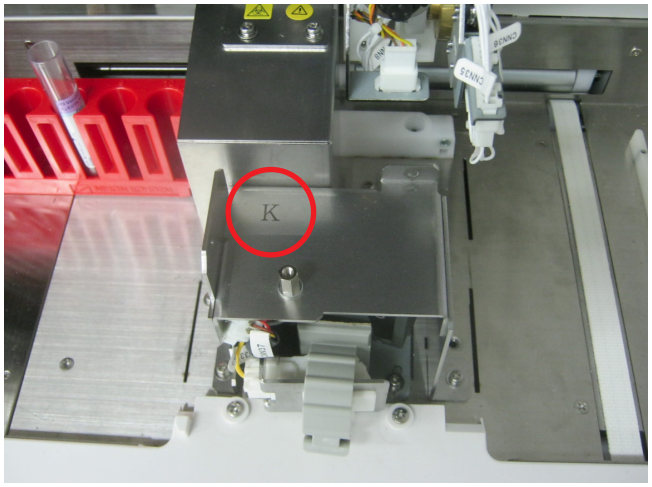
4-8. Adapting to the SARSTEDT / KABE Sampling Tubes

4-8-1. Changing the autoloader measurement section

When you use the SARSTEDT / KABE sampling tube, the following kit is required.

- SARSTEDT: YZ-008B1 (SARSTEDT KIT)
- KABE: YZ-008B2 (KABEVETTE G KIT)

The autoloader compatible with SARSTEDT has the stopper marked with “K”.



NOTE: The procedure of adapting the autoloader to the SARSTEDT / KABE sampling tube is almost the same. If you want to adapt the autoloader to the KABE sampling tube, skip the only SARSTEDT steps.

Preparation

1 Remove the mixing cover, front cover and top cover.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)

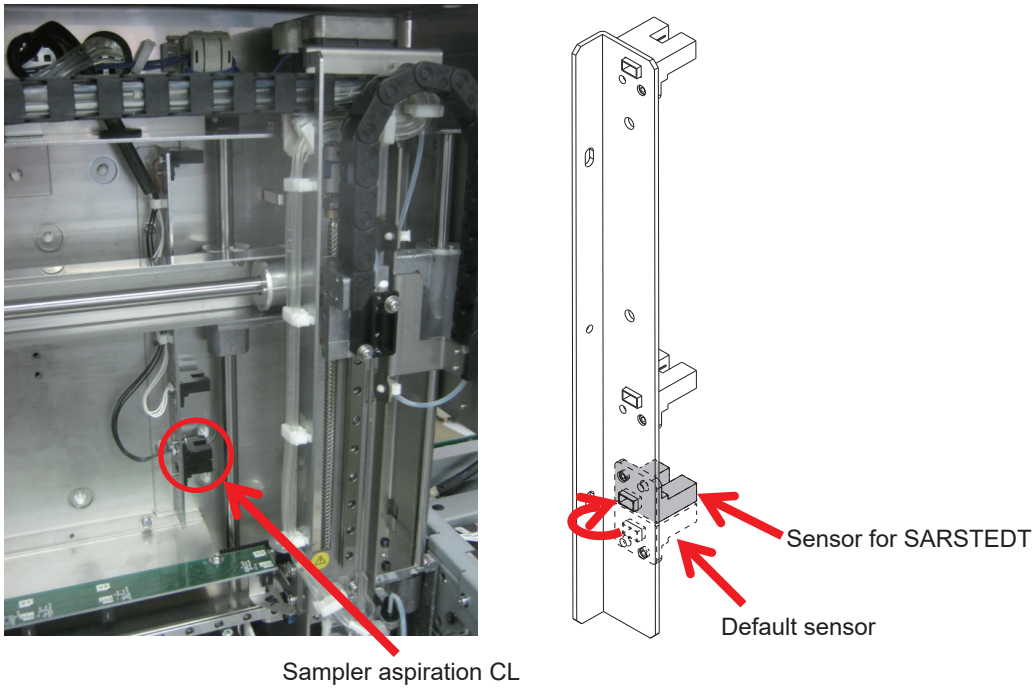
2 Open the FRONT PANEL UNIT.

Section 4-3-7 (p. 4-10)

Procedures

1 Disconnect the connector from the default sensor and connect the connector to the sensor for SARSTEDT.

NOTE
- Before the operation, turn off the analyzer main power.
- Be careful of the sampling needle during the operation.
- This step is not applied to the sampler unit which does not have the sensors.
- After disconnecting the connector, vertically invert the connector and connect it to the sensor for SARSTEDT.



2 Replace the rotate head.

NOTE
- For KABE sampling tube, this step is not required. Go to the next step.
- Do not remove the other parts in the autoloader. Some of the parts need adjustment if they are removed.

1) Turn on the analyzer.

Operator's Manual: "Turning On the Analyzer" in Section 5

2) Log in as a [Technical User].

Section 7-1-1 (p. 7-3)

3) Open the Service Maintenance window.

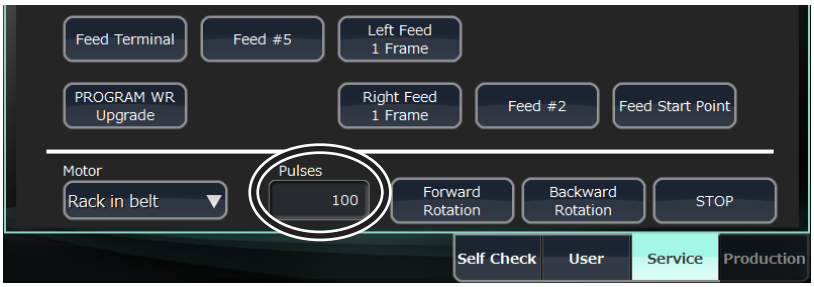
Section 7-3-3 (p. 7-27)

4) Touch [AL OP] to open the Autoloader Operation window.

5) Touch [Motor] and select [Rotate sampling tube] from the drop-down menu.

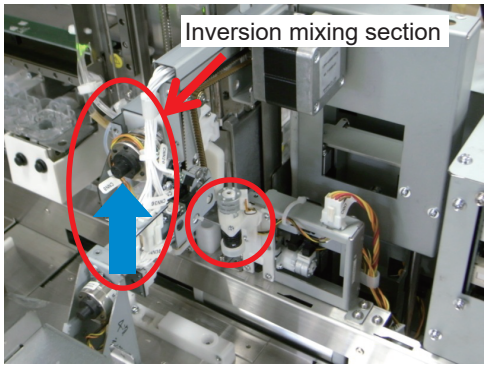
6) Enter the number of operation pulses for the controlled motor.

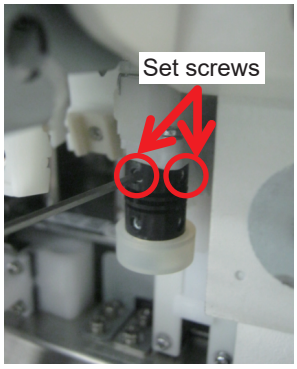
NOTE: If you enter “500” in the input box, rotate the rotate head by approximately 90 degrees.



7) Touch [Forward Rotation] or [Backward Rotation] to rotate the rotate head so that you can easily access the set screws of the rotate head.

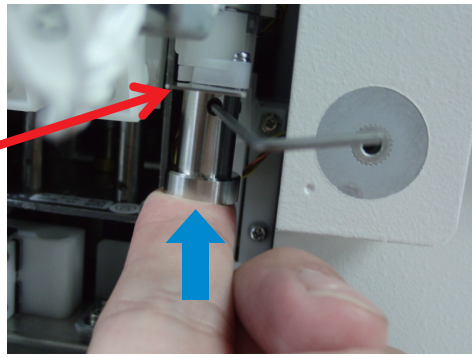
8) While lifting up the inversion mixing section, loosen the two set screws with a 1.5 mm hex wrench, and remove the rotate head.



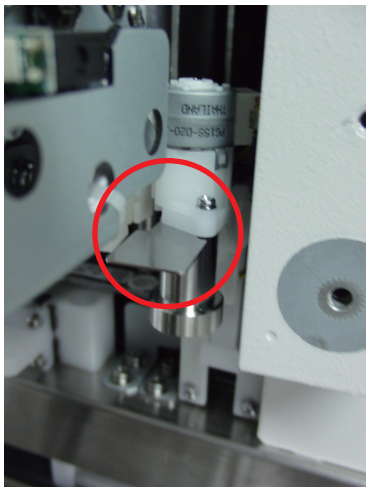


9) Insert the spacer, and then attach the rotate head for SARSTEDT by pressing it from the bottom.

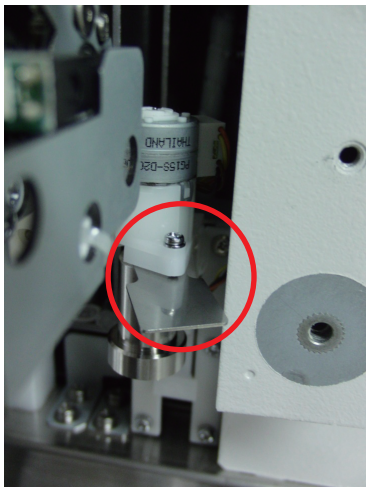
Spacer



NOTE: Insert the spacer vertically toward the front side of the unit. When the spacer is not correctly inserted, the unit does not work properly.

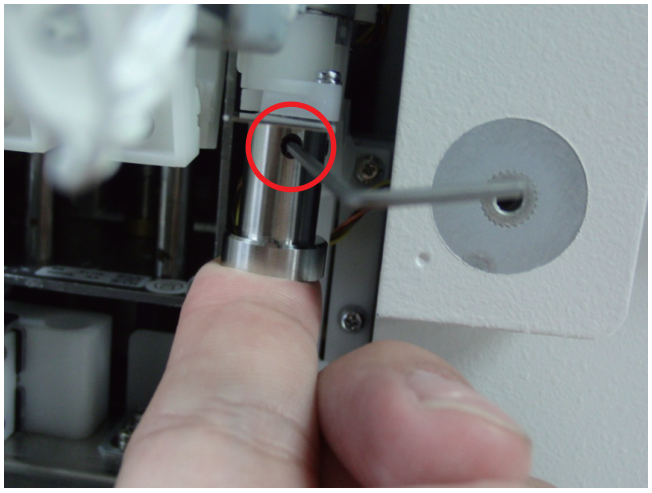


Correct position



Wrong position

10) Temporarily fix the rotate head with the provided set screw, and then tighten the two set screws to secure the rotate head.



3 Change the settings.

1) Open the Home screen.
If you are in another window, touch [⌂] at the lower left.

2) Touch [Settings] on the Home screen. The Settings window opens.

3) Touch [+] to expand the Measurement Conditions and select [Raised bottom] for Sample tube type.

4) Return to the Home screen.

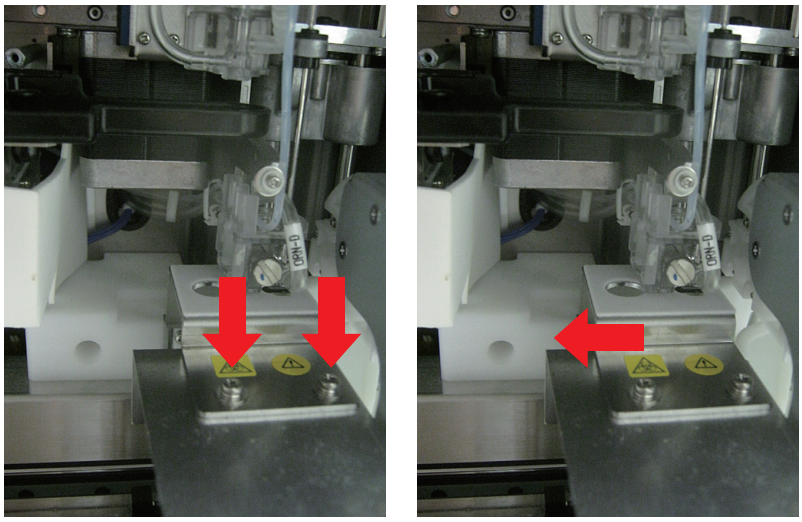
NOTE • This setting does not change if the system settings is initialized to the factory default settings.

• To change the setting, the following software is required:
Main: ver. 01-06 or later
GUI: ver. 01-05 or later
Autoloader: ver. 01-04 or later

4 Check the piercing position.

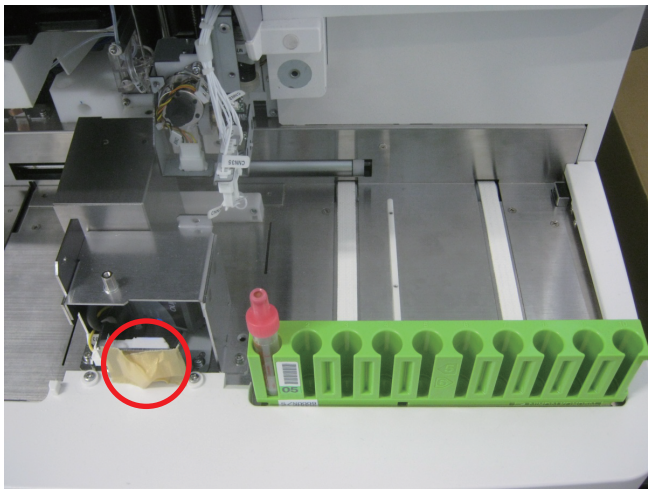
NOTE: For KABE sampling tube, this step is not required. Go to the next step.

1) Remove the two screws and the stopper (AL) SARSTEDT.



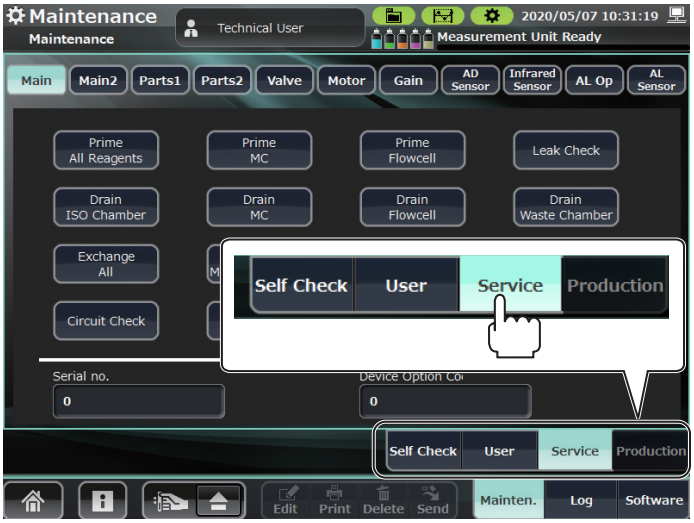
2) Set the SARSTEDT to the left-most of the rack.

NOTE: Be sure to keep pushing the mixing cover removal sensor not to cause an emergency stop.

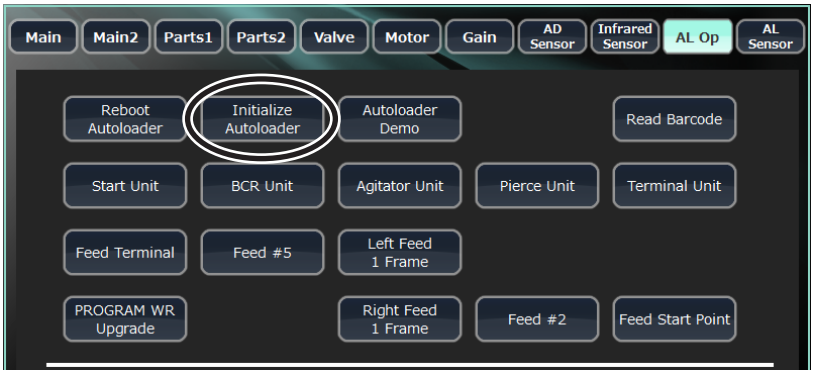


3) Touch [Maintenance] on the Home screen. The Maintenance Self Check window opens.

4) Touch [Service]. The Service Maintenance window opens.



5) Touch [AL Op] to open the Autoloader Operation window and touch [Initialize Autoloader].

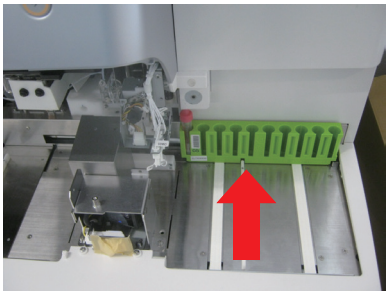


6) Touch [Yes] on the Confirm Operation window.

NOTE: All the moving parts in the autoloader are initialized.

7) Touch [Start Unit] on the Autoloader Operation window.

8) Touch [Yes] on the Confirm Operation window to move the rack by the conveyor belt.



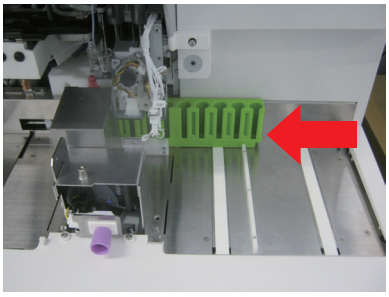
9) Select “Hold/release feed tab” from the drop-down menu, enter “1000” in the pulses parameter box, and then touch [Forward Rotation].

10) Touch [Yes] on the Confirm Operation window.

The feed tabs come down and hold the rack.

11) Touch [Feed #5] on the Autoloader Operation window.

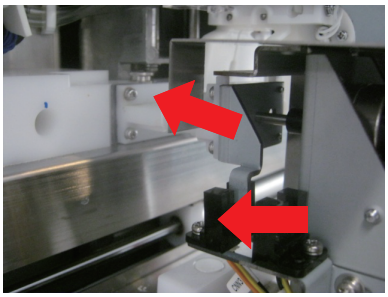
12) Touch [Yes] on the Confirm Operation window to move the rack to the aspiration and discharge position.



13) Select “Grip/Ungrip tube gui” from the drop-down menu, enter “1000” in the pulses parameter box, and then touch [Backward Rotation].

14) Touch [Yes] on the Confirm Operation window.

The sampling tube is fixed by the guide.



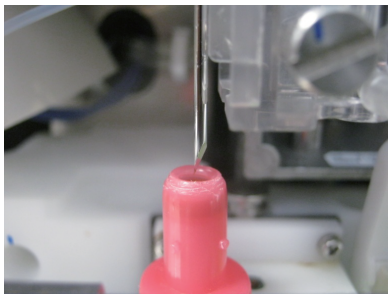
15) On the Service Maintenance window, touch [Motor], and touch the following buttons:

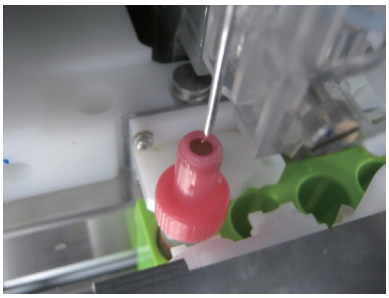
- Touch [Initialize], and then touch [Yes] in the popup window.
- Touch [Not Pierced], and then touch [Yes] in the popup window.

The sampling needle moves to the position of the sampling tube.

NOTE
- The sampling needle stops just before piercing the sampling tube.
- Be careful not to touch the needle coming down. This may cause damage.

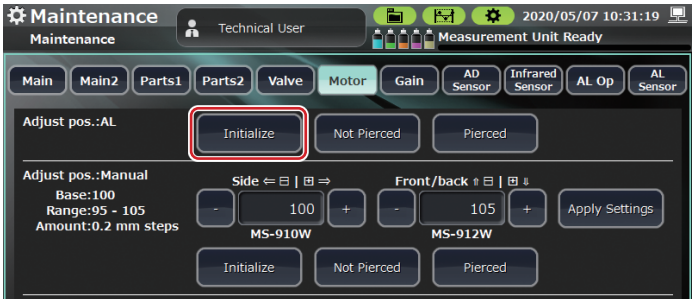
16) Check that the sampling needle is located in the center of the sampling tube.





17) Touch [Initialize] on theMotor window.

18) Touch [Yes] on the Confirm Operation window to move the sampling needle to the default position.



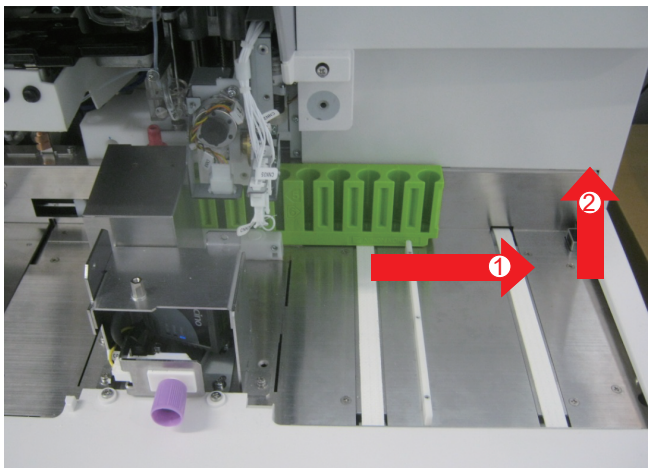
19) On the Service Maintenance window, touch [AL Op] and touch [Initialize Autoloader].

20) Touch [Yes] on the Confirm Operation window. to move each actuator of the autoloader to the default position.

NOTE: Perform this operation with the rack left.

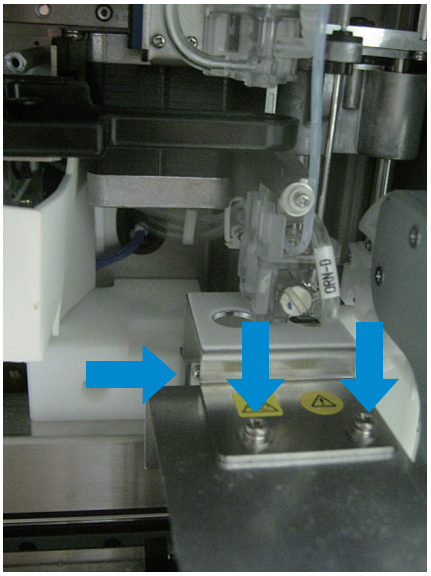
21) Manually remove the rack as shown below.

NOTE: Do not remove the rack diagonally.



5 Attach the stopper (AL) SARSTEDT while pushing the stopper to the right and fix it with the two screws.

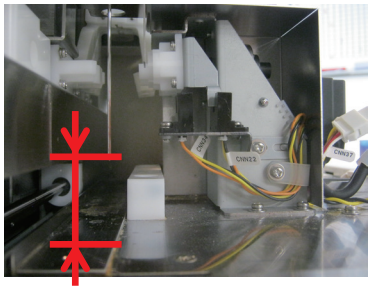
NOTE: For KABE sampling tube, this step is not required. Go to the next step.



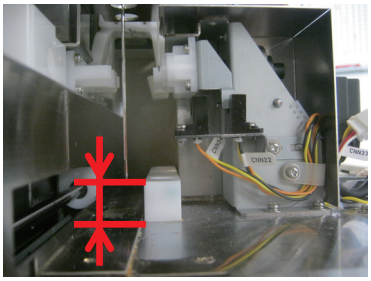
6 Visually confirm the height of the aspiration and discharge position in the following procedure.

- On the Service Maintenance window, touch [Main2] and touch [Sampler Step Move].
  Touch [Yes] on the Confirm Operation window

[Sampler Step Move] is a function that performs a series of autoloader measurement of the sampler unit step by step.



Setting position of [Raised bottom]

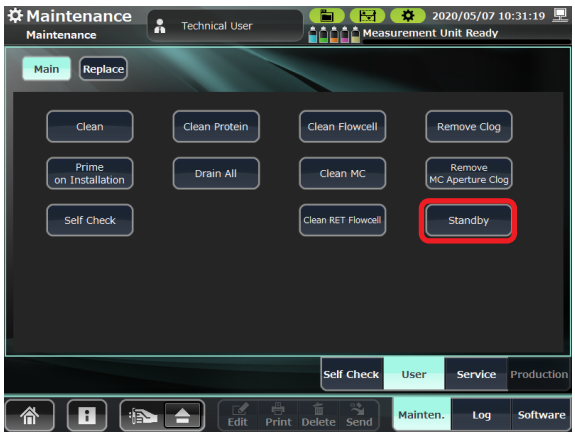


Setting position of [Normal bottom]

7 Touch [User] to open the User Maintenance window.

8 Touch [Standby] to initialize the sampler unit.

[Standby] is a function that initialize all the actuators when turning on the analyzer.



9 Reattach the FRONT PANEL UNIT, the top cover, the front cover and the mixing cover.

10 Confirm that the autoloader works normally by performing the rack measurement with SARSTEDT. Check items are as follows:

- An error does not occur.
- The sampling tube can be rotated and the bar code can be read (only SARSTEDT).
- The sampling needle enters the sampling tube normally.
- The sampling needle do not hit the bottom of the sampling tube.

5 Calibration

5-1. Performing Calibration

When an unacceptable error is found in a measurement value as a result of quality control, the analyzer needs to be calibrated so that measurements are closer to the true values.

Operator's Manual:
Section 6 "Quality Control"

The analyzer calibrates CBC and adjusts the sensitivity of the WBC 5-part differential scattergram using the MEK-CAL hematology calibrator.

Section 5-2 (p. 5-8)

NOTE
- WBC, RBC, HGB, HCT, RDW-CV, PLT and MPV and sensitivity adjustment (FS, FL, SD) of the WBC 5-part differential scattergram are calibrated with MEK-CAL calibrator.
- The WBC 5-part differential and reticulocytes are calibrated by checking that the calibration coefficient of NE%, LY%, MO%, EO%, BA%, RET% and IRF is 1000. Only check the calibration coefficient here because the sensitivity adjustment of the scattergram allows for precise calibration of the WBC 5-part differential and reticulocytes.
- When calibrating with a reference method that uses a calibrator other than the one recommended by Nihon Kohden, measure more than 10 samples collected within the past 8 hours (past 4 hours for WBC differential and reticulocytes) and which were stored at room temperature after collection, then adjust the calibration coefficient according to the comparison between the measurement values and the reference method values. Do not use a sample which is suspected to be abnormal as the calibrator.
- The MEK-5D hematology control and MK-RE hematology control for reticulocyte cannot be used as a calibrator. These hematology controls are for quality control.
- Do not use a calibrator past its expiration date.

  Unopened: Expiration date on the label or package
  Opened: 7 days after opening
- Store the control between 2 and 8°C (36 and 46°F). Do not freeze the calibrator.
- Use the calibrator once it has returned to room temperature.
- Mix the calibrator by gently turning it upside down several times before measurement.
- Read the calibrator manual thoroughly and follow its precautions.
- Re-calibrate when there is difference with the reference method. Decide the calibration coefficient from the average of the measured data then enter the coefficient.

1 Touch [CAL] on the QC window. The Calibration window opens.

Operator's Manual:
Section 6 "Opening the QC Window"

2 Select a measurement mode (Normal or Pre-dilution) and touch [Calibration Measurement]. Check the measurement method to use and select the calibration mode.

Calibration Mode	Auto Measurement	Manual Measurement		
		Whole Blood	Pre-dilution	WBC High
Normal	✓	✓	—	✓ [1]
Pre-dilution	—	—	✓	—

[1] The calibration coefficients for the measurement of high WBC dilution can be edited manually only by users with Technical User privileges. For the use of this function, contact your Nihon Kohden representative.

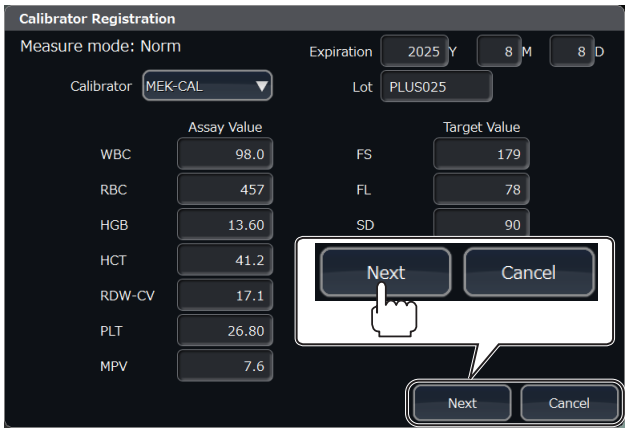
The aspirating position is different for auto and manual measurement (except pre-dilution) but it uses the same nozzle. Use normal mode for calibration.
The reagent needs to be prepared in Pre-dilution measurement. Use pre-dilution mode for calibration.

3 After the Calibrator Registration window appears, scan the QR code on the assay sheet of the calibrator with the barcode reader.

The information of the read calibrator is set and displayed on the window.

The information can also be entered directly by touching the setting parameter. (Refer to P.8-2)

4 After checking the information on the window, touch [Next] to open the Auto Calibration window.



5 Measure the calibrator.

Normal mode:

1) Insert the calibrator into the left end (first position) of the rack.

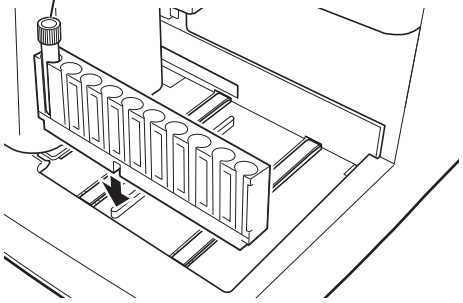
2) Place the rack with the calibrator in the analyzer, and touch [Measure]. Measure the calibrator 10 times.

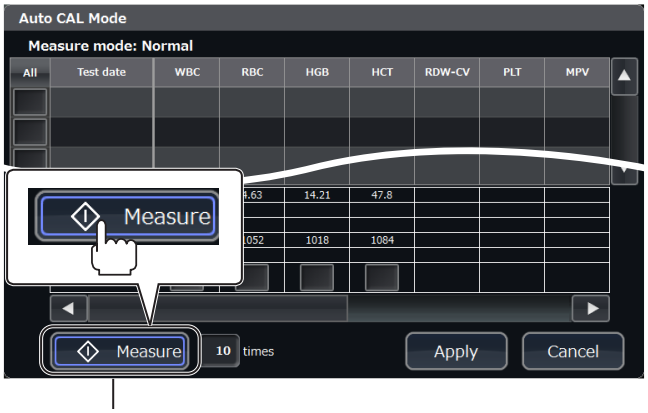
Operator's Manual:
"Performing Auto Measurement" in Section 5

You can measure the calibrator from 1 to 20 times. Enter the number of times to automatically measure the calibrator.

Normal mode

Hematology calibrator (MEK-CAL)

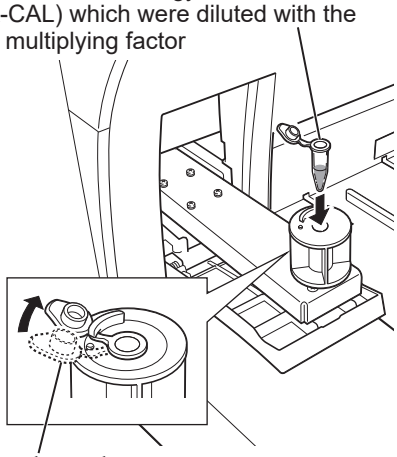




You can measure the calibrator from 1 to 20 times.

Pre-dilution mode

20 µL of the hematology calibrator (MEK-CAL) which were diluted with the same multiplying factor



Secure the cap by inserting the cap under the tab of the adapter.

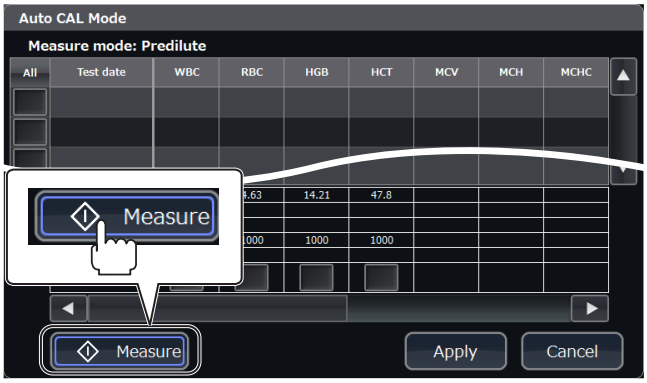
Pre-dilution mode:

1) Prepare 10 samples of 20 µL of MEK-CAL hematology calibrator which were diluted with 120 µL of diluent (ISOTONAC•3/4). Refer to steps **4** to **7** in Section 5 "Performing Pre-dilution Measurement" of the Operator's Manual.

Operator's Manual:
"Performing Pre-dilution Measurement" in Section 5

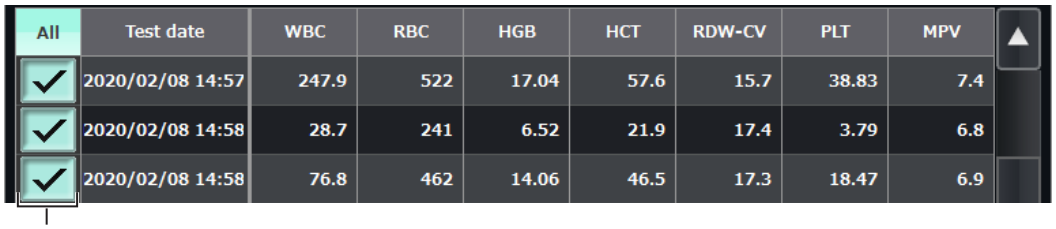
2) Uncap the micro tube, insert it into the adapter of the sample tube holder, and touch [Measure]. Perform manual measurement 10 times.

Operator's Manual:
"Performing Manual Measurement" in Section 5



When measurement is complete, the measurement results appear on the screen.

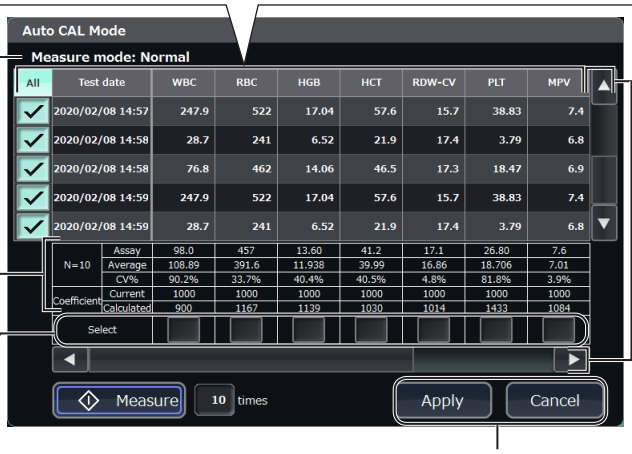
NOTE: When the number of measurement data exceeds 20, the oldest data is overwritten in order to keep the latest 20 data.



All	Test date	WBC	RBC	HGB	HCT	RDW-CV	PLT	MPV
✓	2020/02/08 14:57	247.9	522	17.04	57.6	15.7	38.83	7.4
✓	2020/02/08 14:58	28.7	241	6.52	21.9	17.4	3.79	6.8
✓	2020/02/08 14:58	76.8	462	14.06	46.5	17.3	18.47	6.9

Check box

- Touch to select the measurement data to perform statistical calculation. The check icon appears in the box.
- To unselect, touch the selected data again.
- Touch [All] to select or unselect all items.



Measurement mode

Statistical data

Displays the results of the statistical calculation.

Touch [▲], [▼], [◀] or [▶] to scroll the list vertically or horizontally.

Select

Touch to select the parameter to change the calibration coefficient.

The check icon appears in the box.

[Apply]: Applies the revised calibration coefficient to the selected parameters.

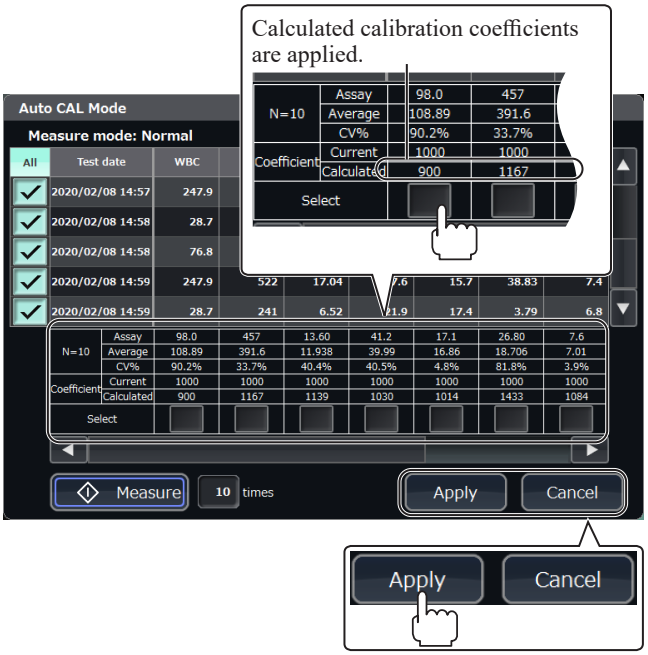
[Cancel]: Discards all data including the measurement data and returns to the Calibration window.

6 Select 10 or more sets of measurement data to do a statistical calculation.

NOTE: If the number of measurement data is less than 10, repeat measurement.

- To unselect, touch the selected data again.
- Touch [All] to select or unselect all items.

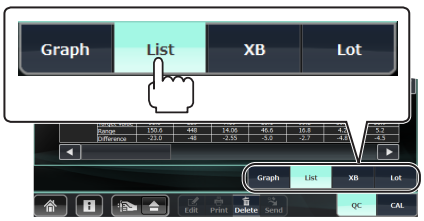
7 Check the data, select the parameter column to change the calibration coefficient, and touch [Apply].



8 Check that the calibration coefficient is correctly applied on the Calibration window.

9 Perform a quality control measurement using a hematology control and check that the result is within the control range.

Operator's Manual:
"Measuring the Hematology Control" in Section 6



Touch [List] in the QC window to open the List window. The List window lists the measured data of each hematology control.

Data in the Trend window and List window are linked.

5-1-1. Checking Calibration History

The calibration history can be displayed on the Calibration window.

Sort icon

Touching sortable displayed items sorts them in ascending or descending order.

Touch [▲], [▼], [◄] or [►] to scroll the list vertically or horizontally.

5-2. HGB, HCT and PLT Calibration with Human Blood

Measure 10 human blood samples of healthy persons using the analyzer as well as a spectrophotometer and microhematocrit centrifuge. Calculate the calibration coefficient using the HGB, HCT and PLT values obtained from a spectrophotometer and microhematocrit centrifuge.

1 Prepare 10 human blood samples collected from the veins of 10 different healthy persons.

2 Measure each sample twice with the analyzer.

3 Measure with a spectrophotometer and microhematocrit centrifuge.

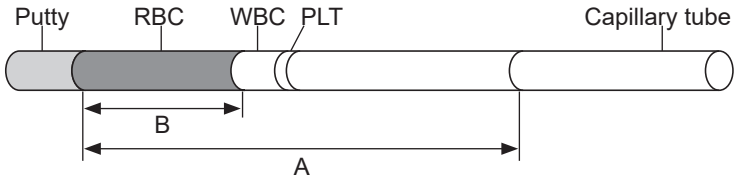
NOTE: Measurement accuracy with the spectrophotometer and microhematocrit centrifuge depends on the processes. Perform the processes carefully.

HCT Measurement

1) Aspirate the whole blood sample into 2/3 of the capillary tube, wipe away any blood from the outside of the tube, and seal the end of the tube (blood aspiration side) with putty.

2) Set the microhematocrit centrifuge for 11,000 rpm for 5 minutes and rotate the tube in the centrifuge.

3) Immediately after rotation stops, remove the tube and measure the length of Layers A and B with a microscope. Then calculate each HCT.



$$HCT = \frac{B\ (\text{Red blood cell volume})}{A\ (\text{Blood volume})} \times 100\ (\%)$$

4) Measure 2 tubes for each sample and treat the mean of the measurements as the HCT values with the spectrophotometer and microhematocrit centrifuge method.

HGB Measurement

1) Prepare a lysing reagent in accordance with the International Committee for Standardization in Hematology (ICSH) and use it as a diluent.

2) Make a pair of two 200:1 diluted samples from each sample.

3) Set up the spectrophotometer as follows to measure the 200:1 diluted samples, and calculate HGB values.

- Wavelength: approx. 540 nm
- Mode: ABS (absorbance) mode

Multiply each measured absorbance by 29.3 to obtain the HGB value.

$$\text{HGB} = \text{Measured absorbance} \times 29.3\ (\text{g/dL})$$

$$29.3 = \frac{64458 \times 200}{44 \times 1000 \times 1 \times 10}$$

64458: Molecular weight of HGB
200: Dilution ratio
44: Optical density coefficient in mm mol
1000: from mg to g
1: Cell thickness (cm)
10: from g/L to g/dL

4) Measure the two 200:1 diluted samples and treat the average of the measurements as the HGB values with the spectrophotometer and microhematocrit centrifuge method.

PLT Measurement

Measure the platelet count according to the following international standard.

ICSH/ISLH 2001:

International Council for Standardization in Hematology Expert Panel on Cytometry and International Society of Laboratory Hematology Task Force on Platelet Counting. Platelet counting by RBC/platelet ratio method. A reference method. Am Journal of Clinical Pathology 115:460-464 2001

4 Calculate the HGB, HCT and PLT calibration coefficients.

1) By filling the following table with the HGB, HCT and PLT values, calculate the mean (A) among the 8 data, excluding the highest one data and the lowest one data.

2) By applying the calculated mean (A) and calibration coefficient (B) to the following formula, calculate the revised calibration coefficient (C).

Sample No.	Measurement Value		Data: $\frac{\text{Analyzer measurement data} - \text{Spectrophotometer and microhematocrit centrifuge measurement data}}{\text{Spectrophotometer and microhematocrit centrifuge measurement data}} \times 100$ (%)
	Spectrophotometer and microhematocrit centrifuge	Analyzer	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Mean among the 8 data excluding the highest one data and lowest one data (A)			(%)
Current calibration coefficient (B)			
Revised calibration coefficient (C) $(C) = (B) \times \left(1 - \frac{(A)}{100}\right)$			

5 Open the Calibration window and set the revised calibration coefficient.

5-3. Forced Calibration

Forced calibration is a method for manually editing the calibration coefficient.

This is different from the normal calibration method in which the calibrator (MEK-CAL) is measured and the calibration coefficient is calculated automatically.

1 Touch [CAL] on the QC window. The Calibration window opens.

Operator's Manual:
Section 6 "Opening the QC Window"

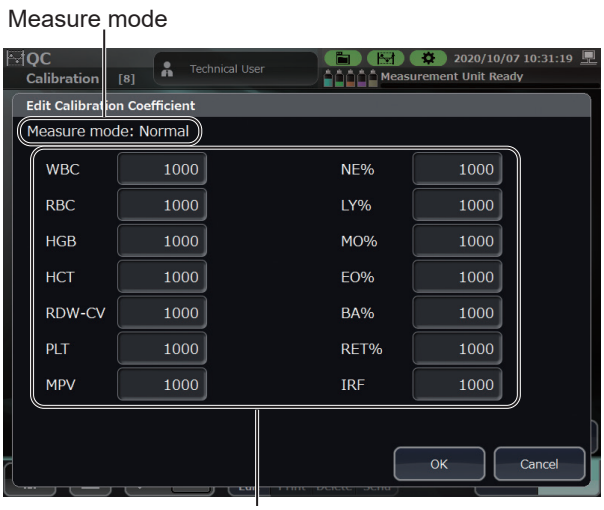
[Edit]: Display the Edit Calibration Coefficient window.

2 Select a calibration mode ("Normal" or "Pre-dilution", "WBC High" [1]) from the measurement mode drop-down list.

[1] The calibration coefficients for the measurement of high WBC dilution can be edited manually only by users with Technical User privileges. For the use of this function, contact your Nihon Kohden representative.

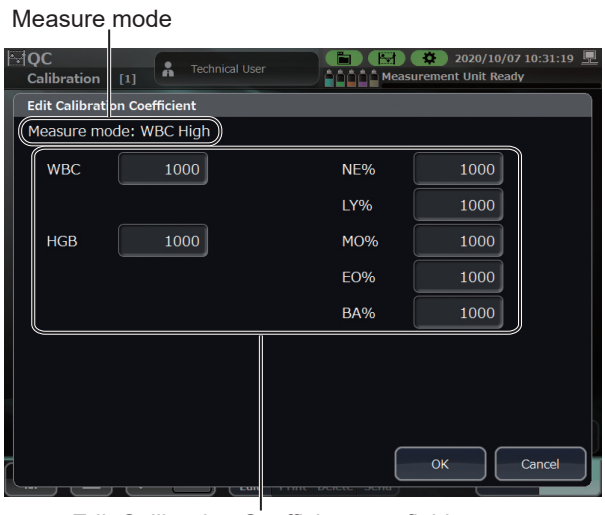
3 Touch [Edit] on the Calibration window. The Edit Calibration Coefficient window appears.

Edit Calibration Coefficient Window (Normal or Pre-dilution)



Edit Calibration Coefficient text field

Edit Calibration Coefficient Window (WBC High)



Edit Calibration Coefficient text field

4 Enter the desired calibration coefficient in the Edit Calibration Coefficient text field.

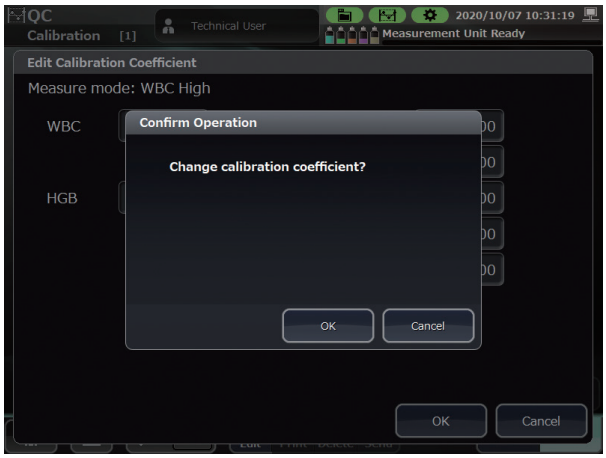
NOTE: The entry range is 500 to 2000 and within ±20% of the current value.

5 Touch [OK] on the Edit Calibration Coefficient window.

When the change is allowed in a before and after comparison, the confirmation window appears.

6 Touch [OK] on the Confirm Operation window.

Confirmation window when change allowed



Example of error when the entry range is exceeded

6 Adjustment

6-1. General

This device uses parts that require adjustments when they are replace or removed. Make the following adjustments when replacing or removing such parts.

Also note that adjustments may be required as a result of self checks.

Adjustment Items		Timing of Implementation
Adjusting the Sampling Needle Position	Adjusting the Auto Measurement Position	Adjust when any of the following parts is replaced or removed. • AUTO LOADER(K) (RP-6114937826) • SAMPLER UNIT (MS-910W) • OPEN AIR UNIT (MS-911W)
	Adjusting the Manual Measurement Position	Adjust when any of the following parts is replaced or removed. • SAMPLER UNIT (MS-910W) • OPEN AIR UNIT (MS-911W) • OPEN LOADER UNIT (MS-912W)
Adjusting Gain		Adjust when any of the following parts is replaced or removed. • HGB MEASURING UNIT (MH-910W) • Fluid Sensor (CLEANAC710, Hemolynac310, Hemolynac510, Reticulonac) • RET CUP HEATER UNIT (ZY-921W)
Adjusting MO-910W Sensitivity		Adjust when any of the following parts is replaced or removed. • LASER OPTICAL UNIT (MO-910W)
Adjusting RET Optical Sensitivity		Adjust when any of the following parts is replaced or removed. • LASER OPTICAL UNIT (BLUE) (MO-920W)
Adjusting RET Flow Cell Position		Adjust when each of the CV% and BTOC do not satisfy the standard value in RET optical sensitivity adjustment.

6-2. Adjustment Preparation

Adjustment Items		Preparation
Adjusting the Sampling Needle Position	Adjusting the Auto Measurement Position	• Remove the mixing cover and front cover. • Remove the top cover and open the FRONT PANEL UNIT. • Remove the autoloader sheet metal parts. • Install the jig.
	Adjusting the Manual Measurement Position	• Remove the mixing cover and front cover. • Remove the top cover and open the FRONT PANEL UNIT. • Install the jig.
Adjusting Gain		—
Adjusting RET Optical Sensitivity		Make a sample.
Adjusting RET Flow Cell Position		Remove the MO access cover.

NOTE: When removing or assembling the covers, parts or jig, turn off the analyzer and disconnect the power cord from the wall AC outlet.

6-2-1. Removing the Autoloader Sheet Metal Parts

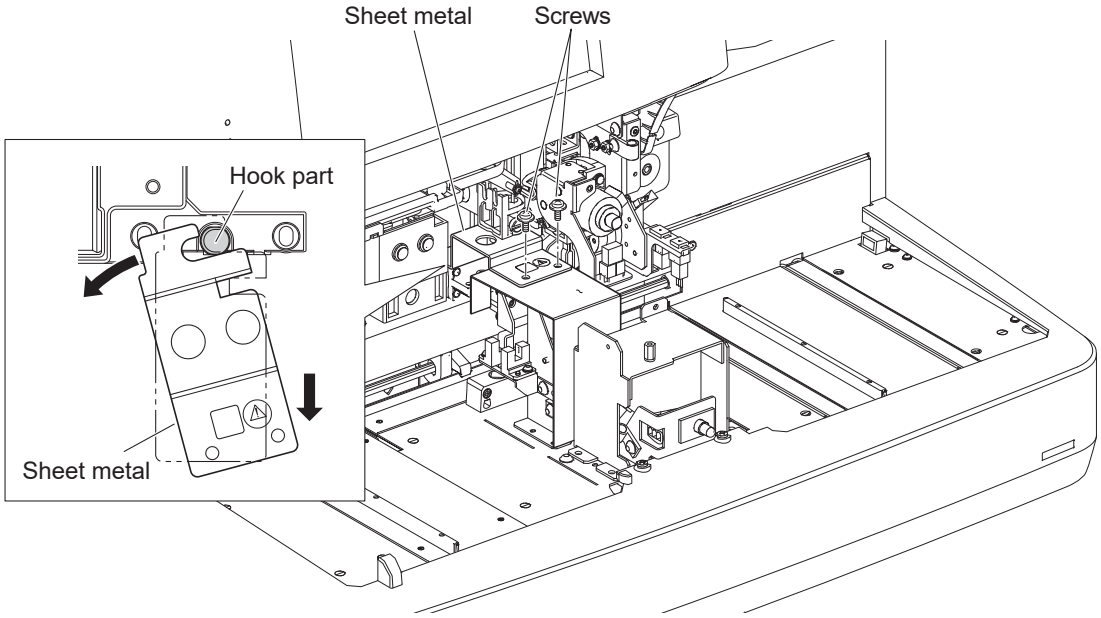
Preparation

1 Remove the mixing cover and front cover.

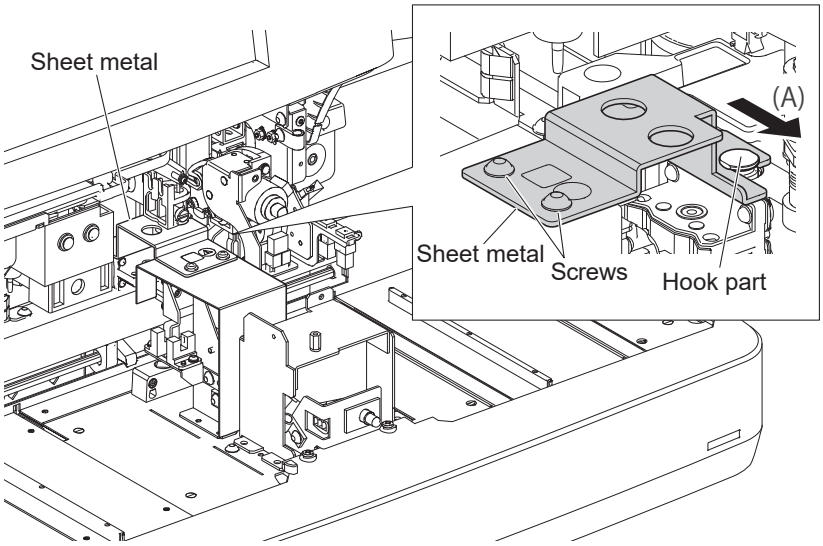
- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)

Procedures

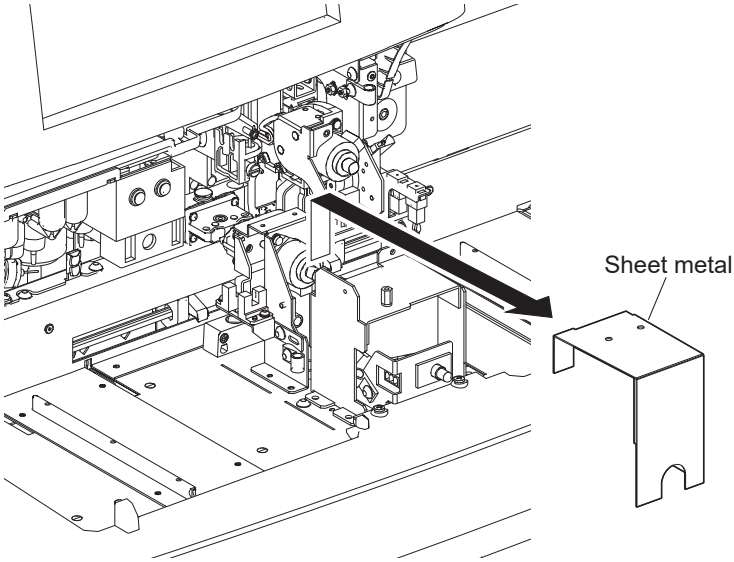
1 Remove the two screws and slide and remove the sheet metal horizontally.



NOTE: When assembling the sheet metal part, push the removed sheet metal part in the direction of the arrow (A) and secure it with the two screws.



2 Remove the sheet metal.



6-2-2. Installing the Jig

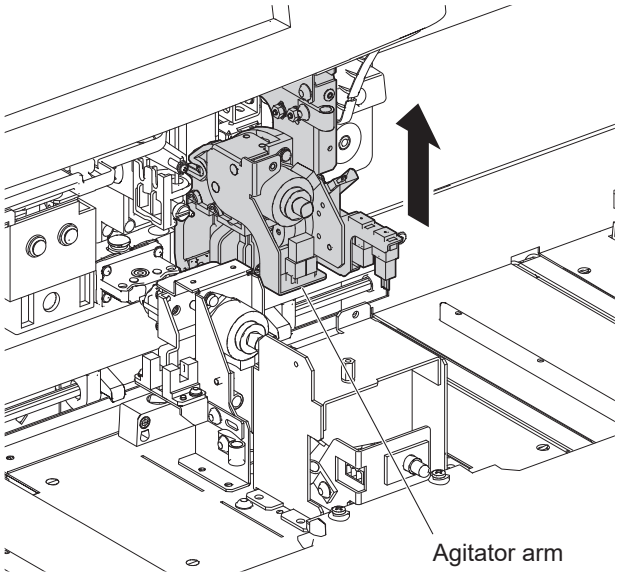
Jig

Needle position adjustment jig (auto measurement and manual measurement)

Repair Part No.	Repair Part Name
RPK-6113924534	JIG. nozzle position adjustment jig (K)

Auto Measurement Position Adjustment Jig

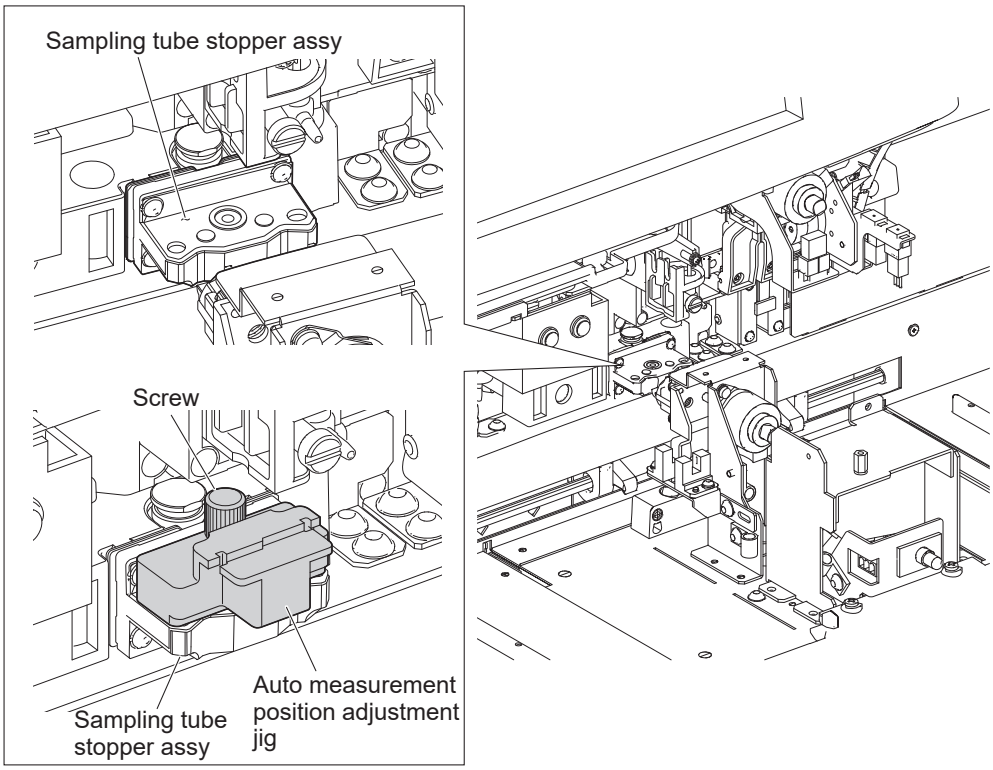
1 Raise the agitator arm.



2 Attach the jig to the sampling tube stopper assy.

Screw: 1 place

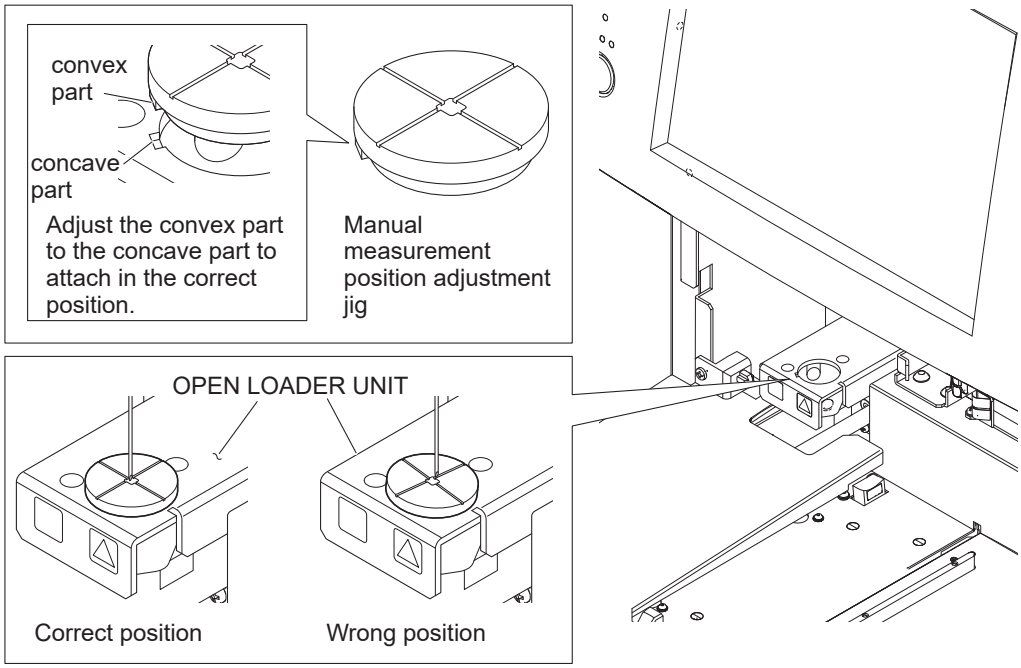
Specified jig: Needle position adjustment jig (auto measurement)



Manual Measurement Position Adjustment Jig

1 Attach the jig to the OPEN LOADER UNIT (MS-912W).

Specified jig: Needle position adjustment jig (manual measurement)



NOTE: Attach the jig in the correct position.

6-3. Sampling Needle Position Adjustment

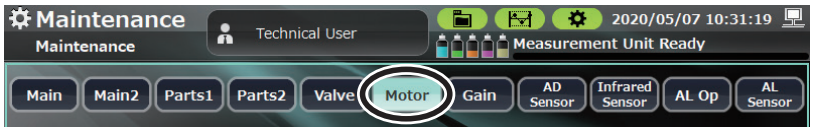
6-3-1. Auto Measurement Position Adjustment

6-3-1-1. Overview

This procedure checks and adjusts the sampling needle and autoloader aspiration position for auto measurements.

Operating procedure

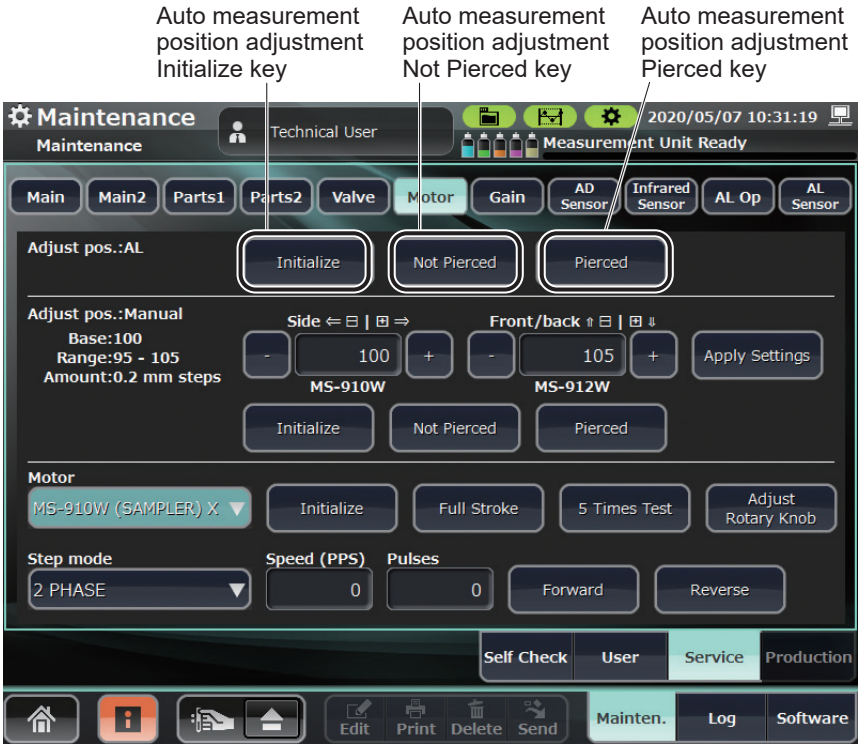
1 Open the Service Maintenance window and touch [Motor].



2 Attach the target jig to the autoloader, touch the operating keys according to the desired adjustments, check and adjust the position of the sampling needle.

The following operating keys are used when performing auto measurements:

Operating Key Name	Operation Details
Initialize key	Moves the SAMPLER UNIT (MS-910W) to the initial position.
Not Pierced key	Moves the SAMPLER UNIT (MS-910W) to the start point on the X-axis and directly before piercing of the target jig on the Y-axis.
Pierced key	Moves the SAMPLER UNIT (MS-910W) at the (not pierced) position directly before piercing, to a position such that it pierces the target jig. NOTE: When this operation is executed before the Not Pierced key, an error occurs. (Error code: 00400)



6-3-1-2. Checking the Sampling Needle Position

Preparation

NOTE: When removing or assembling the covers, parts or jig, turn off the analyzer and disconnect the power cord from the wall AC outlet.

1 Remove the mixing cover, front cover and top cover and open the FRONT PANEL UNIT.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-7 (p. 4-10)

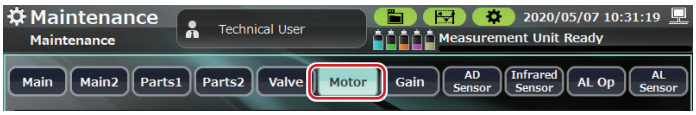
2 Remove the sheet metal parts and attach the jig.

- Section 6-2-1 (p. 6-4)
- Section 6-2-2 (p. 6-5)

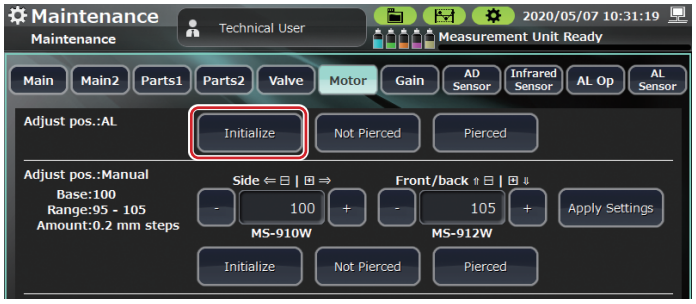
3 Turn the analyzer ON and change the operator to [Technical User].

Procedures

1 Open the Service Maintenance window and touch [Motor].



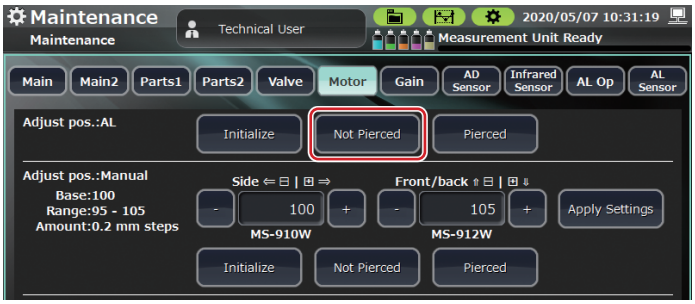
2 Initialize the X and Y directions of the SAMPLER UNIT (MS-910W) with the [Initialize] key.

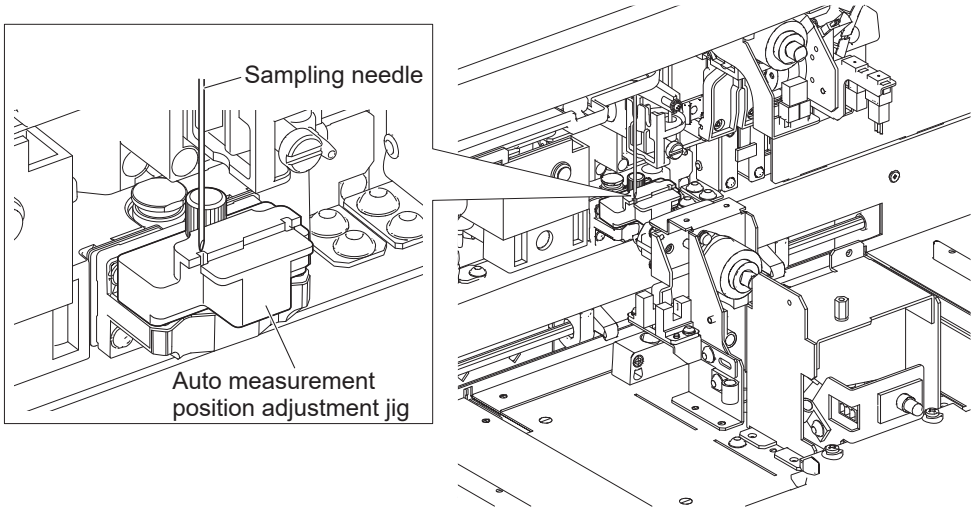


3 Touch the [Not Pierced] key to move the sampling nozzle to directly before the jig pierce position.

Check that the sampling nozzle is within the area of the hole.

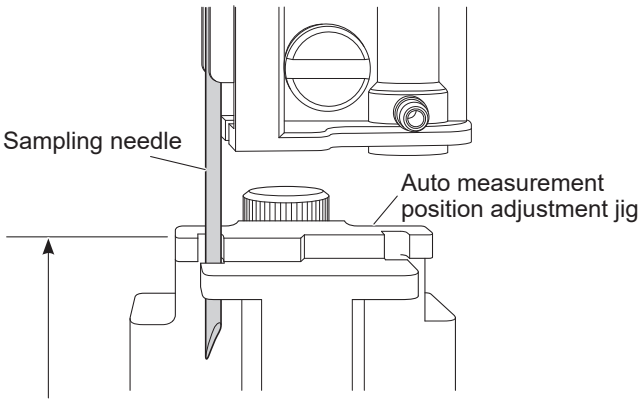
If the sampling needle is out of the area of the hole
Section 6-3-1-3 (p. 6-11)





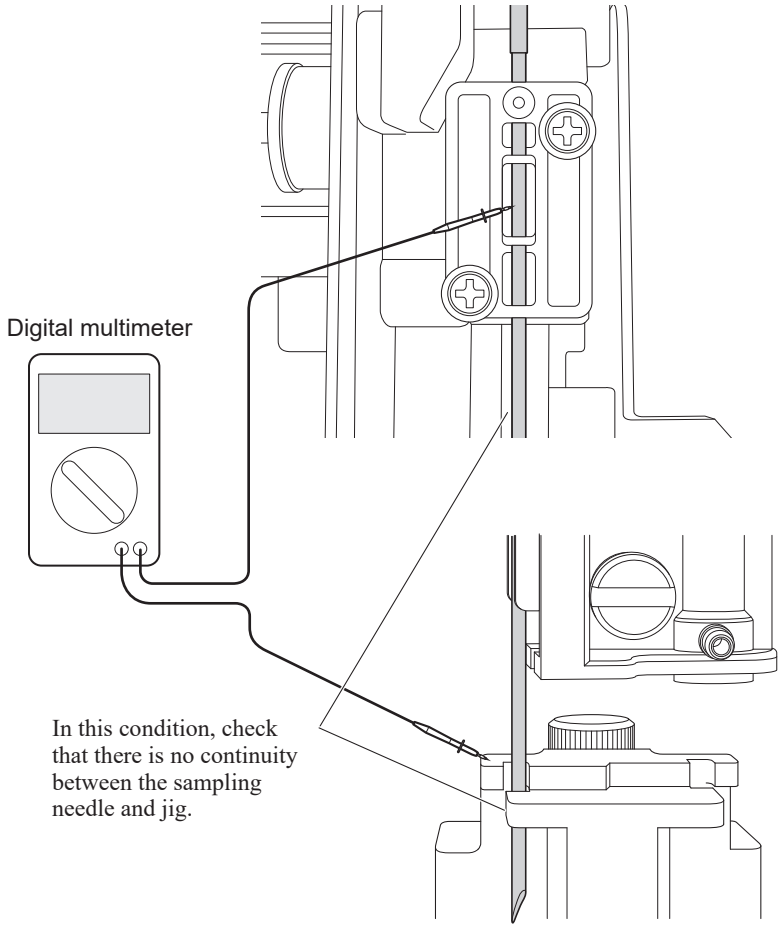
4 Touch the [Pierced] key to lower the sampling needle.

Visually check that the sampling needle does not hit against the jig.



Lower the sampling needle from this position.
Check visually that the jig is not hit.

5 Use a digital multimeter to check that there is no continuity between the jig and sampling needle.



NOTE: If the sampling needle hits against the jig or there is continuity between the jig and the sampling needle, adjust the position of the autoloader.

Adjusting the Autoloader Position
Section 6-3-1-3 (p. 6-11)

6-3-1-3. Adjusting the Autoloader Position

If the sampling needle is out of the area of the hole or the sampling needle hits against the jig, or there is continuity between the jig and the sampling needle in the steps **3** to **5** of "6-3-1-2. Checking the Sampling Needle Position", adjust the position of the autoloader.

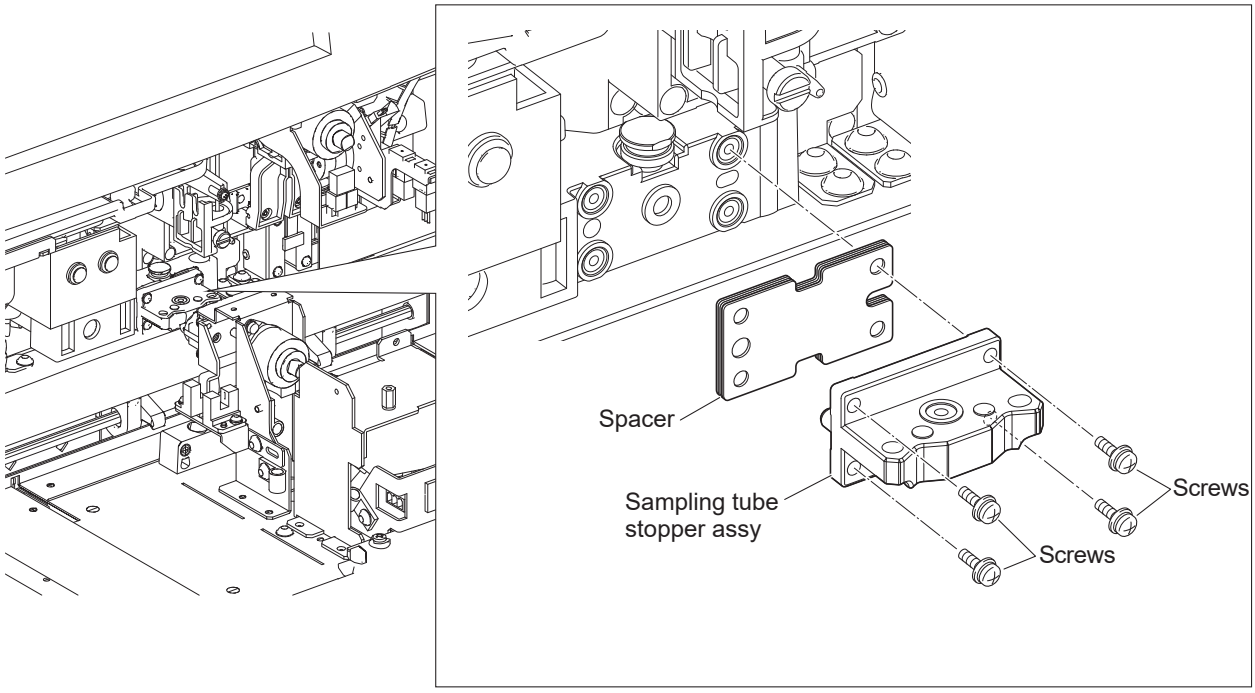
Checking the Sampling Needle Position
Section 6-3-1-2 (p. 6-8)

NOTE: When adjusting the position of the autoloader, turn off the analyzer and disconnect the power cord from the wall AC outlet.

Adjusting the Autoloader Position Back and Front

1 Remove the four screws which secure the sampling tube stopper assy.

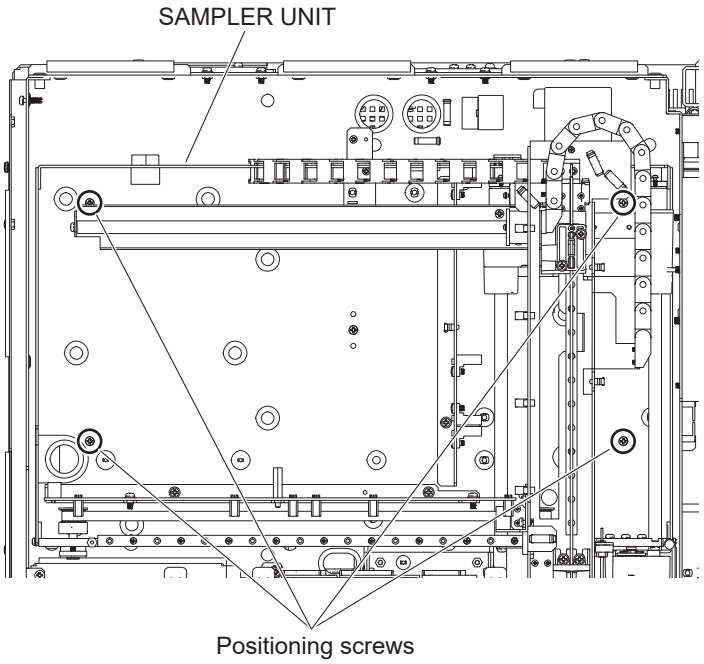
NOTE: There are some spacers between the sampling tube stopper assy and the autoloader. Store the spacers not to lose them.



2 Adjust the sampling tube stopper assy by adding or removing the spacer.

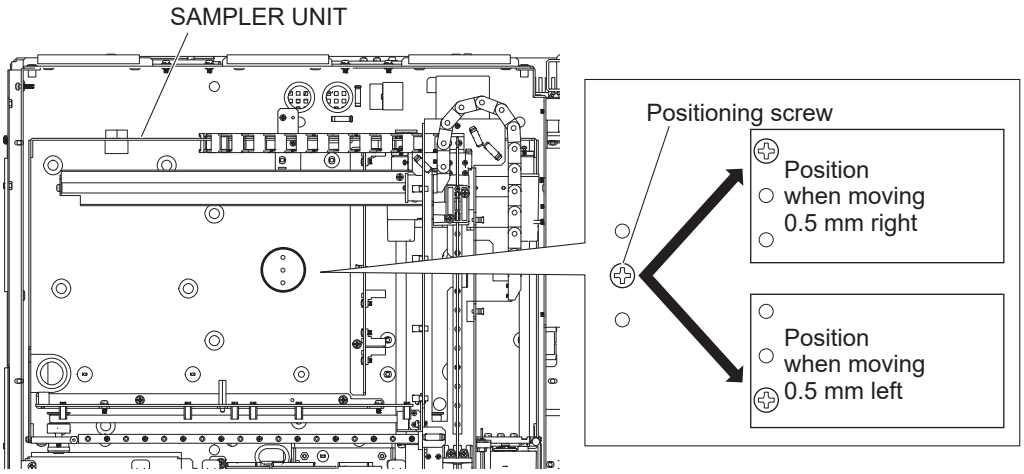
Adjusting the Autoloader Position Left and Right

1 Loosen the four positioning screws of the SAMPLER UNIT (MS-910W).



2 Remove the rest of the positioning screw and adjust the autoloader by moving the SAMPLER UNIT (MS-910W) left and right.

NOTE: Peel off the label and tighten the screw according to the direction. Attach the label to the screw hole.



3 Tighten the four loosened positioning screws.

4 Perform “6-3-1-2. Checking the Sampling Needle Position” and adjust the position of the autoloader until there is no continuity between the jig and the sampling needle.

Checking the Sampling Needle Position
Section 6-3-1-2 (p. 6-8)

6-3-2. Manual Measurement Position Adjustment

6-3-2-1. Overview

Check and adjust the position of the sampling needle and the sampling nozzle aspiration position for manual measurement.

Adjust the sampling nozzle aspiration position for manual measurement by adjusting the positions of the SAMPLER UNIT (MS-910W) and OPEN LOADER UNIT (MS-912W).

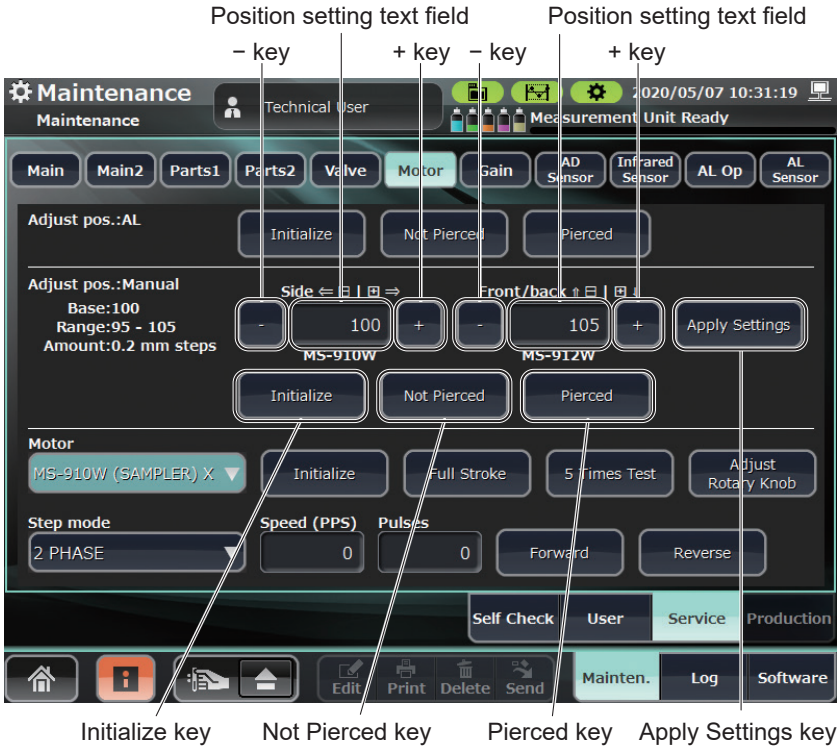
Operation Procedure

1 Open the Service Maintenance window and touch [Motor].

2 Attach the target jig to the OPEN LOADER UNIT (MS-912W). Touch the operating keys according to the desired adjustment operation and check and adjust the sampling needle.

The following operating keys are used when performing manual measurements:

Manual Measurement Position Adjustment Key Name		Description of Manual Adjustment
MS-910W (SAMPLER UNIT) position adjustment Side to side position	Position setting text field	SAMPLER UNIT (MS-910W) position input box (input range: 95 to 105, default setting: 100) A position input value of 1 corresponds to a movement of 0.2 mm. Increasing the value adjusts the aspiration position to the right, as viewed from the front. Decreasing the value adjusts it to the left.
	+key, −key	Changes the SAMPLER UNIT (MS-910W) position input value by 1.
MS-912W (OPEN LOADER UNIT) position adjustment Front to back position	Position setting text field	OPEN LOADER UNIT (MS-912W) position input box (input range: 95 to 105, default setting: 100) A position input value of 1 corresponds to a movement of 0.2 mm. Increasing the value adjusts the aspiration position toward you, as viewed from the front. Decreasing the value adjusts it backward.
	+key, −key	Changes the OPEN LOADER UNIT (MS-912W) position input value by 1.
MS-910W/MS-912W	Apply Settings key	Applies each of the SAMPLER UNIT (MS-910W) position adjustments and OPEN LOADER UNIT (MS-912W) position adjustments. After applying, the sampling nozzle is forced to move to its initial position.
Initialize key		Moves the SAMPLER UNIT (MS-910W) to the initial position.
Not Pierced key		Moves the SAMPLER UNIT (MS-910W) to the open loader position on the X-axis and directly before piercing of the target jig on the Y-axis.
Pierced key		Moves the SAMPLER UNIT MS-910W at the (not pierced) position directly before piercing, to a position such that it pierces the target jig. NOTE: When this operation is executed before the Not Pierced key, an error occurs. (Error code: 00401)



6-3-2-2. Checking the Sampling Needle Position

NOTE: Be sure to perform auto measurement position adjustment before manual measurement position adjustment.

Section 6-3-1 (p. 6-7)

Preparation

NOTE: When removing or assembling the covers or jig, turn off the analyzer and disconnect the power cord from the wall AC outlet.

1 Remove the mixing cover, front cover and top cover and open the FRONT PANEL UNIT.

- Section 4-3-1 (p. 4-6)
- Section 4-3-2 (p. 4-6)
- Section 4-3-3 (p. 4-7)
- Section 4-3-7 (p. 4-10)

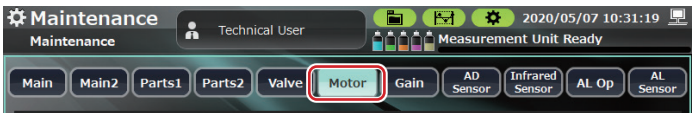
2 Attach the jig.

Section 6-2-2 (p. 6-5)

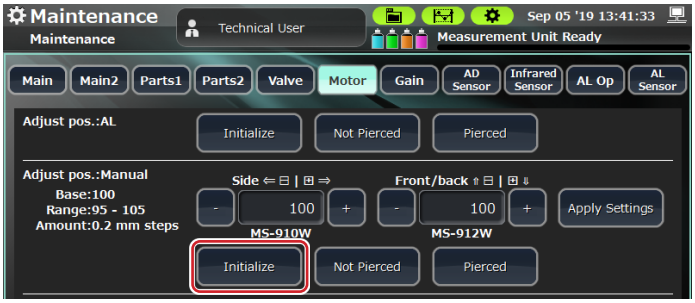
3 Turn the analyzer ON and change the operator to [Technical User].

Procedures

1 Open the Service Maintenance window and touch [Motor].



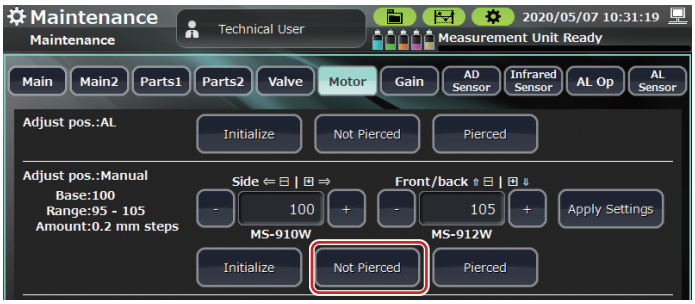
2 Initialize the X and Y directions of the SAMPLER UNIT (MS-910W) with the [Initialize] key.

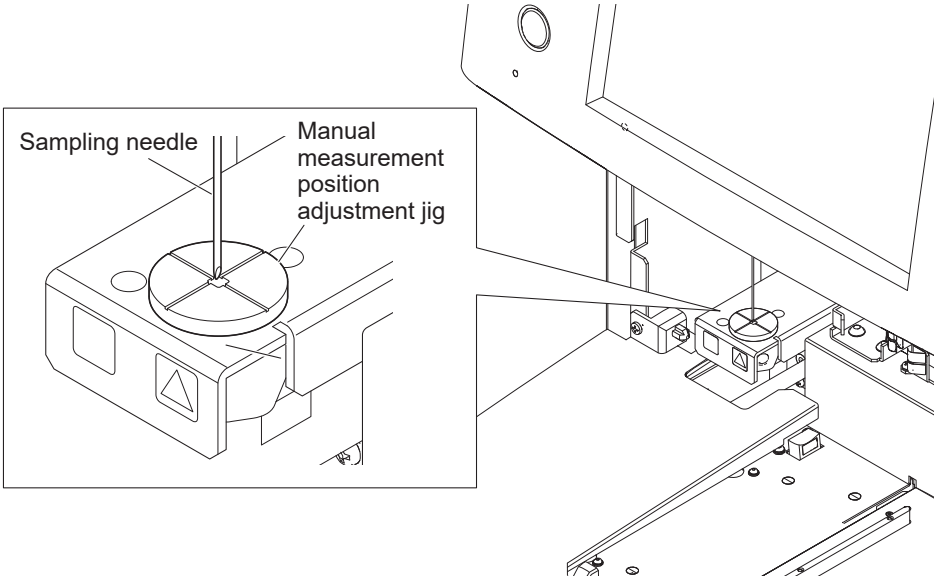


3 Touch the [Not Pierced] key to move the sampling nozzle to directly before the jig pierce position.

Check that the sampling nozzle is within the area of the hole.

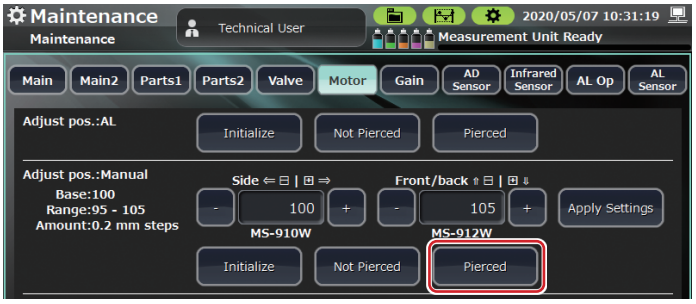
If the sampling needle is out of the area of the hole
Section 6-3-2-3 (p. 6-17)

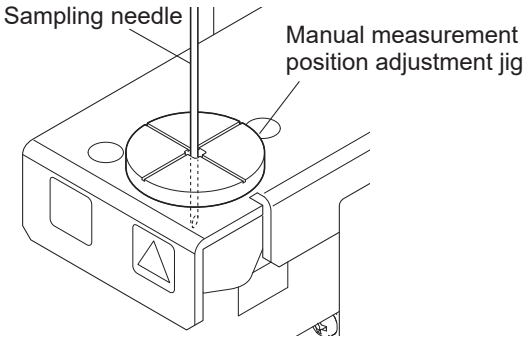




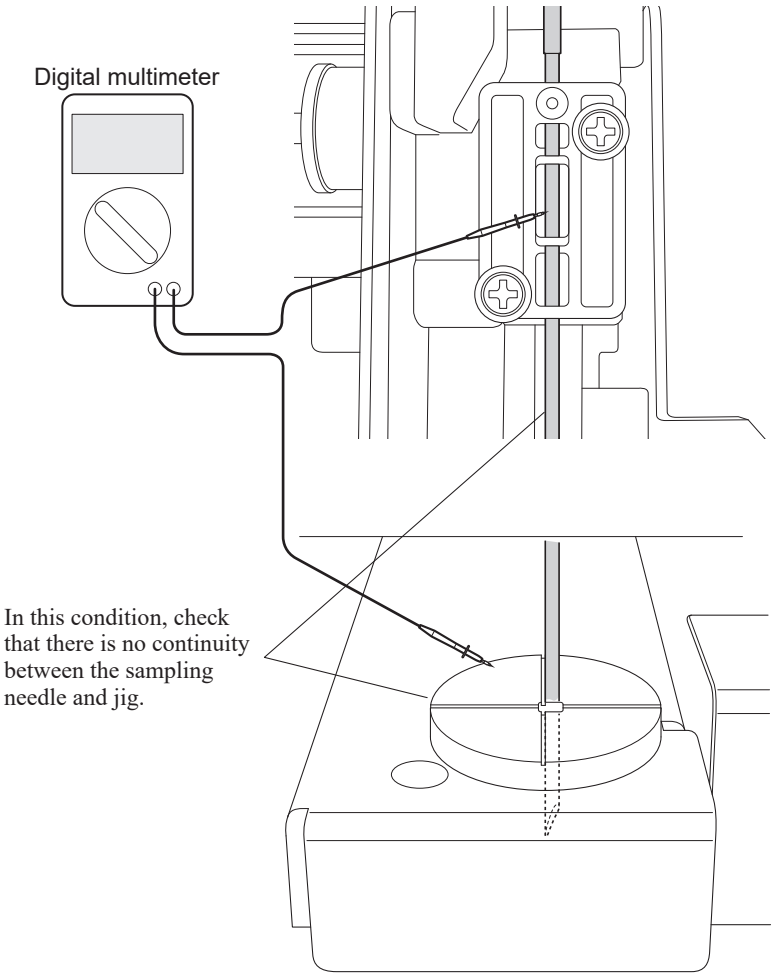
4 Touch the [Pierced] key to lower the sampling needle.

Visually check that the sampling needle does not hit against the jig.





5 Use a digital multimeter to check that there is no continuity between the jig and sampling needle.



NOTE: If the sampling needle hits against the jig or there is continuity between the jig and the sampling needle, adjust the position of the sampling needle.

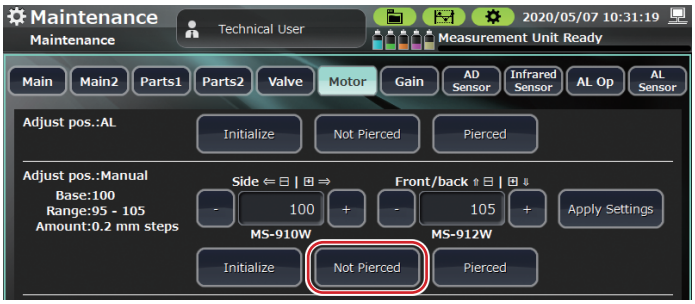
Adjusting the Sampling Needle Position
Section 6-3-2-3 (p. 6-17)

6-3-2-3. Adjusting the Sampling Needle Position

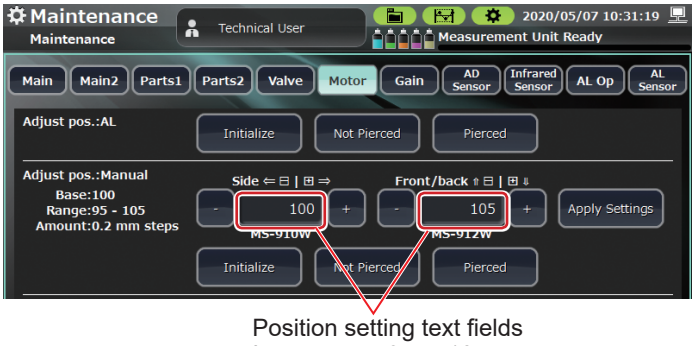
If the sampling needle is out of the area of the hole or the sampling needle hits against the jig, or there is continuity between the jig and the sampling needle in the steps **3** to **5** of "6-3-2-2. Checking the Sampling Needle Position", adjust the positions of the SAMPLER UNIT (MS-910W), OPEN LOADER UNIT (MS-912W).

Checking the Sampling Needle Position
Section 6-3-2-2 (p. 6-14)

1 Touch the [Not Pierced] key and check the sampling nozzle aspiration position.



2 Enter any value into each of the Position setting text fields for the SAMPLER UNIT (MS-910W) and OPEN LOADER UNIT (MS-912W) so that it is within the area.



Position setting text fields
Input range: 95 to 105

Side to side position:

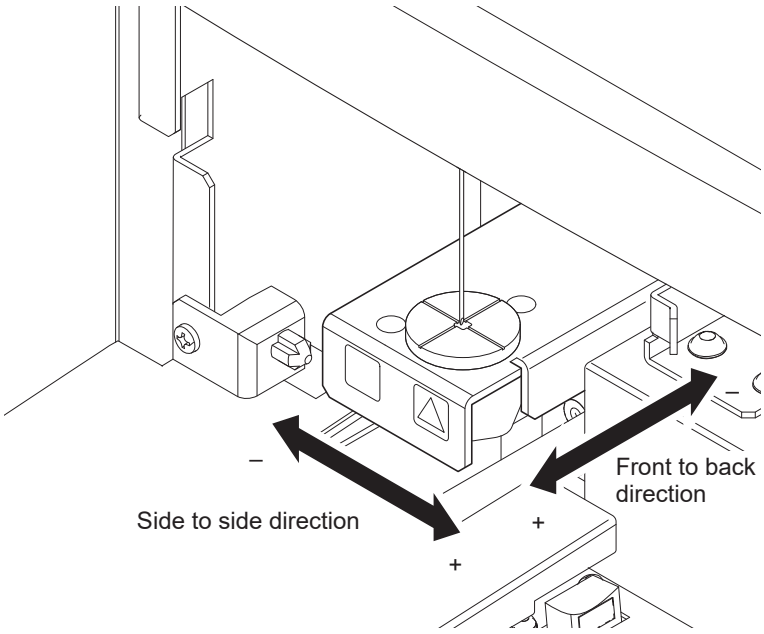
Adjusted by the SAMPLER UNIT (MS-910W)

Minute adjustment with [+] or [–] of [Side]

Front to back position:

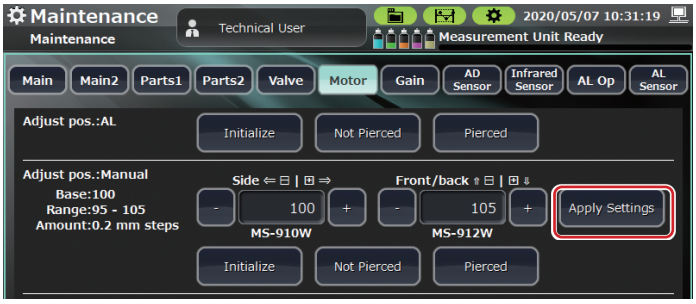
Adjusted by the OPEN LOADER UNIT (MS-912W)

Minute adjustment with [+] or [–] of [Front/back]



3 Touch the [Apply Settings] key.

Initialization is performed when touched.

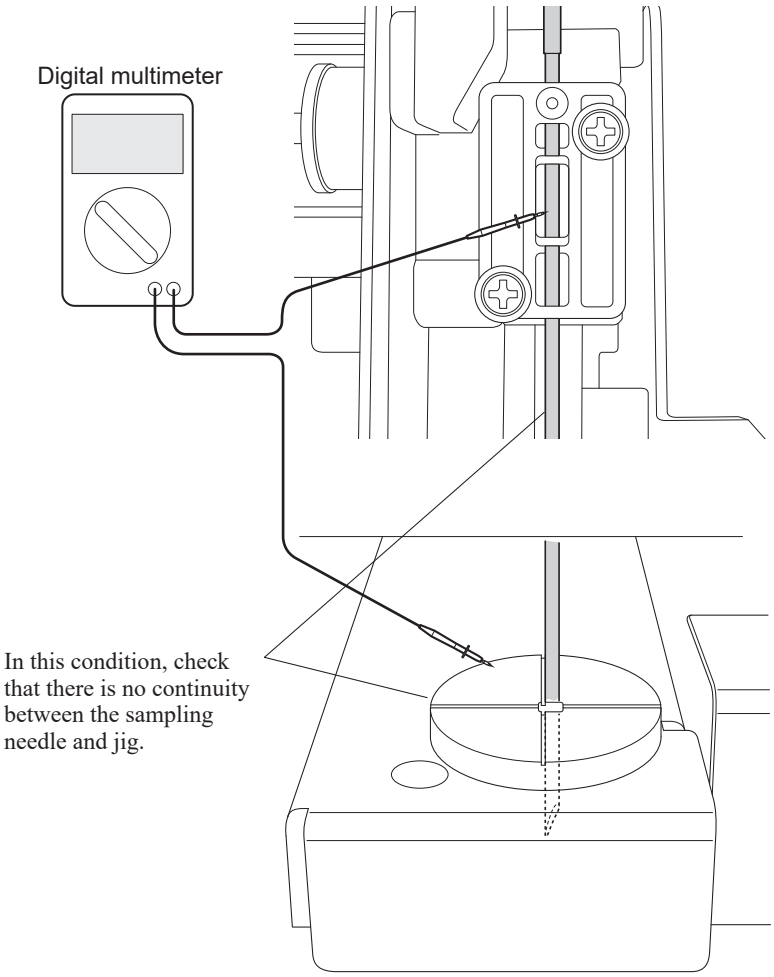


4 Repeat steps **1** to **3** until the sampling needle center and jig hole center are aligned.

5 Touch the [Pierced] key to lower the sampling needle.

Visually check that the sampling needle does not hit against the jig.

6 Use a digital multimeter to check that there is no continuity between the jig and sampling needle.



6-4. Gain Adjustment

This procedure adjusts the voltage of the infrared sensors in the analyzer.

There are sensors at each of the CLEANAC•710, HEMOLYNAC•310, HEMOLYNAC•510 and Reticulonac ports. To ensure the sensors are working properly, adjust the gain value while checking measurement values.

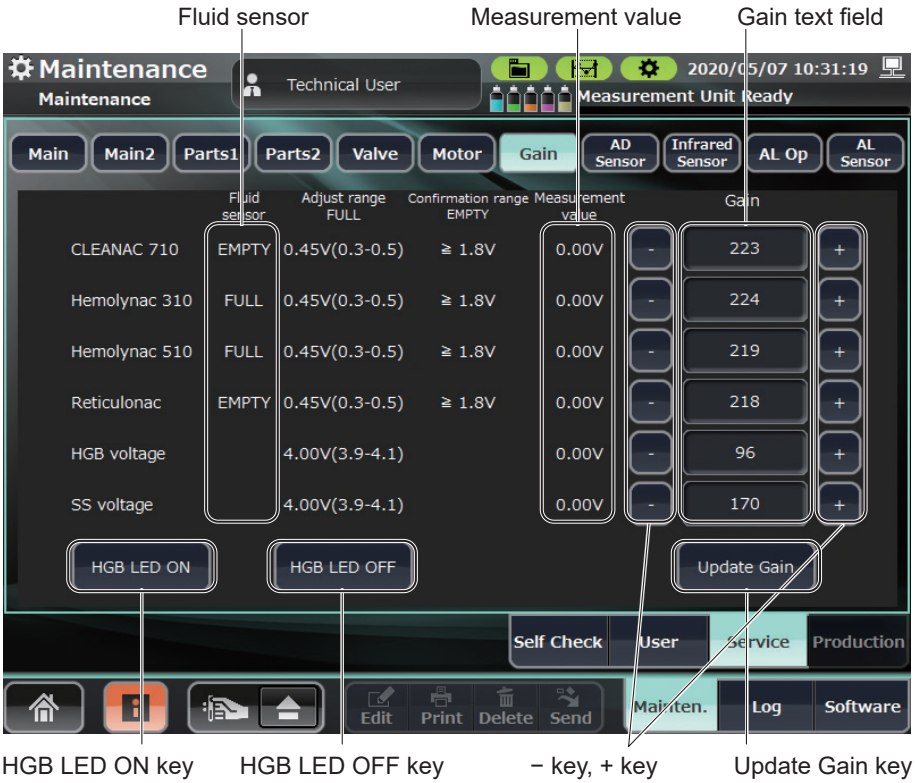
There are also sensors in the HGB unit. To ensure appropriate electrical sensitivity, adjust the gain value while checking measurement values.

Adjustment procedure

1 Open the Service Maintenance window and touch [Gain].

2 The Gain Adjustment window appears.

Gain window details



Details for each column are shown below.

Column Name	Description
Fluid sensor status	Shows either EMPTY (no fluid) or FULL (fluid present) for the relevant reagent. The reference is 1.8 [V], with fluid present for lower values and no fluid for higher values.
Measurement value	Values obtained from the AD sensor, which determine the fluid sensor status. The HGB voltage is obtained from the voltage when the LED is blinking or lit.

Column Name	Description
Gain text field	Gain input box for obtaining effective measurement values (input range: 0 to 255, default setting: 127)
+key, −key	Changes the gain value by 1. Measurement values are not updated until the Update Gain key is touched.

Each row represents a sensor.

Sensor Name	Display Description
CLEANAC•710	The measurement value is the same as shown in [Maintenance] > [Service] > [AD Sensor] > [Detergent port].
HEMOLYNAC•310	The measurement value is the same as shown in [Maintenance] > [Service] > [AD Sensor] > [CBC lyse reagent port].
HEMOLYNAC•510	The measurement value is the same as shown in [Maintenance] > [Service] > [AD Sensor] > [DIFF lyse reagent port].
Reticulonac	The measurement value is the same as shown in [Maintenance] > [Service] > [AD Sensor] > [RETICULONAC port].
HGB voltage	The measurement value is the same as shown in [Maintenance] > [Service] > [AD Sensor] > [HGB Gain].
SS voltage	The measurement value is the same as shown in [Maintenance] > [Service] > [AD Sensor] > [SS gain].
HGB LED ON key	Causes the HGB LED to blink and starts the acquisition of measurement values.
HGB LED OFF key	Turns off the HGB LED and terminates the acquisition of measurement values.
Update Gain key	Applies the gain values adjusted via direct input or the + key and – key.

3 Change the Gain text field for adjusting the desired item by using the numeric keypad dialog or the + and − keys. Refer to the following table for the adjustment ranges and confirmation ranges.

	Adjust range		Confirmation range	
	Fluid sensor status	Measurement value (V)	Fluid sensor status	Measurement value (V)
CLEANAC•710	FULL (fluid present)	0.45 (0.3 to 0.5)	EMPTY (no fluid)	≥ 1.8
HEMOLYNAC•310	FULL (fluid present)	0.45 (0.3 to 0.5)	EMPTY (no fluid)	≥ 1.8
HEMOLYNAC•510	FULL (fluid present)	0.45 (0.3 to 0.5)	EMPTY (no fluid)	≥ 1.8
Reticulonac	FULL (fluid present)	0.45 (0.3 to 0.5)	EMPTY (no fluid)	≥ 1.8
HGB voltage1	FULL (fluid present)	4.00 (3.90 to 4.10)	FULL (fluid present)	0.05–0.15
SS voltage1	FULL (fluid present)	4.00 (3.90 to 4.10)	FULL (fluid present)	0.05–0.15

[1]To adjust the LED ON measurement values, it is necessary to light the HGB LED by touching the [HGB LED ON] key (measurement values cannot be updated when the HGB LED is off).

4 When the measurement values are appropriate, touch the Update Gain key.

NOTE: Otherwise, repeat steps **3** and **4** until appropriate values are obtained.

Terminating an adjustment

5 If the HGB voltage was adjusted and the HGB LED ON key was touched, touch the HGB LED OFF key to turn off the LED.

6-5. MO-910W Sensitivity Adjustment

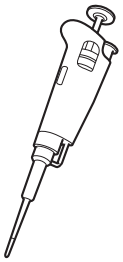
Adjust the LASER OPTICAL UNIT (MO-910W) sensitivity. For details, refer to "5-1. Performing Calibration".

Section 5-1 (p. 5-2)

6-6. RET Optical Sensitivity Adjustment

6-6-1. Preparation

R1 particle



Pipette dropper

Required reagents and tools

Name and Model		Qty
R1 particle	Rainbow Fluorescent Particles (RFP-30-5)	1
Diluent	ISOTONAC•3/4 MEK-640	2.5 ml[1]
Sample tube[2]		1
Adapter for sample tube		1
Pipette dropper3		1

[1]: Determine 2.5 ml with pipette dropper from the container that contains tens of ml of diluent

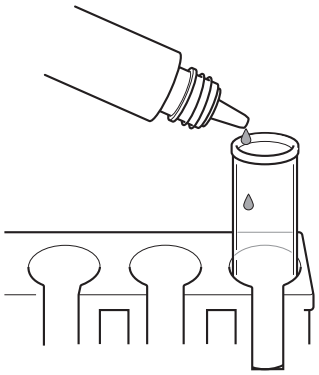
[2]: Empty sample tube

NOTE: If empty sample tube cannot be prepared, rinse the inside of the sample tube with diluent.

[3]: Pipette dropper that can determine 2.5 ml

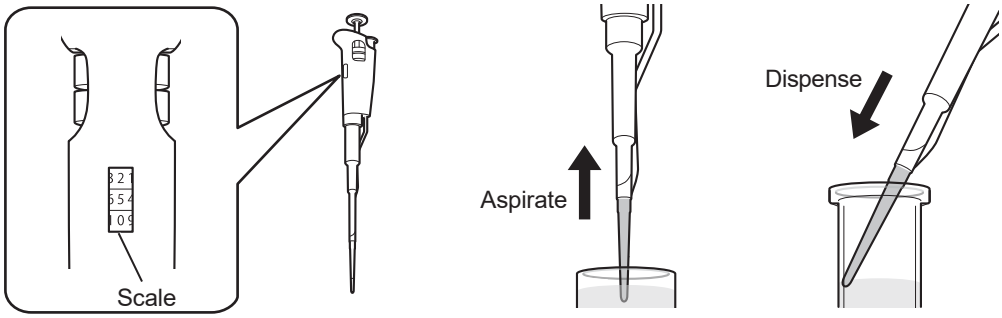
Making a sample

1 Drop two drops of R1 particle into the empty sample tube.



2 Aspirate 2.5 ml of the diluent from the container.

3 Dispense the 2.5 ml of the diluent that is determined with pipette dropper to the sample tube with two drops of R1 particle in the step **1**.



4 Attach the cap to the sample tube and agitate and invert the sample tube about 10 times.

NOTE: One sample is used for one measurement in optical sensitivity adjustment. Perform a measurement at least three times. Perform optical sensitivity adjustment making a sample at each measurement or making about five samples in advance.

6-6-2. Adjusting Optical Sensitivity

Preparation

1 Make a sample.

Section 6-6-1 (p. 6-22)

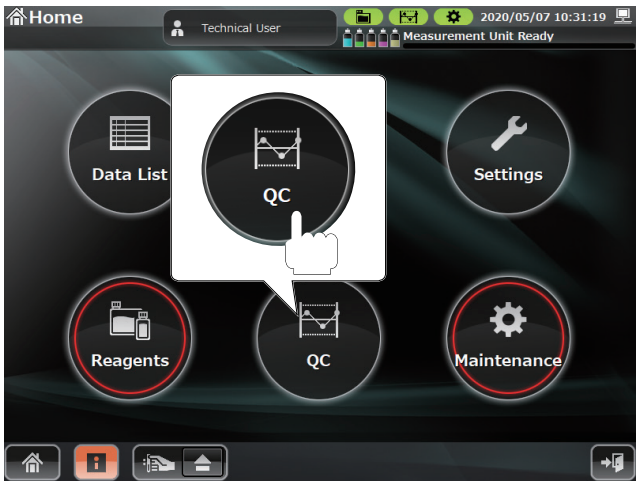
2 Turn on the analyzer and change the operator to [Technical User].

Procedures

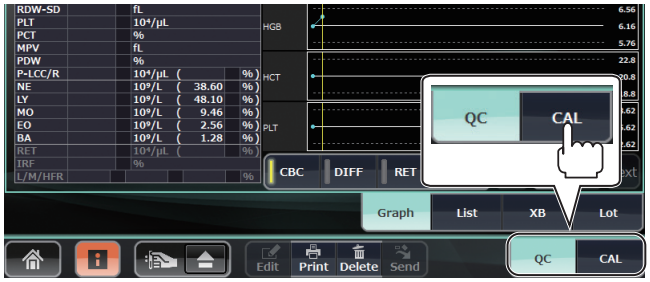
1 Check that a [Technical User] is logged in, then open the Home screen.

If you are in another window, touch [⌂] at the lower left.

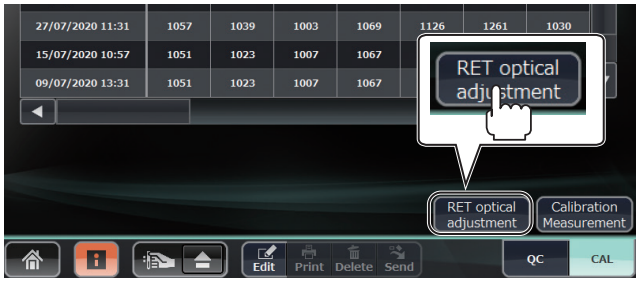
2 Touch [QC] on the Home screen. The QC window opens.



3 Touch [CAL] on the QC window. The Calibration window opens.



4 Touch [RET optical adjustment].



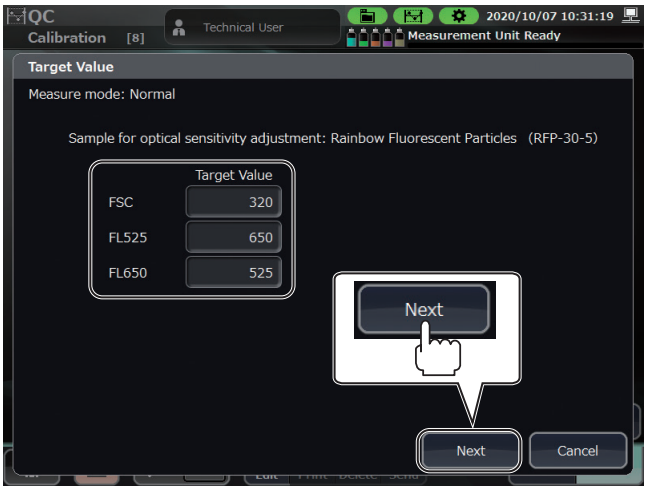
5 Check that each of the target values matches the values in the following table and touch [Next].

- Target value

Items	Model (R1 particle)
	RFP-30-5
FSC	320
FL525	650
FL650	525

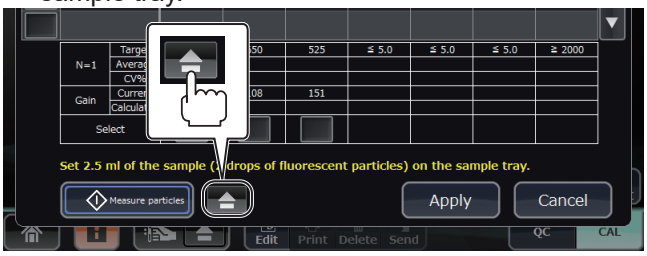
The following is the default setting.

Items	Default
FSC	320
FL525	650
FL650	525



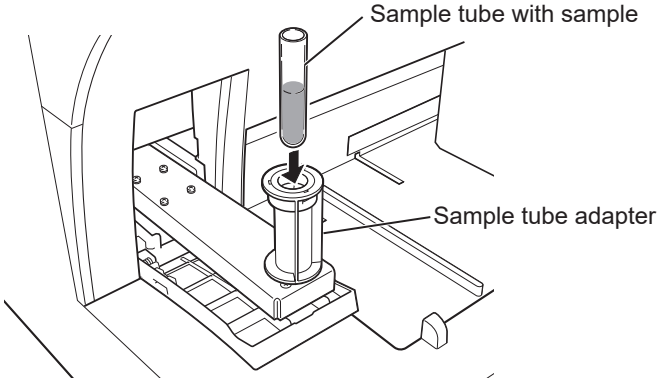
The window is changed and the sample tube holder is ejected automatically.

NOTE: Eject key is basically not used. If an error occurs and the sample tray cannot be ejected, touch [⏏] to eject the sample tray.



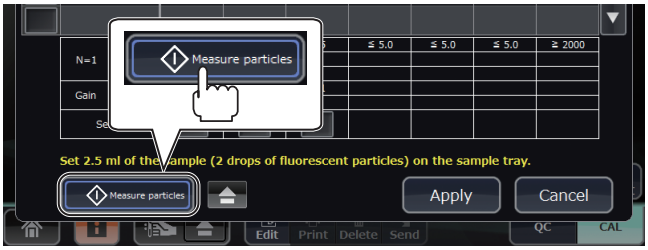
6 Attach the sample tube adapter to the sample tube holder and set the sample tube with sample in the adapter for the sample tube holder.

NOTE: Be sure to remove the cap from the sample tube.



7 Touch [Measure particles].

The sample tube holder slides in and measurement begins.



When measurement is complete, the measurement results appear on the screen.

8 Check that each of the CV% and BTOC of the particle measurement results are within the criteria.

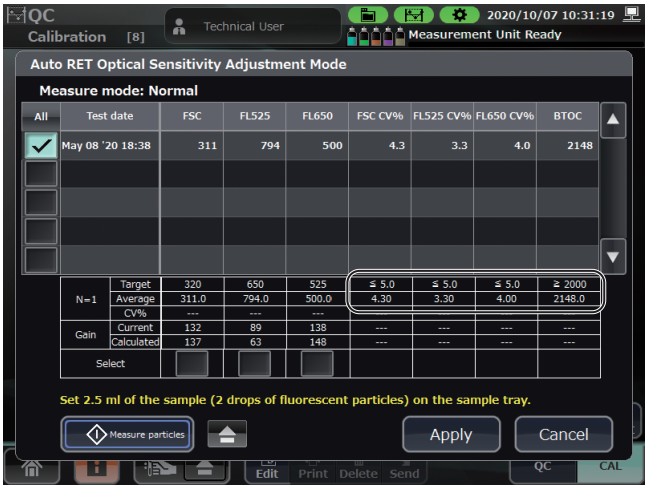
- Appropriate range

  FSC CV%: 5.0 or less

  FL525 CV%: 5.0 or less

  FL650 CV%: 5.0 or less

  BTOC: 2000 or more



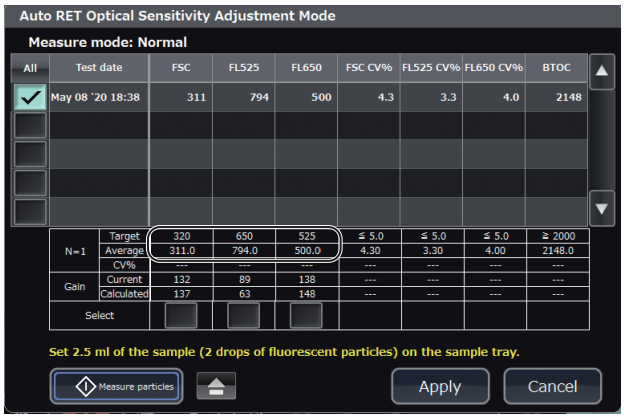
NOTE
- If the results are out of the criteria, set another sample and touch [Measure particles] to start measurement again.
- If the results are out of the criteria after remeasurement, clean the RET flow cell. If it is not yet improved , adjust the RET flow cell position.

- Section 7-2-2-5 (p. 7-9)
- Section 6-6-3 (p. 6-29)

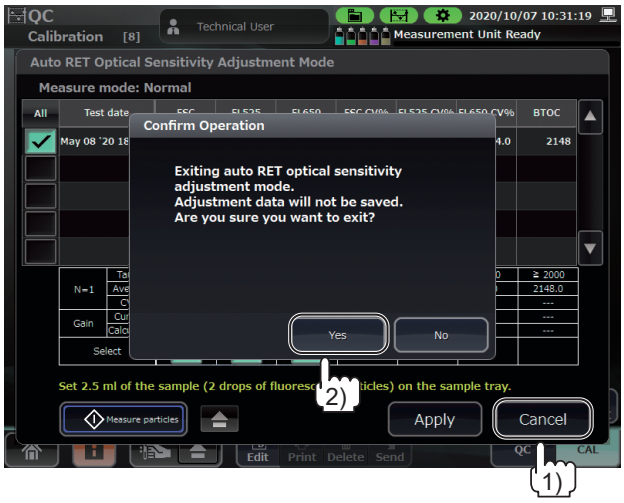
If the results are out of the criteria, the results are displayed in red.

9 Repeat steps **6** to **8** and measure RET particles twice (three times in total).

10 Check that the average values of FSC, FL525 and FL650 are the target value ±20% or less.
If the average values are the target value ±20% or more, proceed to "6-6-2-1. Adjusting Calibration Coefficient".



11 Touch [Cancel]. When the Confirm Operation window appears, touch [Yes].

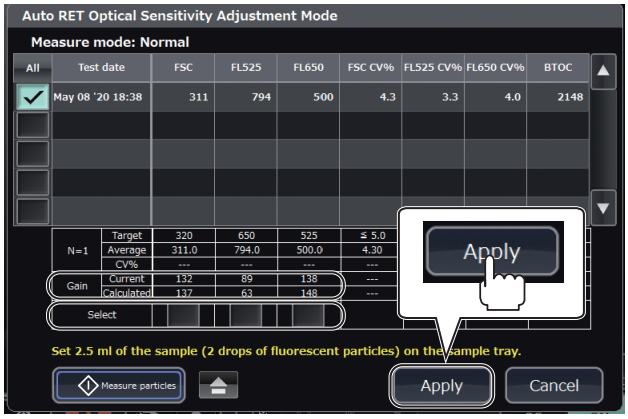


12 Remove the sample tubes and touch [⏏] to slide in the sample tube holder.

6-6-2-1. Adjusting Calibration Coefficient

1 Touch check boxes of FSC, FL525 and FL650 to show the check icon and touch [Apply].

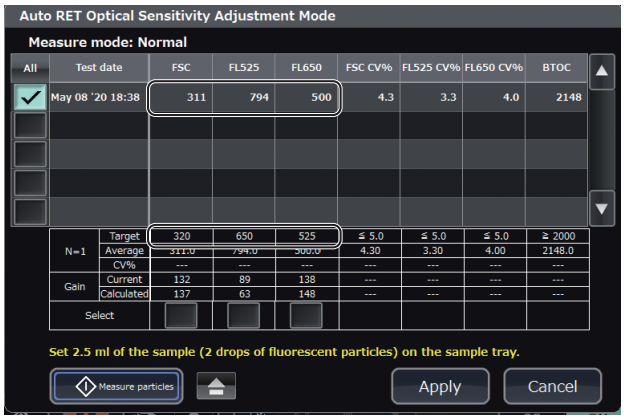
Calculated gain value for RET is applied to the calibration coefficient.



2 Touch [Yes] on the Confirm Operation window.

3 Check that the calibration coefficient is correctly applied on the Calibration window.

4 Measure RET particles again and check that the particle measurement results are the target value ±6% or less.



6-6-3. Adjusting RET Flow Cell Position

When one of CV% or BTOC do not satisfy the standard value after cleaning RET flow cell, adjust the RET flow cell position. Adjust the RET flow cell position based on the value of FSC CV%.

FSC CV% is 5.8 in the above figure. (standard value of FSC CV%: 5.0 or less) Adjust the RET flow cell position so that the value of FSC CV% is within the appropriate range after position adjustment.

NOTE: The appropriate range is different before and after the RET flow cell position adjustment. The appropriate range after the position adjustment is 3.5 or less for all of the CV%.

Laser

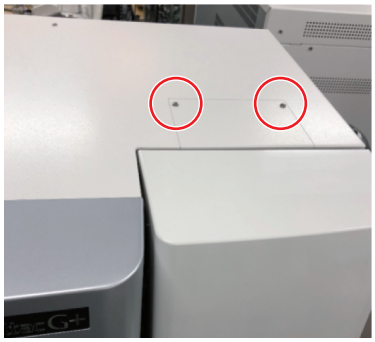
⚠ WARNING

Do not disassemble anything unless specified by the operator's manual. This may result in exposure to laser radiation.

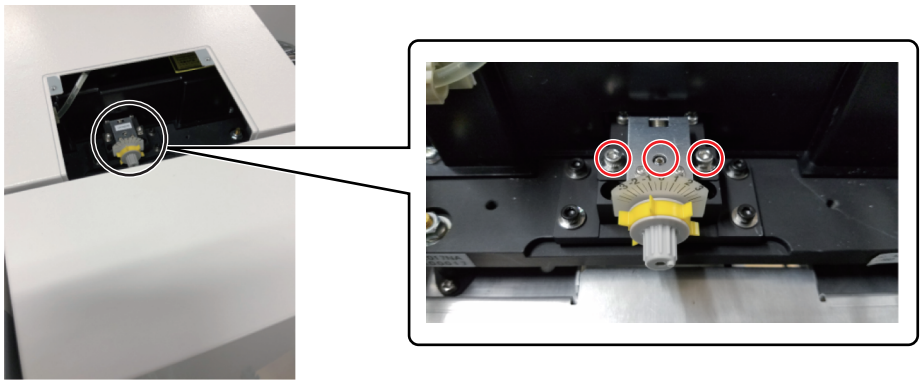
The analyzer complies with IEC 60825 (Class 1 laser products) which is the international standard for laser and there is no hazard of exposure to laser radiation. Laser is radiated inside the analyzer but it is contained within the evacuated enclosure and cover. There is no exposure to laser radiation as long as the analyzer is used as specified in the operator's manual.

Procedures

1 Remove the two screws and open the MO access cover.

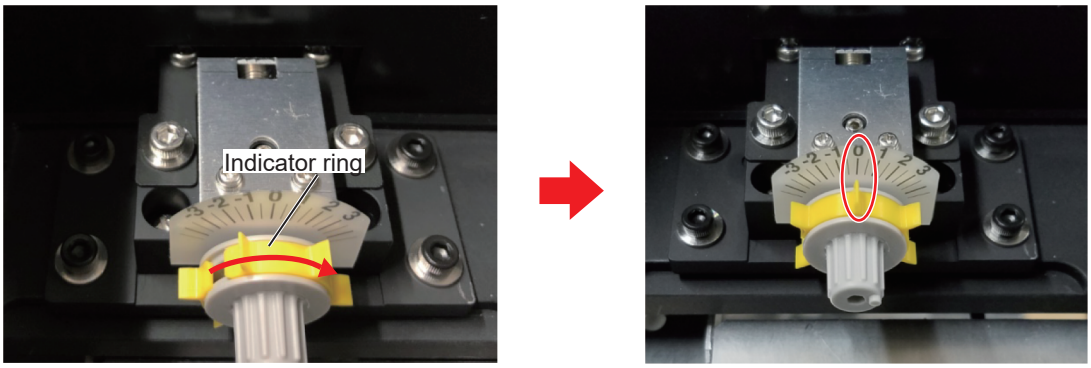


2 Loosen the three fixing screws which secure the RET flow cell.



3 Rotate the indicator ring and align the projection part of the indicator ring with "0" of the scale.

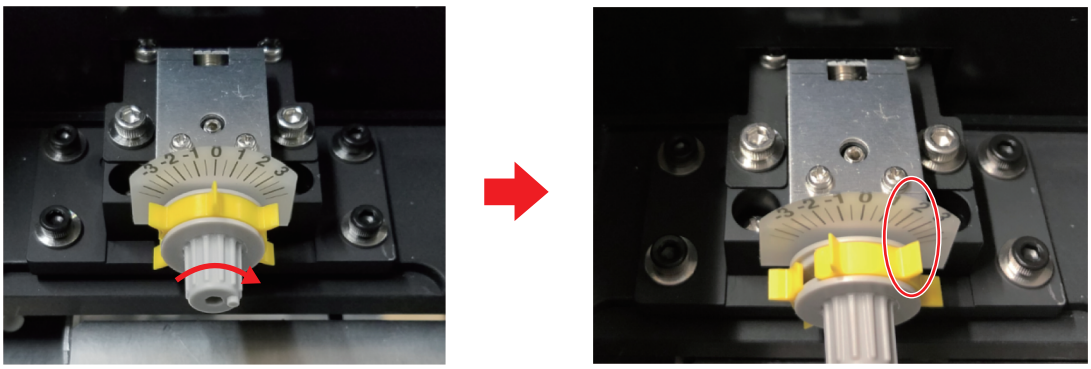
The indicator ring is the guide for how much the indicator ring is rotated.
The rotation of the indicator ring does not affect the value of CV%.



4 Rotate the dial and adjust the RET flow cell position by referring to the following table.

In this section, the value of FSC CV% is 5.8 and the displacement is 2.0 to 2.5 or -2.0 to -2.5. To correct the displacement, rotate the dial to align the projection part of the indicator ring with 2.0 to2.5 of the scale.

Displacement (dial scale)	FSC CV%
-3.0	9.2
-2.5	7.0
-2.0	5.2
-1.5	3.8
-1.0	2.8
-0.5	2.2
0.0	2.0
0.5	2.2
1.0	2.8
1.5	3.8
2.0	5.2
2.5	7.0
3.0	9.2



NOTE
- When rotating the dial in plus direction, rotate the dial in plus direction more than 1 of the scale compared with the target scale and rotate in minus direction to the target scale.
- When the value of FSC CV% does not improve after remeasuring the RET particles, return the dial to "0" and rotate the dial in the opposite direction.

5 Perform RET particle measurement once and check that all the CV% and BTOC are within the appropriate range.

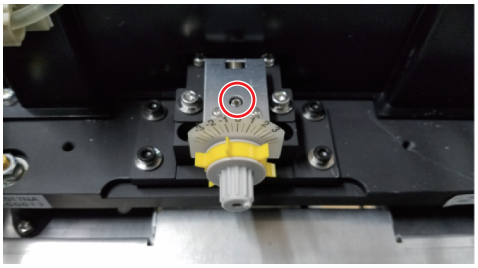
Section 6-6-2 (p. 6-24)

- Appropriate range after adjusting the RET flow cell position

  FSC CV%: 3.5 or less
  FL525 CV%: 3.5 or less
  FL650 CV%: 3.5 or less
  BTOC: 2000 or more

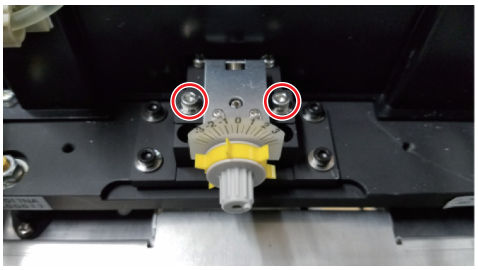
NOTE
- The appropriate range is different before and after the position adjustment.
- When the value is out of the appropriate range, adjust the RET flow cell position again.

6 Tighten the center fixing screw of the RET flow cell.



NOTE: Do not fasten the screw tightly because the screw may be broken.

7 Tighten the rest of fixing screws of the RET flow cell.



NOTE
- To avoid the impact to the screws, fasten the screws in several times.
- Tightening torque: 41.2 N·cm (equivalent to M2.6)

8 Close the MO access cover and install the two screws.

9 Measure RET particles again.

Section 6-6-2 (p. 6-24)

Appropriate range of each of the CV% and BTOC are the following.

- Appropriate range after adjusting the RET flow cell position

FSC CV%:	3.5 or less
FL525 CV%:	3.5 or less
FL650 CV%:	3.5 or less
BTOC:	2000 or more

NOTE: The appropriate range is different before and after the RET flow cell position adjustment.

For the following procedures, see steps **9** to **10** in Section 6-6-2 (p. 6-24).

7 Maintenance

(Contents continued on next page.)

7-1. Maintenance Inspection

If the periodic inspection is not performed, degradation or loss of function may go unnoticed and lead to misdiagnosis.

Service personnel should perform the maintenance inspection at least twice every year. Make sure that the analyzer operates properly and replace the consumables.

Section 9 “Maintenance Procedure”

7-1-1. Repair Parts Availability Policy

Nihon Kohden Corporation (NKC) shall stock repair parts (parts necessary to maintain the performance of the analyzer) for a period of 7 years after delivery of the analyzer.

During that period, NKC or its representatives will repair the analyzer.

This period may be shorter than 7 years if the necessary board or part is not available.

7-2. Maintenance Operations

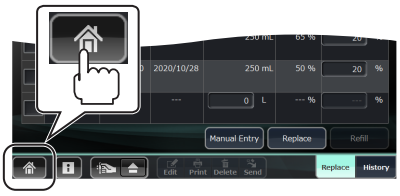
Open the User Maintenance window and perform the required cleaning, priming/draining or other operations.

Check the self check result on the Mainenance Self Check window.

Measure a background noise as required.

Item	Description	Refer to
Clean	Cleans the fluid path inside the analyzer with CLEANAC•710.	p. 7-5
Clean Protein	Cleans the fluid path inside the analyzer with CLEANAC•810 (sodium hypochlorite).	p. 7-6
Clean Flowcell	Removes dirt and bubbles from the flow cell unit.	p. 7-7
Clean RET Flowcell	Removes dirt and bubbles from the flow cell unit for reticulocyte.	p. 7-9
Remove Clog	Removes clogs in the fluid path inside the analyzer.	p. 7-9
Priming on Installation	Refills reagent inside the analyzer.	p. 7-11
Drain All	Drains diluent from the fluid path inside the analyzer.	p. 7-12
Clean MC	Removes dirt and bubbles from the MC.	p. 7-8
Remove MC Aperture Clog	Cleans the aperture cap.	p. 7-113
Self Check	Runs the self check.	p. 7-13
Viewing Self Check Results	Views the self check result.	p. 7-14
Standby	Returns the autoloader and the actuators in the analyzer (such as electromagnetic valves and pumps) to their initial positions and sets the analyzer to stand by.	p. 7-18
Measuring Background Noise	Measures a sample that only contains diluent. (Measures diluent and staining reagent in +RET measurement)	p. 7-19

7-2-1. Opening the User Maintenance Window



1 Open the Home screen.

If you are in another window, touch [ ] at the lower left.

2 Open the Maintenance window.

1) Touch [Maintenance] on the Home screen. The Maintenance Self Check window opens.

2) Touch [User]. The User Maintenance window opens.

7-2-2. Cleaning

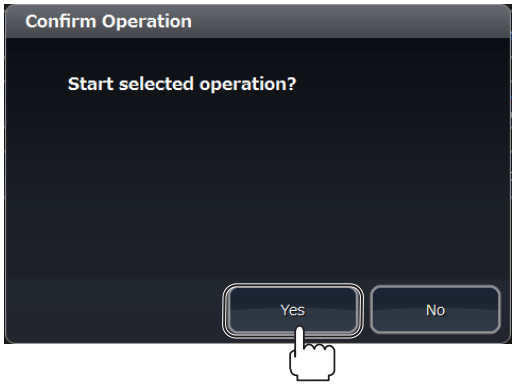
7-2-2-1. Cleaning the Fluid Path

Clean the fluid path inside the analyzer with CLEANAC•710.

1 Open the User Maintenance window and touch [Clean].

Section 7-2-1 (p. 7-4)

2 Touch [Yes] on the Confirm Operation window.



7-2-2-2. Cleaning Protein

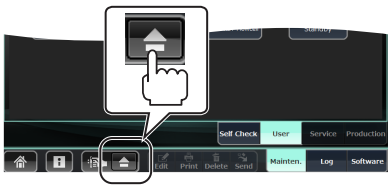
Clean the fluid path inside the analyzer with CLEANAC•810 (sodium hypochlorite).

Do this whenever normal cleaning was not effective.

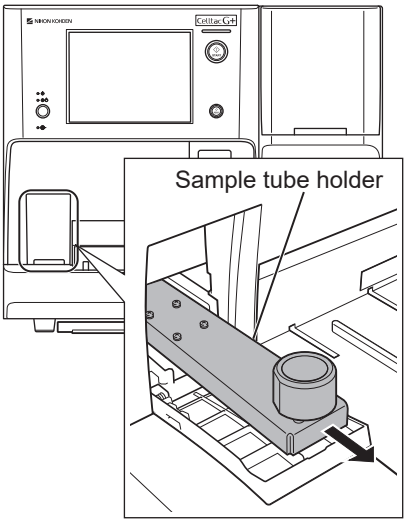
NOTE: Do the protein cleaning at least once every month (required after around 2000 measurements).

1 Open the User Maintenance window and place the CLEANAC•810 detergent on the sample tube holder.

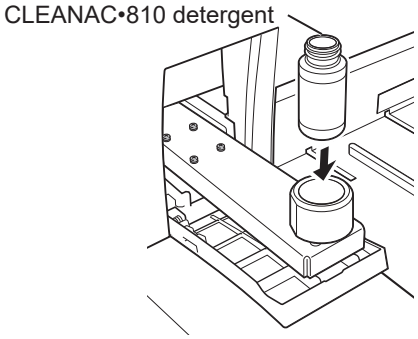
Section 7-2-1 (p. 7-4)



1) Touch [⏏] to eject the sample tube holder.



2) Check that the detergent adapter is attached on the ejected sample tube holder.



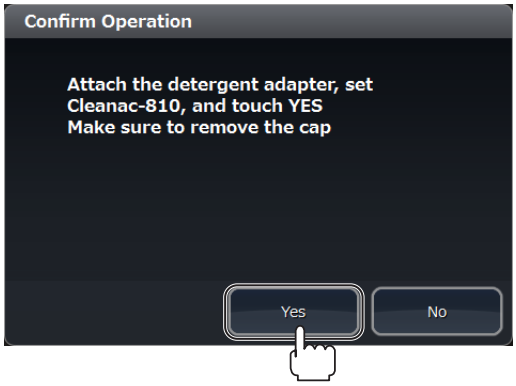
3) Remove the cap from the CLEANAC•810 detergent bottle and insert the bottle into the sample tube holder adapter.

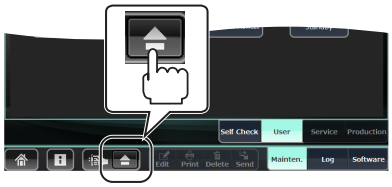
NOTE • Insert the detergent into the adapter until it stops at the end.

• Make sure to remove the cap.

2 Touch [Clean Protein] on the User Maintenance window.

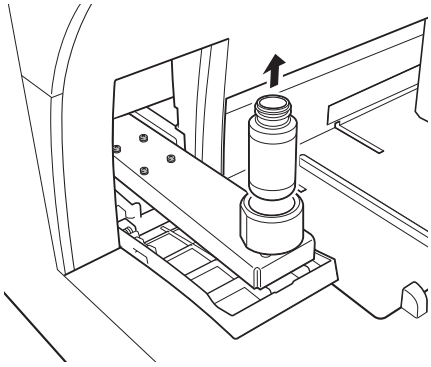
3 Touch [Yes] on the Confirm Operation window.





4 When the protein cleaning operation is complete, the sample tube holder is ejected.

Remove the CLEANAC•810 detergent and adapter for cleaning, and touch [⏏] to slide in the sample tube holder.



7-2-2-3. Cleaning the Flowcell

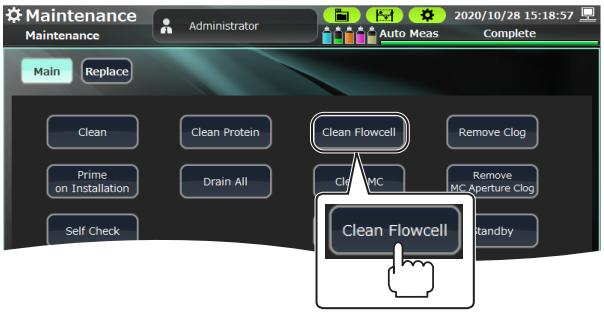
Remove dirt and bubbles from the flow cell unit.

Flow cell unit cleaning takes about 16 minutes.

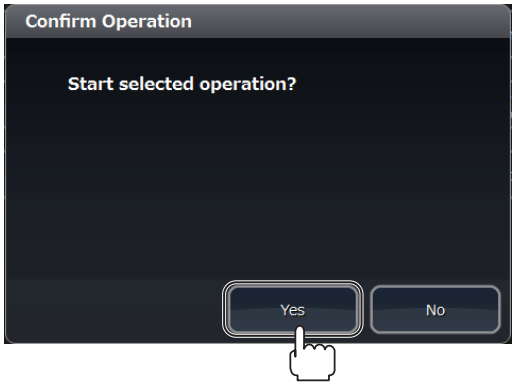
NOTE: Before starting the flow cell unit cleaning, check that each reagent connected is sufficient and that the waste container is not full.

1 Open the User Maintenance window and touch [Clean Flowcell].

Section 7-2-1 (p. 7-4)



2 Touch [Yes] on the Confirm Operation window.



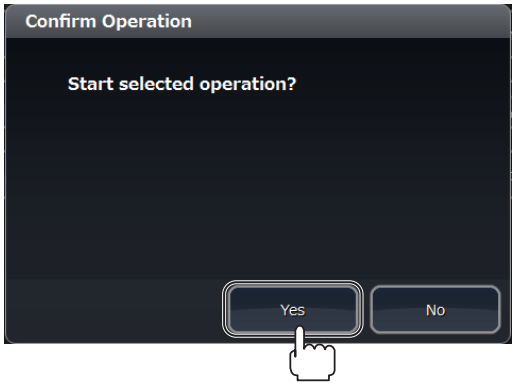
7-2-2-4. Cleaning the MC

Remove dirt and bubbles from the MC.

1 Open the User Maintenance window and touch [Clean MC].

Section 7-2-1 (p. 7-4)

2 Touch [Yes] on the Confirm Operation window.

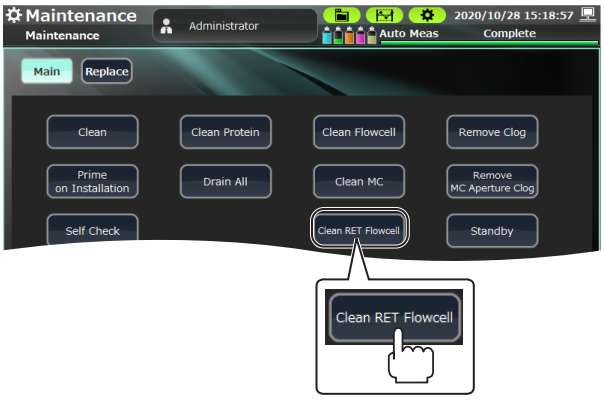


7-2-2-5. Cleaning the Flowcell for Reticulocytes

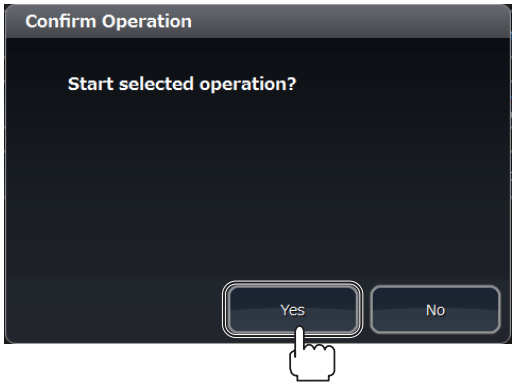
Remove dirt and bubbles from the flow cell unit for reticulocytes.

1 Open the User Maintenance window and touch [Clean RET Flowcell].

Section 7-2-1 (p. 7-4)



2 Touch [Yes] on the Confirm Operation window.



7-2-3. Removing Clogs

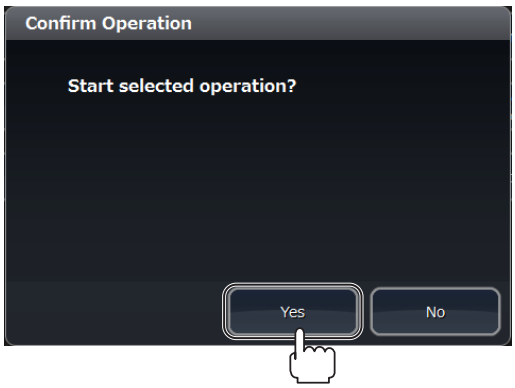
If necessary, you can manually remove clogs in the aperture cap inside the MC-910W.

If a clog occurs during measurement, the aperture cap clear function automatically removes the clog with a brief high voltage pulse.

1 Open the User Maintenance window and touch [Remove Clog].

Section 7-2-1 (p. 7-4)

2 Touch [Yes] on the Confirm Operation window.



7-2-4. Priming on Installation

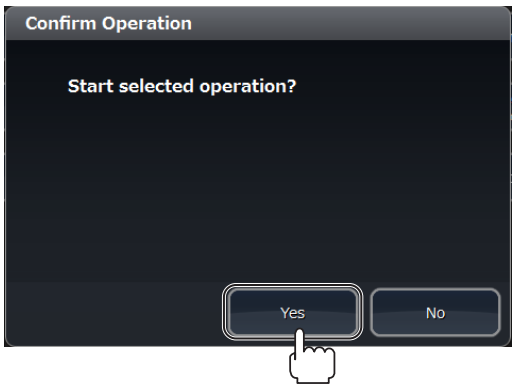
Priming takes about 23 minutes.

NOTE: Before starting priming, check that each reagent connected is sufficient and that the waste container is not full.

1 Open the User Maintenance window and touch [Prime on Installation].

Section 7-2-1 (p. 7-4)

2 Touch [Yes] on the Confirm Operation window.



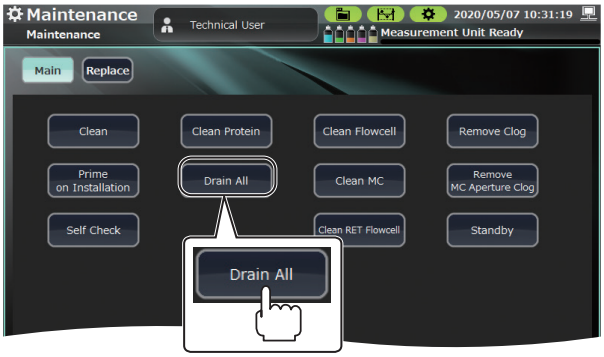
When an analyzer message “21110 Analyzer internal draining status” appears on the Maintenance Log window, touch [RESTORE] to perform priming on installation.

7-2-5. Draining All Fluid

Drain diluent from the fluid path inside the analyzer to prepare for maintenance inspection or long term storage.

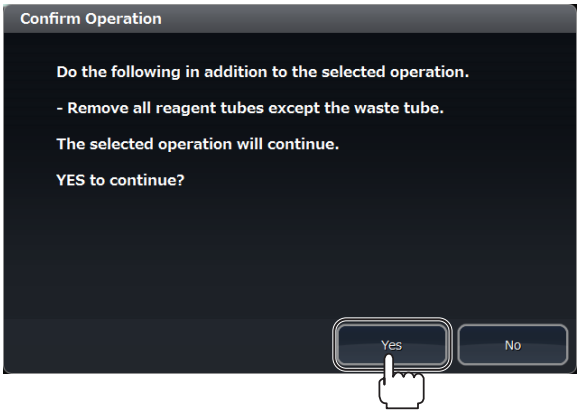
1 Open the User Maintenance window and touch [Drain All].

Section 7-2-1 (p. 7-4)



2 When the Confirm Operation window appears, disconnect all reagent[1] tubes except the waste tube and touch [Yes].

[1] ISOTONAC•3 or ISOTONAC•4 diluent, HEMOLYNAC•310 lysing reagent (CBC), HEMOLYNAC•510 lysing reagent (DIFF), CLEANAC•710 detergent, Reticulonac stain

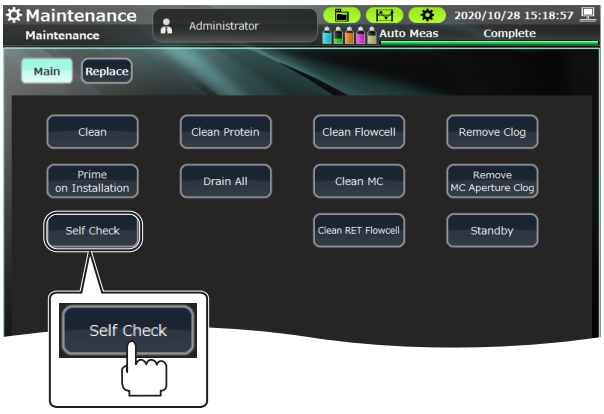


7-2-6. Running Self Check

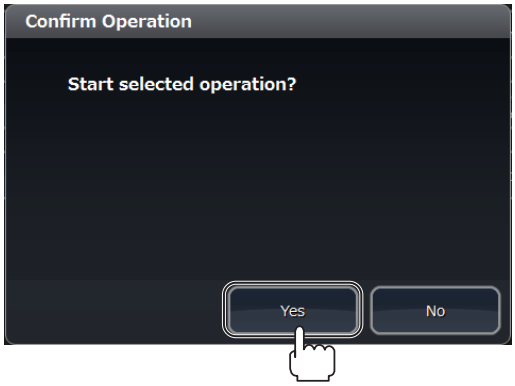
The self check takes about 8 minutes.

1 Open the User Maintenance window and touch [Self Check].

Section 7-2-1 (p. 7-4)



2 Touch [Yes] on the Confirm Operation window.



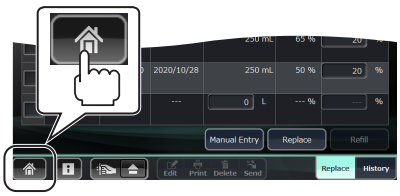
7-2-7. Viewing Self Check Results

On the Self Check window, you can view the operation history and self check results of this analyzer.

The Self Check window has the following windows.

Window	Description
Summary	Shows the check results of each self check item.
Details1	Shows detailed check results for remaining reagent and instrument internal temperature.
Details2	Shows detailed check results for instrument internal pressure and circuit check.
Details3	Shows detailed check results for background measurement, maintenance parts, maintenance operation and maintenance log.
Log	Shows self check history (up to 300 times).

7-2-7-1. Displaying the Self Check Window



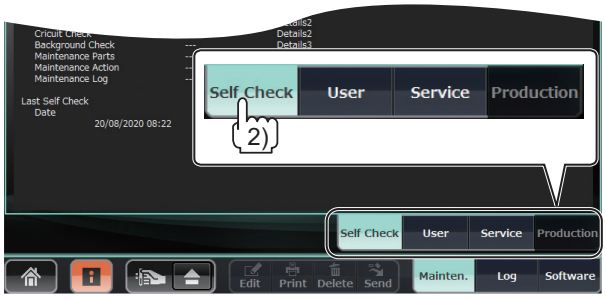
1 Open the Home screen.

If you are in another window, touch [ ] at the lower left.

2 Open the Maintenance window.

1) Touch [Maintenance] on the Home screen. The Maintenance Self Check window opens.

2) Touch [Self Check]. The Self Check window opens.



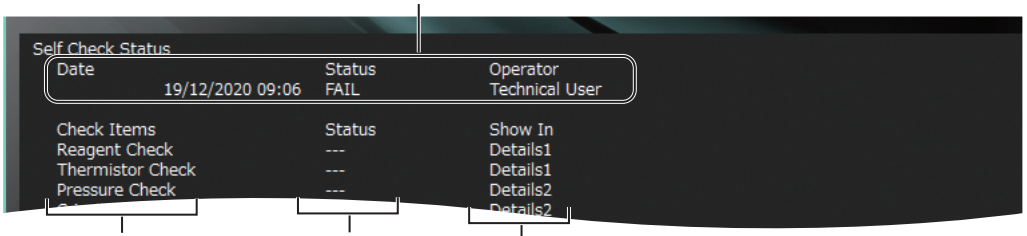
3 On the Self Check window, touch the [Details1], [Details2], [Details3] or [Log] key to display one of those windows.

7-2-7-2. Summary Window

On the Summary window, you can check the PASS/FAIL result of each check item. To see more details for an item, you can change to one of the detail windows (Details1, Details2, Details3).

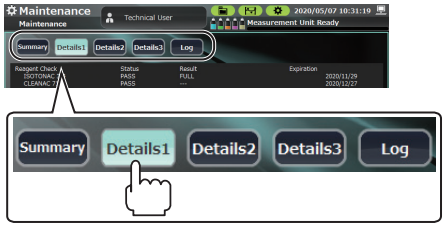
Shows the most recent self check date and time, overall result (PASS/FAIL), and operator.

The overall result is FAIL if any one check item is FAIL.



Shows the date and time and operator for the most recent check in which all items were PASS.

7-2-7-3. Details1, Details2 and Details3 Windows



The Details1, Details2, and Details3 windows show detailed check results for each check item. You can check the PASS/FAIL result for each item.

Example: Details1 window

7-2-7-4. Log Window

On the Log window, you can view the results of up to 300 past checks. One line shows the results of one check. The Log window is a brief list of the test results on the Summary window.

Sort mark

If the column has a sort mark, you can touch it to sort in ascending or descending order.

Date	Operator	Status	Reagent Check	Thermistor Check	Pressure Check
15/12/2020 18:06	Technical User	FAIL	---	---	---
16/12/2020 06:30	Technical User	FAIL	---	---	---
16/12/2020 06:46	Technical User	FAIL	---	---	---

Date and time of past checks | Operator | Overall check result | Check result of individual items

Touch [▲], [▼], [◄] or [►] to scroll the list vertically or horizontally.

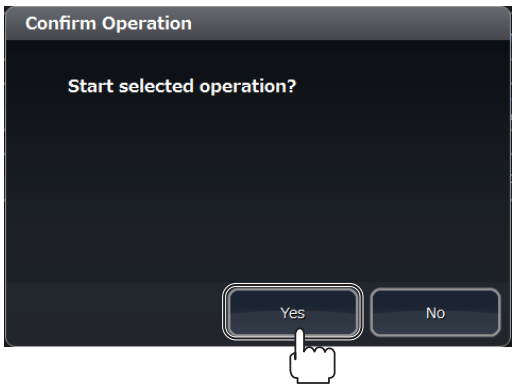
7-2-8. Setting the Analyzer to Stand By

Returns the autoloader and the actuators in the analyzer (such as electromagnetic valves and pumps) to their initial positions.

1 Open the User Maintenance window and touch [Standby].

Section 7-2-1 (p. 7-4)

2 Touch [Yes] on the Confirm Operation window.



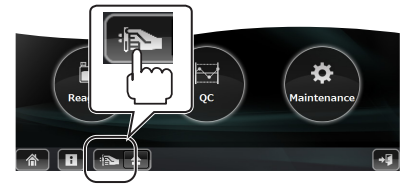
7-2-9. Measuring Background Noise

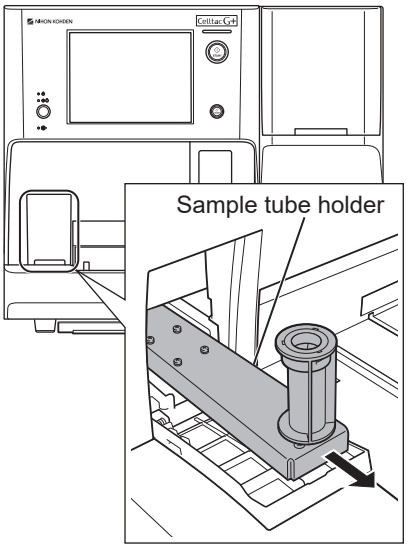
Measure the diluent and stain to check the influence of noise.

Measure diluent and staining reagent in +RET measurement.

Background noise increases in the following cases.

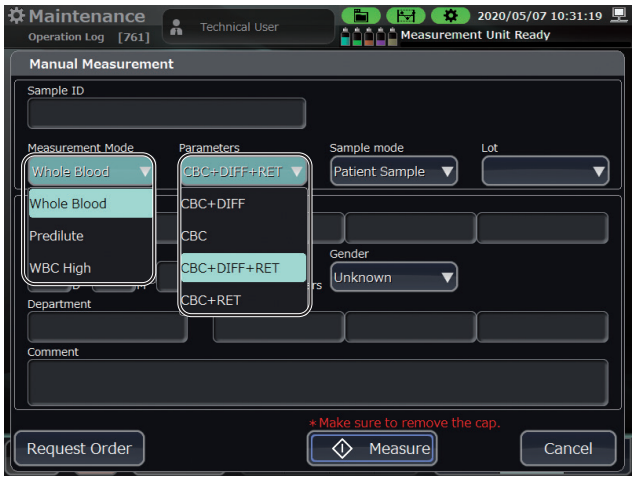
- The diluent or stain is old.
  Replace the diluent or stain if it is past the expiration period after opening the package.
- There is dirt or dust in the diluent or stain container.
- The diluent or stain temperature is extremely high or low.
  The normal operating temperature range is 15 to 30°C (59 to 86°F).





1 Touch [ ] to open the Manual Measurement window and eject the sample tube holder.

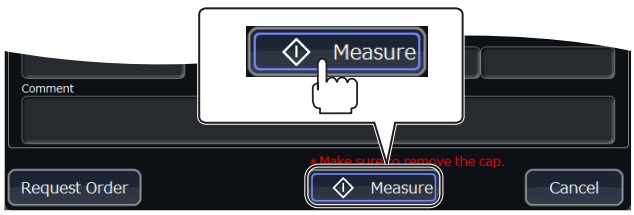
2 On the Manual Measurement window, set Measurement Mode to [Whole Blood] and set Parameters to [CBC+DIFF+RET].

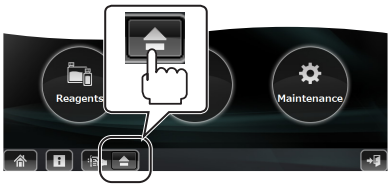


3 Make sure nothing is on the sample tube holder adapter and touch [Measure].

The sample tube holder slides in and measurement starts.

The sample tube holder slides out automatically after measurement is finished.





4 Touch [⏏] to slide in the sample tube holder.

5 Check the measured results on the Data List window to confirm that the measured values fall within the following ranges.

Data Management and Setting Guide: Section 4 “Data Review”

- Measured parameters other than TWBC, RBC, HGB and PLT are not affected by noise.
- TOC and TFC values can be viewed only with “Factory Operator” or “Technical User” operator privileges. Other operators can confirm measured values other than TOC and TFC.

Measured Parameters	Normal Range
WBC	$2.0 \times 10^2/\mu L$ or less
RBC	$2 \times 10^4/\mu L$ or less
HGB	0.1 g/dL or less
PLT	$1.00 \times 10^4/\mu L$ or less
TOC	100 counts or less
TFC	100 counts or less

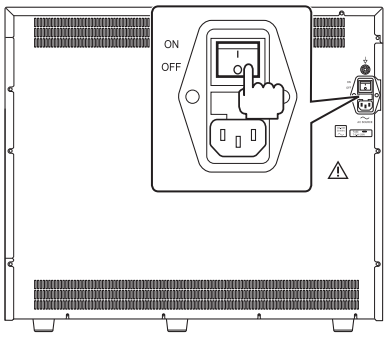
When the check result exceeds the normal value, check the following points and measure background noise again.

- Diluent is not dirty.
- There are no bubbles in the diluent.
- Stain is not past the expiration period after opening the package.

If the measured value exceeds the above range even after it is measured again, refer to “2. High background noise” in “3-10. Troubleshooting”.

Section 3-10 (p. 3-45)

7-2-10. Backing Up Measurement Data Summaries



You can back up the measurement data stored in the internal memory of the analyzer onto an SD card.

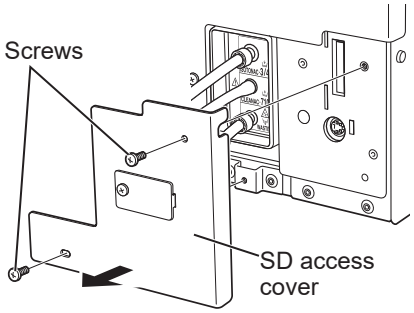
NOTE: One SD card can only hold one backup set.

1 Turn off the analyzer and switch off (to ○) the main power on the rear of the analyzer.

Operator's Manual: "Turning Off the Analyzer" in Section 5

2 Remove the two screws from the right side panel of the analyzer and remove the SD access cover.

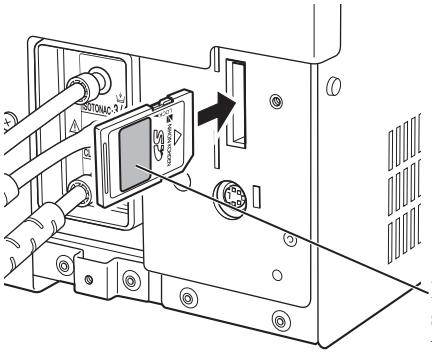
NOTE: Keep the two screws to reattach the cover later.



3 Insert the SD card into the analyzer SD card slot.

NOTE: Handle the SD card according to "SD Card Precautions" in the operator's manual.

Operator's Manual: "SD Card Precautions" in Section 3



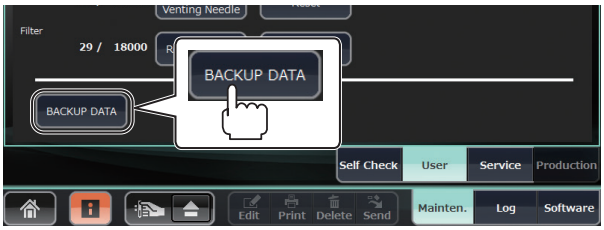
4 Turn on the analyzer.

Operator's Manual: "Turning On the Analyzer" in Section 5

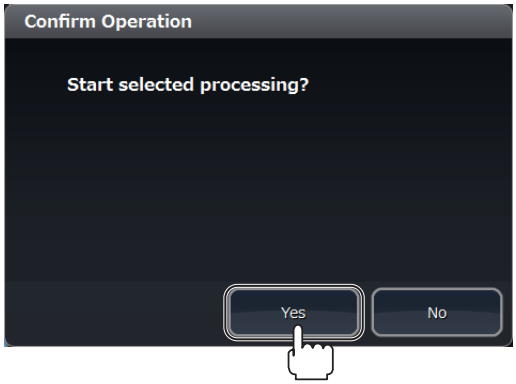
5 Open the User Maintenance window and touch [Replace].

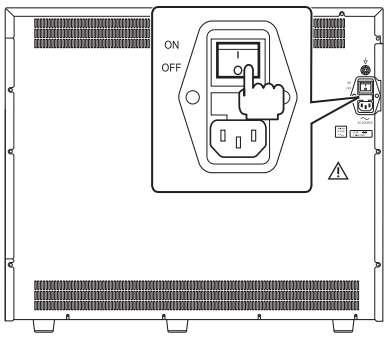
Section 7-2-1 (p. 7-4)

6 Touch [BACKUP DATA].



7 When the Confirm Operation window appears, touch [Yes].

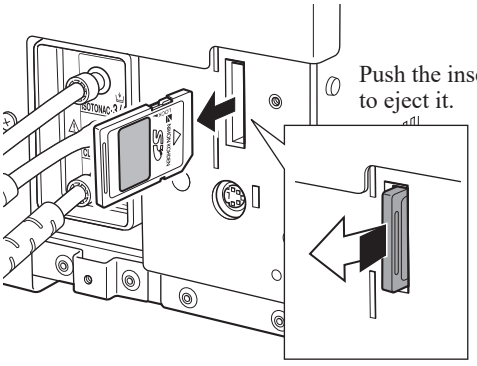




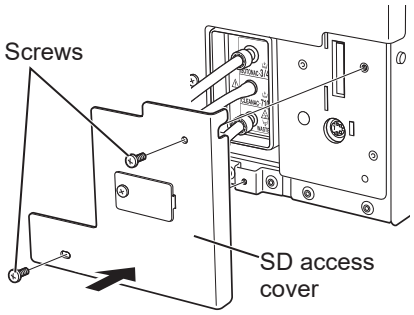
8 Turn off the analyzer and switch off (to ○) the main power on the rear of the analyzer.

Operator's Manual: "Turning Off the Analyzer" in Section 5

9 Eject the SD card.

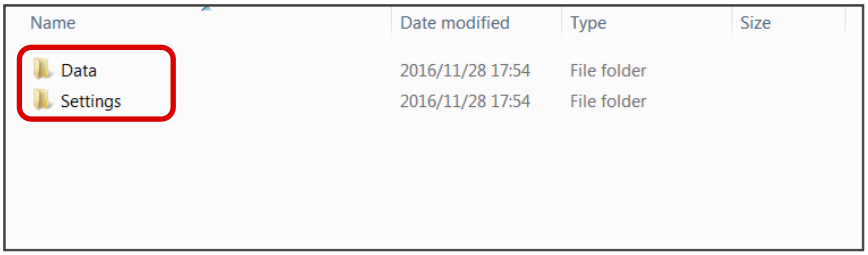


10 Attach the SD access cover to the right side of the analyzer and fix it with the two screws removed in step **2**.

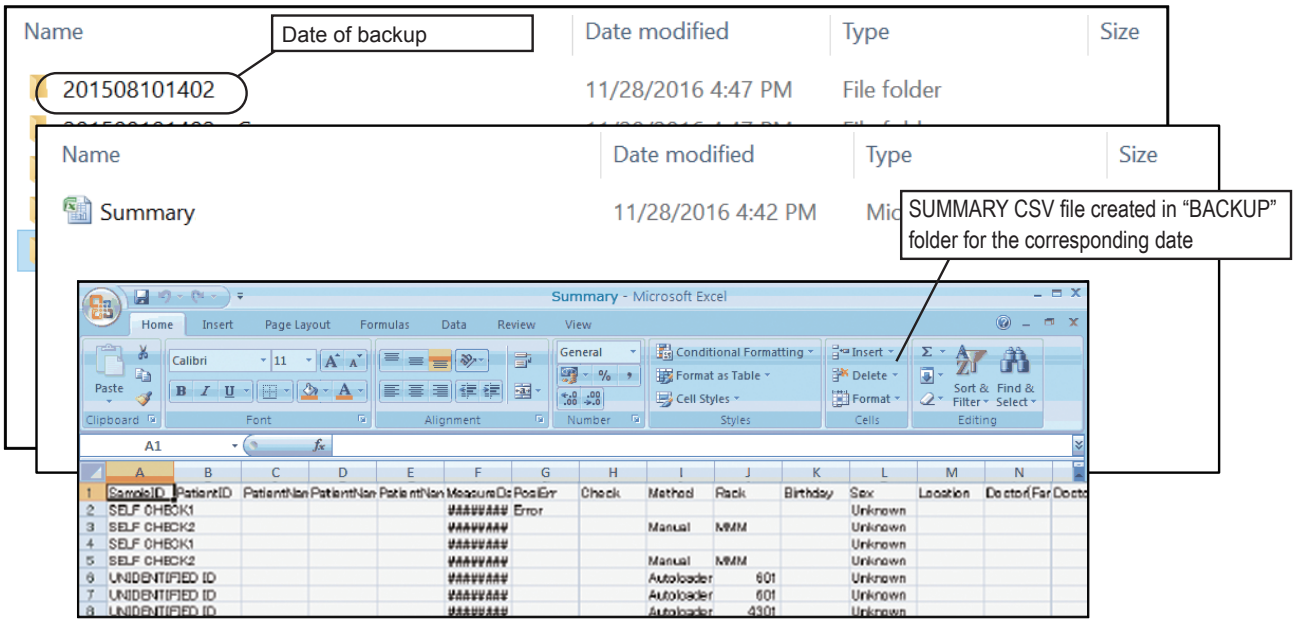


Backup Data

- A folder named “Data” is created on the SD card and all the data is stored in a single CSV file.



- Backup data is stored as a summary CSV in a dated folder which is created upon each backup.



7-3. Service Maintenance Operations

Displays the Service window for performing maintenance on the analyzer.

NOTE: It is necessary to switch the operator to Technical User in order to open the Service window.

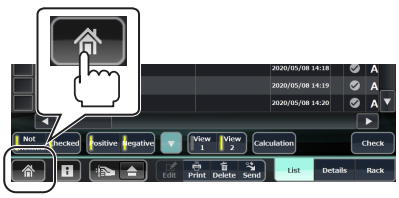
Item		Required Time	Description
Main	Prime All Reagents	Approx. 8 minutes	Primes the diluent (ISOTONAC•3/4), hemolysing reagent (HEMOLYNAC•310/510), detergent (CLEANAC•710) and staining reagent (Reticulonac).
	Prime MC	Approx. 4 minutes	Passes diluent (ISOTONAC•3/4) into the CBC MEASURING UNIT (MC-910W) to make an environment suitable for measurement.
	Prime Flowcell	Approx. 3 minutes	Passes diluent (ISOTONAC•3/4) into the LASER OPTICAL UNIT (MO-910W) to make an environment suitable for measurement.
	Leak Check	Approx. 15 minutes	Checks internal tubes of the analyzer for leaks and clogging and checks opening and closing of the electromagnetic valves.
	Drain ISO Chamber	Approx. 2 minutes	Drains reagent from the ISO chamber, emptying it.
	Drain MC	Approx. 4 minutes	Drains reagent from the MC.
	Drain Flowcell	Approx. 4 minutes	Drains reagent from the MO.
	Drain Waste Chamber	Approx. 1 minute	Drains waste from waste chamber 1 and 2 to empty the waste chambers.
	Exchange All	Approx. 2 minutes	Simultaneously drains all fluid paths to allow replacement of the sampling needle, venting needle and filter at the same time.
	Prime after MC Replacement	Approx. 5 minutes	Performs MC priming operations including swirl chamber fluid level adjustments for rapid validation after replacing the MC.
	Measure 10 Times	—	Measures the hematology control which is inserted into the left end (first position) of the rack 10 times.
	Circuit Check	Approx. 1 minute	Performs a self check of electrical circuits in the analyzer.
	Measure Particles	Approx. 4 minutes	Performs aspiration and measurement of 7 µm standard particles to regulate the flow cell unit.
Main2	Check network status	Approx. 1 minute	Checks the basic network condition of the analyzer.
	Sampler Move Check	Approx. 1 minute	Performs the move of the SAMPLER UNIT (MS-910W) the same way as actual measurement.
	Sampler Step Move	Approx. 2 minutes	Performs the step move of the SAMPLER UNIT (MS-910W) the same way as actual measurement.
	Drain All Cups	Approx. 1 minute	Drains reagents from each cup of the RET CUP HEATER UNIT (ZY-921W).
	Prime Flowcell	Approx. 3 minutes	Primes diluent to the LASER OPTICAL UNIT (BLUE) (MO-920W).
	Drain Flowcell	Approx. 4 minutes	Drains reagents from the LASER OPTICAL UNIT (BLUE) (MO-920W).
	Dispense ISOTONAC 3/4 RET opt. adjustment	Approx. 1 minute	Dispense diluent (ISOTONAC•3/4) to prepare a sample for RET particle measurement.
	Calibrate Touch Panel	Approx. 2 minutes	Performs adjustments for touch points on the touch screen.
Parts1		—	Shows the operating time for the relevant consumables.
Parts2		—	Shows the number of uses for the relevant consumables.
Electromagnetic Valve		—	Individually controls each electromagnetic valve, pinch valve and compressor.

Item		Required Time	Description
Motor	Auto Measurement Position Adjustment	—	Checks the sampling needle and autoloader aspiration position for auto measurement.
	Manual measurement position adjustment	—	Adjusts and checks the sampling needle and open loader position for manual measurement.
	Motor	—	Individually controls motors in the analyzer.
Gain		—	Adjusts the voltage of the infrared sensors in the analyzer.
AD Sensor		—	Shows relevant pressures, temperatures, etc. from the voltages measured at sensors inside the analyzer.
Infrared Sensor		—	Shows the detection of the sensors inside the analyzer.
Autoloader Operation	Reboot Autoloader	—	Restarts the autoloader.
	Initialize Autoloader	—	Restores (initializes) the moving parts of the autoloader to their original positions.
	Autoloader Demo	—	Performs the transport operations used with the rack and sample tubes when doing auto measurement.
	Read Barcode	—	Performs a single operation that reads a barcode. (The result of this reading is not displayed.)
	Start Unit	—	Performs a single operation that draws in a rack positioned in the start unit.
	BCR Unit	—	Performs a single operation that presses down the sample tubes and reads the affixed barcodes while rotating the sample tubes.
	Agitator Unit	—	Performs a single operation that holds the sample tubes and agitates them (for 5 inversions).
	Pierce Unit	—	Performs a single operation that releases the pressure that holds the sample tubes in the pressure release aspiration position by the pierce guide.
	Terminal Unit	—	Performs a single operation that draws the rack removal tab in or out.
	Feed Unit	—	Performs a single operation that transports the rack horizontally.
	Motor	—	Individually controls motors inside the autoloader.
AL Sensor		—	Shows the detection of the sensors inside the autoloader.

7-3-1. Changing the Operator to a Technical User

Change the operator to a [Technical User] in order to enter the Service Maintenance window.

Modification Procedure

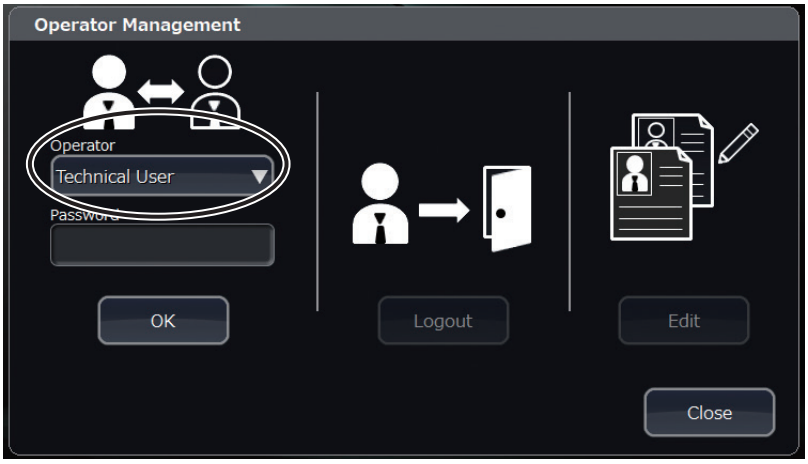


1 Open the Home screen.

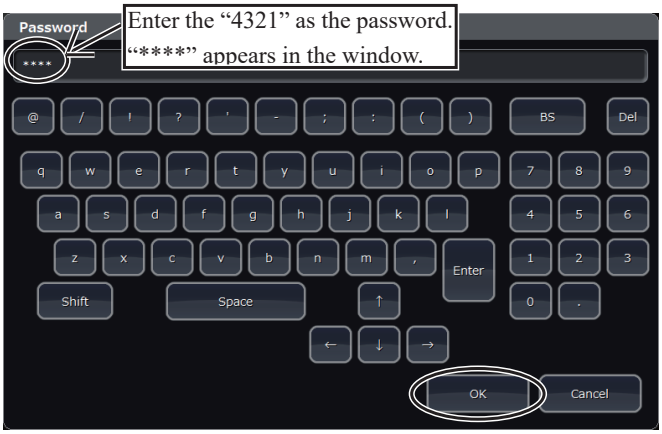
If you are in another window, touch [🏠] at the lower left.

2 Touch [➜]. The Operator Management window opens.

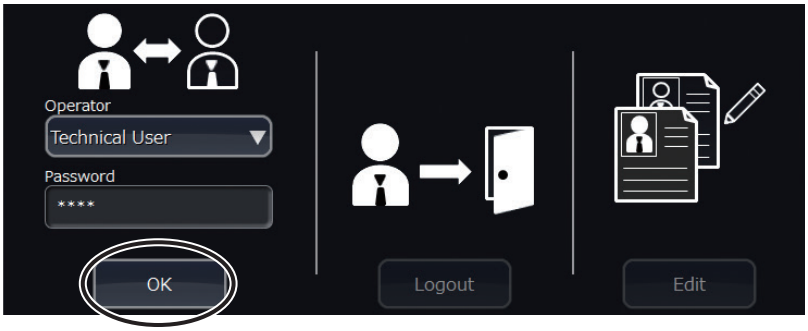
3 Select [Technical User] from the drop-down menu.



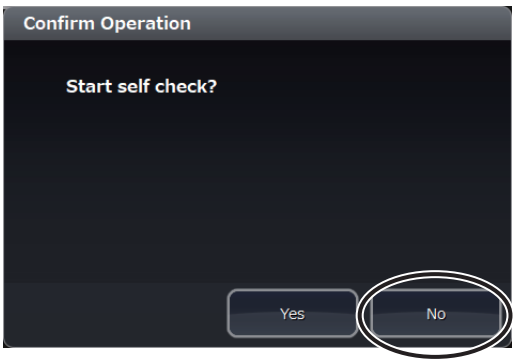
4 Type “4321” (default) in the password input window and touch the OK key.



5 Upon entering the password and touching the OK key, the operator for the Home screen changes to [Technical User].



6 Touch [No] on the window to skip the self check if the self check is not necessary.



7-3-2. Service Maintenance Window

- This window is for use by qualified service personnel. Incorrect use may cause problems such as leakage of reagent inside the analyzer.
- Some functions in the Maintenance window are for use with special jigs at the factory. No operation can occur without these jigs, so do not use functions which are not described in this service manual.
- It is possible to perform operations on individual units and functional blocks. Avoid the leak of fluids or contamination when performing operations with reagents and samples inside the analyzer.
- Functions may be added to the Maintenance window at any time for the purpose of increasing productivity.
- If you are unsure of the procedure, do not use this window because it may damage the analyzer.

7-3-3. Opening the Service Maintenance Window

1 Check that a [Technical User] is logged in, then open the Home screen.

If you are in another window, touch [⌂] at the lower left.

2 Open the Maintenance window.

1) Touch [Maintenance] on the Home screen. The Maintenance Self Check window opens.

2) Touch [Service]. The Service Maintenance window opens.

7-3-4. Priming

7-3-4-1. Priming All Reagents

This procedure primes the diluent (ISOTONAC•3/4), hemolysing reagent (HEMOLYNAC•310/510), detergent (CLEANAC•710) and staining reagent (Reticulonac).

Operating Procedure

1 Open the Service Maintenance window and touch [Prime All Reagents].

2 Touch [Yes] on the Confirm Operation window.

7-3-4-2. Priming the MC

This procedure passes diluent (ISOTONAC•3/4) into the MC to make an environment suitable for measurement.

Operating Procedure

1 Open the Service Maintenance window and touch [Prime MC].

2 Touch [Yes] on the Confirm Operation window.

7-3-4-3. Priming the Flowcell

This procedure passes diluent (ISOTONAC•3/4) into the LASER OPTICAL UNIT (MO-910W) to make an environment suitable for measurement.

However, flow cell cleaning is necessary for official measurement. (There may be bubbles in the flow cell.)

Operating Procedure

1 Open the Service Maintenance window and touch [Prime Flowcell].

2 Touch [Yes] on the Confirm Operation window.

7-3-4-4. Priming after MC Replacement

This procedure performs MC priming operations, including swirl chamber fluid level adjustments, for rapid validation after replacing the CBC MEASURING UNIT (MC-910W).

However, MC cleaning is required for correct measurements. (Since the MC chamber makes a layer of air, it is possible that some air may remain when this operation is performed alone.)

Operating Procedure

1 Open the Service Maintenance window and touch [Prime after MC Replacement].

2 Touch [Yes] on the Confirm Operation window.

7-3-4-5. Priming the RET Flowcell

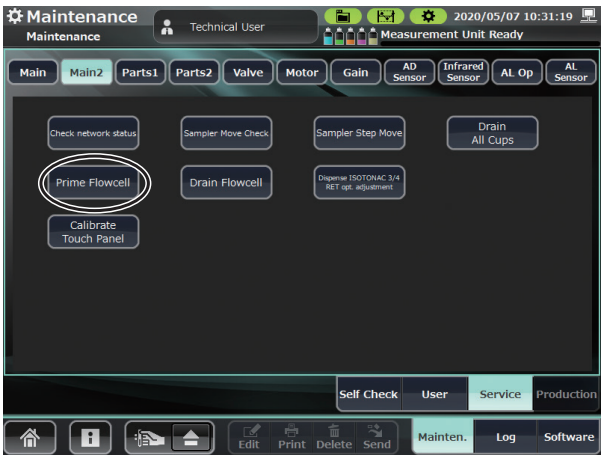
This procedure passes diluent (ISOTONAC•3/4) into the LASER OPTICAL UNIT (BLUE) (MO-920W) to make an environment suitable for measurement.

However, RET flow cell cleaning is necessary for official measurement. (There may be bubbles in the RET flow cell.)

Operating Procedure

1. Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.

2. Touch [Prime Flowcell].



3. Touch [Yes] on the Confirm Operation window.

7-3-5. Draining

7-3-5-1. Draining the ISO Chamber

This procedure drains reagent from the ISO chamber to empty it.

Operating Procedure

1 Open the Service Maintenance window and touch [Drain ISO Chamber].

2 Touch [Yes] on the Confirm Operation window.

7-3-5-2. Draining the MC

This procedure drains reagent from the MC.

Operating Procedure

1 Open the Service Maintenance window and touch [Drain MC].

2 Touch [Yes] on the Confirm Operation window.

7-3-5-3. Draining the Flowcell

This procedure drains reagent from the LASER OPTICAL UNIT (MO-910W).

Operating Procedure

1 Open the Service Maintenance window and touch [Drain Flowcell].

2 Touch [Yes] on the Confirm Operation window.

7-3-5-4. Draining the Waste Chamber

This procedure drains waste from waste chamber 1 and 2, emptying the waste chambers.

Operating Procedure

1 Open the Service Maintenance window and touch [Drain Waste Chamber].

2 Touch [Yes] on the Confirm Operation window.

7-3-5-5. Draining All Cups

This procedure drains reagent from each cup of the RET CUP HEATER UNIT (ZY-921W).

Operating Procedure

1. Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.
2. Touch [Drain All Cups].

3. Touch [Yes] on the Confirm Operation window.

7-3-5-6. Draining the RET Flowcell

This procedure drains reagent from the LASER OPTICAL UNIT (BLUE) (MO-920W).

Operating Procedure

1. Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.
2. Touch [Drain Flowcell].

3. Touch [Yes] on the Confirm Operation window.

7-3-6. Checking Leak, Circuit and Measuring

7-3-6-1. Leak Check

This procedure includes a function to check whether electromagnetic valves are open or closed and whether there are leaks or kinks (due to bending or collapse) along the tubes in the analyzer.

This function can only be performed when the analyzer is drained.

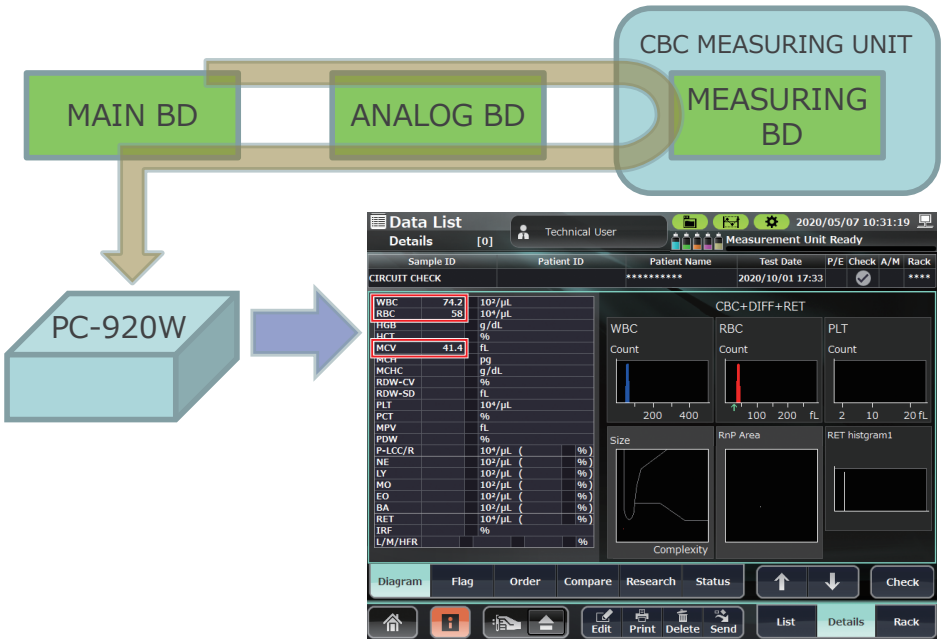
NOTE: Further details are recorded in the “Technical Reference Manual”. Perform this function in accordance with the directions in “Technical Reference Manual”.

7-3-6-2. Circuit Check

This procedure does the following.

- Performs a self check of internal circuits. Performs a measurement using a pseudo pulse and checks that values are within specifications.
- WBC, RBC and MCV are displayed following an analysis by PC-920W of pulses produced by the MAIN BD and returned from the MEASURING BD.

NOTE: No judgment is made regarding the success or failure of values in the circuit check. Run the self check to make a judgment.



Maintenance Procedure

1 Open the Service Maintenance window and touch [Circuit Check].

2 Touch [Yes] on the Confirm Operation window.

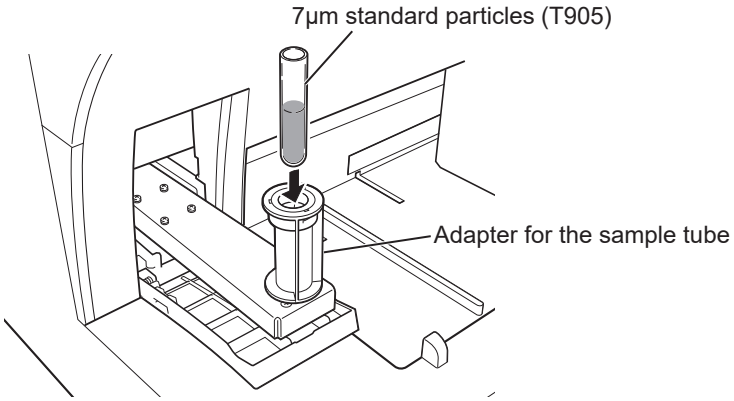
7-3-6-3. Measuring Particles

This procedure aspirates and measures of 7 µm standard particles to regulate the flow cell unit.

Measurement Procedure

1 Set a sample tube of 7 µm standard particles in the sample tube holder.

1) Touch [⏏] to eject the sample tube holder.
2) Check that the sample tube adapter is attached on the ejected sample tube holder.
3) Set a sample tube of the 7 µm standard particles in the adapter for the sample tube holder.

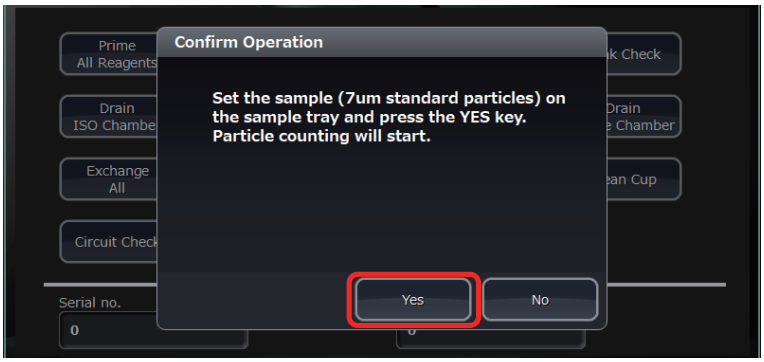


2 Open the Service Maintenance window and touch [Measure Particles].

3 Touch [Yes] on the Confirm Operation popup.

Sample tray is stored and particle measurement starts.

When aspiration of the particles is completed, the sample tube holder is ejected.



4 Remove the sample tubes and touch [⏏] to slide in the sample tube holder.

5 Open the Data List window and select the latest [PARTICLE] measurement data, then touch the Details tab.

6 Check that the particle measurement results are within the following criteria from the Research tab of the Data Details window.

- FS CV 5% or less
- FL CV 5% or less
- TOC 2000 or more

- The data is stored in the [Data List] with a Sample ID of [PARTICLE].
- Each of the FS, FL and SD results can be checked from: [Data List] > [Details] > [Research] > [Details].

NOTE: During the particle measurement, measurements of the diluent are performed with the CBC-type measurement part. Consequently, results for WBC, RBC, HGB, PLT and electrode voltage measurements are displayed.

7-3-6-4. Measuring 10 Times

Measurement Procedure

1 Insert the MEK-5DN or MK-RE hematology control into the left end (first position) of the rack.

NOTE: Register the lot No. of the hematology control to be measured before using it.

2 Open the Service Maintenance window and touch [Measure 10 Times].

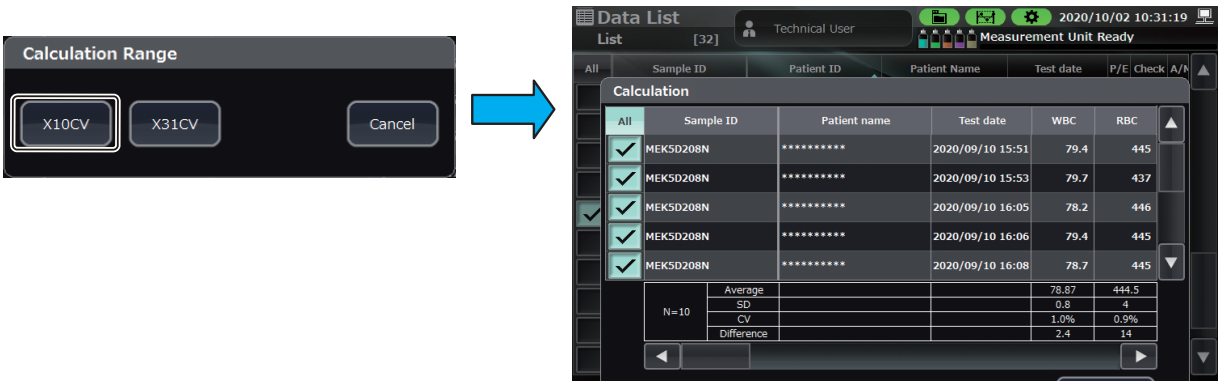
3 Touch [Yes] on the Confirm Operation window.

The analyzer consecutively measures the hematology control 10 times.

4 Return to the Home screen, select the last data measured from step **3** in the Data List window and touch [Calculation].

5 On touching the [X10CV] key on the Calculation Range window, the average value, CV value and SD value are shown for each measured parameter column for the hematology control measured 10 times.

Touching [X10CV], displays statistical data for the last 10 measurements obtained from the selected measurement results.



7-3-7. Making a Sample

7-3-7-1. Dispensing ISOTONAC 3/4 for RET Particle Measurement

Dispense diluent (ISOTONAC•3/4) to prepare a sample for RET particle measurement.

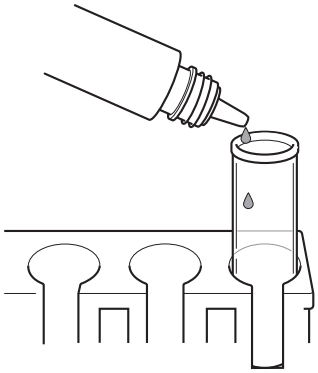
NOTE • It is an alternative way when there is no diluent or pipette dropper. Normally, see “6-6-1. Preparation”.

Section 6-6-1 (p. 6-22)

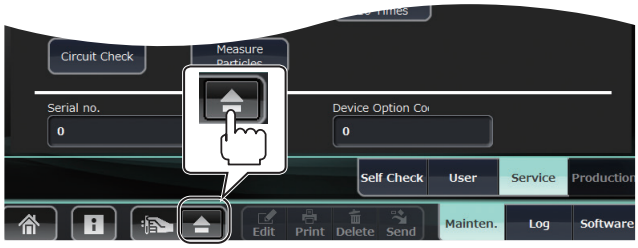
- Incorrect procedures may cause diluent to be drained in the analyzer and the analyzer may break down.
- This operation cannot be performed in the adjustment window of [RET optical sensitivity adjustment]. Make about five samples in advance.

Procedures

1 Drop two drops of R1 particle into the empty sample tube.

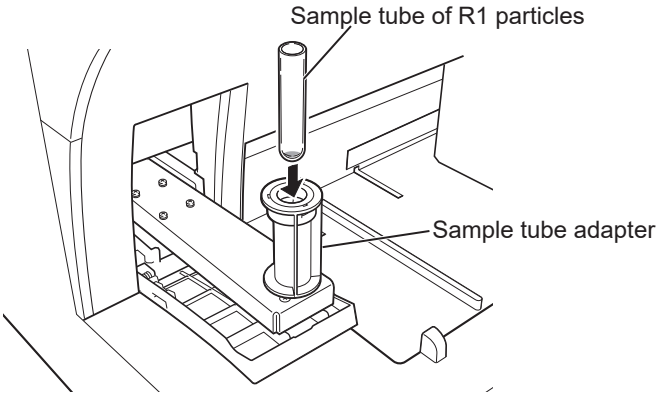


2 Touch [⏏] to eject the sample tube holder.



3 Attach the sample tube adapter to the sample tube holder and set the sample tube of R1 particles.

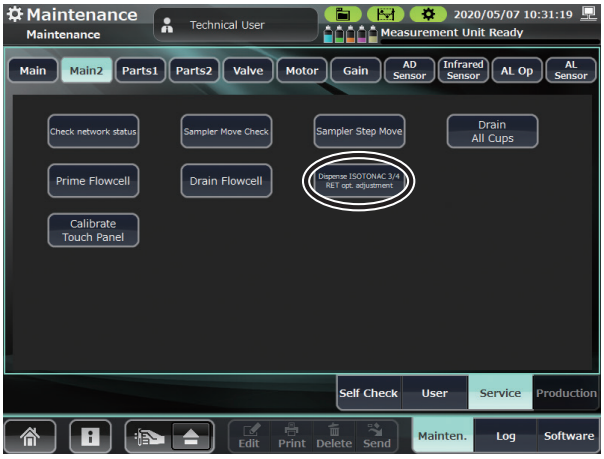
NOTE: Be sure to remove the cap from the sample tube.



4 Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.

5 Touch [Dispense ISOTONAC 3 RET opt. adjustment].

NOTE: Do not perform the above operation when the sample tube is not installed in the analyzer. Diluent may be drained in the analyzer and the analyzer may break down.



6 Touch [Yes] on the Confirm Operation window.

7 Diluent is drained in the sample tube and the sample for RET optical adjustment is made.

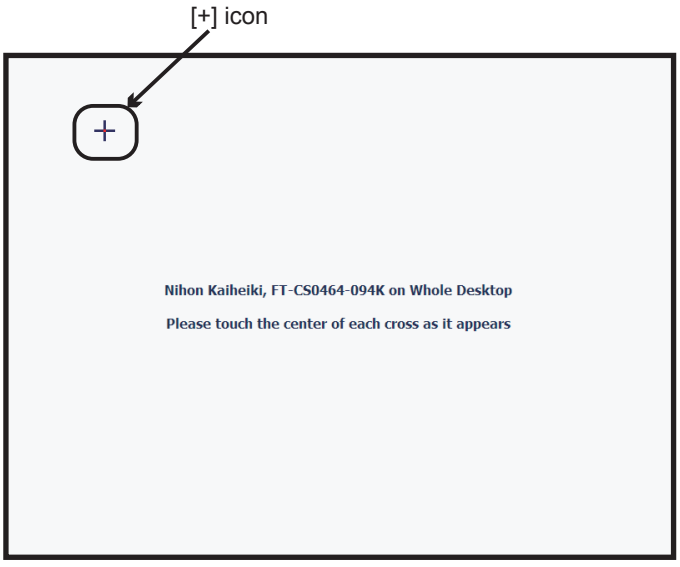
7-3-8. Calibrating the Touch Panel

This procedure adjusts the the touch points on the touch screen.

Operating Procedure

1. Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.
2. Touch [Calibrate Touch Panel].

3. Touch [Yes] on the Confirm Operation window.
4. The Calibration window for the touch screen appears. Touch the four [+] icons as they appear.



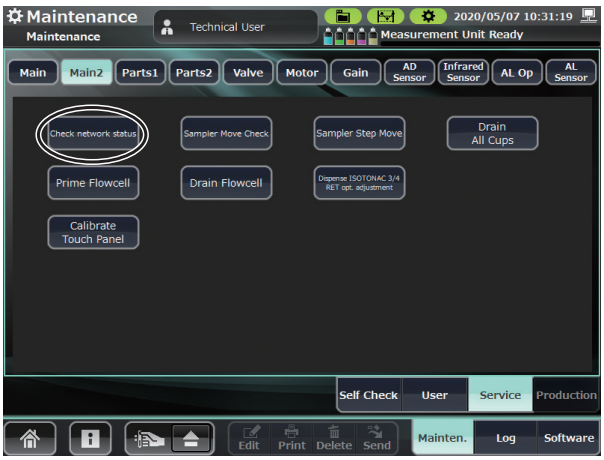
When calibration of the touch screen is finished, the PC-920W (PC board) automatically restarts and saves the calibration results.

7-3-9. Checking the Network Condition

This procedure checks the basic network condition of the analyzer.

Check Procedure

1. Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.
2. Touch [Check network status].



3. Touch [Yes] on the Confirm Operation window.
4. Another popup appears and the following network information is displayed.
   - The configuration information of the network adaptor (ipconfig / all).
   - All the Receive state port of the TCP protocol (netstart -a -p tcp).
   - The routing table of IPv4 (route print -4).
   - The continuity to ping the connection destination (ping the destination IP address).

External Output
Section 8-1-11 (p. 8-10)

7-3-10. Checking the the SAMPLER UNIT (MS-910W) Operations

7-3-10-1. Checking Sampler Move

This procedure operates the SAMPLER UNIT (MS-910W) the same way as actual measurement.

NOTE: The sampling needle moves to the aspiration position.

Check Procedure

1. Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.
2. Touch [Sampler Move Check].

3. Touch [Yes] on the Confirm Operation window.

7-3-10-2. Checking Sampler Step Move

This procedure performs the step move of the SAMPLER UNIT (MS-910W) the same way as actual measurement.

NOTE: The sampling needle moves to the aspiration position.

Maintenance Procedure

1. Open the Service Maintenance window. Touch [Main2] and open the Main 2 window.
2. Touch [Sampler Step Move].

3. Touch [Yes] on the Confirm Operation window.

7-3-11. Checking the Analyzer Operations

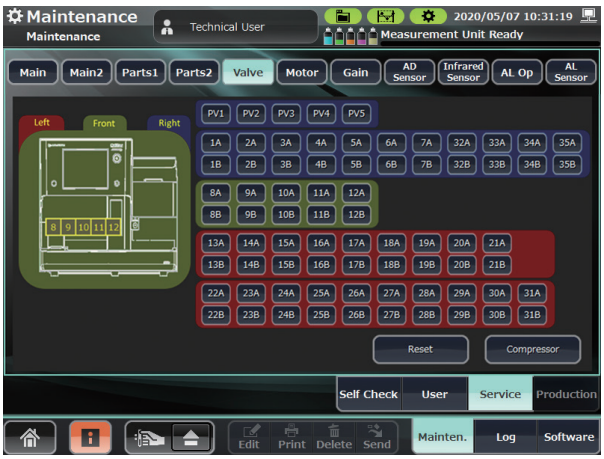
7-3-11-1. Electromagnetic Valves, Pinch Valves and Compressors

The analyzer's electromagnetic valves, pinch valves and compressors can be individually controlled by operating the [Valve] key in the Service Maintenance window.

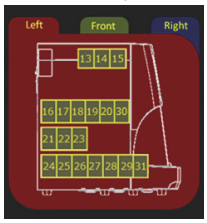
NOTE: Only use this function with a thorough understanding of the fluid paths within the analyzer.

Control Procedure

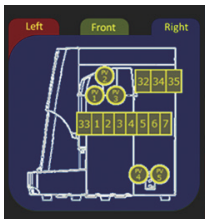
1. Open the Service Maintenance window and touch [Valve].
2. Touch the key for the individual electromagnetic valve, pinch valve or compressor that you want to control.



Left electromagnetic valve display



Right panel electromagnetic valve and pinch valve display



Key Name	Description
PV1 to PV5	Keys for individually controlling the pinch valves. When touched (illuminated), the valve is open. If there is a discrepancy between a key's display and the open/closed state of a pinch valve (PV), the first use of the key does not cause any action. To make the key displays correspond with the actual open/closed states, touch the [Reset] key.
1A to 35B	Keys for individually controlling the electromagnetic valves. When touched (illuminated), the valve is open.
Compressor	Turns the compressor on or off.
Reset	Sets all electromagnetic valves and pinch valves to "closed".

Electromagnetic Valve Maintenance
Section 7-8 (p. 7-120)

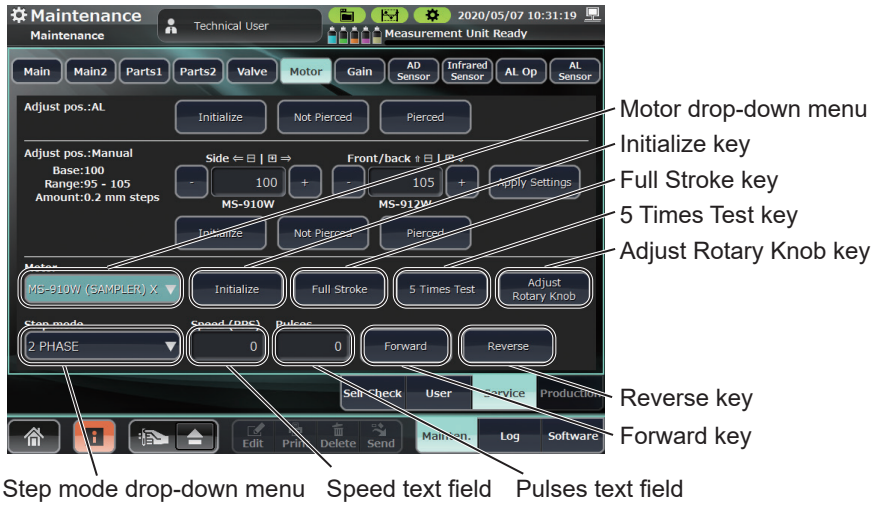
7-3-11-2. Motor (Inside Analyzer)

This procedure controls the individual motors inside the analyzer.

NOTE: This procedure may break the analyzer. Do not perform this procedure unless specific instructions are provided.

Operating Procedure

1 Open the Service Maintenance window and touch [Motor] to open the Motor window.



2 Using the Motor drop-down menu, select an individually controllable motor from the list below.

The following motors can be chosen from the drop-down menu:

- • MP-911W (ISO PUMP)
- •MP-912W (SAMPLE PUMP)
- •MP-912W (RBC PUMP)
- •MP-913W (WBC PUMP)
- •MS-910W (SAMPLER) X
- •MS-910W (SAMPLER) Y
- •MS-911W (OPEN AIR)
- •MS-912W (OPEN LOADER)
- •XP-910W (PINCH VALVE) 1
- •XP-910W (PINCH VALVE) 2
- •XP-910W (PINCH VALVE) 3
- •XP-910W (PINCH VALVE) 4
- •XP-910W (PINCH VALVE) 5
- •MP-912W (RET PUMP)
- •MP-921W (FL PUMP)

3 Motors are controlled either with a one-touch operation or by parameter-based operation.

• The following keys can be used forone-touch operation.

One-touch Operation Key Name	Operation Details
Initialize	Returns the motor selected in the Motor drop-down menu to its initialized position.
Full Stroke	Moves the motor selected in the Motor drop-down menu to its full stroke position (the maximum driven position).
5 Times Test	Repeats the initialization and full stroke 5 times, then initializes.
Adjust Rotary Knob	This key acts only on the pump's unit (nothing other than the pump is operated), and moves the pump up to the upper sensor detection position. Do not do this operation when the motor is in the initialized position. (Error) This is mainly used during production.

• The following keys and fields can be used for parameter-based operation.

Parameter-based Operation Key or Field Name	Operation Details
Step mode	When operating the motor selected in the Motor drop-down menu via parameters, the following step modes can be selected from the drop-down menu. • 2PHASE • 1_2PHASE • W1_2PHASE • 2W1_2PHASE • 4W1_2PHASE • 2PHASE_F • 1_2PHASE_F • SLEEP
Speed	Input box for the speed parameter of the parameter-based operation (input range: 0 to 500, default setting: 0)
Pulses	Input box for the pulses parameter of the parameter-based operation (input range: 0 to 5000, default setting: 0)
Forward	The motor's parameter-based operation is performed in the direction away from its initialized position[1]. The driving force depends on the selected motor and step mode, as well as the entered speed and pulse parameters. [1] The aspirating direction (down) for pumps and leftwards for the samplers
Reverse	The motor's parameter-based operation is performed in the direction towards its initialized position[2]. The driving force depends on the selected motor and step mode, as well as the entered speed and pulses parameters. [2] The discharge direction (up) for pumps and rightwards for the samplers

• Following is a summary of the operations for one-touch operations or parameter-based operations for each motor.

Motor Name	One-touch Operation				Parameter-based Operation	
	Initialize key	Full Stroke key	5 Times Test key	Adjust Rotary Knob key	Forward key	Reverse key
MP-911W (ISO PUMP)	Move to highest point	Move to lowest point	Available	Available	Upwards motion	Downwards motion
MP-912W (SAMPLE PUMP)	Move to highest point	Move to lowest point	Available	Available	Upwards motion	Downwards motion
MP-912W (RBC PUMP)	Move to highest point	Move to lowest point	Available	Available	Upwards motion	Downwards motion
MP-913W (WBC PUMP)	Move to highest point	Move to lowest point	Available	Available	Upwards motion	Downwards motion
MS-910W (SAMPLER) X	Move to the rightmost position	Move to the leftmost position	Auto and manual measurement operation	Not available	Left motion	Right motion
MS-910W (SAMPLER) Y	Move to highest point	Move to lowest point	Auto and manual measurement operation	Not available	Downwards motion	Upwards motion
MS-911W (OPEN AIR)	Move to highest point	Move to lowest point	Available	Not available	Downwards motion	Upwards motion
MS-912W (OPEN LOADER)	Stow	Eject	Available	Not available	Not available	Not available
XP-910W (PINCH VALVE) 1	Open	Close	Available	Not available	Not available	Not available
XP-910W (PINCH VALVE) 2	Open	Close	Available	Not available	Not available	Not available
XP-910W (PINCH VALVE) 3	Open	Close	Available	Not available	Not available	Not available
XP-910W (PINCH VALVE) 4	Open	Close	Available	Not available	Not available	Not available
XP-910W (PINCH VALVE) 5	Open	Close	Available	Not available	Not available	Not available
MP-912W (RET PUMP)	Move to highest point	Move to lowest point	Available	Available	Upwards motion	Downwards motion
MP-921W (FL PUMP)	Move to highest point	Move to lowest point	Available	Available	Downwards motion	Upwards motion

7-3-11-3. Restarting the Autoloader

Performs a single operation that restarts the autoloader.

Restart Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Reboot Autoloader] in the Autoloader Operation window.

3. Touch [Yes] on the Confirm Operation window.

7-3-11-4. Initializing the Autoloader

This procedure restores (initializes) the moving parts of the autoloader to their original positions in a single operation.

Initialization Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Initialize Autoloader] in the Autoloader Operation window.

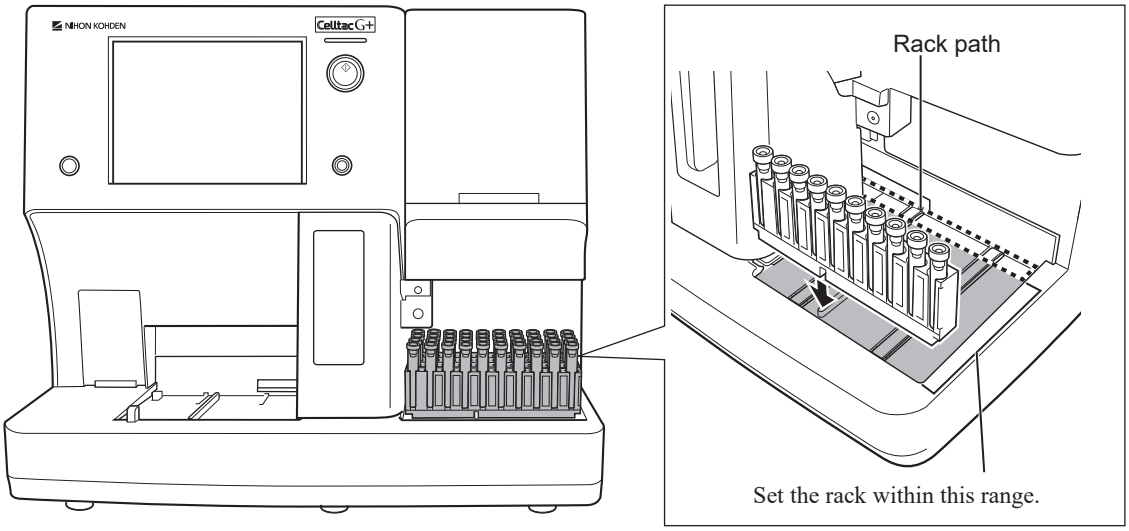
3. Touch [Yes] on the Confirm Operation window.

7-3-11-5. Autoloader Demo

This demonstrates the transport operations used with the rack and sample tubes when performing auto measurements. It is not an adjustment procedure.

Operating Procedure

1 Arrange the sample tubes on the rack and set the rack in the analyzer.



2 Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.

3 Touch [Autoloader Demo] in the Autoloader Operation window.

4 Touch [Yes] on the Confirm Operation window.

7-3-11-6. Barcode Reading

This procedure performs a single operation that reads a barcode.

Operating Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Read Barcode] in the Autoloader Operation window.

3. Touch [Yes] on the Confirm Operation window.

   NOTE: The result of this reading is not displayed.

7-3-11-7. Start Unit

This procedure performs a single operation that draws in a rack positioned in the start unit.

Operating Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Start Unit] in the Autoloader Operation window.

3. Touch [Yes] on the Confirm Operation window.

7-3-11-8. BCR Unit

This procedure performs a single operation that presses down the sample tubes and reads the affixed barcodes while rotating the sample tubes.

Operating Procedure

1 Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.

2 Touch [BCR Unit] in the Autoloader Operation window.

3 Touch [Yes] on the Confirm Operation window.

If there are sample tubes in the rack directly below the sample rotator for barcodes, the sample tubes are detected and the barcodes are read.

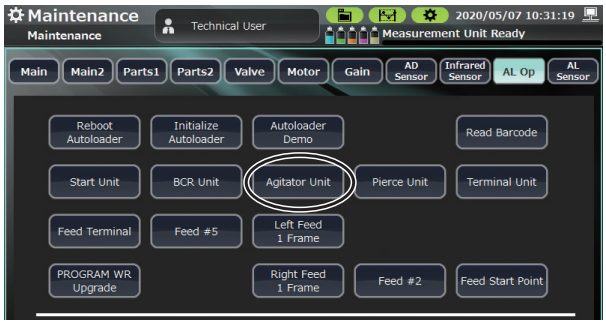
7-3-11-9. Agitator Unit

This procedure performs a single operation that holds the sample tubes and agitates them (for 5 inversions).

Operating Procedure

1 Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.

2 Touch [Agitator Unit] in the Autoloader Operation window.



3 Touch [Yes] on the Confirm Operation window.

7-3-11-10. Pierce Unit

This procedure performs a single operation that releases the pressure that holds the sample tubes in the pressure release aspiration position by the pierce guide.

Operating Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Pierce Unit] in the Autoloader Operation window.

3. Touch [Yes] on the Confirm Operation window.

7-3-11-11. Terminal Unit

This procedure performs a single operation that draws the rack removal tab in or out.

Operating Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Terminal Unit] in the Autoloader Operation window.

3. Touch [Yes] on the Confirm Operation window.

7-3-11-12. Feed Start Point, Feed Terminal

This procedure performs a single operation that transports the feed unit horizontally to a position corresponding to the touched key.

Operating Procedure

1 Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.

2 Touch [Feed Start Point] or [Feed Terminal] in the Autoloader Operation window.

3 Touch [Yes] on the Confirm Operation window.

7-3-11-13. Feed #2

This procedure performs a single operation that transports the feed unit horizontally to a position corresponding to the touched key.

Operating Procedure

1 Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.

2 Touch [Feed #2] in the Autoloader Operation window.

3 Touch [Yes] on the Confirm Operation window.

NOTE: This operation only occurs when the feed unit is in the feed 3 to 5 position or feed end position.

7-3-11-14. Feed #5

This procedure performs a single operation that transports the feed unit horizontally to a position corresponding to the touched key.

Operating Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Feed #5] in the Autoloader Operation window.

3. Touch [Yes] on the Confirm Operation window.

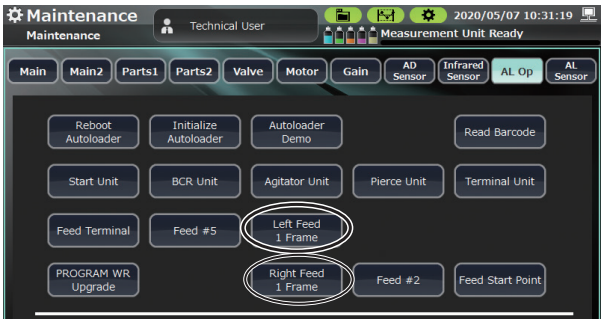
   NOTE: This operation only occurs when the feed unit is in the feed 2 to 4 position or feed start position.

7-3-11-15. Right Feed 1 Frame, Left Feed 1 Frame

This procedure performs a single operation that transports the feed unit horizontally to the next sample tube position.

Operating Procedure

1. Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.
2. Touch [Right Feed 1 Frame] or [Left Feed 1 Frame] in the Autoloader Operation window.



3. Touch [Yes] on the Confirm Operation window.

7-3-11-16. Motor (Inside Autoloader)

This procedure controls each individual motor inside the autoloader.

NOTE: This procedure may break the analyzer. Do not perform this procedure unless specific instructions are provided.

Operating Procedure

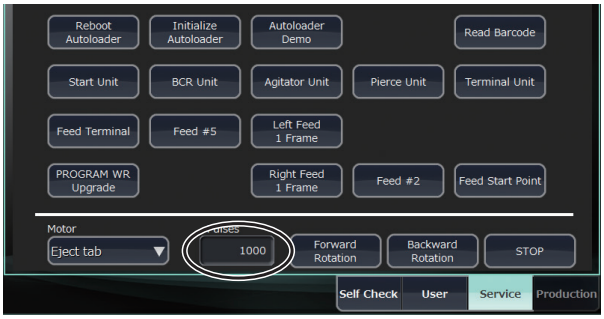
1 Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window.

2 Select the motor to control from the drop-down menu in the Autoloader Operation window.

- The following motors can be chosen from the drop-down menu:

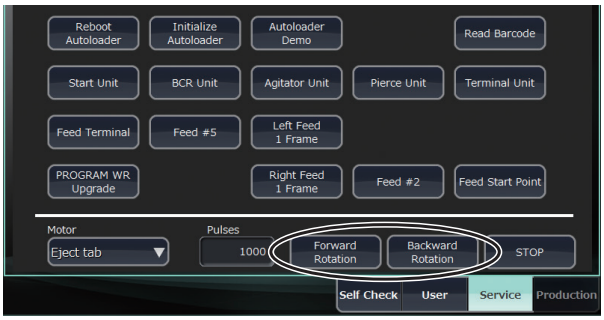
Motor Name	Description
Rack in belt	Controls the motor that draws in racks.
Agitator up/down	Controls the motor that performs inversion-mixing operations.
Raise agitator arm	Controls the motor that raises and lowers the arm to the sample tube rack storage position and inversion-mixing position.
Hold/release feed tab	Controls the motor that operates the tab that fixes the rack and feed units.
Raise sampling tube check arm	Controls the motor that operates the sample tube detection arm.
Rotate sampling tube	Controls the motor that operates the rotation of sample tubes for the reading of affixed barcodes.
Hold/release agitator grip	Controls the motor that operates the grip that engages sample tubes for inversion-mixing.
Feed conveyor	Controls the motor that performs horizontal rack transport operations.
Hold/release sampling tube guide	Controls the motor that operates the pierce guide that holds the sample tubes at the position used for piercing with the sampling needle and venting needle.
Eject tab	Controls the motor that operates the rack's eject tab.

3 Enter the number of operation pulses for the controlled motor.



Pulses: This is an input box for the pulses parameter that controls the motor selected in the drop-down menu. (Input range: 0 to 19999, no default setting)

4 Touch [Forward Rotation] or [Backward Rotation].



Key Name	Description
Forward Rotation	Controls the motor based on the pulses parameter in the positive direction.
Backward Rotation	Controls the motor based on the pulses parameter in the negative direction.
STOP	Unused

7-3-11-17. PROGRAM WR Update

PROGRAM WR Update is not used.

Open the Service Maintenance window and touch [AL Op] to open the Autoloader Operation window. [PROGRAM WR Upgrade] is displayed.

7-3-12. Adjusting the Measurement Position

This procedure checks and adjusts the position of the sampling needle and the autoloader aspiration position.

Open the Service Maintenance window and touch [Motor] to open the Motor window.

7-3-12-1. Auto Measurement Position Adjustment

This procedure checks and adjusts the position of the sampling needle and the autoloader aspiration position for auto measurement.

For the procedure of the auto measurement position adjustment, refer to“6-3-1. Auto Measurement Position Adjustment”.

Section 6-3-1 (p. 6-7)

7-3-12-2. Manual Measurement Position Adjustment

This procedure checks and adjusts the position of the sampling needle and the sampling nozzle aspiration position for manual measurement.

For the procedure of the manual measurement position adjustment, refer to“6-3-2. Manual Measurement Position Adjustment”.

Section 6-3-2 (p. 6-13)

7-3-13. Adjusting Gain

This procedure adjusts the voltage of the infrared sensors in the analyzer.

Open the Service Maintenance window and touch [Gain] to open the Gain adjustment window.

For the procedure of the gain adjustment, refer to“6-4. Gain Adjustment”.

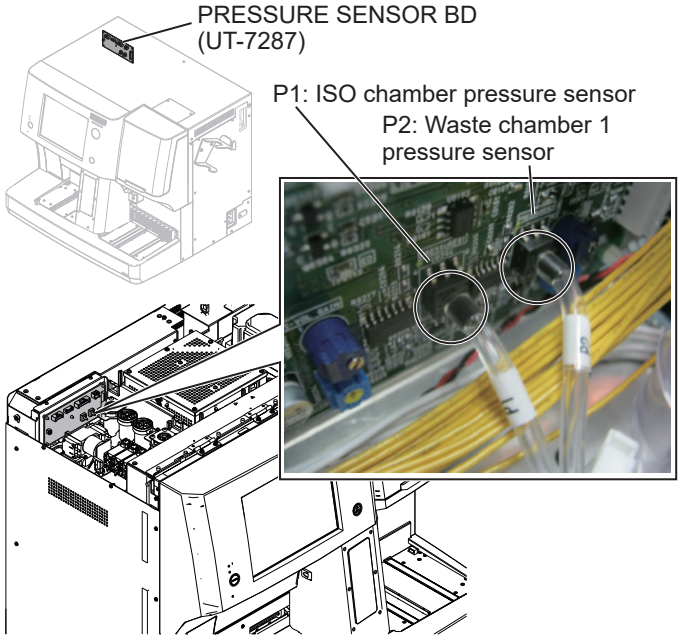
Section 6-4 (p. 6-19)

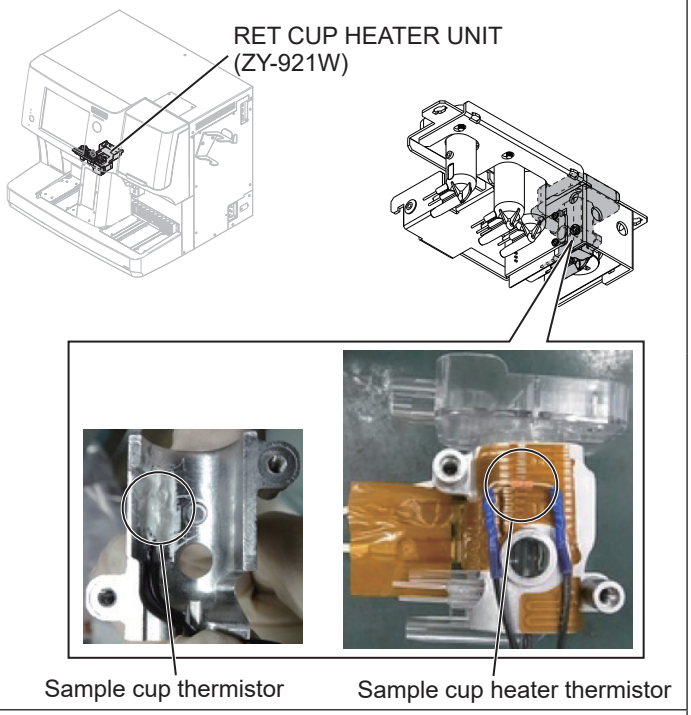
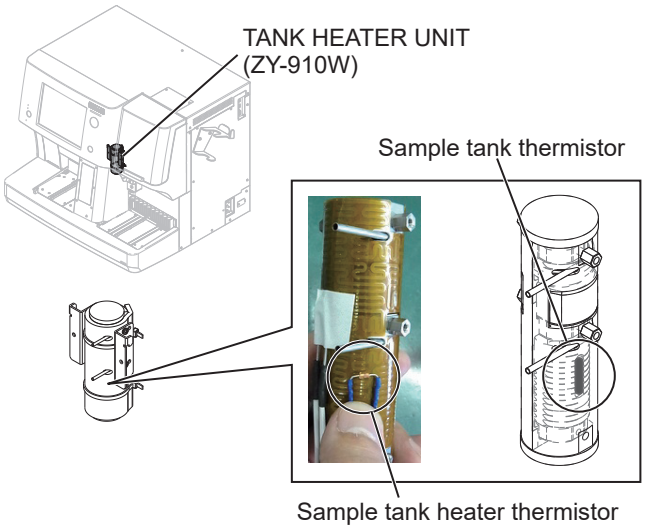
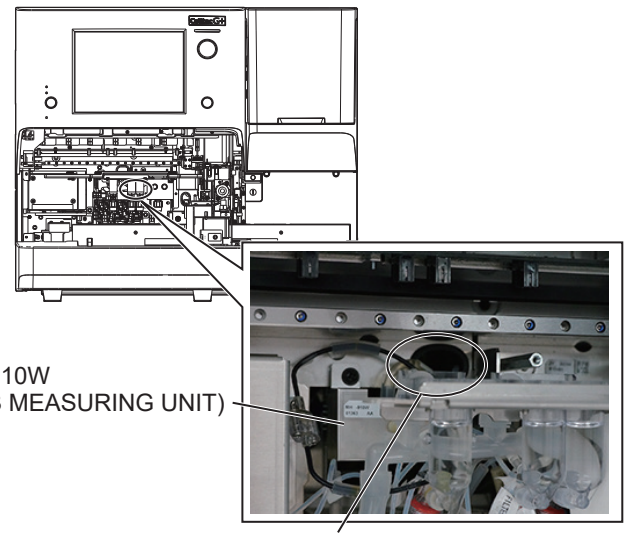
7-3-14. Checking the Sensors Inside the Analyzer

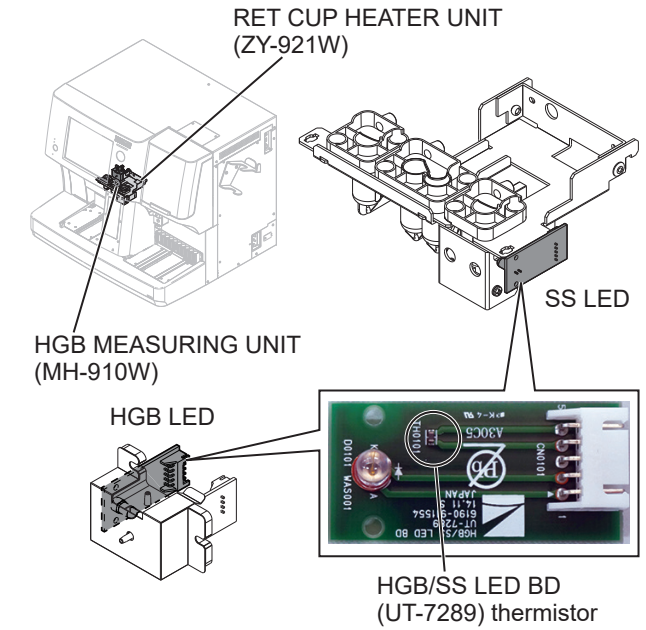
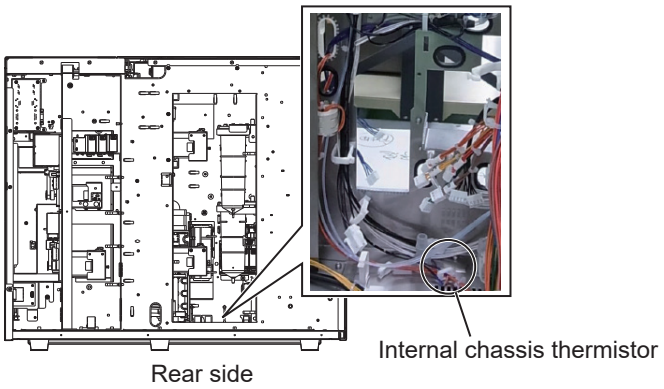
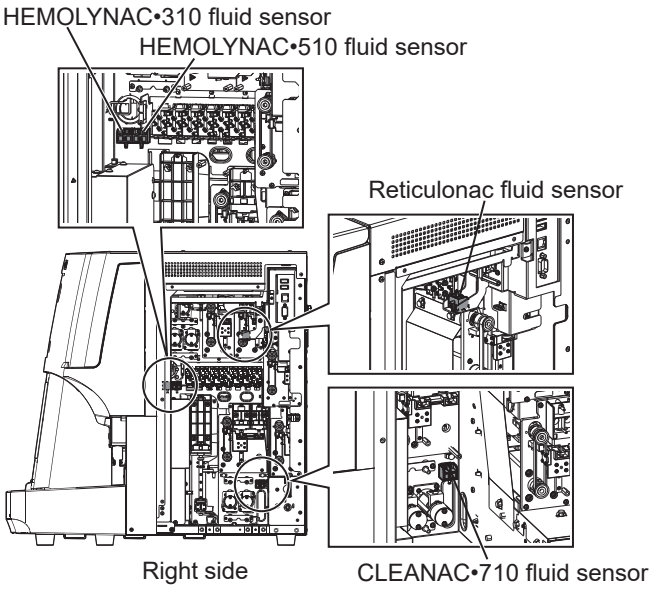
7-3-14-1. AD Sensor

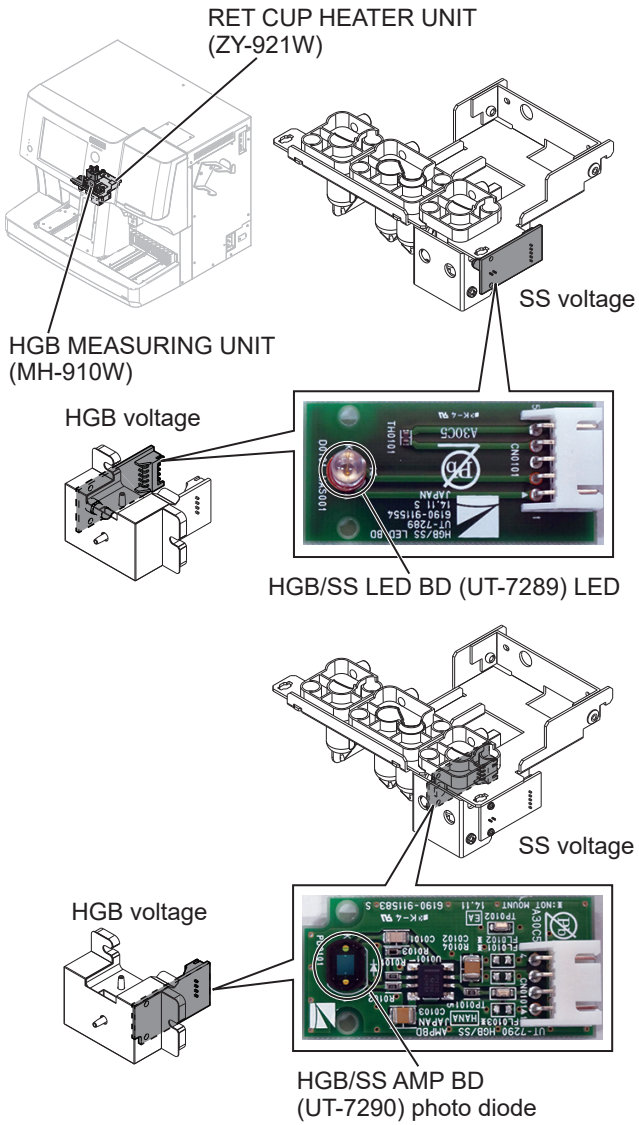
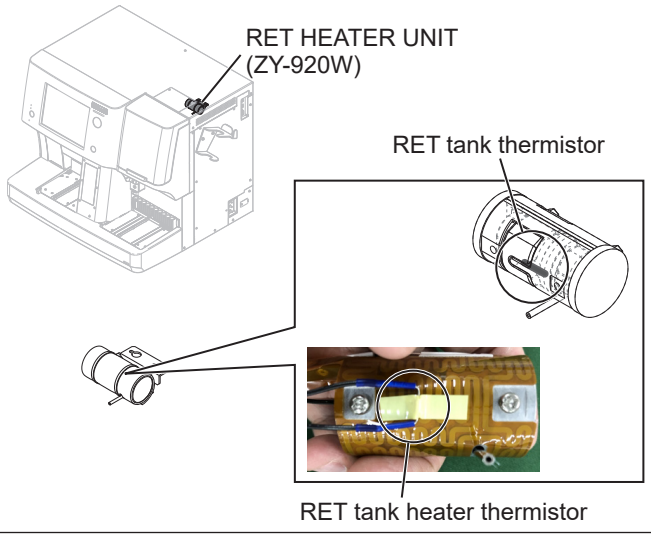
This procedure shows relevant pressures and temperatures from the voltages measured regularly at sensors inside the analyzer.

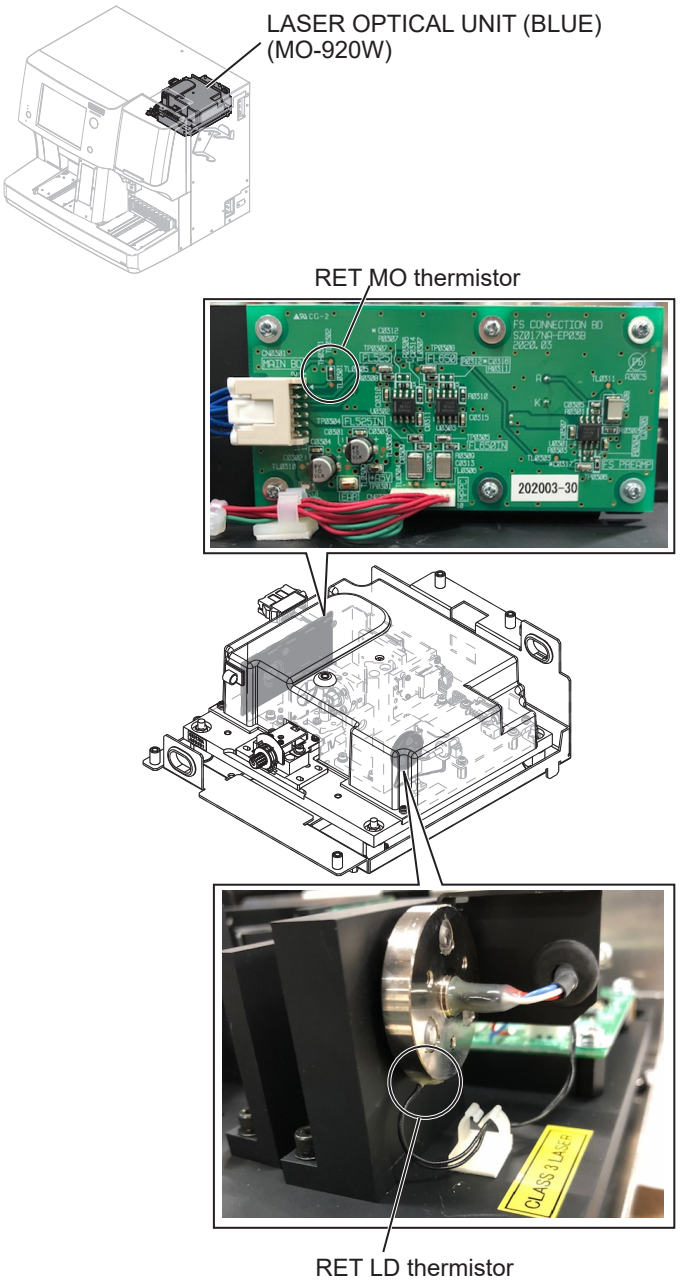
1 Open the Service Maintenance window and touch [AD Sensor]. AD sensor window opens.

Item	Description	Sensor Location
ISO chamber pressure	Measures ISO chamber pressure.	
Waste chamber 1 pressure	Measures waste chamber 1 pressure.	

Item	Description	Sensor Location
Sample cup temperature	Measures temperatures in the range of 37 to 43°C (98.6 to 109.4°F).	
Sample cup heater temperature	Measures temperatures in the range of 35 to 45°C (95 to 113°F).	
Sample tank temperature	Measures temperatures in the range of 37 to 43°C (98.6 to 109.4°F).	
Sample tank heater temperature	Measures temperatures in the range of 35 to 45°C (95 to 113°F).	
HGB diluent temperature	Measures temperatures in the range of 10 to 50°C (50 to 122°F).	 The thermistor is installed on the tube connected to the MH-910W (HGB MEASURING UNIT). The thermistor is inside the CHASSIS UNIT.

Item	Description	Sensor Location
SS LED temperature HGB LED temperature	Measures temperatures in the range of 10 to 50°C (50 to 122°F).	
Internal chassis temperature	Measures temperatures in the range of 10 to 50°C (50 to 122°F).	
HEMOLYNAC•310 port HEMOLYNAC•510 port CLEANAC•710 port Reticulonac port	Determines whether the port has fluid (0.8 V or less) or not (1.8 V or more).	

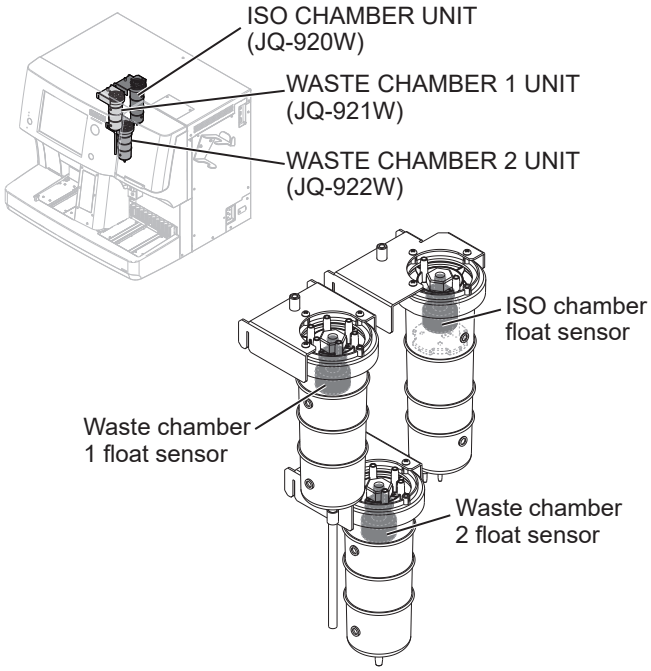
Item	Description	Sensor Location
HGB voltage ON/OFF	Measures the HGB ON voltage (4.00 ±0.50 V) and OFF voltage (0.05 to 0.15 V).	
SS voltage ON/OFF	Measures the SS ON voltage (4.00 ±0.50 V) and OFF voltage (0.05 to 0.15 V).	
RET tank temperature	Measures temperatures in the range of 37 to 43°C (99 to 109°F).	
RET tank heater temperature	Measures temperatures in the range of 35 to 45°C (95 to 113°F).	

Item	Description	Sensor Location
RET LD temperature	Measures temperatures in the range of 10 to 50°C (50 to 140°F).	
RET MO temperature	Measures temperatures in the range of 10 to 50°C (50 to 140°F).	

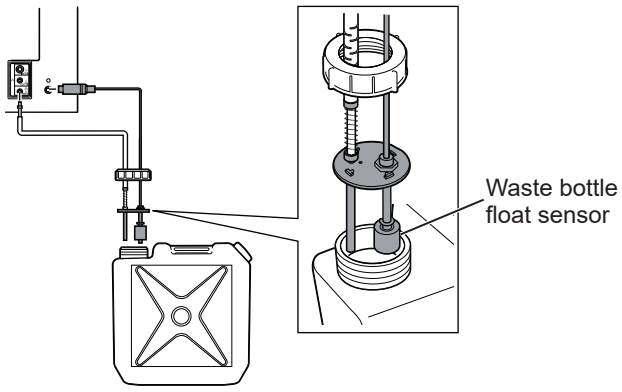
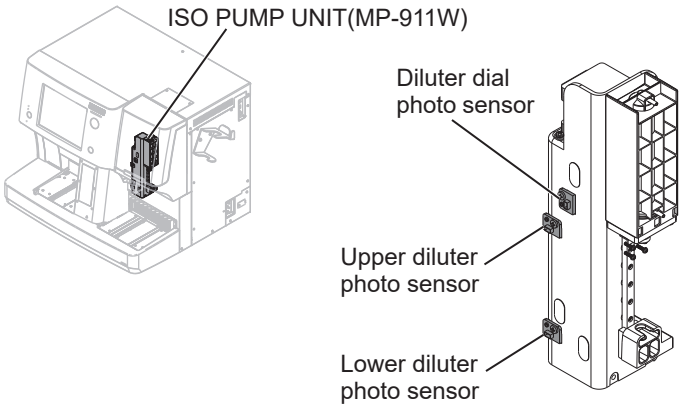
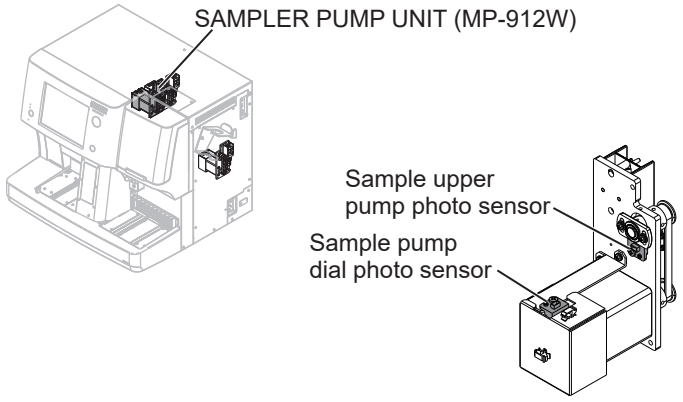
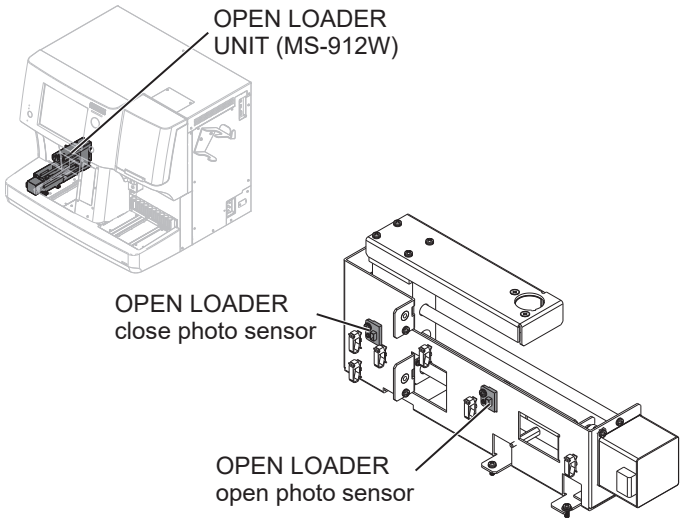
7-3-14-2. Infrared Sensor

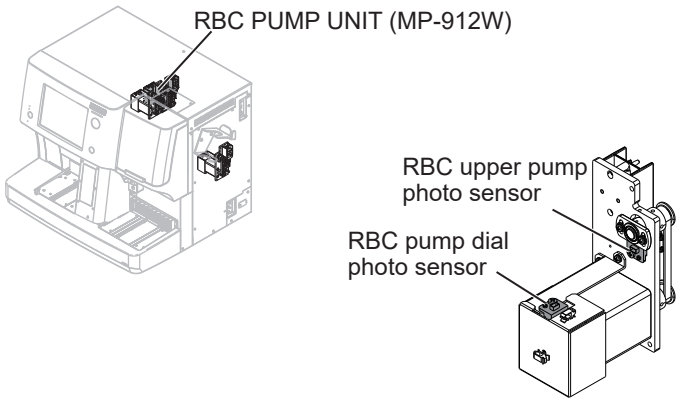
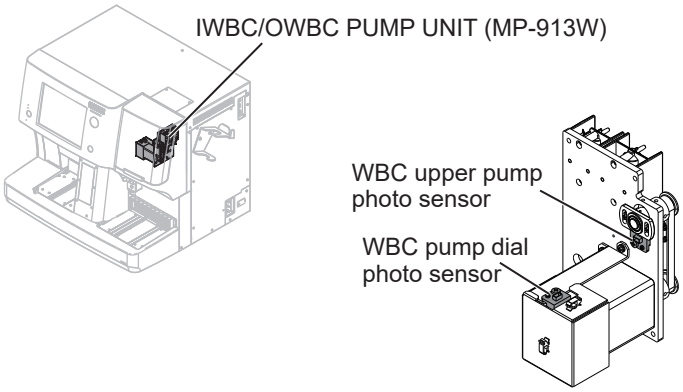
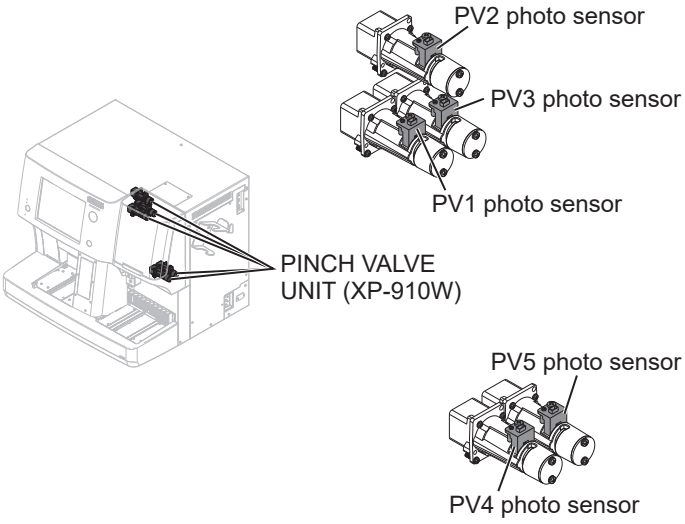
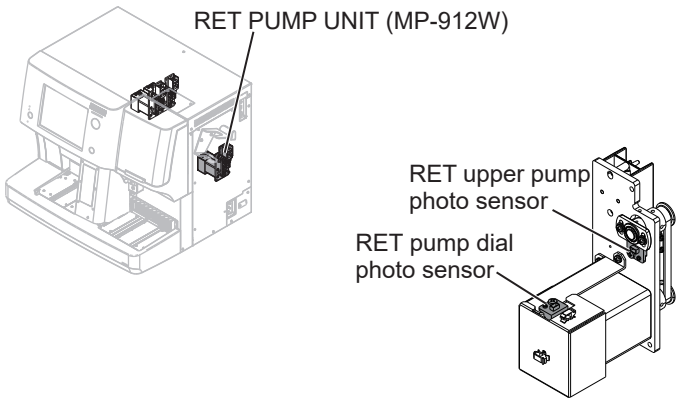
This procedure shows the detection of the sensors inside the analyzer listed below, based on regular measurements.

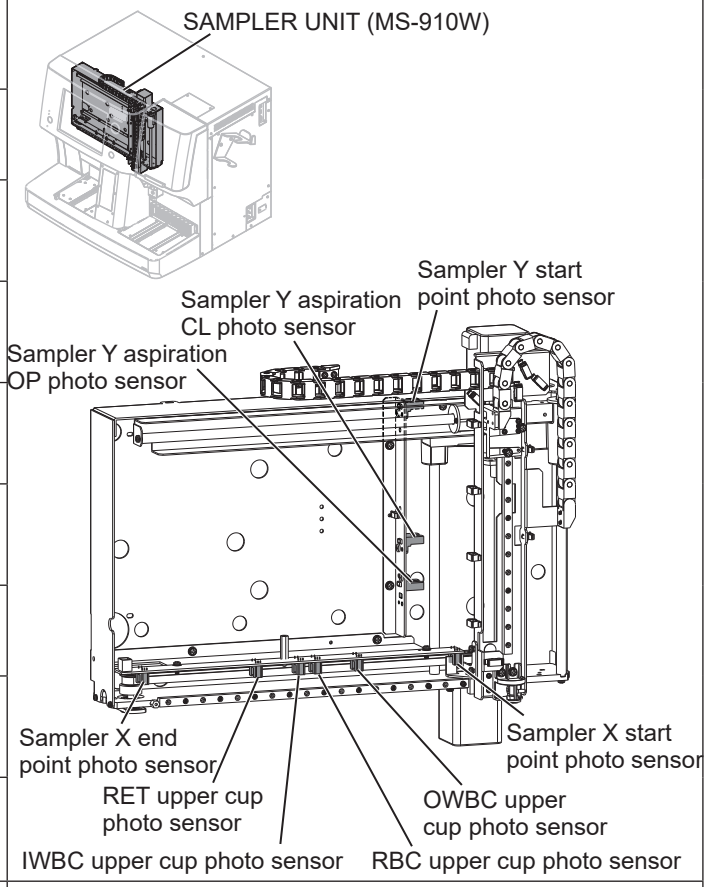
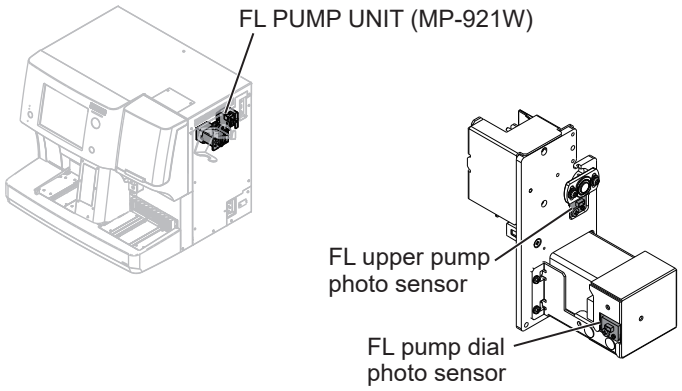
1 Open the Service Maintenance window and touch [Infrared Sensor]. Infrared Sensor opens.

Item	Description	Sensor Location
ISO chamber	Detects the priming of the reagents. Shows ○ when full.	
Waste chamber 1	Detects the amount of water stored in waste chamber 1. Shows ○ when full.	
Waste chamber 2	Detects the amount of water stored in waste chamber 2. Shows ○ when full.	

NOTE: When the float sensors are unconnected or cut off, this always shows ○ (full).

Item	Description	Sensor Location
Waste bottle	Detects the amount of water stored in the waste container. Shows ○ when full.	 NOTE: When the float sensors are unconnected or cut off, this always shows ○ (full).
Upper diluter	When detected at the top dead point of the diluter pump, ○ is displayed.	
Lower diluter	When detected at the bottom dead point of the diluter pump, ○ is displayed.	
Diluter dial	When detected at the start position of the diluter pump, ○ is displayed.	
Sample upper pump	When detected at the top dead point of the sample pump, ○ is displayed.	
Sample lower pump	Not used	
Sample pump dial	When detected at the start position of the sample pump, ○ is displayed.	
OPEN LOADER close	When detected at the fully closed position of the OPEN LOADER, ○ is displayed.	
OPEN LOADER open	When detected at the fully open position of the OPEN LOADER, ○ is displayed.	

Item	Description	Sensor Location
RBC upper pump	When detected at the top dead point of the RBC pump, ○ is displayed.	
RBC pump dial	When detected at the start position of the RBC pump, ○ is displayed.	
WBC upper pump	When detected at the top dead point of the WBC pump, ○ is displayed.	
WBC pump dial	When detected at the start position of the WBC pump, ○ is displayed.	
PV1	Detects the open/closed state of pinch valve 1. Shows ○ when “closed”.	
PV2	Detects the open/closed state of pinch valve 2. Shows ○ when “closed”.	
PV3	Detects the open/closed state of pinch valve 3. Shows ○ when “closed”.	
PV4	Detects the open/closed state of pinch valve 4. Shows ○ when “closed”.	
PV5	Detects the open/closed state of pinch valve 5. Shows ○ when “closed”.	
RET upper pump	When detected at the top dead point of the RET pump, ○ is displayed.	
RET pump dial	When detected at the start position of the RET pump, ○ is displayed.	

Item	Description	Sensor Location
Sampler X start point	When the sampler X-position is at the start position, ○ is displayed.	
Sampler X end point	When the sampler X-position is at the end position, ○ is displayed.	
OWBC upper cup	When the sampler X-position is directly above the OWBC cup, ○ is displayed.	
RBC upper cup	When the sampler X-position is directly above the RBC cup, ○ is displayed.	
IWBC upper cup	When the sampler X-position is directly above the IWBC cup, ○ is displayed.	
RET upper cup	When the sampler X-position is directly above the RET cup, ○ is displayed.	
Sampler Y start point	When the sampler Y-position is at the start position, ○ is displayed.	
Sampler Y aspiration CL	When the sampler Y-position is at the auto measurement aspiration position, ○ is displayed.	
Sampler Y aspiration OP	When the sampler Y-position is at the manual measurement aspiration position, ○ is displayed.	
FL upper pump	When detected at the top dead point of the FL pump, ○ is displayed.	
FL pump dial	When detected at the start position of the FL pump, ○ is displayed.	

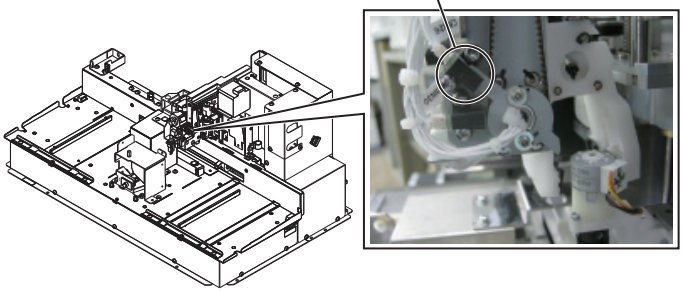
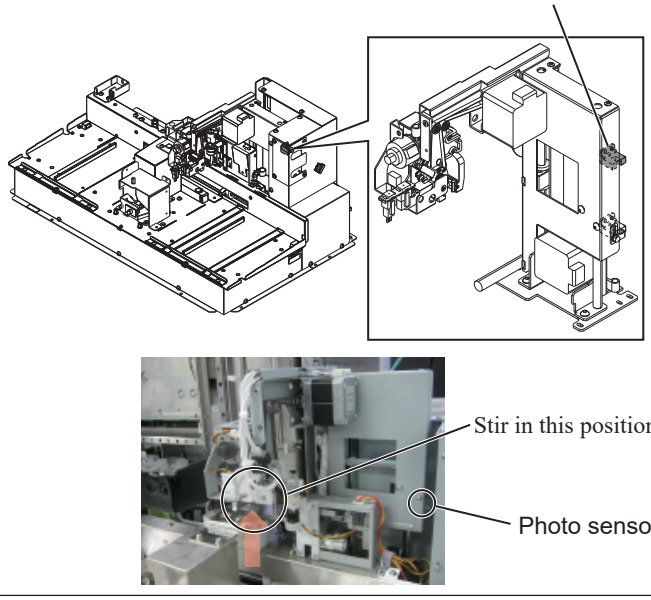
7-3-14-3. AL Sensor

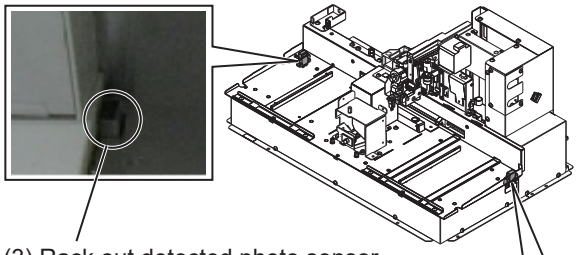
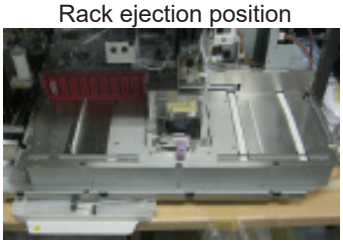
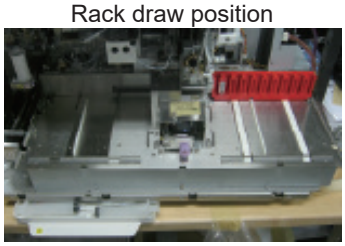
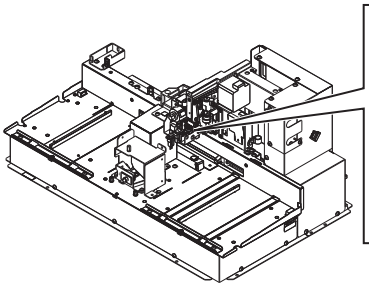
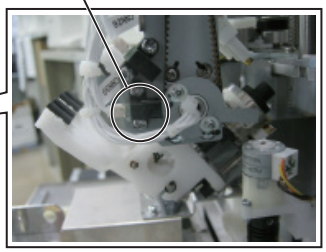
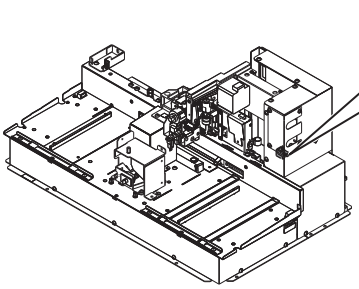
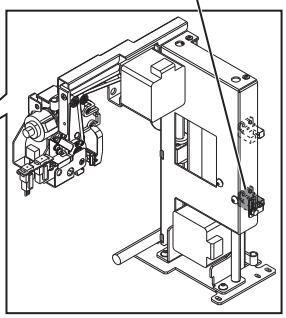
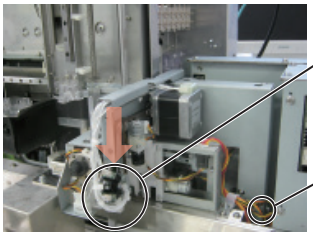
This procedure shows the detection status of the following sensors inside the AUTOLOADER.

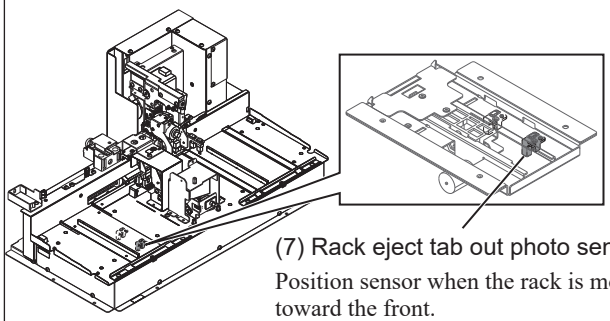
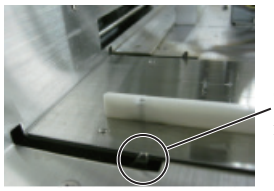
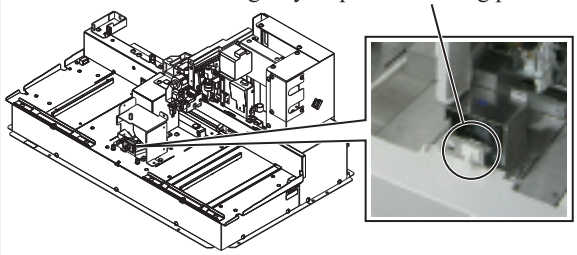
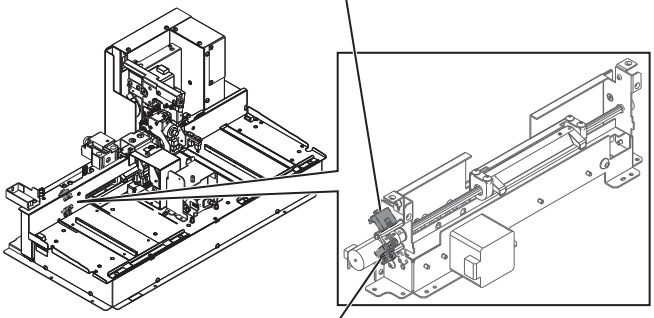
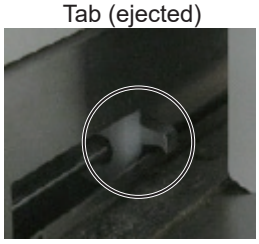
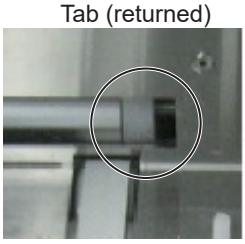
1 Open the Service Maintenance window and touch [AL Sensor].

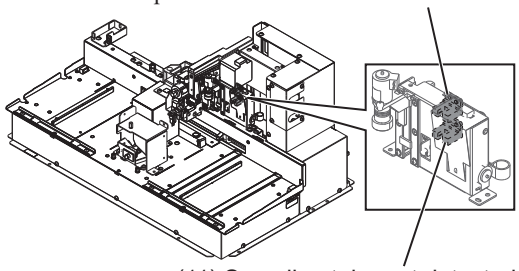
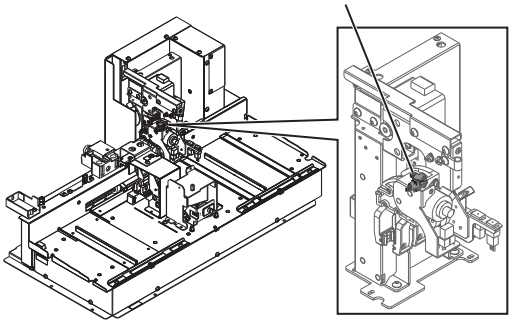
2 Touch [Update Sensor Value] on the AL Sensor window.

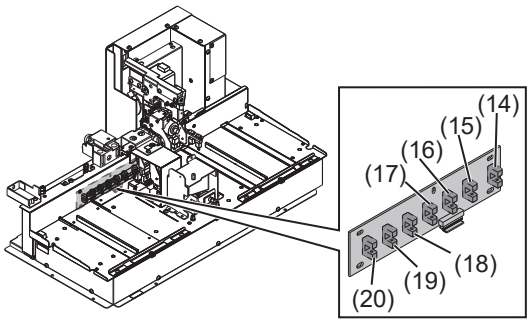
3 Touch [Yes] on the Confirm Operation window.

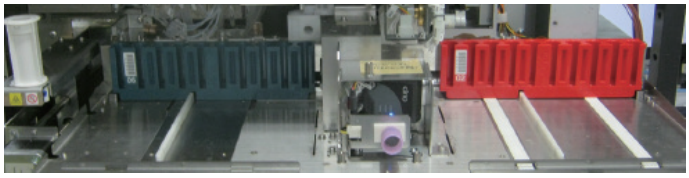
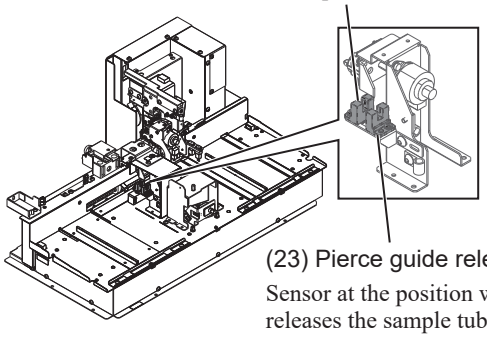
No.	Item	Description	Sensor Location
(1)	Stirring rotation down (start point)	Shows ○ when the inversion/ mixing operation of the agitator is detected to be in the lower position of the swinging motion.	(1) Stirring rotation down (start point) photo sensor Position sensor for agitating motion of the agitator (start position) Position sensor when the agitator holds the sample tube. 
(2)	Raise stirring arm	Shows ○ when the stirring arm is detected to be in the raised position (the position where the sample tubes are inversion-mixed).	(2) Raise stirring arm photo sensor Upper position sensor for vertical motion of the agitator. (reference position) 

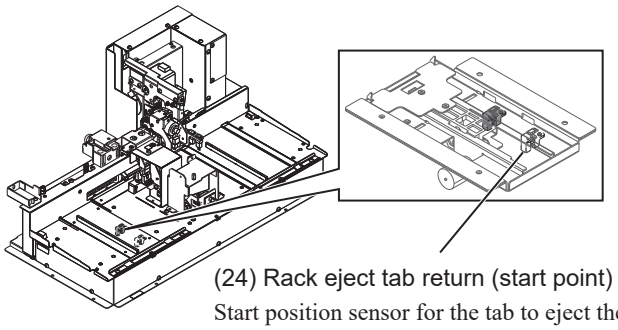
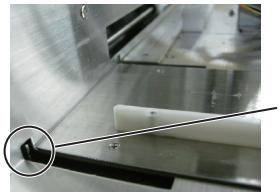
No.	Item	Description	Sensor Location
(3)	Rack out detected	Shows ○ when the rack is detected at the end position of the rack path.	 (3) Rack out detected photo sensor The position of ejecting the rack after measurement.  (4) Rack in detected photo sensor The position when drawing the rack toward the analyzer after measurement starts.
(4)	Rack in detected	Shows ○ when the rack is detected at the start position of the rack path.	Rack ejection position  Rack draw position 
(5)	Stirring rotation up	Shows ○ when the inversion/ mixing operation of the agitator is detected to be in the upper position of the swinging motion.	(5) Stirring rotation up photo sensor Position sensor for agitating motion of the agitator Upper point position sensor when the agitator stirs the sample tube.  
(6)	Lower stirring arm (start point)	Shows ○ when the stirring arm is detected to be in the lowered position (the position where the sample tubes are gripped).	(6) Lower stirring arm (start point) Lower position sensor for vertical motion of the agitator. (reference position)    Hold the sample tube in this position Photo sensor

No.	Item	Description	Sensor Location
(7)	Rack eject tab out	Shows ○ when the eject tab of the transported rack is detected to be in the ejected position.	 (7) Rack eject tab out photo sensor Position sensor when the rack is moved toward the front.  Tab position when the rack is moved toward the front.
(8)	Agitator cover removal detected	Shows ○ when the removal of the mixing cover is detected.	(8) Agitator cover removal detected photo sensor Sensor to detect whether the mixing cover is removed or not. Detect the emergency stop at the moving part. 
(9)	Feed axle tab out	Shows ○ when the tab that fixes the rack and feed units is detected as being out.	(10) Feed axle tab return (start point) photo sensor Sensor to check the state of returning the tab.  (9) Feed axle tab out photo sensor Sensor to check the state of ejecting the tab to move the rack horizontally.
(10)	Feed axle tab return (start point)	Shows ○ when the tab that fixes the rack and feed units is detected in the stowed position.	Tab (ejected)  Tab (returned) 

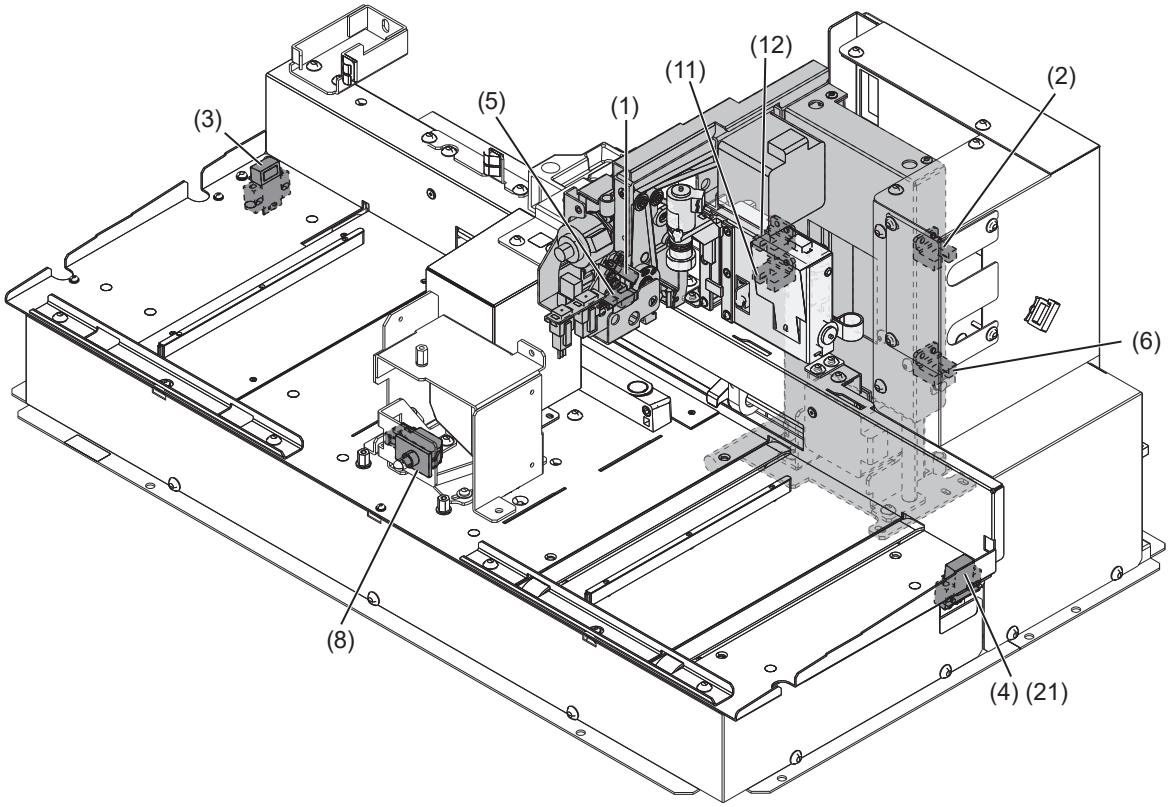
No.	Item	Description	Sensor Location
(11)	Sampling tube not detected	Shows ○ when the sample tube detection arm is detected to be in the lowered position (the position at which the absence of sample tubes can be confirmed). If the sensor does not detect anything after the detection arm lowers, the presence of sample tubes can be confirmed.	(12) Sample tube release (start point) photo sensor Start point sensor of the detection arm  (11) Sampling tube not detected photo sensor Sensor to detect the sample tube. Lower the detection arm. If the sensor is not detected, it is judged that there is a sample tube.
(12)	Sample tube release (start point)	Shows ○ when the sample tube detection arm is detected to be in the raised position.	
(13)	Agitator grip release (start point)	Shows ○ when the grip is detected to be in the open state (the sample tubes are released). There is no sensor for detecting the closed state.	(13) Agitator grip release (start point) photo sensor Sensor to check that the sample tube is removed. (Sensor to check that the grip to hold the sample tube opens.) There is no sensor for holding the sample tube. the motor is driven by the pulse. 

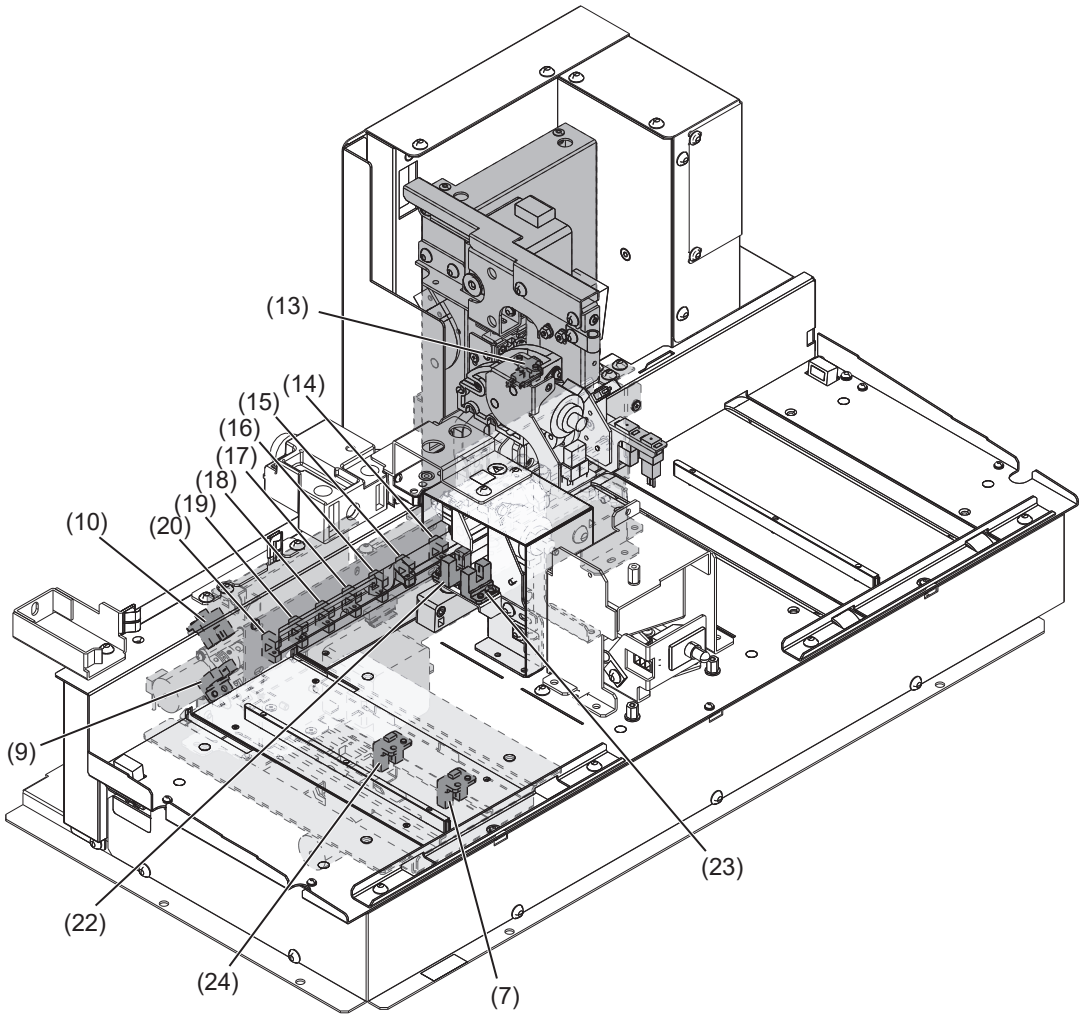
<table>
<tr><th>No.</th><th>Item</th><th>Description</th><th>Sensor Location</th></tr>
<tr><td>(14)</td><td>Feed transport position 1 (start point)</td><td>Shows ○ when the rack transport mechanism is detected as being in the start position.</td><td rowspan="8"> 


(14) Feed transport position 1 (start point) photo sensor
Start position sensor for feed to transport the rack.
(15) Feed transport position 2 photo sensor
Sensor at the position where the rack is moved 1 sample tube from the start position.
(16) Feed transport position 3 photo sensor
Sensor at the position where the rack is moved 2 sample tubes from the start position.
(17) Feed transport position 4 photo sensor
Sensor at the position where the rack is moved 3 sample tubes from the start position.
(18) Feed transport position 5 photo sensor
Sensor at the position where the rack is moved 4 sample tubes from the start position.
(19) Feed transport position 6 photo sensor
Sensor at the position where the rack is moved 5 sample tubes from the start position.
(20) Feed transport end point photo sensor
Sensor at the position where the rack is ejected.</td></tr>
<tr><td>(15)</td><td>Feed transport position 2</td><td>Shows ○ when the rack transport mechanism is detected as having moved 1 sample tube from the start position.</td></tr>
<tr><td>(16)</td><td>Feed transport position 3</td><td>Shows ○ when the rack transport mechanism is detected as having moved 2 sample tube from the start position.</td></tr>
<tr><td>(17)</td><td>Feed transport position 4</td><td>Shows ○ when the rack transport mechanism is detected as having moved 3 sample tube from the start position.</td></tr>
<tr><td>(18)</td><td>Feed transport position 5</td><td>Shows ○ when the rack transport mechanism is detected as having moved 4 sample tube from the start position.</td></tr>
<tr><td>(19)</td><td>Feed transport position 6</td><td>Shows ○ when the rack transport mechanism is detected as having moved 5 sample tube from the start position.</td></tr>
<tr><td>(20)</td><td>Feed transport end point</td><td>Shows ○ when the rack transport mechanism is detected as being in the end position.</td></tr>
<tr><td>(21)</td><td>Rack detected</td><td>Shows ○ when the rack is detected at the start position of the rack path.</td><td>This sensor is shared with (4) rack in detected photo sensor.</td></tr>
<tr><td>(22)</td><td>Pierce guide fixed</td><td>Shows ○ when the pierce guide is detected to be in the position that fixes the sample tubes.</td><td rowspan="2">(22) Pierce guide fixed photo sensor
Sensor at the position where the guide fixes the sample tube.
 
(23) Pierce guide release (start point)
Sensor at the position where the guide releases the sample tube.</td></tr>
<tr><td>(23)</td><td>Pierce guide release (start point)</td><td>Shows ○ when the pierce guide is detected to be in the position that releases the sample tubes.</td></tr>
</table>

No.	Item	Description	Sensor Location
(24)	Rack eject tab return (start point)	Shows ○ when the eject tab of the rack is detected to be in the stowed position.	 (24) Rack eject tab return (start point) Start position sensor for the tab to eject the rack. (Position sensor at the position where the tab is stored)  Start position of the tab to eject the rack
—	Load cell sample tube cap detected	Not used.	—

AL sensor location





7-4. Checking Self Check Results

On the Self Check window, you can view the operation history and self check results of this analyzer.

The Self Check window has the following windows.

Window	Description
Summary	Shows the check results of each self check item.
Details1	Shows detailed check results for remaining reagent and instrument internal temperature.
Details2	Shows detailed check results for instrument internal pressure and circuit check.
Details3	Shows detailed check results for background measurement, maintenance parts, maintenance operation and maintenance log.
Log	Shows self check history (up to 300 times).

7-4-1. Self Check (Summary)

Check each check item from [Maintenance] > [Self Check] > [Summary].

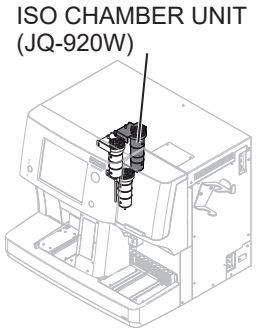
Section 7-2-7-2 (p. 7-15)

7-4-2. Self Check (Details1)

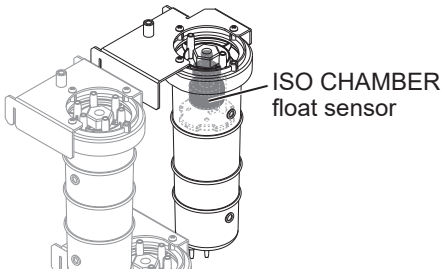
Check the results of self checks for remaining reagents and internal temperature from [Maintenance] > [Self Check] > [Details1].

7-4-2-1. Reagent Check

ISOTONAC•3/4

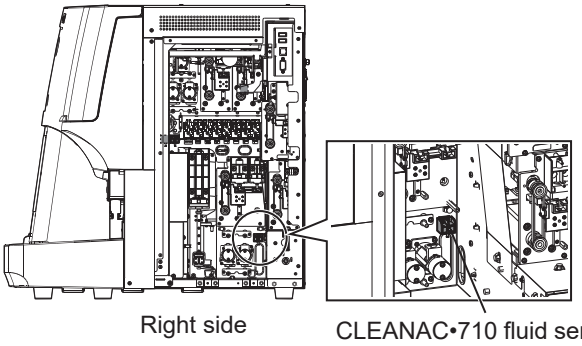


This procedure performs diluent (ISOTONAC•3/4) priming operations, detects the presence of diluent in the ISO chamber and checks that the expiration dates have not expired.



CLEANAC•710

This procedure checks that the expiration dates of the detergent (CLEANAC•710) have not expired.

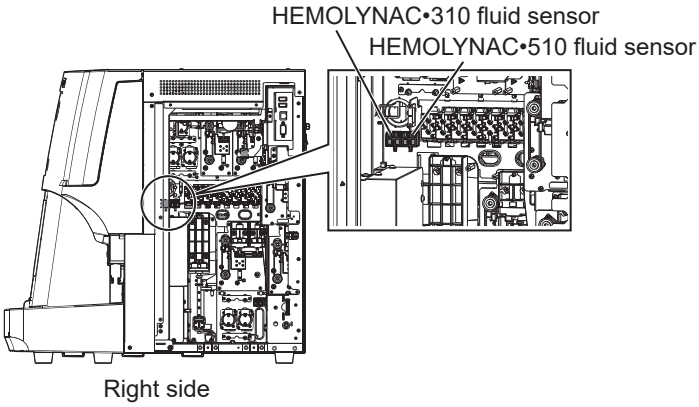


NOTE: It never shows [FULL] for the detergent (CLEANAC•710) because the priming operation is not performed in the self check.

Reagent Check	Status	Result
ISOTONAC 3/4	PASS	FULL
CLEANAC 710	PASS	---
HEMOLYNAC 310	PASS	FULL
HEMOLYNAC 510	PASS	FULL
RETICULONAC	PASS	FULL

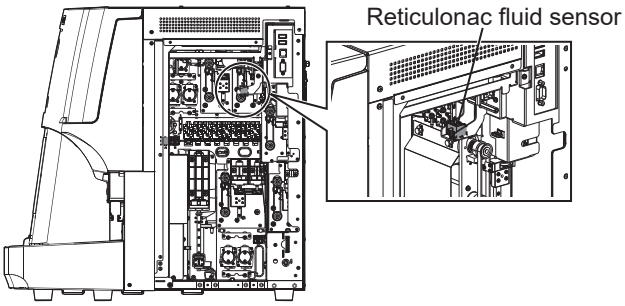
HEMOLYNAC•310/HEMOLYNAC•510

This procedure performs lysing reagent (HEMOLYNAC•310/ HEMOLYNAC•510), priming operations, detects the presence of the lysing reagent, with the infrared sensor and checks that the expiration dates have not expired.

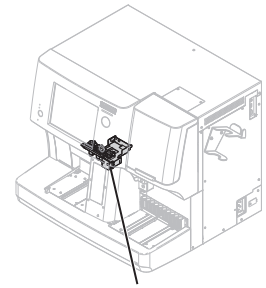


Reticulonac

This procedure performs staining reagent (Reticulonac), priming operations, detects the presence of the staining reagent, with the infrared sensor and checks that the expiration dates have not expired.

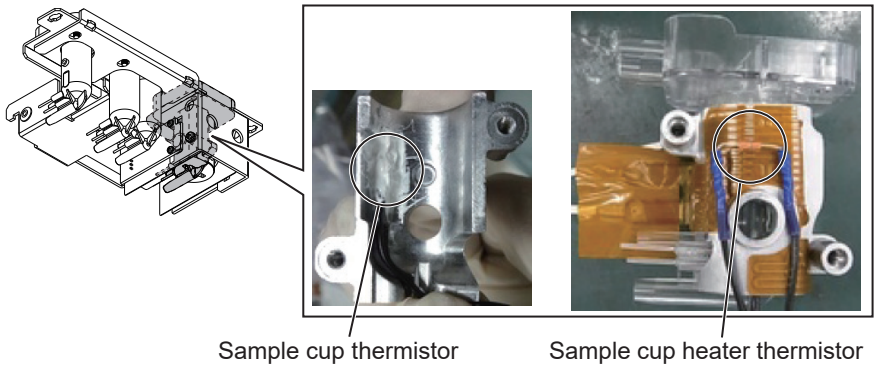


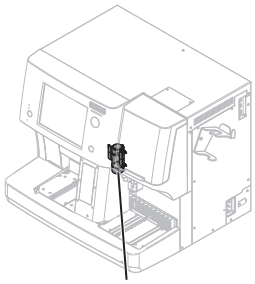
7-4-2-2. Checking Thermistor



Cup Temperature, Cup Heater Temperature

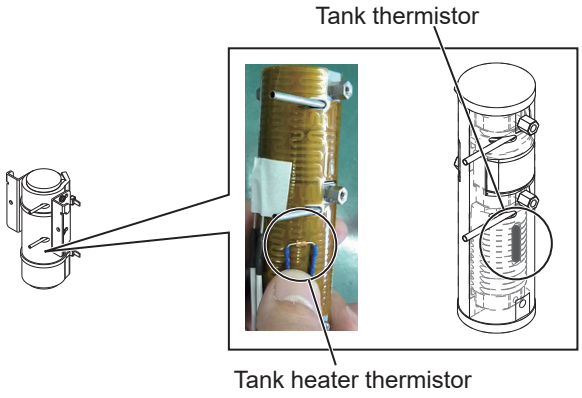
This procedure uses each of the thermistors in the cup heater unit to check that temperatures are within their criteria.





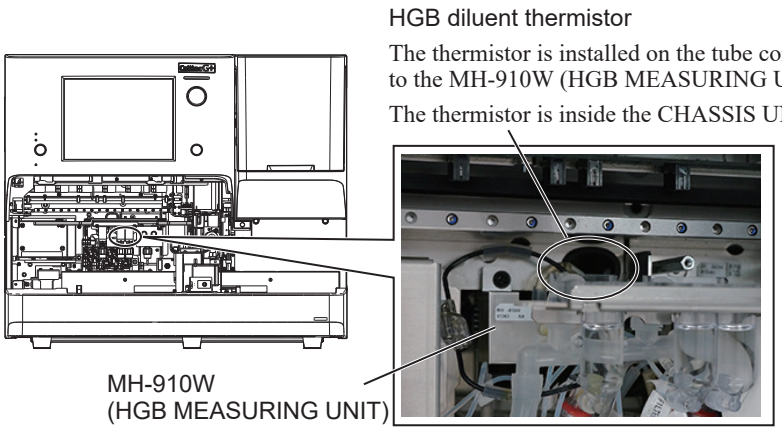
Tank temperature, Tank heater temperature

This procedure uses each of the thermistors in the reagent tank heater unit to check that temperatures are within their criteria.

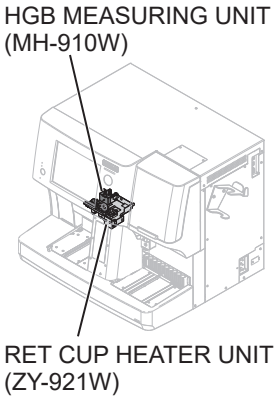


HGB Diluent Temperature

This procedure checks the temperatures of the measured reagents and diluents using a thermistor before they enter the HGB measurement part.

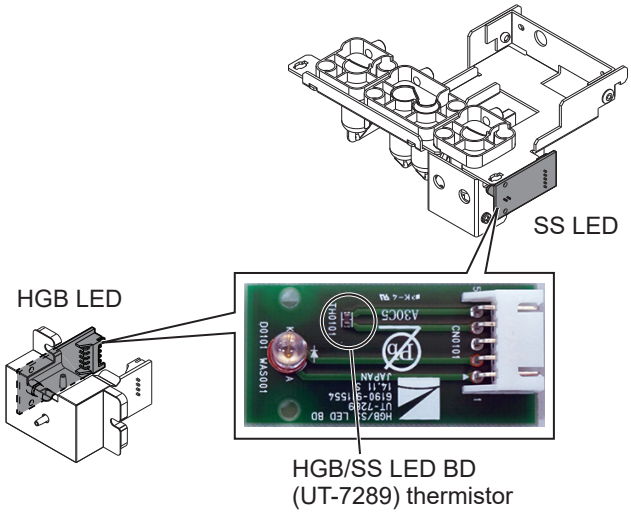


HGB LED Temperature, SS LED Temperature



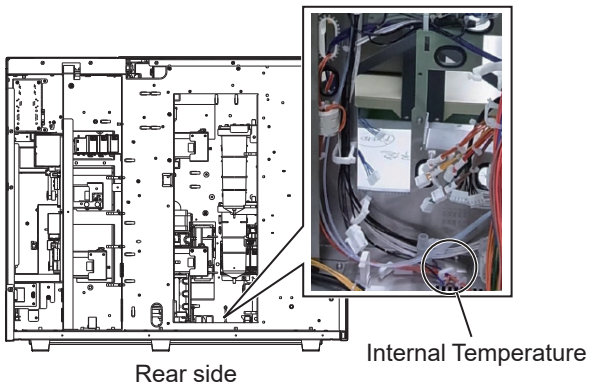
This procedure uses the thermistor on the UT-7289 to check that temperatures are within their criteria. The HGB unit and SS (short sample) are both UT-7289.

* The SS is mounted in the cup heater unit.



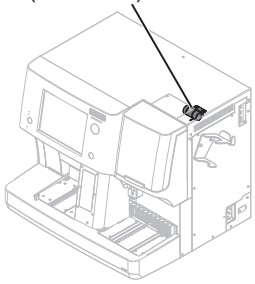
Internal Temperature

This procedure uses thermistors inside the casing to check that temperatures are within their criteria.

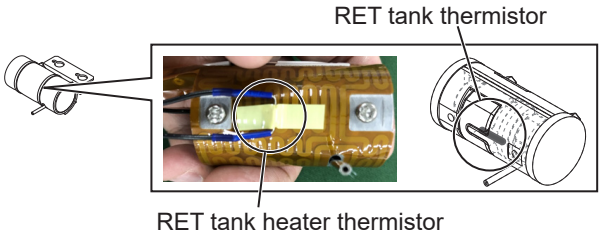


RET Tank Temperature, RET Tank Heater Temperature

RET HEATER UNIT
(ZY-920W)

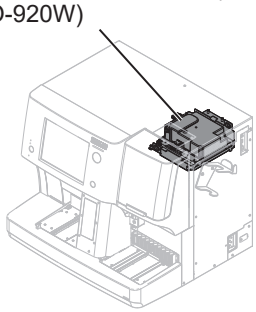


This procedure uses each thermistor in the RET HEATER UNIT to check that temperatures are within their criteria.

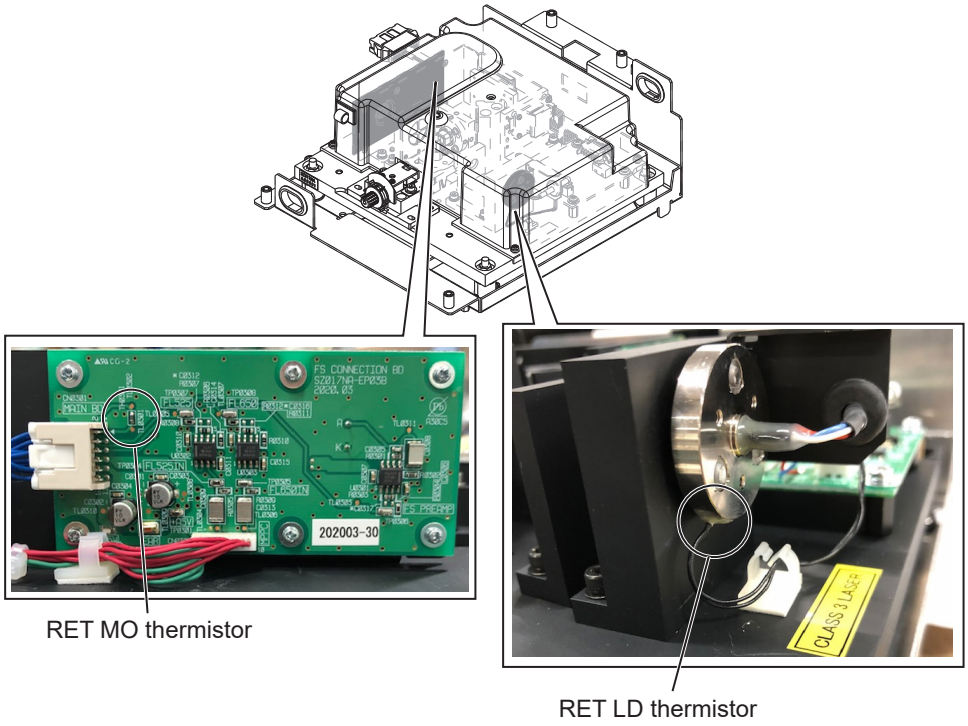


RET LD Temperature, RET MO Temperature

LASER OPTICAL UNIT (BLUE)
(MO-920W)



This procedure uses each thermistor in the LASER OPTICAL UNIT (BLUE) to check that temperatures are within their criteria.



7-4-3. Self Check (Details2)

This procedure checks the results of self checks for pressure checks and circuit checks from [Maintenance] > [Self Check] > [Details2].

7-4-3-1. Pressure Check

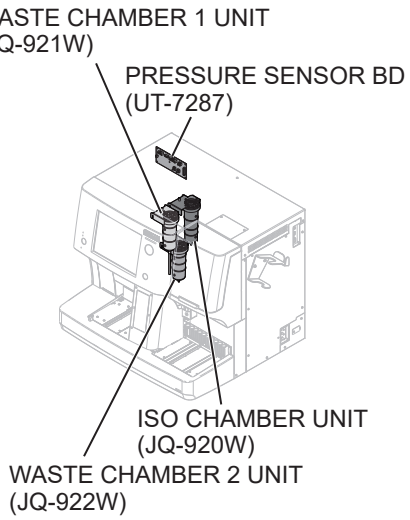
- Checks the pressure in the ISO chamber and waste chamber 1
- Checks 3 states: positive pressure, negative pressure and air pressure

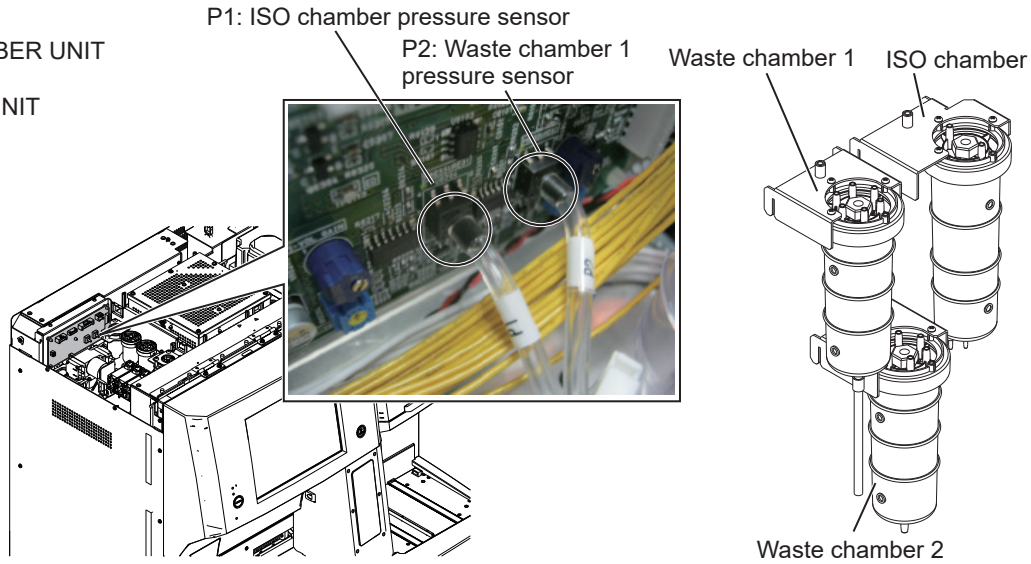
Detection uses a pressure sensor on the UT-7287 PRESSURE SENSOR BD.

The pressure of the ISO chamber is checked via Pressure Sensor 1 on the board. The pressure of waste chamber 1 is checked via Pressure Sensor 2 on the board.

Atmospheric pressure is checked by releasing MV15. (The compressor does not stop.)

* Waste chamber 2 is always open to environmental air pressure.





Pressure Check					
ISO Chamber	Status	Result		Range	
Air Pressure	PASS		1.40 kPa	-8.00 ~ 8.00	kPa
Positive Pressure	PASS		69.53 kPa	57.96 ~ 80.04	kPa
Negative Pressure	PASS		-29.39 kPa	-35.00 ~ -25.00	kPa
Waste Chamber1	Status	Result		Range	
Air Pressure	PASS		0.47 kPa	-8.00 ~ 8.00	kPa
Positive Pressure	PASS		67.67 kPa	57.96 ~ 80.04	kPa
Negative Pressure	PASS		-29.86 kPa	-35.00 ~ -25.00	kPa

7-4-3-2. Circuit Check

The circuit check does not perform checks for fluid paths or sensors, etc.

→ When the results of a check show a status of [FAIL], it is likely that there is a hardware problem.

Circuit Check	Status	Result	Range	
WBC	PASS	74.2 10^2/μL	70.2 ~ 77.5	10^9/L
RBC	PASS	58 10^4/μL	53 ~ 59	10^4/μL
MCV	PASS	41.4 fL	37.7 ~ 41.7	fL
DIFF	PASS	5999 count	5700 ~ 6300	Count
BTOC	PASS	6000 count	5700 ~ 6300	Count
WBC Voltage	PASS	17.90 V	17.50 ~ 18.70	V
RBC Voltage	PASS	17.77 V	17.50 ~ 18.70	V
HGB ON Voltage	PASS	3.99 V	3.50 ~ 4.50	V
HGB OFF Voltage	PASS	0.10 V	0.05 ~ 0.15	V
SS ON Voltage	PASS	4.01 V	3.50 ~ 4.50	V
SS OFF Voltage	PASS	0.10 V	0.05 ~ 0.15	V

WBC	Checks the circuits that perform WBC measurements.
RBC	Checks the circuits that perform RBC measurements.
MCV	Checks the circuits that perform MCV measurements.
DIFF	Checks the circuits that perform 5 part differential measurement.
BTOC	Checks the circuits that perform BTOC measurements.
WBC•RBC Voltage	Checks the WBC and RBC electrode voltages.
HGB ON/OFF Voltage	Checks the circuits that perform HGB measurements.
SS ON/OFF Voltage	Checks the circuits that perform SS measurements.

The result of the circuit check in the self check remains in the data list as “BACKGROUND CHECK”.

7-4-4. Self Check (Details3)

Check the results of self checks for the background measurement, usage state of maintenance parts, previous maintenance results and the maintenance log confirmation status from [Maintenance] > [Self Check] > [Details3].

7-4-4-1. Background Check

This procedure checks the measurement results from measurements of the diluent only.

In +RET measurement, measures the diluent and staining reagent

Checks the reliability of the measurement results.

The result of the background measurement in the self check remains in the data list as “BACKGROUND CHECK”.

Background Check	Status	Result	Range	
WBC	PASS	0.1 10²/µL	0.0 ~ 2.0	10²/µL
RBC	PASS	0 10⁴/µL	0 ~ 2	10⁴/µL
HGB	PASS	0.00 g/dL	0.00 ~ 0.10	g/dL
PLT	PASS	0.01 10⁴/µL	0.00 ~ 1.00	10⁴/µL
TOC	PASS	3 count	0 ~ 100	count
TFC	PASS	2 count	0 ~ 100	count

7-4-4-2. Replace Maintenance Parts

This procedure shows the result of a check that the number of uses for each maintenance part has not exceeded the upper limit.

- For the sampling needle
  Section 7-5-1-2 (p. 7-84)
- For the venting needle
  Section 7-5-1-3 (p. 7-91)
- For the filter
  Section 7-5-1-4 (p. 7-94)

7-4-4-3. Periodic Maintenance

Check that the period for cleaning protein has not been exceeded.

Cleaning Protein

Section 7-2-2-2 (p. 7-6)

7-4-4-4. Maintenance Log

Check that there are no unconfirmed logs from Maintenance Log.

Maintenance Log	Status
Unconfirmed Items	PASS

7-4-5. Self Check (Log)

A history of performed self checks (maximum 300) is displayed in [Maintenance] > [Self Check] > [Log].

7-5. Periodic Maintenance

⚠ WARNING

Always wear rubber gloves to protect yourself from infection.

7-5-1. Analyzer

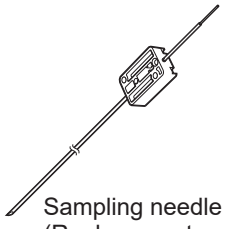
7-5-1-1. Periodic Maintenance Parts

The following components need to be replaced regularly according to the following schedule to maintain the functions and performance of the analyzer.

NOTE: The relief valve tube assy is replaced by a Nihon Kohden representative.

Periodic Replacement Parts	Schedule
Analyzer	
Sampling needle	Every 12,000 to 18,000 measurements
Venting needle	
WBC filter assy	
RET filter assy	
Hemoglobin filter assy	
Relief valve tube assy	Every 1 year

7-5-1-2. Replacing the Sampling Needle



Sampling needle (Replacement part: sampling nozzle)

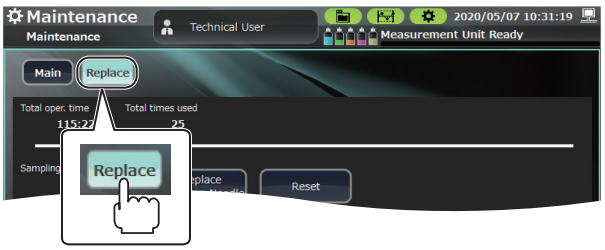
Schedule: **Every 12,000 to 18,000 measurements**

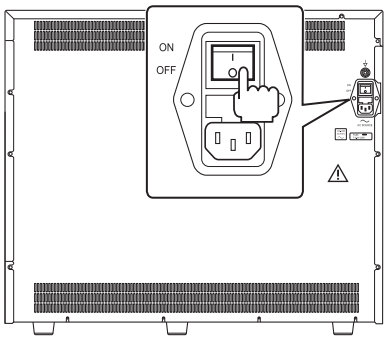
Replacement part: **Sampling nozzle (supply code: YZ-011B2)**

NOTE
- Keep the screws that were removed during replacement for reuse.
- The sampling nozzle (supply cord: YZ-011B2) is not compatible with the sampling nozzle (supply cord: T444E). Use the sampling nozzle (supply cord: YZ-011B2), which has the white holder.

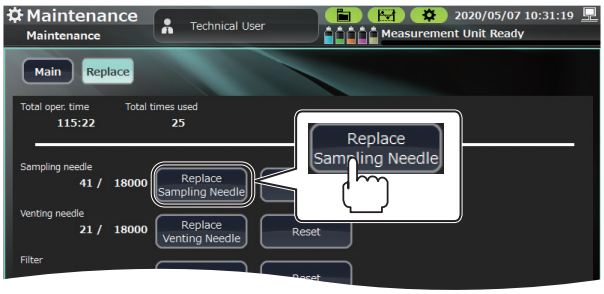
1 Open the User Maintenance window and touch [Replace].

Section 7-2-1 (p. 7-4)



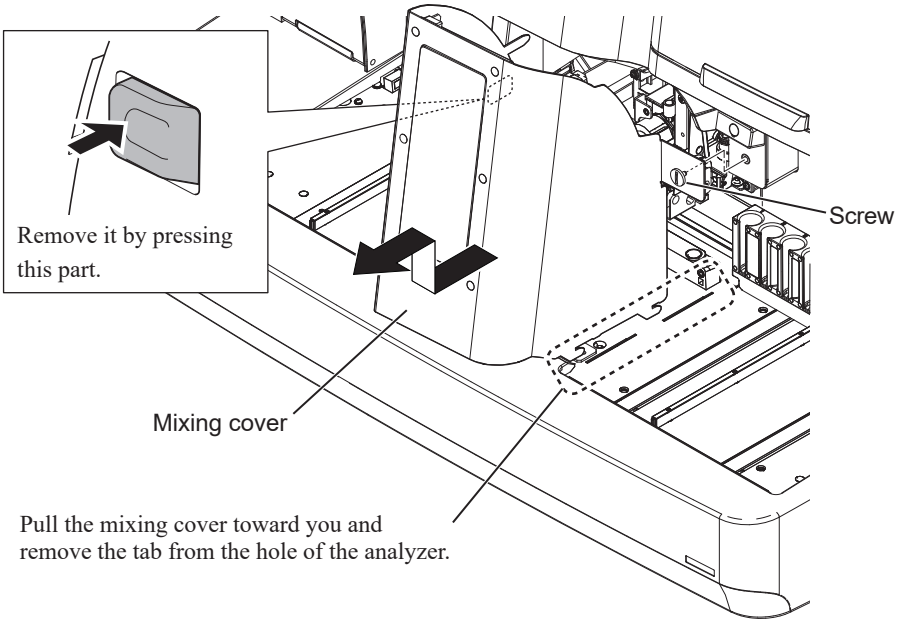


2 Touch [Replace Sampling Needle]. The sampling needle and related fluid paths are drained and the power is automatically turned off.



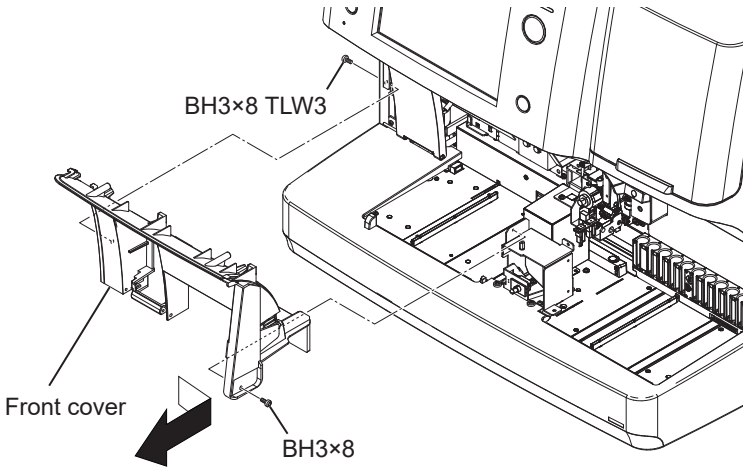
3 Turn off the Main power switch on the rear panel of the analyzer (to ○) and disconnect the power cord from the wall AC outlet.

4 Loosen the screw on the front panel of the analyzer to remove the mixing cover.



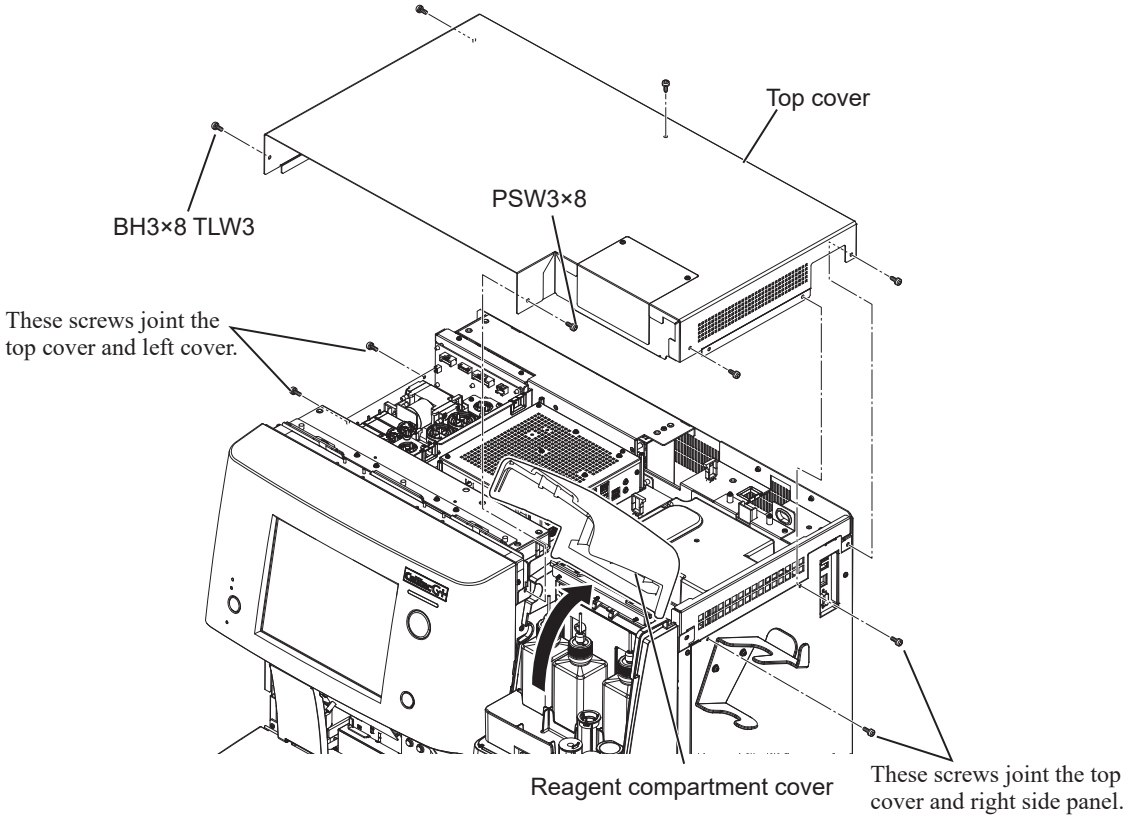
5 Remove the BH3×8 TLW3 screw and BH3×8 screw.

6 Hold the right side of the front cover, move it a little to the right and pull it towards you to remove the front cover.

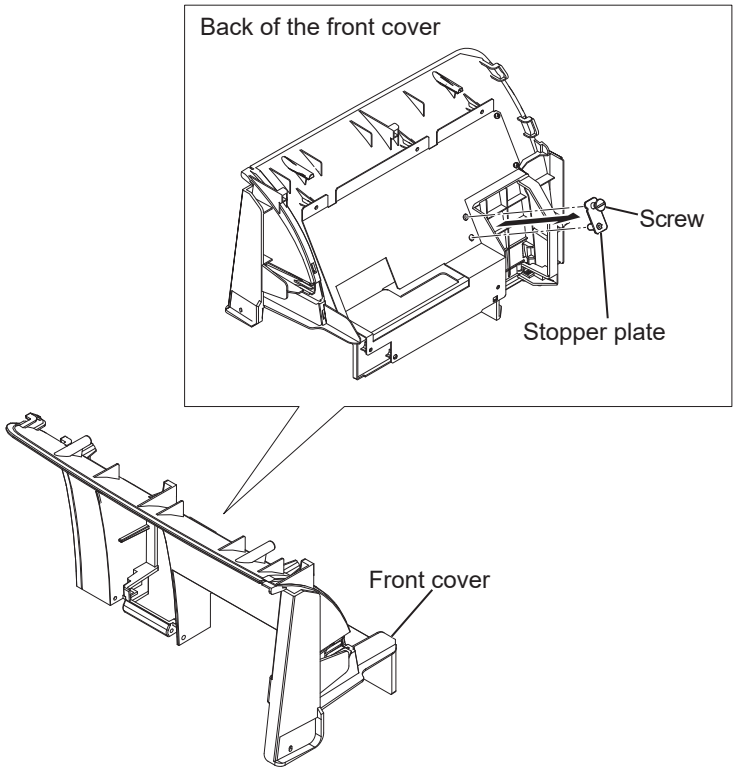


7 Open the reagent compartment cover in the direction of the arrow.

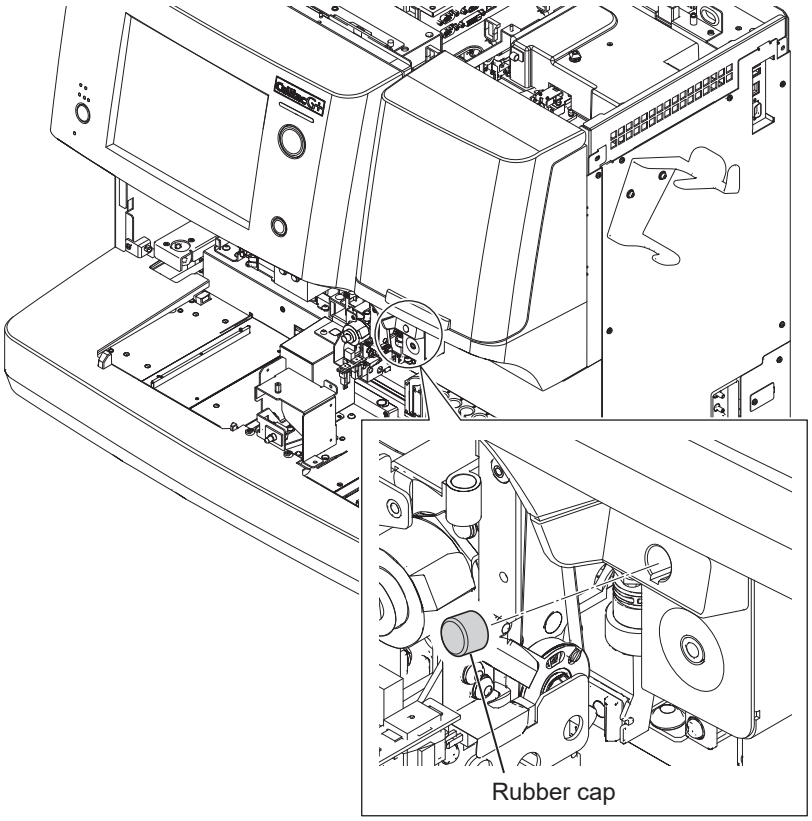
8 Remove the nine BH3×8 TLW3 screws and one PSW3×8 screw and remove the top cover.



9 Loosen the screw from the back of the removed front cover and remove the stopper plate.



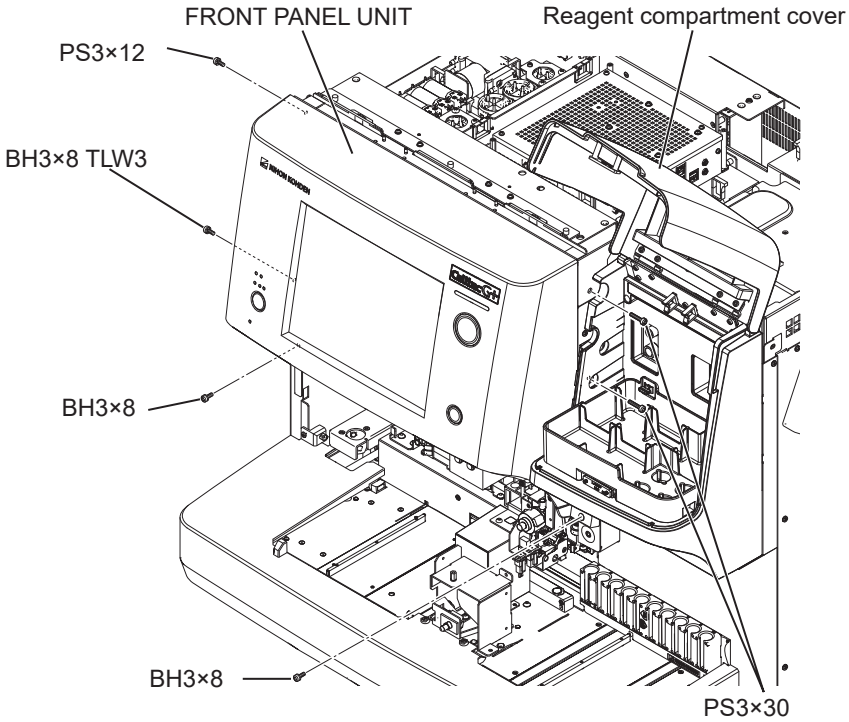
10 Remove the rubber cap.



11 Open the reagent compartment cover and remove the two PS3×30 screws on the reagent compartment side.

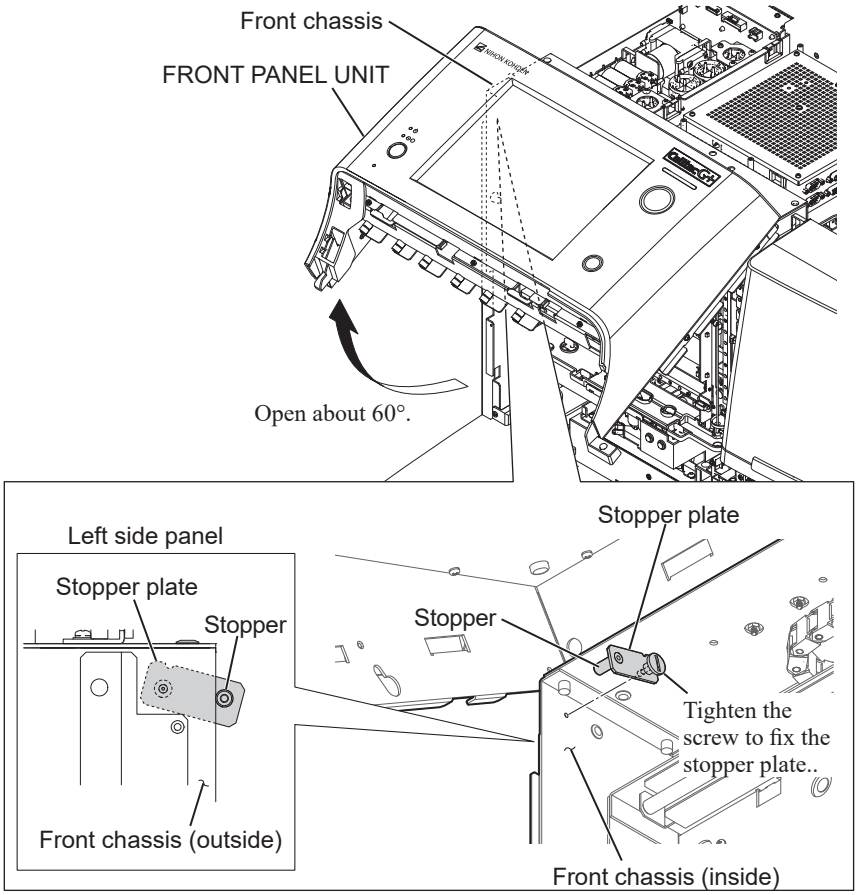
The two screws on the reagent compartment side can easily be removed by using the provided short Phillips screwdriver (option).

12 Remove the two BH3×8 screws, one BH3×8 TLW3 screw and one PS3×12 screw which secure the FRONT PANEL UNIT.

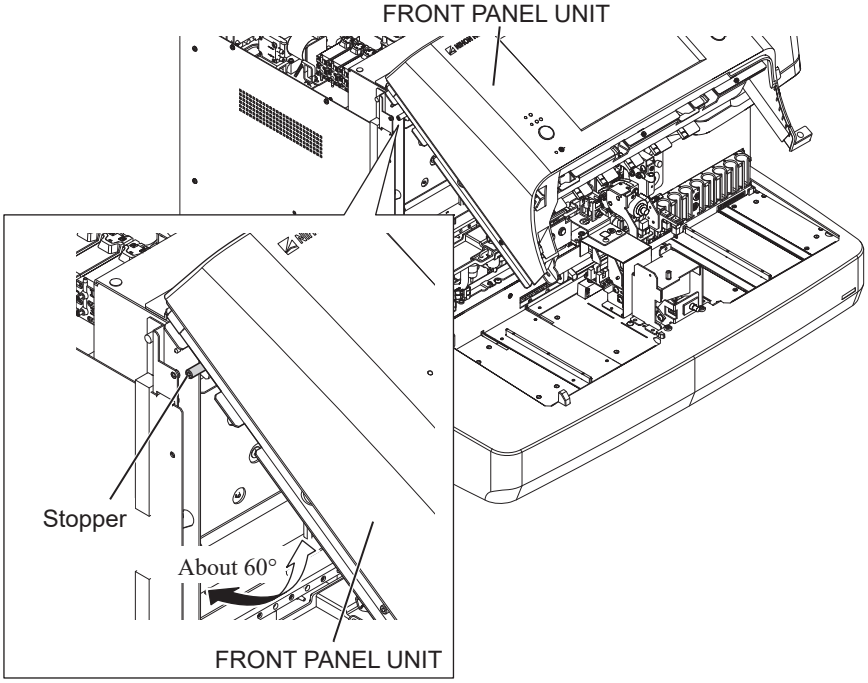


13 Open the FRONT PANEL UNIT about 60° and attach the stopper plate removed in the step **9** to the inside of the front chassis by tightening the screws.

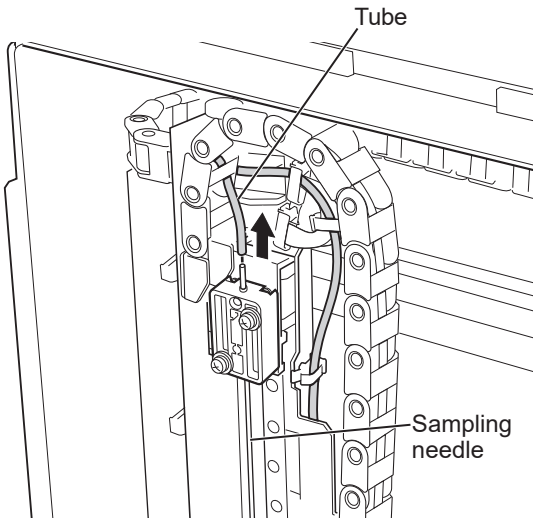
NOTE
- When attaching the stopper plate, attach it while supporting the FRONT PANEL UNIT with hand so that it does not close.
- Do not open the FRONT PANEL UNIT 90° or more. This may damage the analyzer.
- Fix the stopper plate so that stopper section sets outside of the front chassis.



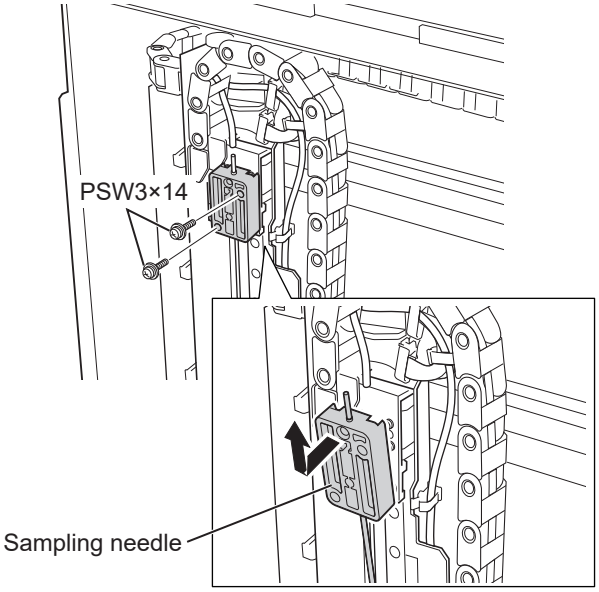
14 Hook the FRONT PANEL UNIT on the stopper of the stopper plate so that it keeps opened about 60°.



15 Remove the tube from the top of the sampling needle.

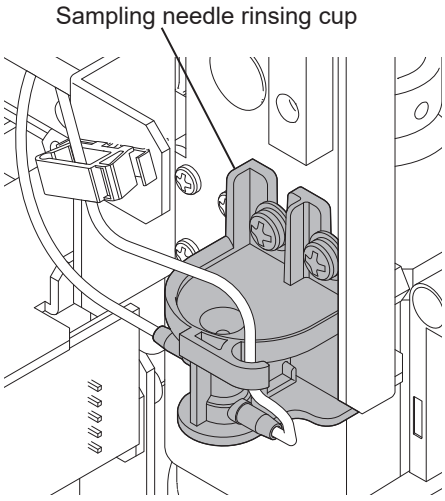


16 Remove the two PSW3×14 screws and remove the sampling needle.



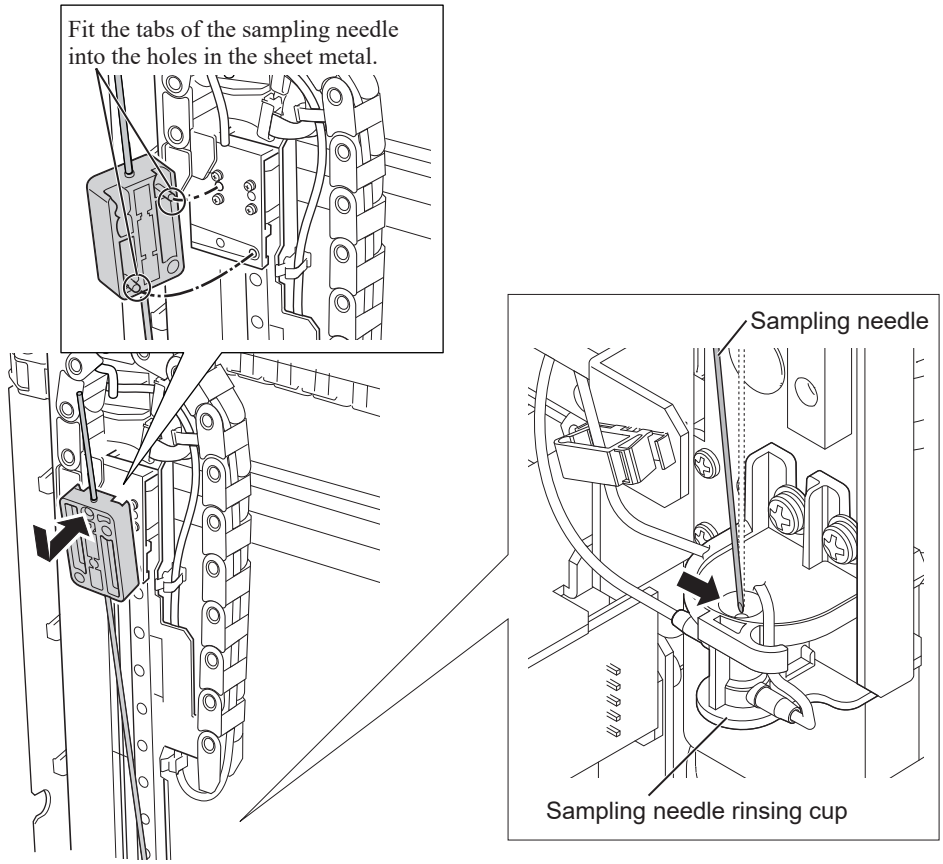
17 Clean the sampling needle rinsing cup.

Section 7-6-1-6 (p. 7-111)

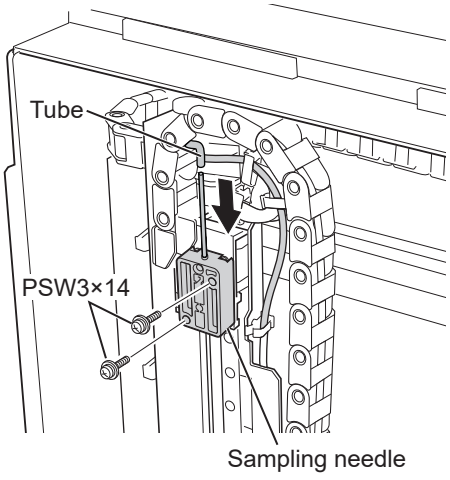


18 Insert the tip of the new sampling needle into the sampling needle rinsing cup and set the sampling needle.

NOTE: Be careful not to damage the tube or the sampling needle rinsing cup when inserting the sampling needle into the rinsing cup.



19 Fix the sampling needle with the two PSW3×14 screws removed in step **16** and connect the tube.



20 Do steps **4** to **14** in reverse order to return the analyzer to its original state.

21 Connect the power cord to the wall AC outlet and turn on the analyzer. Touch [No] on the Confirm Operation window to skip the self check.

Operator's Manual:"Turning On the Analyzer" in Section 5

22 Check that the analyzer message “21200 Maintenance part replacement status” is displayed on the Maintenance Log window and touch [RESTORE].

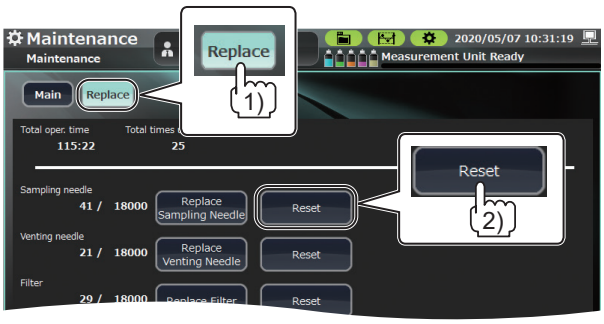
Section 3-4 (p. 3-11)

23 Reset the number of times the sampling needle is used.

1) Display the User Maintenance window and touch [Replace].

Section 7-2-1 (p. 7-4)

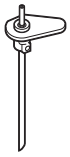
2) Touch [Reset] in Sampling needle.



24 Run the self check.

Section 7-2-6 (p. 7-13)

7-5-1-3. Replacing the Venting Needle



Venting needle
(Replacement part:
Release nozzle assy

Schedule: **Every 12,000 to 18,000 measurements**

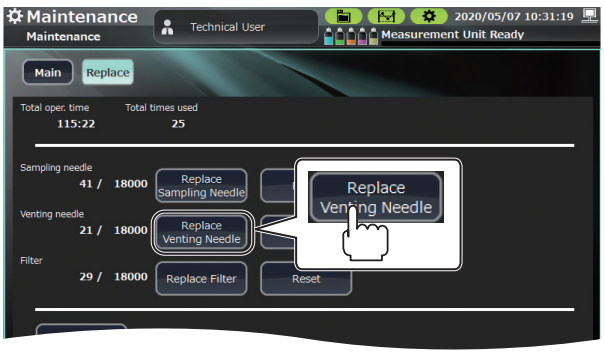
Replacement part: **Release nozzle assy (supply code: T449C)**

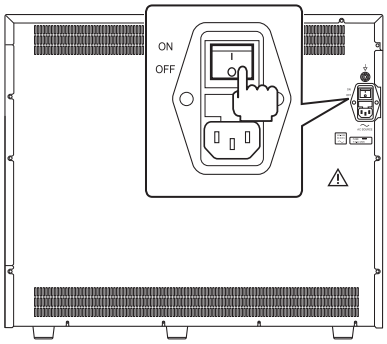
NOTE: Keep the screws that were removed during the replacement for reuse.

1 Open the User Maintenance window and touch [Replace].

Section 7-2-1 (p. 7-4)

2 Touch [Replace Venting Needle]. The venting needle and related fluid paths are drained and the power is automatically turned off.





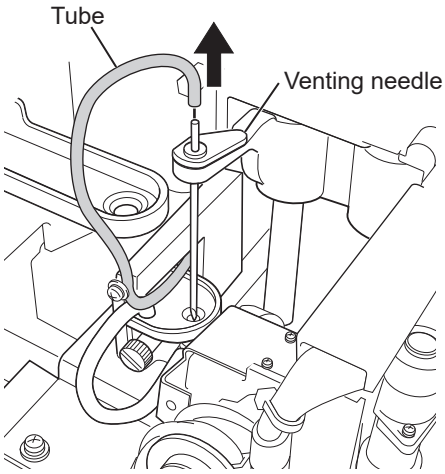
3 Turn off the Main power switch on the rear panel of the analyzer (to ○) and disconnect the power cord from the wall AC outlet.

4 Remove the mixing cover and front cover. Refer to steps **4** to **6** in "7-5-1-2. Replacing the Sampling Needle".

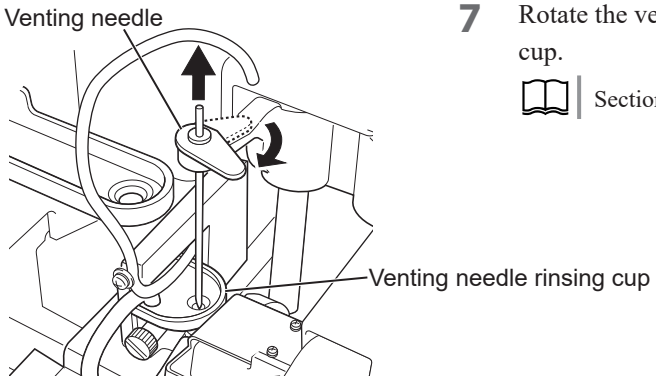
Section 7-5-1-2 (p. 7-84)

5 Keep the FRONT PANEL UNIT opened about 60°. Refer to steps **7** to **14** in "7-5-1-2. Replacing the Sampling Needle".

Section 7-5-1-2 (p. 7-84)

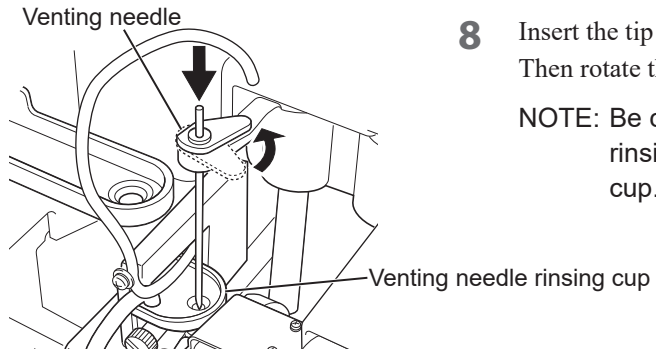


6 Remove the tube from the top of the venting needle.



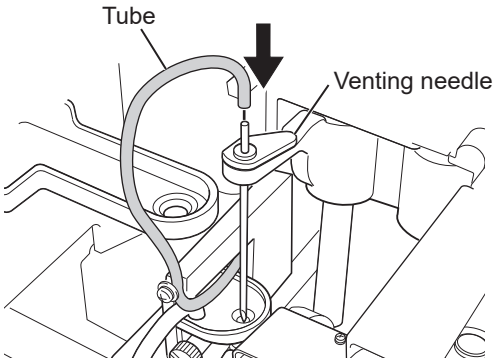
7 Rotate the venting needle to remove it and clean the venting needle rinsing cup.

Section 7-6-1-7 (p. 7-112)



8 Insert the tip of the new venting needle into the venting needle rinsing cup. Then rotate the venting needle to fix it in place.

NOTE: Be careful not to damage the tube or the venting needle rinsing cup when inserting the venting needle into the rinsing cup.



9 Connect the tube to the top of the venting needle.

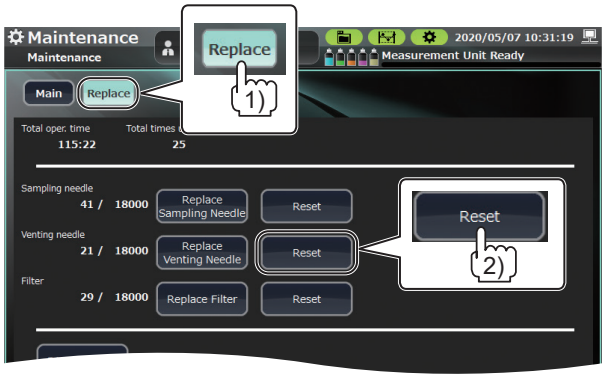
10 Do steps **4** to **6** in reverse order to return the analyzer to its original state.

11 Connect the power cord to the wall AC outlet and turn on the analyzer. Touch [No] on the Confirm Operation window to skip the self check.

Operator's Manual:
"Turning On the Analyzer" in Section 5

12 Check that the analyzer message "21200 Maintenance part replacement status" appears and touch [RESTORE] on the Maintenance Log window.

Section 3-4 (p. 3-11)



13 Reset the number of times the venting needle is used.

1) Display the User Maintenance window and touch [Replace].

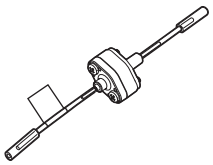
Section 7-2-1 (p. 7-4)

2) Touch [Reset] in Venting needle.

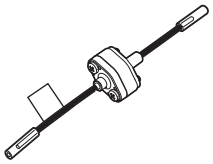
14 Run the self check.

Section 7-2-6 (p. 7-13)

7-5-1-4. Replacing the Filters



WBC filter: 2 pcs
(Replacement part:
WBC filter assy)



RET filter: 1 pc
(Replacement part:
RET filter assy)

Hemoglobin filter: 4 pcs
(Replacement part:
Hemoglobin filter assy)

Replace the 2 WBC filters, 1 RET filter and 4 hemoglobin filters at the same time.

Schedule: **Every 12,000 to 18,000 measurements**

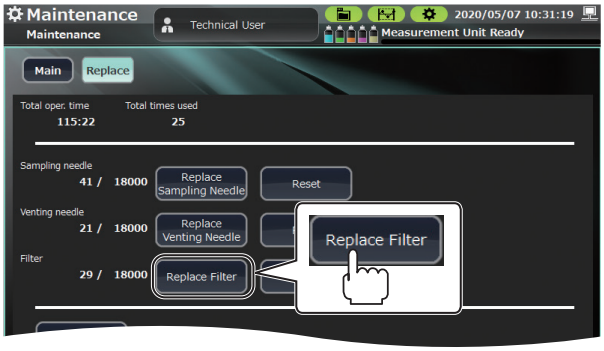
Replacement parts: **WBC filter assy (Supply code: T802A), 2 pcs**
RET filter assy (YZ-011B1), 1 pc
Hemoglobin filter assy (Supply code: T802), 4 pcs

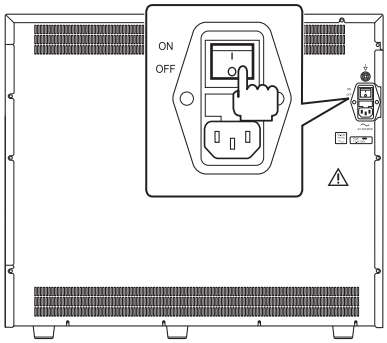
NOTE: Keep the screws that were removed during the replacement for reuse.

1 Open the User Maintenance window and touch [Replace].

Section 7-2-1 (p. 7-4)

2 Touch [Replace Filter]. The filter and related fluid paths are drained and the power is automatically turned off.

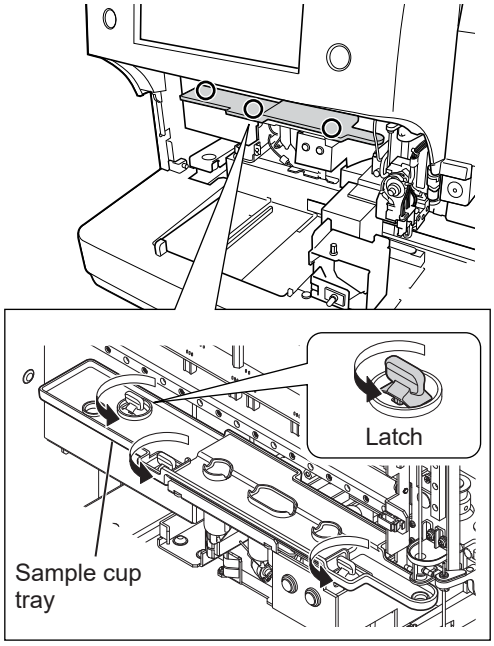




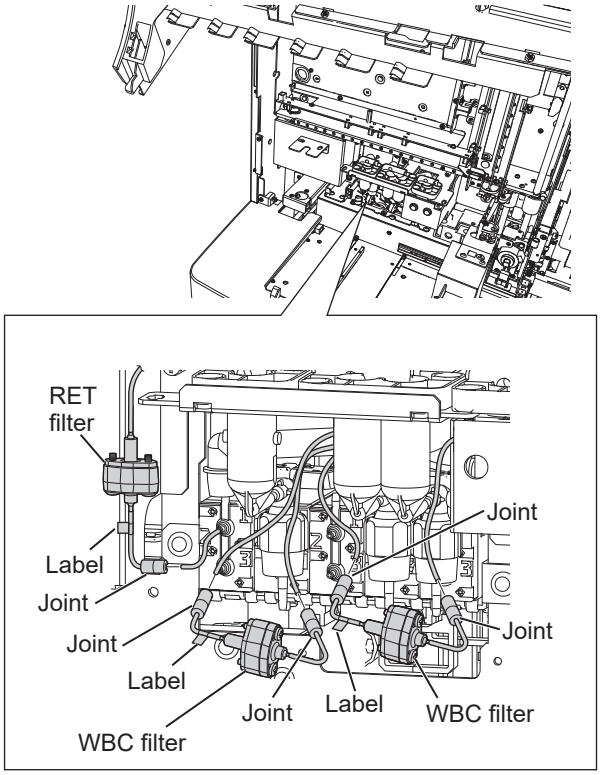
3 Turn off the Main power switch on the rear panel of the analyzer (to ◯) and disconnect the power cord from the wall AC outlet.

4 Remove the mixing cover and front cover. Refer to steps **4** to **6** in "7-5-1-2. Replacing the Sampling Needle".

Section 7-5-1-2 (p. 7-84)

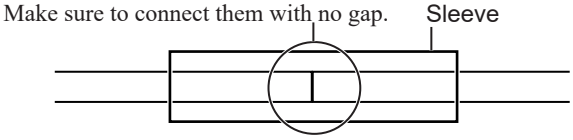


5 Turn the three latches counter-clockwise and remove the sample cup tray.



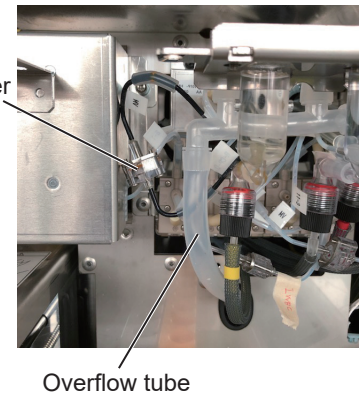
6 Remove the two WBC filters and the RET filter together with the sleeves and replace the filters with new ones.

NOTE • Connect the new filters firmly to prevent gaps inside the sleeves.



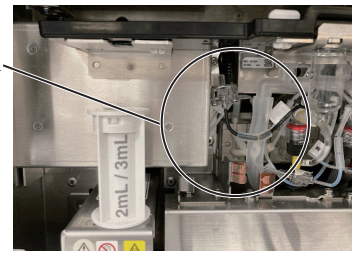
- Connect the label sides of the WBC filters and RET filter to the electromagnetic valve. Be careful not to connect the filters to a different electromagnetic valve.
- Set the RET filter behind the overflow tube. Otherwise leakage may occur and the analyzer may break.

Good example

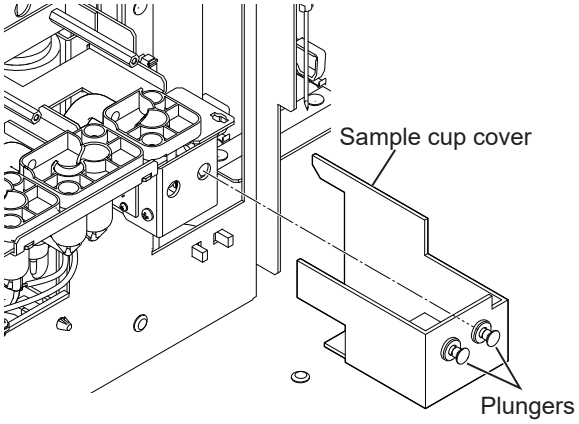


Wrong example

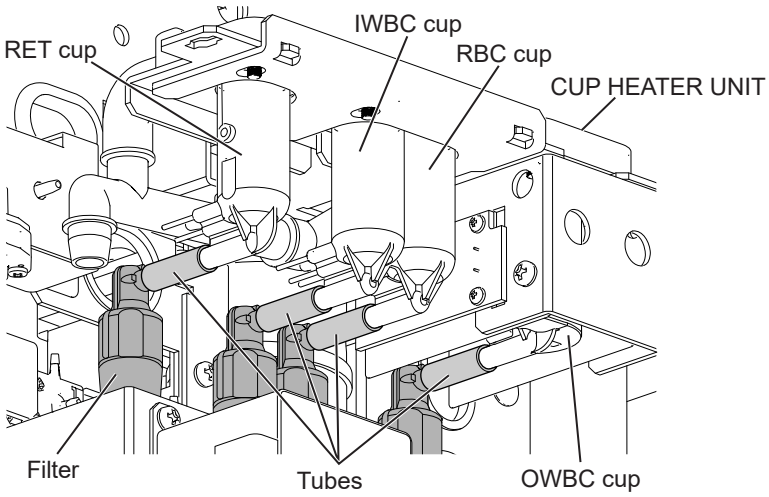
Rearrange the RET filter if it is in front of the overflow tube even if the FG cover can be closed.

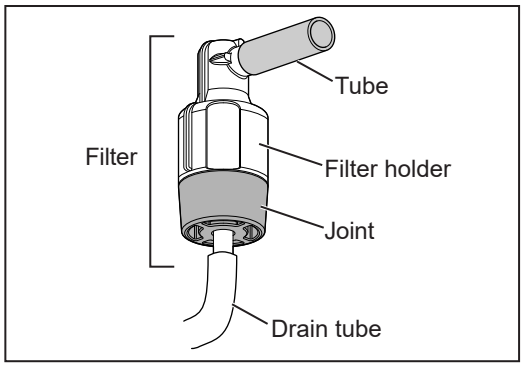


7 Pull the two plungers toward you and remove the sample cup cover.



8 Disconnect the tubes from the RET cup, IWBC cup, RBC cup and OWBC cup and pull the four filters toward you.



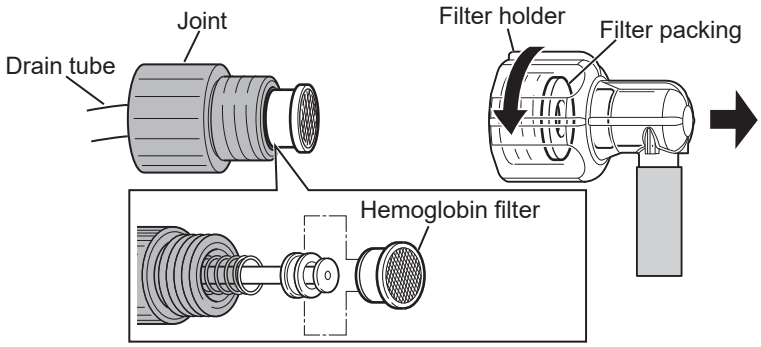


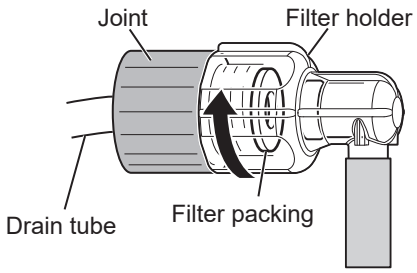
9 Rotate the filter holder and remove the filter holder from the joint.

NOTE: Be careful not to bend or kink the drain tubes.

10 Pull out the four hemoglobin filters and replace them with new ones.

When the filter packing is extremely dirty, deformed or scratched, replace it with new filter packing.





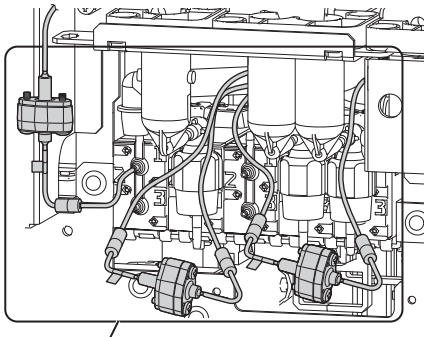
11 Rotate the filter holder and attach the filter holder to the joint.

NOTE
- When inserting the filter into the filter holder, be careful not to break or bend the internal filter packing.
- Make sure the filter fits into the packing and the filter holder and joint are securely tightened.
- If there is a leak, check that there are no scratches or cracks around the filter and reattach the joint.
- Be careful not to bend or kink the drain tube.

12 Attach the filters to each sample cup (RET cup, IWBC cup, RBC cup and OWBC cup) and return them to their original states.

Attach the filters to the correct sample cups. The color of each drain tube is as follows and same colored tape is attached to the tube.

- Yellow drain tube and tape: For the RET cup
- Clear drain tube without tape: For the IWBC cup
- Red drain tube and tape: For the RBC cup
- White drain tube and tape: For the OWBC cup



Check that the tubes are not bent or kinked.

13 Store the tubes in the analyzer and check that the tubes are not bent and kinked.

NOTE: Store the tubes in a location which does not interfere with the rack when the rack is moved.

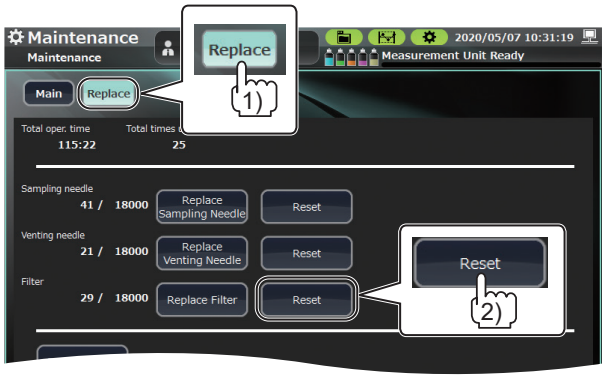
14 Attach the mixing cover and front cover to put the analyzer back to its original state.

15 Connect the power cord to the wall AC outlet and turn on the analyzer. Touch [No] on the Confirm Operation window to skip the self check.

Operator's Manual: "Turning On the Analyzer" in Section 5

16 Check that the analyzer message "21200 Maintenance part replacement status" appears and touch [RESTORE] on the Maintenance Log window.

Section 3-4 (p. 3-11)



17 Reset the number of times the filter is used.

1) Display the User Maintenance window and touch [Replace].

Section 7-2-1 (p. 7-4)

2) Touch [Reset] in Filter.

18 Run the self check.

Section 7-2-6 (p. 7-13)

7-5-1-5. Replacing the Relief Valve Tube Assy

When replacing the relief valve of the analyzer, replace the relief valve tube ASSY.

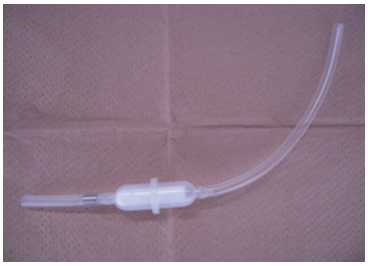
Schedule: **Around every 1 year**

Maintenance item: **Valve for MP-910W Rev. AE or later (Repair Part No. : RPA-6114936370)**

Required tools: Driver, nipper

Required part: Cable tie

NOTE
- Calibration is not required.
- If the analyzer is connected to the LIS system, the External Output settings do not have to be changed.
- Measure the hematology control and check that the analyzer operates properly after replacement.



Relief Valve Tube Assy (Valve for MP-910W Rev.AE or later)
(Repair Part No. : RPA-6114936370)

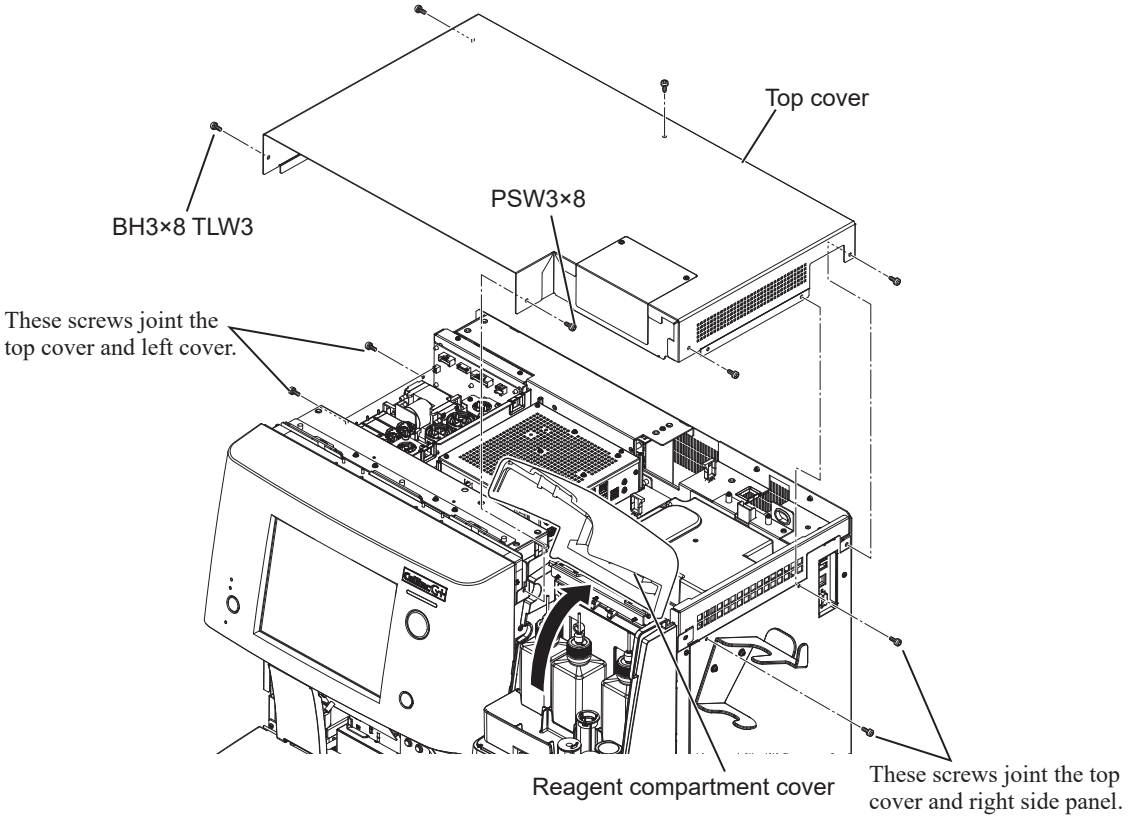
Replacement Procedure

1 Press and hold the Reset button and press the power switch to shut down the analyzer.

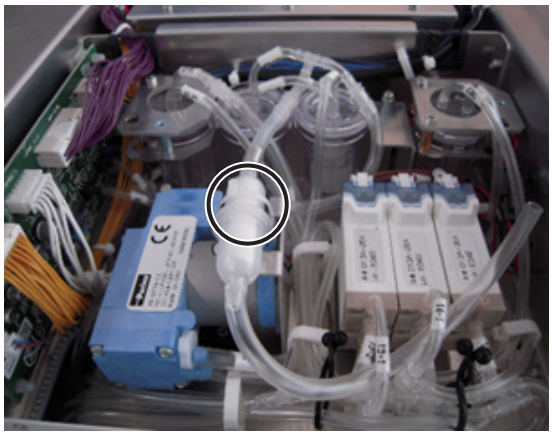
2 Disconnect the power cord from the wall AC outlet.

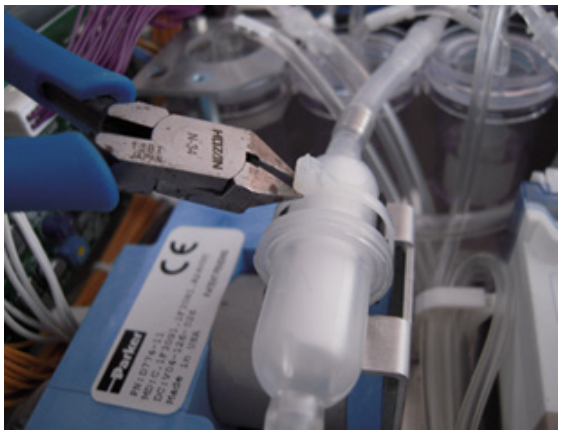
3 Open the reagent compartment cover in the direction of the arrow.

4 Remove the nine BH3×8 TLW3 screws and one PSW3×8 screw and remove the top cover.



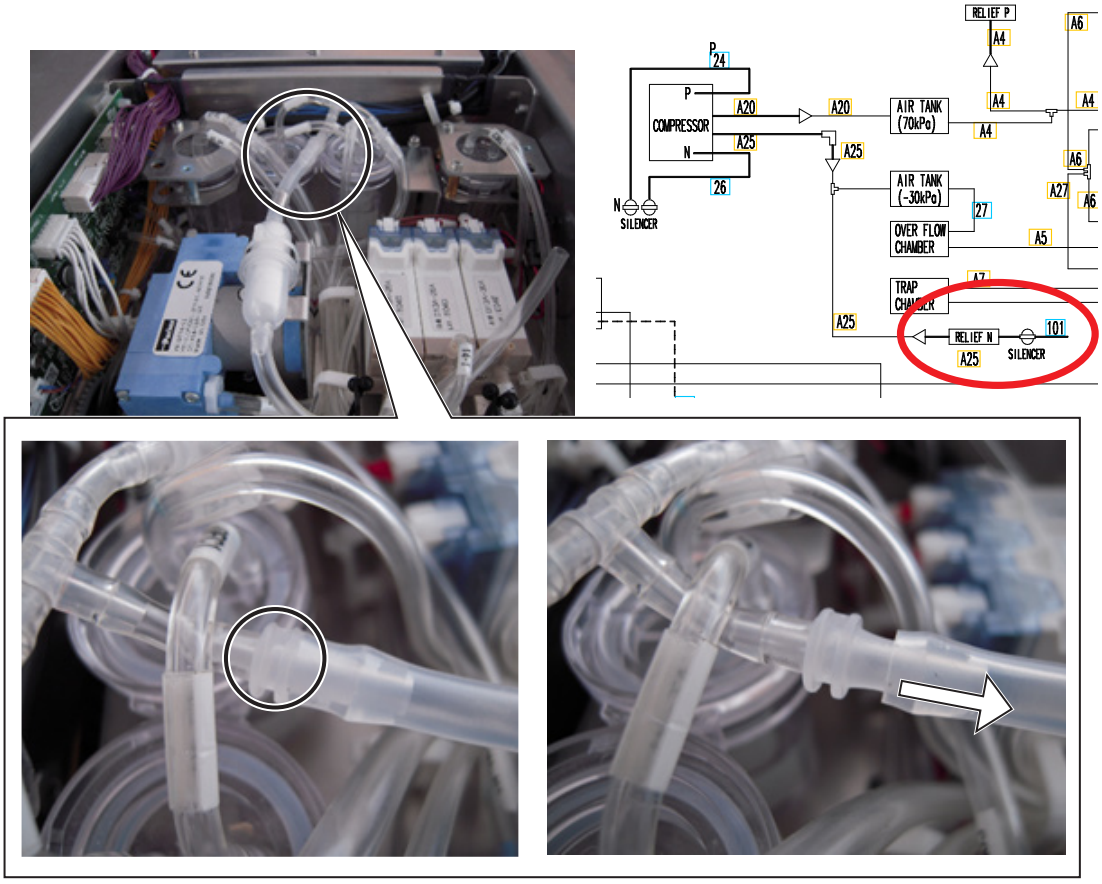
5 Cut the cable tie which secures the filter with a nipper.



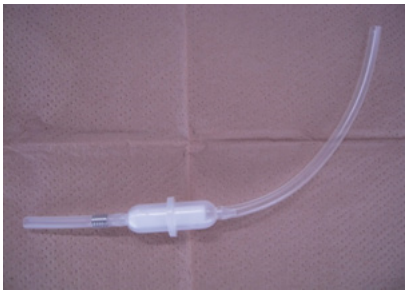


6 Remove the tube from the tube joint.

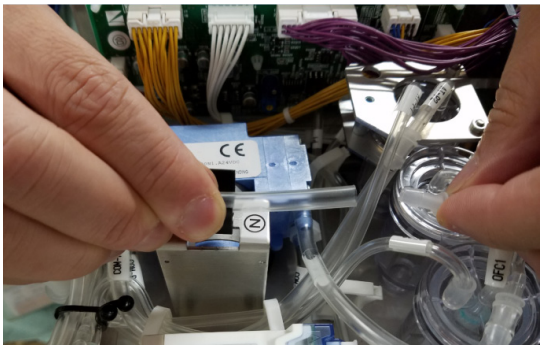
NOTE: When disconnecting the tube, be careful not to damage the tube joint.

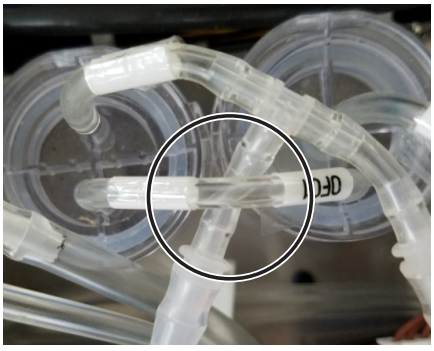


7 Replace the relief valve tube assy with a new one.

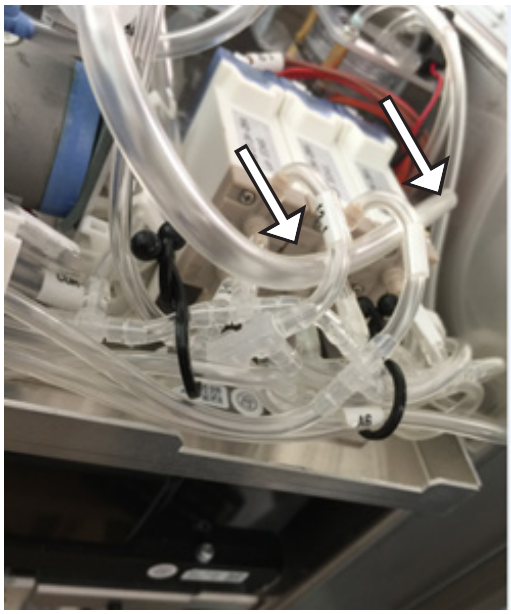


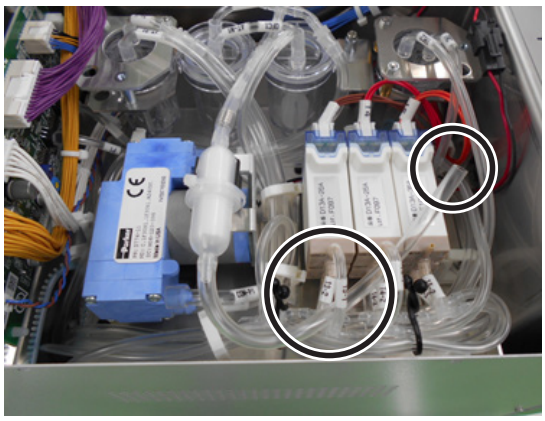
8 Pass the shorter side of the relief valve tube ASSY under the OFC1 tube and AT-N1 tube and connect it to the tube joint.



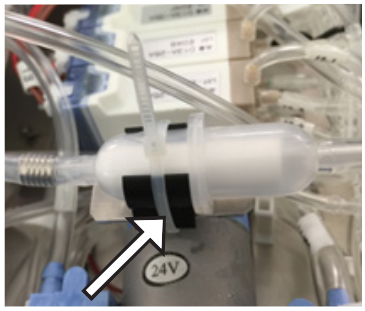


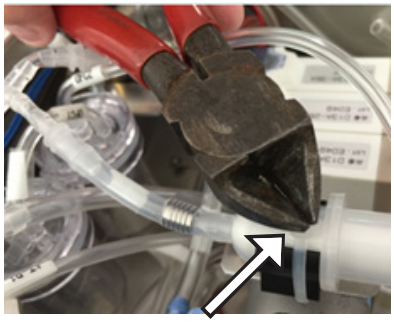
9 Pass the long end of the relief valve tube assy (Atmospheric pressure release side) under the tubes of the electromagnetic valves.





10 Attach the filter of the relief valve tube assy to the compressor heatsink and secure it with a cable tie. Cut off the excess length of the cable tie.



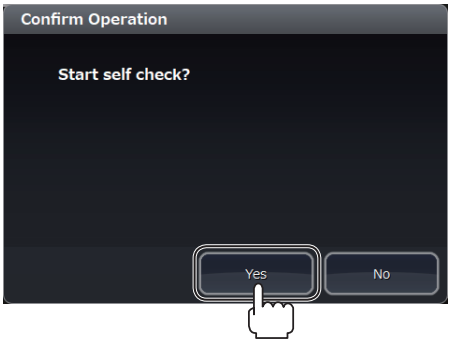


11 Attach the top cover with the ten screws that were removed in step **4**.

12 Connect the power cord to the wall AC outlet, turn on the analyzer and log in as a [Technical User].

When the Confirm Operation window is displayed, touch [Yes] to run the self check.

- Section 7-3-1 (p. 7-25)
- Section 7-2-6 (p. 7-13)



13 Perform a quality control measurement using a hematology control and check that the result is within the control range.

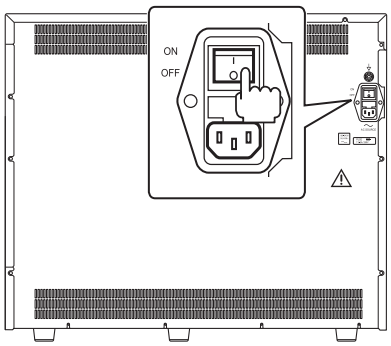
Operator's Manual: "Measuring the Hematology Control" in Section 6

7-5-1-6. Replacing the Fuses

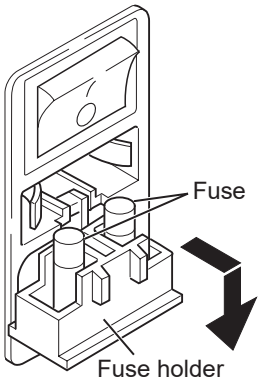
Maintenance item: Fuse. 021506.3mxp 6.3A
(Repair Part No. : RP-9000066197)

Replace the fuses

1 Turn off the Main power switch on the rear panel of the analyzer (to ○) and disconnect the power cord from the wall AC outlet.



2 Pull out the fuse holder, located between the Main power switch and Power socket, in the direction of the arrow.



3 Remove the fuses from the fuse holder and set new fuses.

7-5-1-7. Replacing Maintenance Parts in Batches

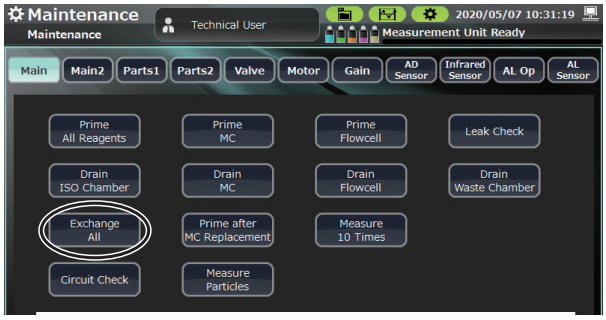
Do this when replacing five types of periodic replacement parts at the same time.

Maintenance items: **Sampling nozzle (supply code: YZ-011B2), 1 pc**
Release nozzle assy (supply code: T449C), 1 pc
WBC filter assy (supply code: T802A), 2 pcs
RET filter assy (supply code: YZ-011B1), 1 pc
Hemoglobin filter assy (Supply code: T802), 4 pcs

NOTE: Keep the screws that were removed during the replacement for reuse.

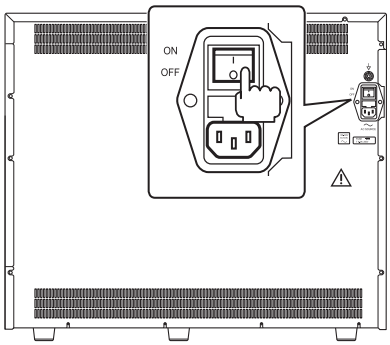
Replacement Procedure

1 Open the Service Maintenance window and touch [Exchange All].



2 When you touch [Yes] on the Confirm Operation window, the fluid paths related to the maintenance items are drained then the secondary power of the analyzer automatically turns off.

3 Turn off the Main power switch on the rear panel of the analyzer (to ○) and disconnect the power cord from the wall AC outlet.



4 Remove the mixing and front covers. Refer to steps **4** to **6** in "7-5-1-2. Replacing the Sampling Needle".

Section 7-5-1-2 (p. 7-84)

5 Check that the sample rotator for barcodes is clean. Clean it if necessary.

Check and clean sample rotator for barcodes
Section 7-6-1-8 (p. 7-112)

6 Replace the filter. Refer to step **5** to **13** in "7-5-1-4. Replacing the Filters".

Section 7-5-1-4 (p. 7-94)

7 Remove the top cover. Refer to step **7** and **8** in "7-5-1-2. Replacing the Sampling Needle". Then, open the FRONT PANEL UNIT about 60° and fix it with the provided stopper plate. Refer to steps **9** to **14** in "7-5-1-2. Replacing the Sampling Needle".

Section 7-5-1-2 (p. 7-84)

8 Check that the sample rotator for barcodes is clean. Clean it if necessary.

Check and clean sample rotator for barcodes

Section 7-6-1-8 (p. 7-112)

9 Replace the venting needle. Refer to steps **7** to **10** in "7-5-1-3. Replacing the Venting Needle".

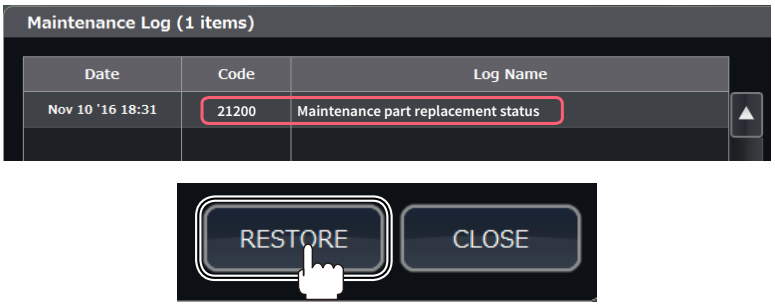
Section 7-5-1-3 (p. 7-91)

10 Do steps **15** to **19** in "7-5-1-2. Replacing the Sampling Needle", replace the sampling needle, do steps **4** to **14** in "7-5-1-2. Replacing the Sampling Needle" in reverse, and return the analyzer to its original state.

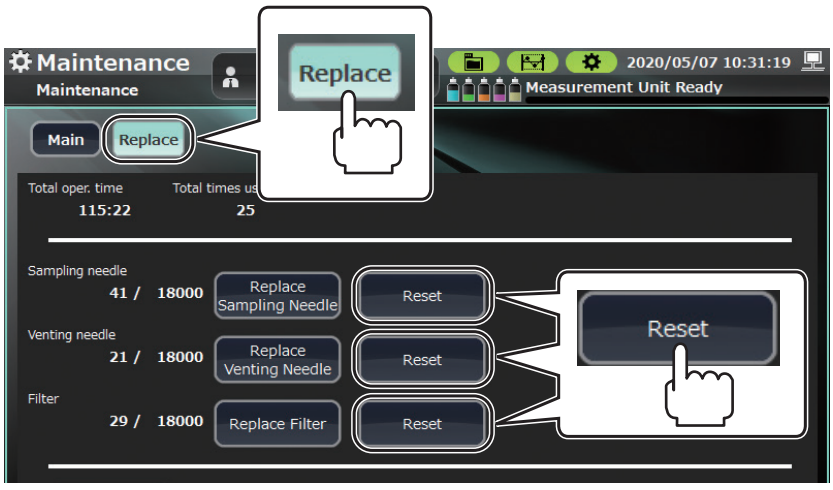
Section 7-5-1-2 (p. 7-84)

11 Connect the power cord to the wall AC outlet and turn on the analyzer. Touch [No] on the Confirm Operation window to skip the self check.

Check that "21200 Maintenance part replacement status" appears then touch [RESTORE] on the Maintenance Log window.



12 Open the User Maintenance window, touch [Replace], then reset the number of uses for each of the repair parts.



Touch the three [Reset] to reset the number of uses for each of the maintenance parts to 0.

13 Run the self check.

Section 7-2-6 (p. 7-13)

7-5-1-8. Checking the Operating State of the Consumables

Parts1

This window shows the operating time for the relevant consumables.

This is used as a reference for recommending the replacement of parts that have exceeded their lifespans.

1 Open the Service Maintenance window and touch [Parts1].

2 Check the operating state of the following consumables.

These are displayed in red when the operation limit is exceeded.

Part Name	Operation Limit	Notes
Analyzer operating time	—	—
Compressor operating time	3000:00	MP-910W
CPU fan operating time	40000:00	PC-920W
MO-910W operating time	45000:00	MO-910W
MO-920W operating time	45000:00	MO-920W

3 When replacing parts, set the operating time to 0 in the popup window displayed by touching operating time.

Parts2

This window shows the number of uses for the relevant components.

This is used as a reference for recommending the replacement of parts that have exceeded their lifespans.

1 Open the Service Maintenance window and touch [Parts2].

2 The operating state of the following consumables can be checked and the operation limit can be edited.

These are displayed in red when the operation limit of the part is exceeded and in yellow when the operation limit has exceeded 80%.

Part Name	Operation Limit
Sampling needle	18000
Venting needle	18000
Filter	18000
Electromagnetic valve 1A	1200000
Electromagnetic valve 1B	1200000
Electromagnetic valve 2A	1200000
Electromagnetic valve 2B	1200000
Electromagnetic valve 3A	1200000
Electromagnetic valve 3B	1200000
Electromagnetic valve 4A	1200000
Electromagnetic valve 4B	1200000
Electromagnetic valve 5A	1200000
Electromagnetic valve 5B	1200000
Electromagnetic valve 6A	1200000
Electromagnetic valve 6B	1200000
Electromagnetic valve 7A	1200000
Electromagnetic valve 7B	1200000
Electromagnetic valve 8A	1200000
Electromagnetic valve 8B	1200000
Electromagnetic valve 9A	1200000
Electromagnetic valve 9B	1200000
Electromagnetic valve 10A	1200000
Electromagnetic valve 10B	1200000
Electromagnetic valve 11A	1200000
Electromagnetic valve 11B	1200000
Electromagnetic valve 12A	1200000
Electromagnetic valve 12B	1200000
Electromagnetic valve 13A	1200000
Electromagnetic valve 13B	1200000
Electromagnetic valve 14A	1200000
Electromagnetic valve 14B	1200000

Part Name	Operation Limit
Electromagnetic valve 15A	1200000
Electromagnetic valve 15B	1200000
Electromagnetic valve 16A	1200000
Electromagnetic valve 16B	1200000
Electromagnetic valve 17A	1200000
Electromagnetic valve 17B	1200000
Electromagnetic valve 18A	1200000
Electromagnetic valve 18B	1200000
Electromagnetic valve 19A	1200000
Electromagnetic valve 19B	1200000
Electromagnetic valve 20A	1200000
Electromagnetic valve 20B	1200000
Electromagnetic valve 21A	1200000
Electromagnetic valve 21B	1200000
Electromagnetic valve 22A	1200000
Electromagnetic valve 22B	1200000
Electromagnetic valve 23A	1200000
Electromagnetic valve 23B	1200000
Electromagnetic valve 24A	1200000
Electromagnetic valve 24B	1200000
Electromagnetic valve 25A	1200000
Electromagnetic valve 25B	1200000
Electromagnetic valve 26A	1200000
Electromagnetic valve 26B	1200000
Electromagnetic valve 27A	1200000
Electromagnetic valve 27B	1200000
Electromagnetic valve 28A	1200000
Electromagnetic valve 28B	1200000
Electromagnetic valve 29A	1200000
Electromagnetic valve 29B	1200000
Electromagnetic valve 30A	1200000

Part Name	Operation Limit
Electromagnetic valve 30B	1200000
Electromagnetic valve 31A	1200000
Electromagnetic valve 31B	1200000
Electromagnetic valve 32A	1200000
Electromagnetic valve 32B	1200000
Electromagnetic valve 33A	1200000
Electromagnetic valve 33B	1200000
Electromagnetic valve 34A	1200000
Electromagnetic valve 34B	1200000
Electromagnetic valve 35A	1200000
Electromagnetic valve 35B	1200000
PV1	1200000
PV2	1200000
PV3	1200000
PV4	1200000
PV5	1200000
DP_1ML (1)	240000
DP_1ML (2)	240000
DP_HEMO3	240000
DP_HEMO5	240000
DP_RET	240000
ISO pump	240000
WBC pump	120000
RBC pump	120000
SAMPLE pump	120000
SAMPLER-Y	480000
SAMPLER-X	120000
Venting	120000
AL agitation	480000
FL pump	120000
RET pump	120000

3 When replacing parts, set the operation counter to 0 in the popup window that is displayed by touching the operation counter.

7-5-2. Reagents

For information about the diluent, detergent and lysing reagent, refer to the package and manual provided with them.

7-5-3. Options

Refer to the manual provided with the options.

7-6. Cleaning and Disinfection

7-6-1. Analyzer

⚠ WARNING

- Be careful not to directly touch any place where blood sample is or may have contacted.
- Always wear rubber gloves to protect yourself from infection.

⚠ CAUTION

Before maintenance, perform cleaning, drain the cups, and turn off the analyzer main power and disconnect the power cord from the AC outlet. If the analyzer is lifted or tilted without cleaning and draining it, the liquid in the cups may spill and damage the electronic circuit or the operator may receive electrical shock. If maintenance is performed while the power is on, the operator may receive electrical shock or the analyzer may start unexpectedly when a key is pressed.

NOTE
- Clean and disinfect the analyzer by the following procedure.
- Wipe off moisture with a dry cloth and thoroughly dry the analyzer before use.
- When using a flammable solvent such as ethanol for cleaning and disinfecting, ventilate the room adequately.

7-6-1-1. Cleaning the Surface of the Analyzer

Cleaning schedule: At least once a month

Wipe the surface with a soft cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C (59°F)), neutral detergent diluted with water, or isopropyl alcohol (concentration: 70 vol%). After cleaning, dry it completely.

Wipe the LCD display with a soft dry cloth.

NOTE
- Do not use volatile liquids such as thinner, benzine or bleach. These will cause the plastic surface to melt or crack.
- If you use a wet cloth with water (or detergent), wring the cloth well to prevent the liquid from spilling into the analyzer.
- Note that disinfecting ethanol or detergent that spills into the analyzer through the gap at the edge of the display may cause a failure.

7-6-1-2. Disinfecting the Surface of the Analyzer

Disinfecting schedule: When an infectious substance (blood) is present on the surface of the analyzer or when the analyzer is moved to another facility.

Wipe the surface with a soft cloth moistened with disinfecting ethanol (Concentration: 76.9 to 81.4 vol% at 15°C (59°F)).

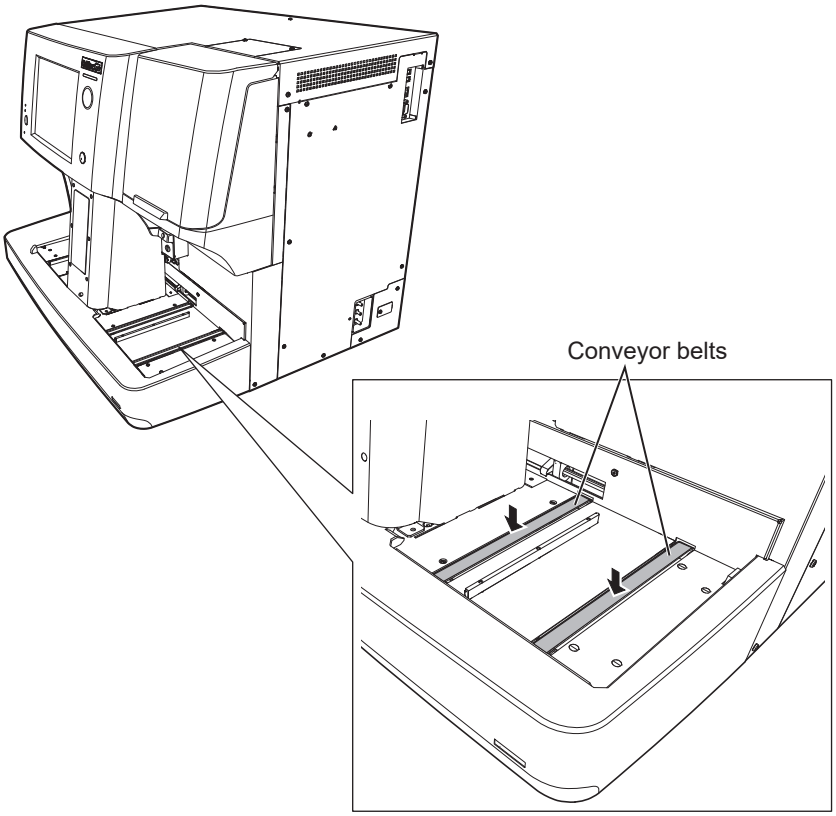
NOTE
- Use disinfectants in the correct concentration.
- Do not use volatile liquids such as thinner, benzine or bleach. These will cause the plastic surface to melt or crack.
- Wipe the analyzer thoroughly after disinfecting it with a sprayer.

7-6-1-3. Cleaning the Conveyor Belt

Cleaning schedule: When the conveyor belt is not clean

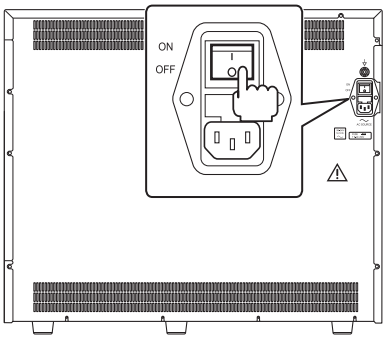
Wipe the conveyor belt with a soft cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C (59°F)), neutral detergent diluted with water, or isopropyl alcohol (concentration: 70 vol%). After cleaning, dry it completely.

NOTE
- Do not use volatile liquids such as thinner, benzine or bleach. These will cause the plastic surface to melt or crack.
- If you use a wet cloth with water (or detergent), wring the cloth well to prevent the liquid from spilling into the analyzer.
- Note that disinfecting ethanol or detergent that spills into the analyzer through the gap may cause a failure.



7-6-1-4. Cleaning the Rack Path

Cleaning schedule: When the rack path is not clean



1 Turn off the analyzer and switch off (to ◯) the main power on the rear of the analyzer.

Operator's Manual: "Turning Off the Analyzer" in Section 5

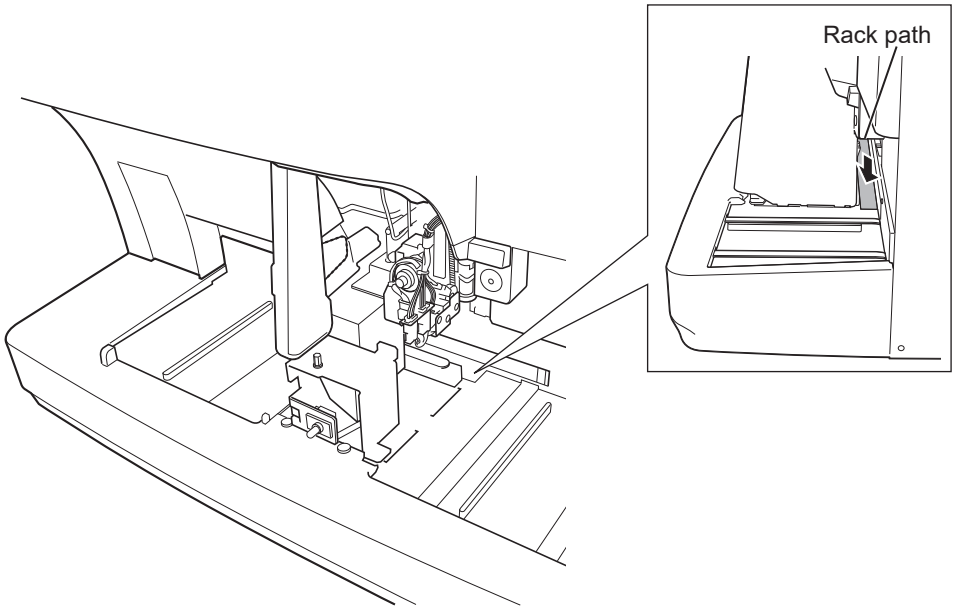
2 Disconnect the power cord from the wall AC outlet.

3 Remove the mixing cover. Refer to step **4** in "7-5-1-2. Replacing the Sampling Needle".

Section 7-5-1-2 (p. 7-84)

4 Wipe the rack path with a soft cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C (59°F)), neutral detergent diluted with water, or isopropyl alcohol (concentration: 70 vol%). After cleaning, dry it completely.

NOTE
- Do not use volatile liquids such as thinner, benzine or bleach. These will cause the plastic surface to melt or crack.
- If you use a wet cloth with water (or detergent), wring the cloth well to prevent the liquid from spilling into the analyzer.
- Note that disinfecting ethanol or detergent that spills into the analyzer through the gap may cause a failure.



5 Do steps **2** to **3** in reverse order to return the analyzer to its original state.

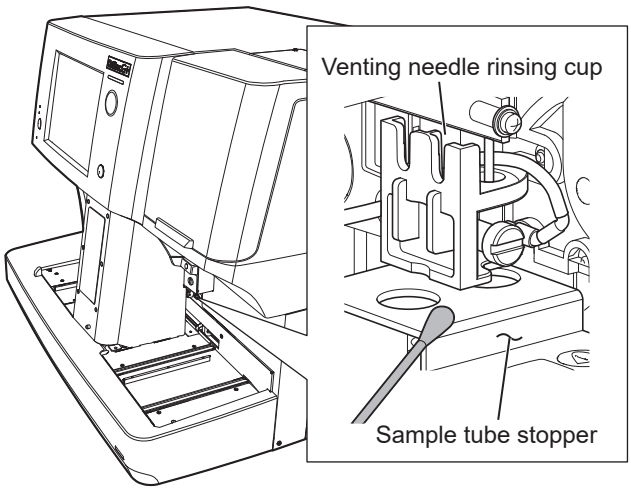
7-6-1-5. Cleaning the Sample Tube Stopper

Cleaning schedule: When the sample tube stopper is not clean

Check for dirt on the sample tube stopper.

Wipe off the dirt on the surface contacting the sample tubes using a cotton swab moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C (59°F)) or isopropyl alcohol (concentration: 70 vol%).

The sample tube stopper is located right below the venting needle rinsing cup. You do not need to remove any covers to clean the stopper.



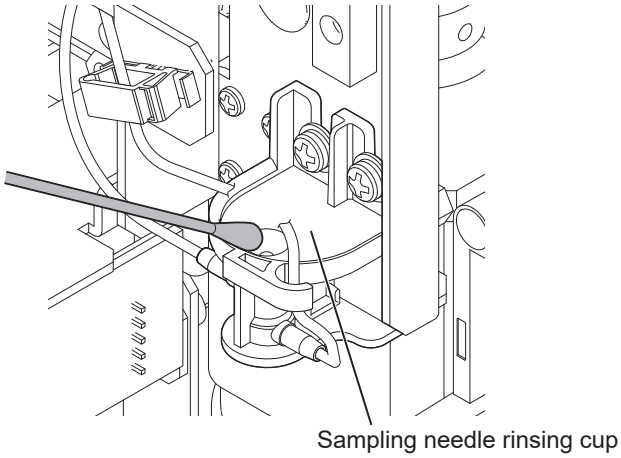
7-6-1-6. Cleaning the Sampling Needle Rinsing Cup

Cleaning schedule: When replacing the sampling needle

After removing the sampling needle, clean the sampling needle rinsing cup with a cotton swab as shown in the figure.

Section 7-5-1-2 (p. 7-84)

NOTE: Do not use disinfecting agents (disinfecting ethanol or isopropyl alcohol) when cleaning the sampling needle rinsing cup.



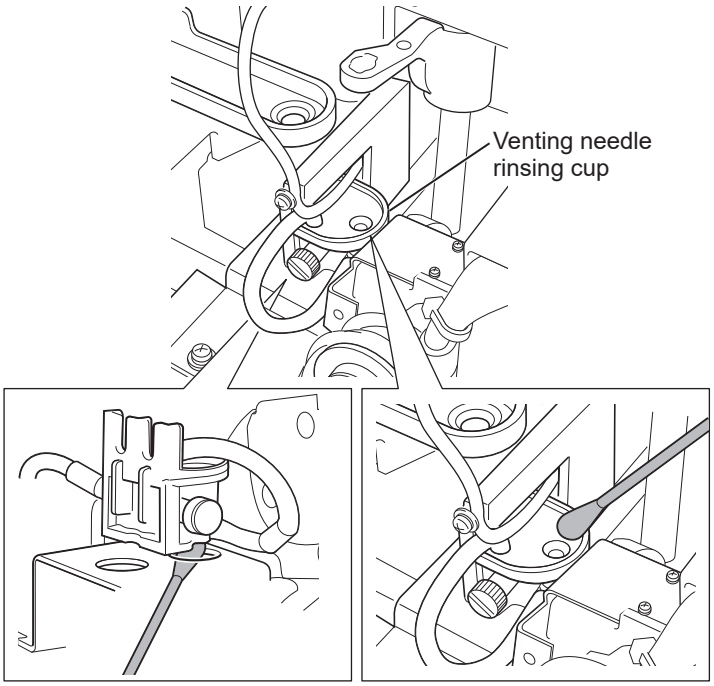
7-6-1-7. Cleaning the Venting Needle Rinsing Cup

Cleaning schedule: When replacing the venting needle

After removing the venting needle, clean the venting needle rinsing cup with a cotton swab as shown in the figure.

Section 7-5-1-3 (p. 7-91)

NOTE: Do not use disinfecting agents (disinfecting ethanol or isopropyl alcohol) when cleaning the venting needle rinsing cup.

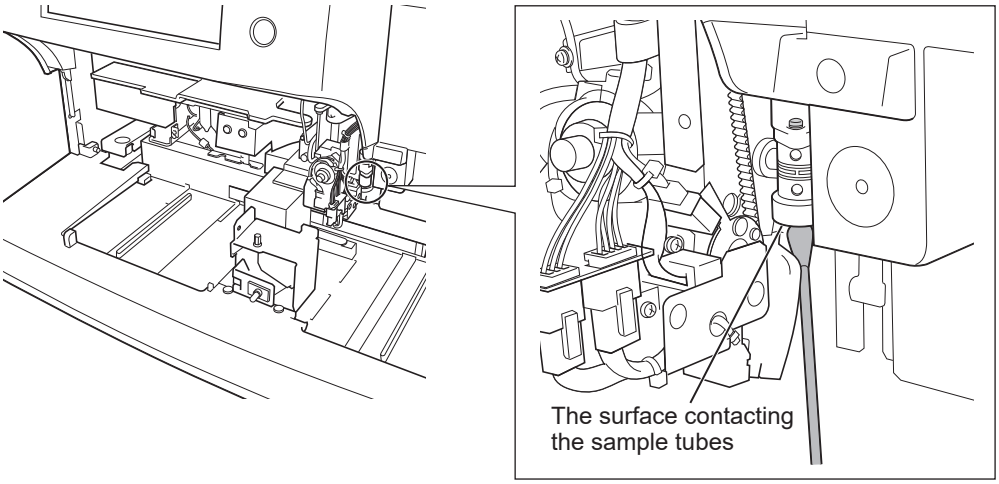


7-6-1-8. Cleaning the Sample Rotator for Barcodes

Cleaning schedule: When the sample rotator for barcodes is not clean (when replacing the sampling needle or the venting needle)

Check for dirt when replacing the sampling needle or the venting needle.

Wipe off the dirt on the surface contacting the sample tubes using a cotton swab moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C (59°F)) or isopropyl alcohol (concentration: 70 vol%).



7-6-1-9. Cleaning the Aperture Caps

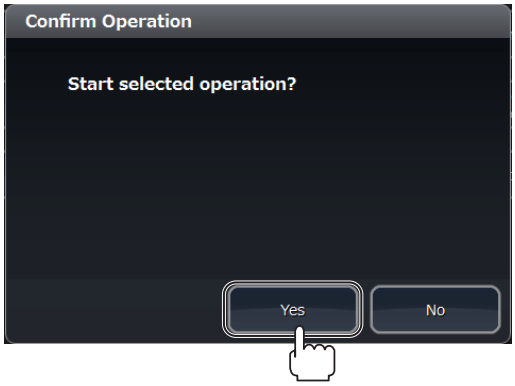
Cleaning schedule: When troubleshooting

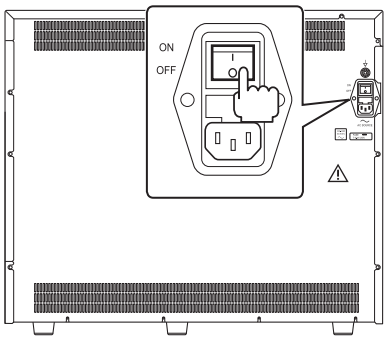
NOTE: Keep the screws that were removed during the cleaning for reuse.

1 Open the User Maintenance window and touch [Remove MC Aperture Clog].

Section 7-2-1 (p. 7-4)

2 Touch [Yes] on the Confirm Operation window. MC and related fluid path is drained and the power is automatically turned off.



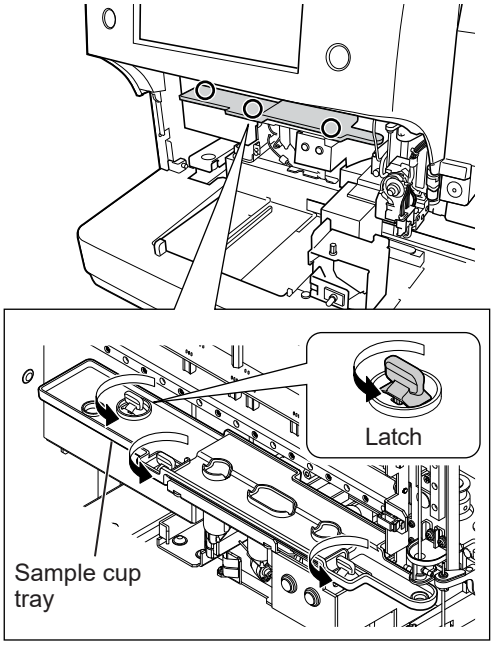


3 Turn off the Main power switch on the rear panel of the analyzer (to ○) and disconnect the power cord from the wall AC outlet.

4 Remove the mixing cover and front cover. Refer to steps **4** to **6** in "7-5-1-2. Replacing the Sampling Needle".

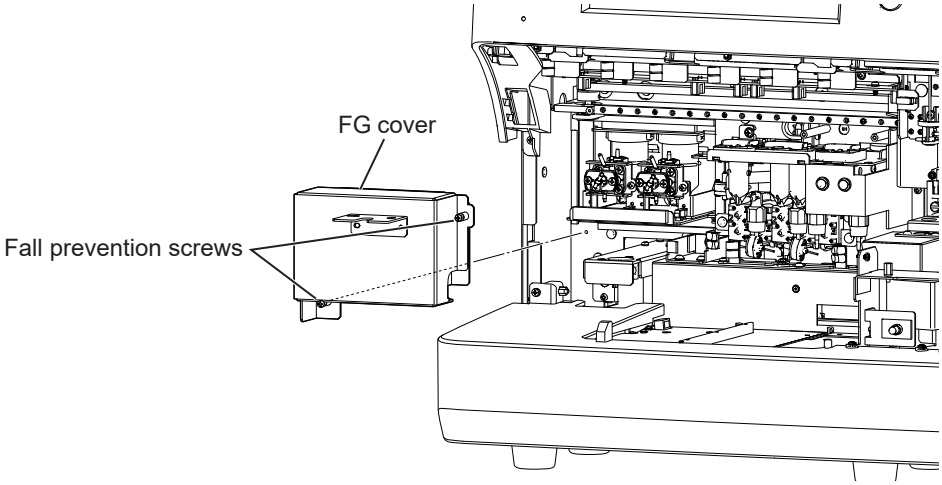
Section 7-5-1-2 (p. 7-84)

5 Turn the three latches counter-clockwise and remove the sample cup tray.

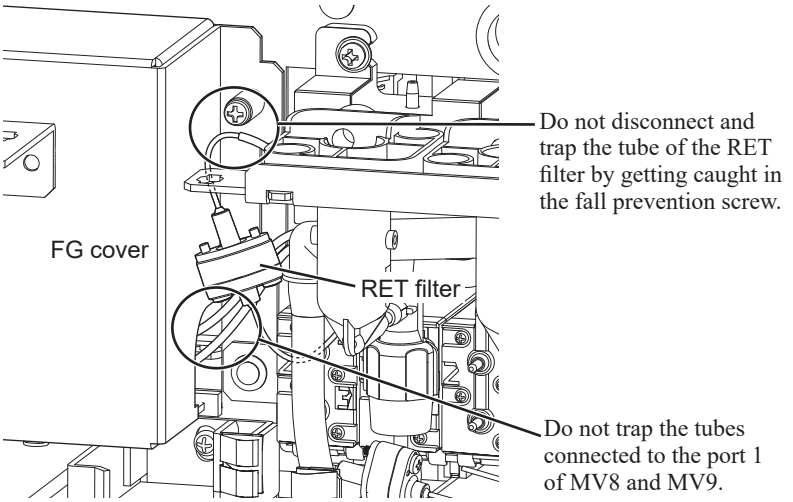


6 Loosen the two fall prevention screws, and remove the FG COVER by moving it upward and sliding it toward you.

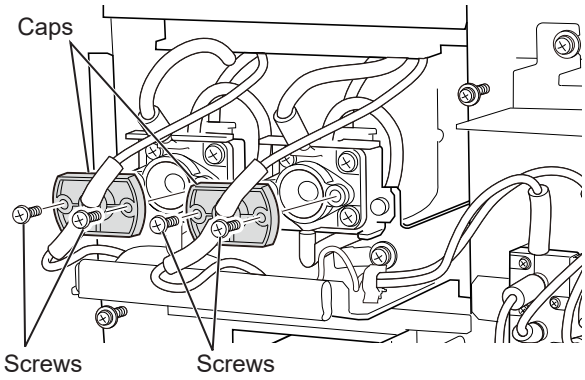
If the FG cover is hard to remove, loosen the washers on the rear of the screws and loosen the screws more.



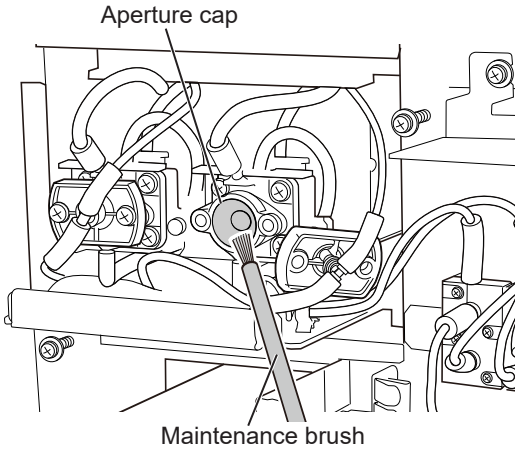
NOTE: When removing or attaching the FG cover, cover the RET filter with fingers so that the RET filter is not trapped.



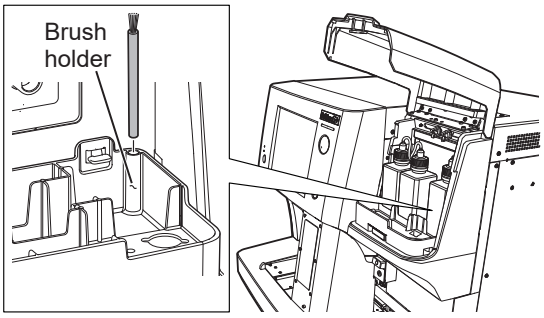
7 Remove the four screws to pull out the two caps.



8 Using the provided maintenance brush dipped in the CLEANAC•810 detergent, clean the both aperture caps by lightly tapping them.



- The provided maintenance brush is housed in the brush holder in the reagent container compartment.



- After cleaning the aperture caps, wash the brush well with tap water, fully dry the tip, and then insert it into the brush holder.

9 Do steps **4** to **7** in reverse order to return the analyzer to its original state.

10 Connect the power cord to the wall AC outlet and turn on the analyzer. Touch [No] on the Confirm Operation window to skip the self check.

Operator's Manual: "Turning On the Analyzer" in Section 5

11 Clean the MC chamber.

Section 7-2-2-4 (p. 7-8)

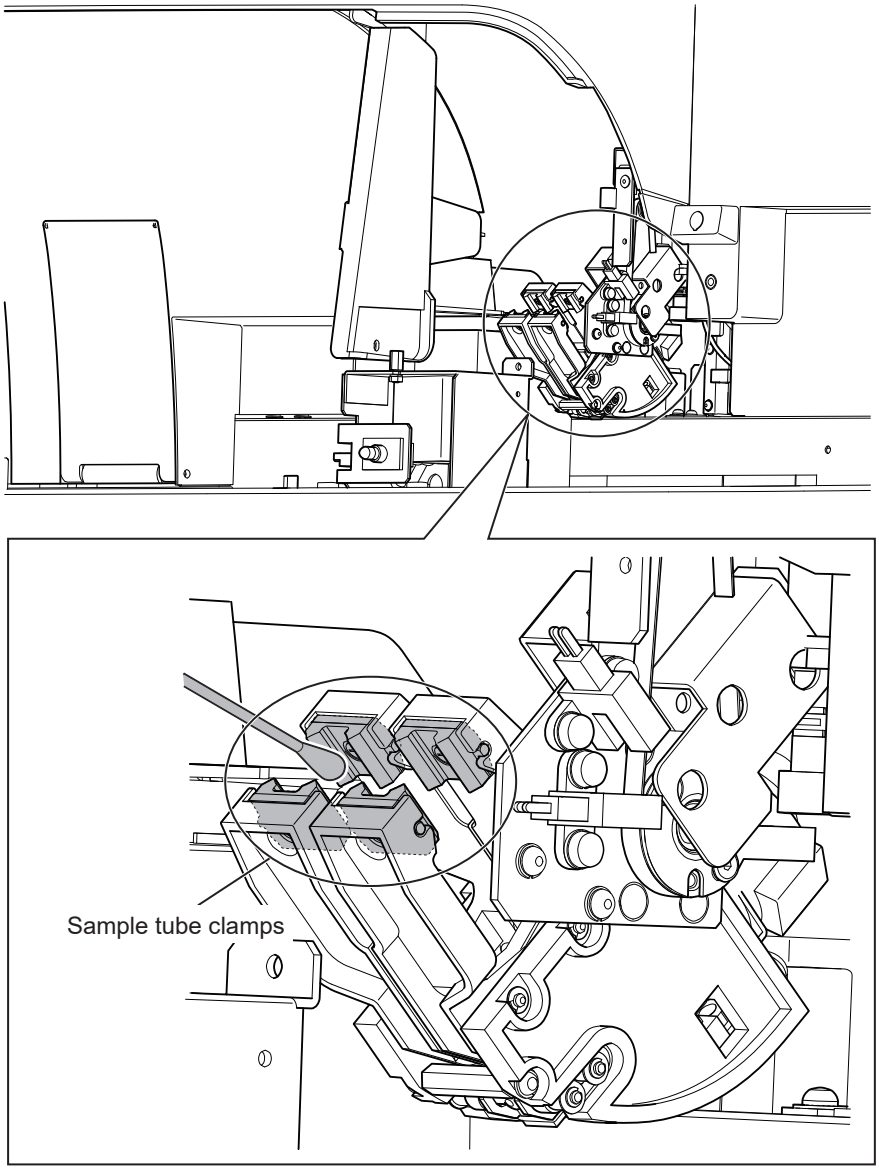
12 Run the self check.

Section 7-2-6 (p. 7-13)

7-6-1-10. Cleaning the Sample Tube Clamp

Cleaning schedule: When replacing a sampling needle, venting needle or filter

Check the sample tube clamps (part name: AL rubber clip). If they are dirty, clean them with a cotton swab.

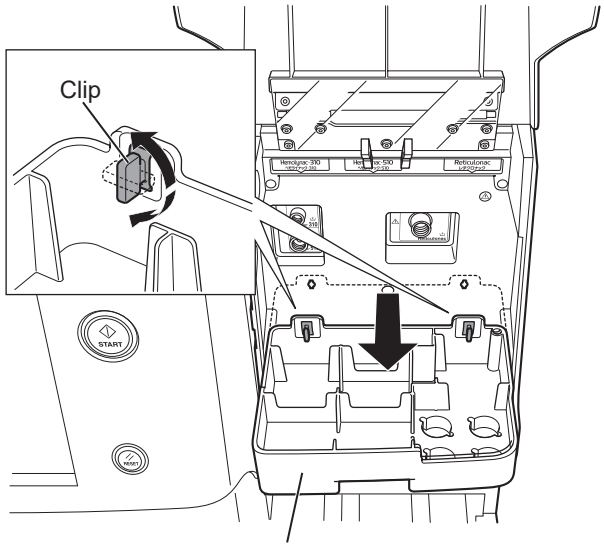


7-6-1-11. Cleaning the Reagent Tray

Cleaning schedule: When the reagent tray is dirty

1 Open the reagent compartment cover.

2 Turn the two latches 90° which secure the reagent tray and remove the tray.



Pull the tray forward and lift up the tray to remove it.

3 Wipe the reagent tray with a soft cloth moistened with disinfecting ethanol (concentration: 76.9 to 81.4 vol% at 15°C (59°F)), neutral detergent diluted with water, or isopropyl alcohol (concentration: 70 vol%). After cleaning, dry it completely.

NOTE
- Do not use bleach or organic solvents such as thinner or benzine. These chemicals may melt or crack the plastic surface.
- To avoid water getting into the equipment, wring water out of the cloth before wiping the reagent tray.
- If disinfecting ethanol or detergent spills into the analyzer through the gap at the edge of the display, it may cause a malfunction.

7-6-2. Cleaning the Rack

Cleaning schedule: When the rack is dirty

Wipe off the dirt on the rack with a soft cloth moistened with neutral detergent diluted with water.

After cleaning, dry it completely.

NOTE: When cleaning the rack, make sure to avoid peeling off the label (identification barcode) on the rack.

7-6-3. Options

Refer to the manual provided with the options.

7-7. Storage and Transport

7-7-1. Long Term Storage and Transport

> **⚠ CAUTION**
>
> Before moving the analyzer, do the following.
> - Perform cleaning and drain the cups. If the analyzer is lifted or tilted without cleaning and draining it, the liquid in the cups may spill and damage the electronic circuit or the operator may receive electrical shock.
> - Turn off the analyzer main power and disconnect the power cord from the AC outlet. If the analyzer is moved while the power is on, the operator may receive electrical shock or the analyzer may start unexpectedly when a key is pressed.

If any diluent remains inside the analyzer when transporting it or storing it for longer than one week, the inside of the analyzer will become dirty because of dried diluent crystals or other contaminants. This increases background noise. If the analyzer needs to be transported or to be stored for longer than one week, clean the inside by flushing the fluid path with distilled water and doing the Drain All operation.

1 Perform cleaning.

Section 7-2-2 (p. 7-5)

2 Remove the tubes connected to the diluent inlet, detergent inlet, lysing reagent inlet and stain inlet. Leave only the waste tube connected.

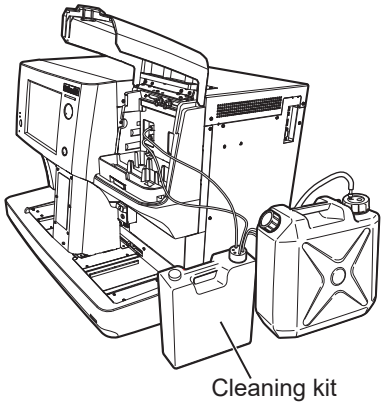
Operator's Manual:
"Connecting the Reagent and Waste Container" in Section 4

3 Perform the draining operation to completely drain all reagent from the inside of the analyzer.

Section 7-2-5 (p. 7-12)

4 Pour distilled water into the bottle of the cleaning kit and connect the tubes of the cleaning kit to the diluent inlet, detergent inlet, lysing reagent inlet and stain inlet.

The cleaning kit consists of a distilled water container and tubes.



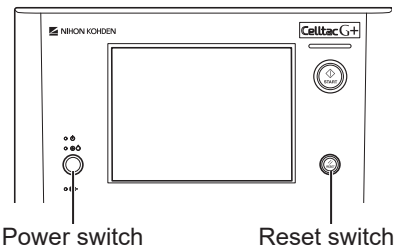
5 Perform priming on installation to fill the analyzer with distilled water.

When an analyzer message “21110 Analyzer internal draining status” appears on the Maintenance Log window, touch [RESTORE] to start priming on installation.

Section 7-2-4 (p. 7-11)

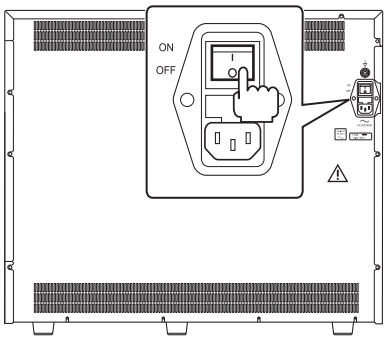
6 Repeat steps **2** to **3** to drain the analyzer of all the distilled water.

7 Remove the waste tube connected to the waste outlet.



8 Press and hold the Reset button and press the power switch to shut down the analyzer.

NOTE: Only shut down the analyzer in this manner when storing it for a long time. Shutting down the analyzer in this manner may affect the measurement data when turning on the power next time.



9 Switch off (to ◯) the main power on the rear of the analyzer.

10 Disconnect the power cord from the wall AC outlet and store or transport the analyzer.

Operator’s Manual: “Carrying the Analyzer” in Section 3

NOTE: When transporting the analyzer, attach the metal fitting for transport which was removed when the analyzer was installed.

7-7-1-1. Using the Analyzer After Long Term Storage

NOTE: When the analyzer is not used for a long time (longer than one week), the fluid path becomes dirty. Do the following operation to clean them.

1 Clean the aperture caps.

Section 7-6-1-9 (p. 7-113)

2 Turn the analyzer on.

Operator’s Manual: “Turning On the Analyzer” in Section 3

3 Perform priming on installation.

When an analyzer message “21110 Analyzer internal draining status” appears on the Maintenance Log window, touch [RESTORE] to start priming on installation.

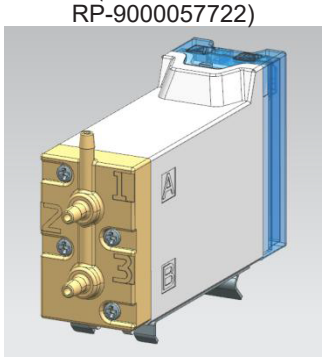
Section 7-2-4 (p. 7-11)

7-8. Electromagnetic Valve Maintenance

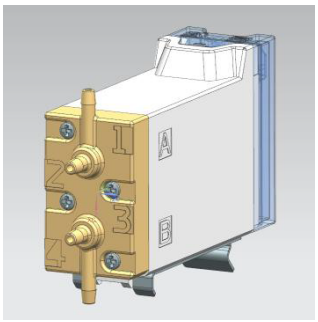
7-8-1. Electromagnetic Valve Structure

Appearance

3-way Valve D13A-35A
(Parts Code:
RP-9000057722)



2-way Valve D13A-25A
(Parts Code:
RP-9000057721)

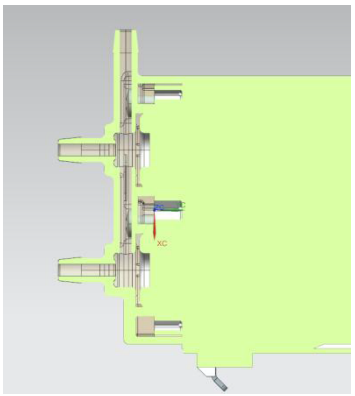


- Flow paths From the top, one to four (only the 13A-25A has four)
- Solenoids From the top, A, B

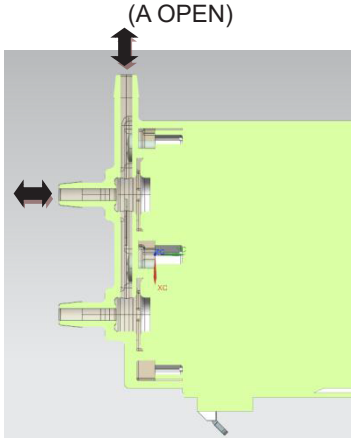
Internal Structure

3-way Valve D13A-35A

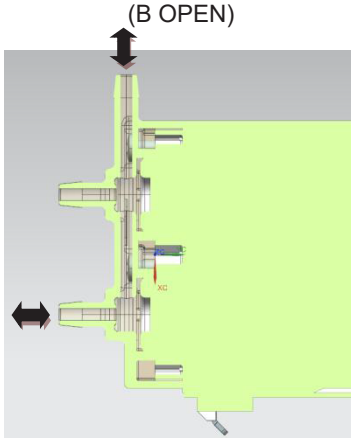
(CLOSE)



(A OPEN)

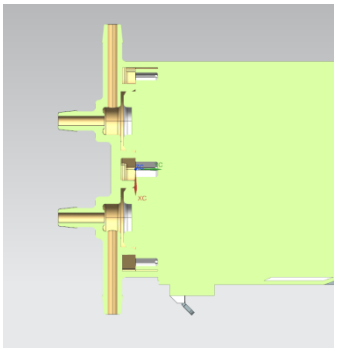


(B OPEN)

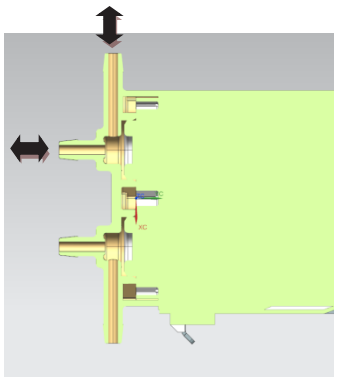


2-way Valve D13A-25A

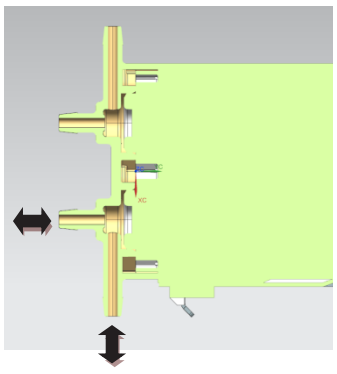
(CLOSE)



(A OPEN)



(B OPEN)



7-8-2. Checking the Operation of Electromagnetic Valves

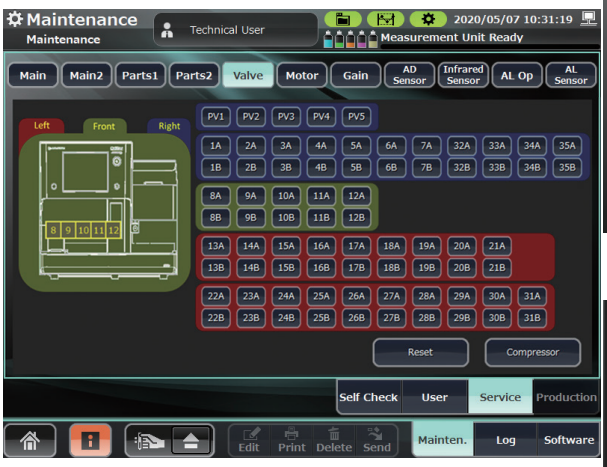
Check operation of valves.

Section 4-7 (p. 4-90)

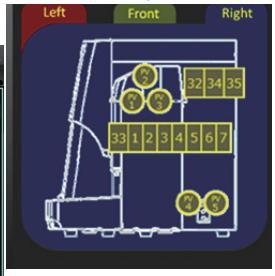
7-8-2-1. Electromagnetic Valve Opening and Closing Check

NOTE: As valves will be operated by hand, be careful about liquid leaks and overflowing. Also, open and close the valves after checking that the flow path is connected.

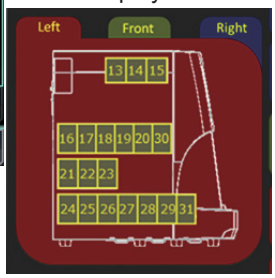
1 Open the Service Maintenance window and touch [Valve].



Right electromagnetic valve display



Left electromagnetic valve display



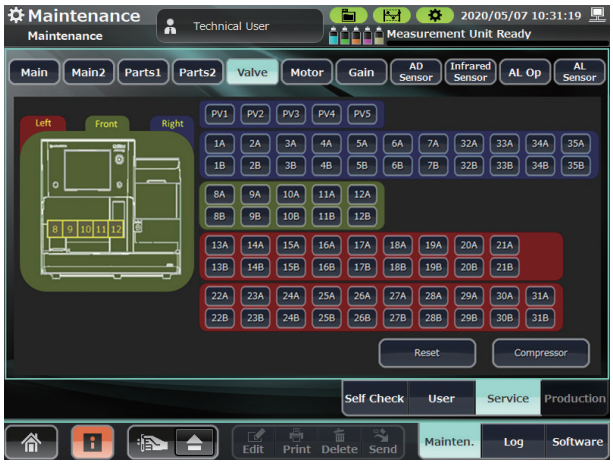
Electromagnetic valve closed when:

- Energized state differs from XP-600 series
- Both sides have color
- Electromagnetic valve LED is on
- Analyzer power is off
- Self check is complete

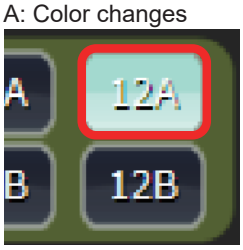
2 Touch an operation button 1 to 29 (A&B) on the Magnetic Valve Check screen and check the closing/opening of the valve.

Touching the "#A/B" button of a valve opens the corresponding valve.

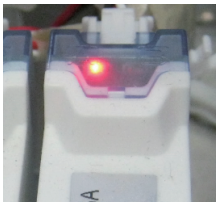
The color of the operation button also changes color and the LED lights.



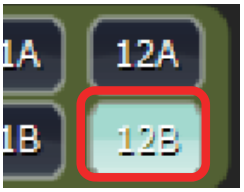
A: Color changes



Red LED lights



B: Color changes



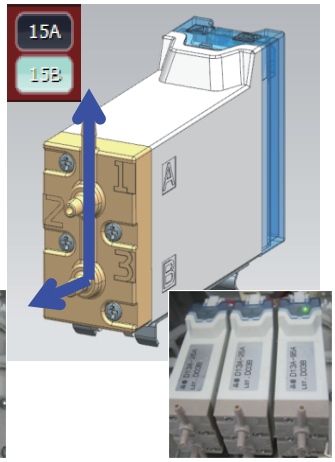
Green LED lights

Check the operation of three-way valves.

Port 1 and 2 open

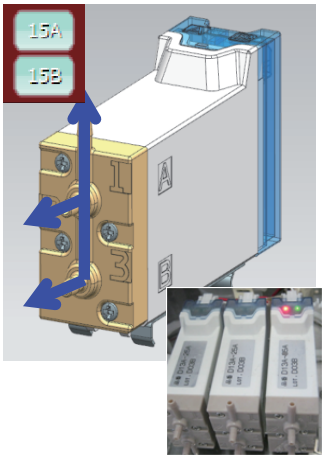
A: Red lights

Port 1 and 3 open



B: Green lights

All ports open



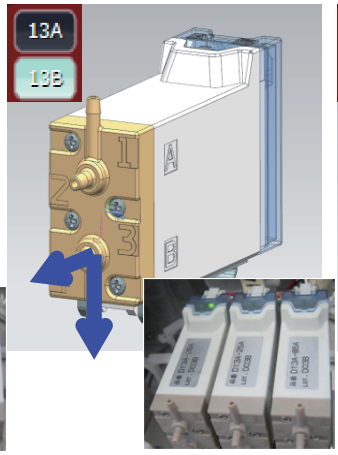
A and B: Red and Green light

Check the operation of two-way valves.

Port 1 and 2 open

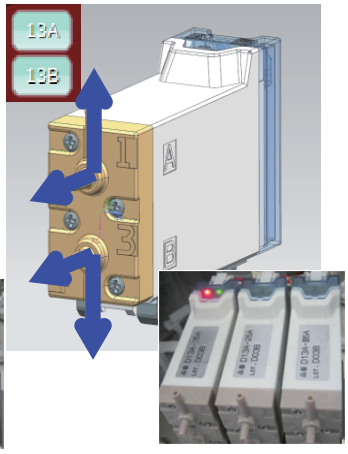
A: Red lights

Port 3 and 4 open



B: Green lights

Port 1 and 2 open
Port 3 and 4 open



A and B: Red and Green light

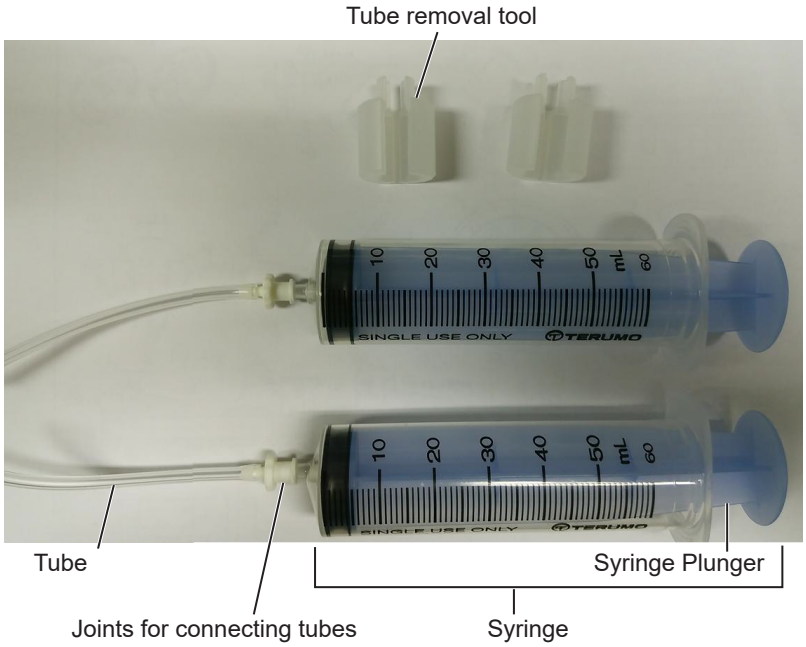
7-8-2-2. Checking Suspected Problems

If an electromagnetic valve is suspected to be faulty, use the following valve inspection jig to check its operation. If faulty, replace the valve.

After replacing it, check its operation again and make sure the problem is resolved.

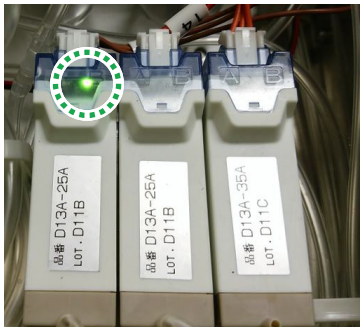
JIG, valve inspection jig (Parts code: RPK-9000061776)

Components	Qty.
50 mL syringe	2
Joints for connecting tubes	2
Tube removal tool	2
Tube	2



A Open (Red LED lit)

B Open (Green LED lit)



1 Checks that valves open and close.

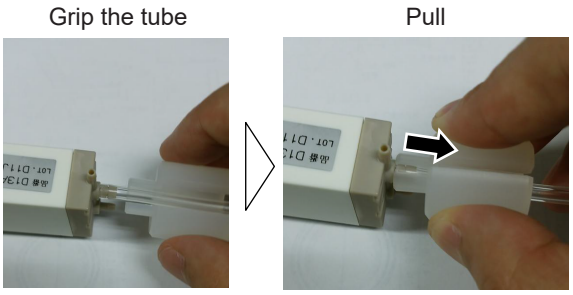
Electromagnetic Valve Opening and Closing Check
Section 7-8-2-1 (p. 7-121)

If the LED of the valve fails to light, potential causes are as follows.

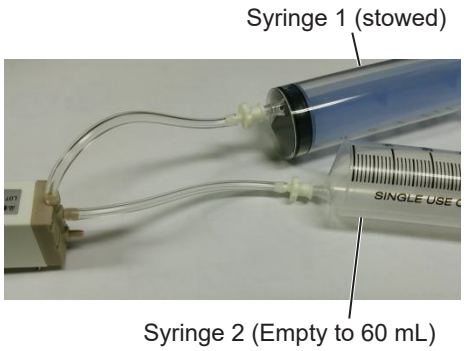
- AMP CONTROL BD faulty
- BD on magnetic valve faulty
- Faulty magnetic valve cable
- Magnetic valve cable inserted incorrectly

2 Use the tube removal tool to disconnect the tubes connected to the valve suspected to be faulty.

Twisting the tube removal tool slightly while pulling on it helps making disconnecting tubes easier.



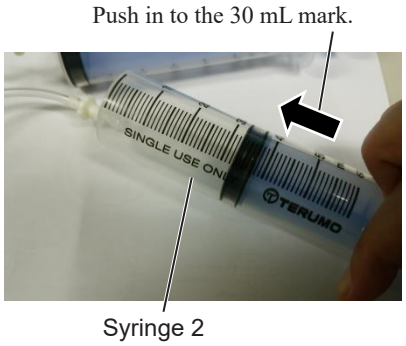
3 Run pressure tests 1 and 2 and check the flow path of the valve.



Pressure Test 1

Perform pressure test 1 with the valve closed (with the LED of the valve OFF).

1) Connect syringes as shown below before and after the flow path being checked.
   - Syringe 1: Stowed state (Plunger pressed in to the zero mark)
   - Syringe 2: Draw the plunger to the 60 mL mark.

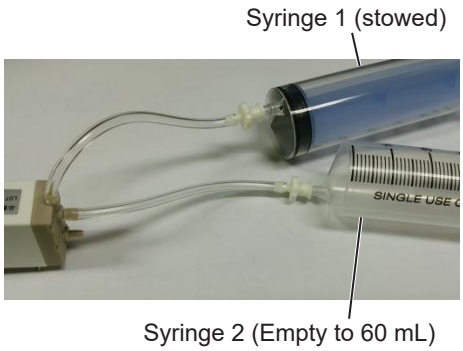


2) Press the plunger of syringe 2 in to the 30 mL mark, release and see what happens. (60 mL to 30 mL applies about 150 kPa of pressure.)

Normal	Plunger of syringe 2 returns to the 60 mL mark.
Abnormal	Plunger of syringe 2 remains as the 30 mL mark.

If abnormal, it may be caused by the following, so replace the valve with a new one.

- Diaphragm seal fault due to blockage by foreign matter.
- Leak from inside to outside of valve



Pressure Test 2

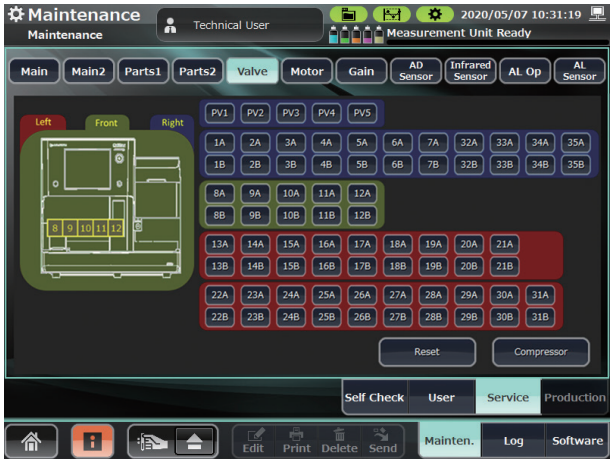
1) Connect syringes as shown below before and after the flow path being checked.
   - Syringe 1: Stowed state (Plunger pressed in to the zero mark)
   - Syringe 2: Draw the plunger to the 60 mL mark.

   The connections are the same as in pressure test 1.

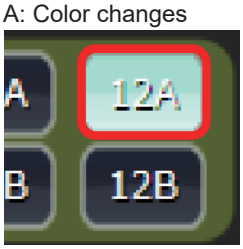
2) Open the valve of the flow path to be tested.

   Section 7-8-2-1 (p. 7-121)

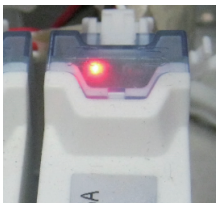
Example: For valve No.12



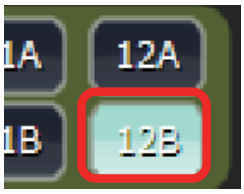
A: Color changes



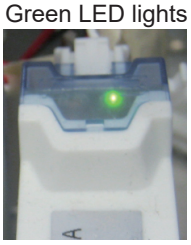
Red LED lights



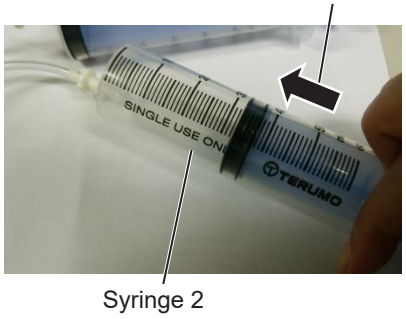
B: Color changes



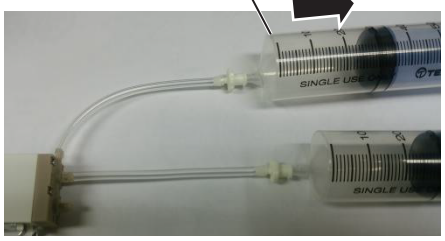
Green LED lights



Push in to the 30 mL mark.



3) Press the plunger of syringe 2 in to the 30 mL mark, release and see what happens.

Normal	Plunger of syringe 1 moves to the 30 mL mark. Moves to the 30 mL mark. Syringe 1 
Abnormal	Plunger of syringe 2 returns to the 60 mL mark.

If abnormal, it may be caused by the following, so replace the valve with a new one.

- BD on magnetic valve faulty
- Malfunction of the solenoid inside the valve

4 Reconnect the tubes disconnected in step **2**.

Section 4-7-2 (p. 4-98)

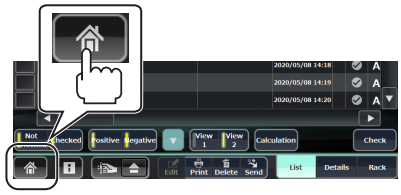
8 System Settings

8-1. System Settings

On the Settings window, you can change settings that are appropriate for the purpose and condition of the analyzer.

NOTE: Only the administrator or qualified personnel can change system settings.

8-1-1. Changing Settings

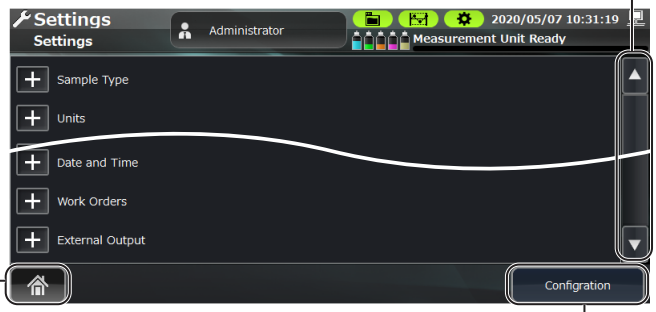


1 Open the Home screen.

If you are in another window, touch [ ] at the lower left.

2 Touch [Settings] on the Home screen. The Settings window opens.

Touch [▲] or [▼] to scroll up and down the setting items.



[ ] : Opens the Home screen.

[Configuration]:
Touch [Configuration] to open the Configuration window and initialize, back up or restore system settings.

3 Set each item.

1) Touch [+] to expand an item.

2) Set the item.

Operator's Manual: "Basic Operations" in Section 1

8-1-2. Sample Type

You can set the measurement value upper and lower limits according to the sample type.

If the sample corresponds to one of the Types 1 to 8, the upper and lower limits of that sample type become the criteria for abnormal values.

NOTE: If a sample does not correspond to Types 1 to 8, the upper and lower limits for the default type become the criteria for abnormal values.

Setting Item					Settings (___: Default Setting)	Description
Sample Type	Sample type name				Up to 20 characters (Blank)	You can set names for the sample Types 1 to 8.
	Sample Types 1 to 8	Apply this sample type			ON, OFF	Set whether to apply the upper or lower limits of each sample type. When this is set to OFF, the upper and lower limits of the default type are applied.
		Gender			Male, Female, Unspecified • Type 1 to 5, 8: Unspecified • Sample Type 6: Male • Sample Type 7: Female	Set the gender.
		Age range	From	Year	0 to 200	Set the age range. (___: Default setting) • Type 1: 0 year 0 month 0 week to 0 year 0 month 1 week • Type 2: 0 year 0 month 1 week to 0 year 1 month 0 week • Type 3: 0 year 1 month 0 week to 1 year 0 month 0 week • Type 4: 1 year 0 month 0 week to 10 year 0 month 0 week • Type 5 to 7: 10 year 0 month 0 week to 60 year 0 month 0 week • Type 8: 60 year 0 month 0 week to 200 year 0 month 0 week
				Month	0 to 12	
				Week	0 to 48	
			To	Year	0 to 200	
				Month	0 to 12	
				Week	0 to 48	
	Sample Types 1 to 8, Default Sample Type	Criteria Lower – Upper	WBC (10^2/μL)		0 to 2999.0 (40.0 – 90.0)	Set the normal range upper and lower limits which become the judgment criteria for each measured parameter.
			RBC (10^4/μL)		0 to 999 (376 – 570)	
			HGB (g/dL)		0 to 29.90 (12.00 – 18.00)	
			HCT (%)		0 to 99.9 (33.5 – 52.0)	
			MCV (fL)		20.0 to 199.0 (80.0 – 100.0)	
			MCH (pg)		10.0 to 50.0 (28.0 – 32.0)	
			MCHC (g/dL)		10.0 to 50.0 (31.0 – 35.0)	
			RDW-CV (%)		0 to 50.0 (11.6 – 14.0)	
			RDW-SD (fL)		0 to 199.0 (42.8 – 51.0)	
			PLT (10^4/μL)		0 to 250.00 (15.00 – 35.00)	
			PCT (%)		0 to 2.90 (0.16 – 0.33)	
			MPV (fL)		0 to 20.0 (7.0 – 11.0)	
			PDW (%)		0 to 50.0 (15.5 – 18.9)	
			P-LCR (%)		0 to 100.0 (20.0 – 58.0)	
			P-LCC (%)		0.00 to 149.00 (7.0 – 17.00)	
			NE%		0 to 100.00 (28.00 – 78.00)	
			LY%		0 to 100.00 (17.00 – 57.00)	
			MO%		0 to 100.00 (0.00 – 10.00)	
			EO%		0 to 100.00 (0.00 – 10.00)	
			BA%		0 to 100.00 (0.00 – 2.00)	
			NE (10^2/μL)		0 to 2999.0 (11.0 – 70.0)	
			LY (10^2/μL)		0 to 2999.0 (7.0 – 51.0)	
			MO (10^2/μL)		0 to 2999.0 (0.0 – 9.0)	
			EO (10^2/μL)		0 to 2999.0 (0.0 – 9.0)	
			BA (10^2/μL)		0 to 2999.0 (0.0 – 2.0)	

Setting Item				Settings (___: Default Setting)	Description
Sample Type	Sample Types 1 to 8, Default Types	Criteria Lower – Upper	RET%	0 to 99.99 (0.50 to 2.50)	Set the normal range upper and lower limits which become the judgment criteria for each measured parameter.
			RET (10^4/μL)	0.0 to 99.9 × 10^4/μL (1.88 to 14.25)	
			IRF (%)	0 to 100.00 (2.1 to 17.5)	
			LFR (%)	0 to 100.00 (87.8 to 99.5)	
			MFR (%)	0 to 100.00 (1.8 to 14.4)	
			HFR (%)	0 to 100.00 (0.0 to 2.4)	

8-1-3. Units

Setting Item		Settings (___: Default Setting)	Description
Units	WBC	10^2/μL, 10^3/μL, 10^9/L	Set the unit for the measurement parameter.
	RBC	10^4/μL, 10^6/μL, 10^{12}/L	
	HGB	g/dL, g/L, mmol/L	
	PLT	10^4/μL, 10^3/μL, 10^9/L	

8-1-4. Operation Settings

Setting Item		Settings (___: Default Setting)	Description
Operation settings	Auto login	ON, OFF	Set whether to automatically log in when the analyzer is turned on. • ON: Log in automatically when the power is turned on. • OFF: Turn on the power then perform the log in manually.
	Auto validation	None, All, Negative, Negative+Positive	Set whether to automatically check (validate) the measurement results after measurement. • None: Do not automatically check (validate) all the measurement results. • ALL: Automatically check (validate) all measurement results. • Negative: Automatically check (validate) the negative measurement results. • Negative+Positive: Automatically check (validate) the negative and positive measurement results. Data with error are not validated.
	Notification sound	ON, OFF	A buzzer sounds when the analyzer detects an abnormality.
	Latest data view	ON, OFF	Set whether to display the [Latest Data] tab when no measurement data is selected on the Data List window. • ON: The [Latest Data] tab is displayed. • OFF: The [Latest Data] tab is not displayed.
	Stop measurement when the Short sample occurs	ON, OFF	Set whether to stop the next and later measurements when a short sample occurs. • ON: The next and later measurements are stopped. • OFF: The next and later measurements are performed.

8-1-5. Pathological Flags

You can set the criteria for flag display. If a parameter flag is set to ON, the analyzer display a flag when a measurement value for that parameter exceeds the flag value.

You can set the value for each flag.

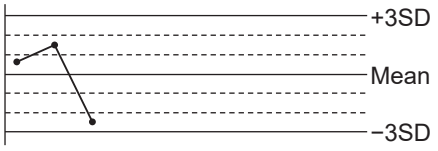
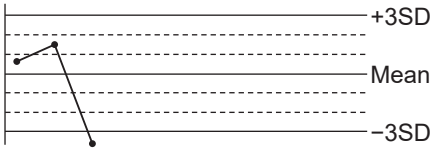
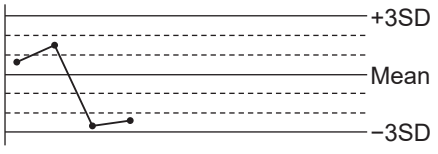
Section 2-4-2 (p. 2-16)

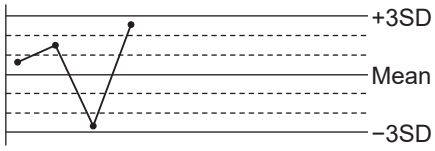
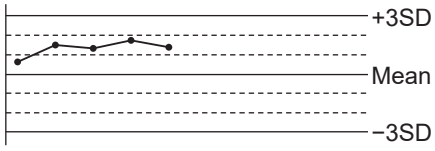
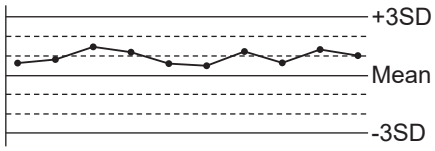
Setting Item		Settings (___: Default Setting)	Description
Pathological flags	Leukocytosis (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 180.0)	Set the positive flagging ON/OFF and the flagging criteria. If the flagging criteria is met, the analyzer judges it as a positive.
	Leukopenia (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 25.0)	
	Neutrophilia (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 110.0)	
	Neutropenia (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 10.0)	
	Lymphocytosis (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 40.0)	
	Lymphopenia (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 8.0)	
	Monocytosis (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 10.0)	
	Eosinophilia (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 7.0)	
	Basophilia (10^2μL)	ON, OFF 0 to 2999.9 (when it is ON: 2.0)	
	Blast	ON, OFF Level 1 to 5 (Level 4)	Set the flag detection sensitivity level from Levels 1 to 5. Higher levels have better detection sensitivity but more false positives.
	Immature Granulocyte	ON, OFF Level 1 to 5 (Level 5)	
	Left Shift	ON, OFF Level 1 to Level 5 (Level 3)	
	Atypical Ly	ON, OFF Level 1 to Level 5 (Level 3)	
	WBC Poor Hemolyzation	ON, OFF	Set the positive flagging ON/OFF and the flagging criteria. If the flagging criteria is met, the analyzer judges it as a positive.
	Small Nucleated Cell	ON, OFF	
	Ly-Mo Interference	ON, OFF	
	Ne-Eo Interference	ON, OFF	
	Erythrocytosis (10^4μL)	ON, OFF 0 to 999 (when it is ON: 650)	
	Anemia (g/dL)	ON, OFF 0 to 29.90 (when it is ON: 10.00)	
	Anisocytosis (%)	ON, OFF 0 to 50.0 (when it is ON: 20.0)	
	Microcytosis (fL)	ON, OFF 0 to 199.0 (when it is ON: 70.0)	
	Macrocytosis (fL)	ON, OFF 0 to 199.0 (when it is ON: 110.0)	
	Hypochromia (g/dL)	ON, OFF 10.0 to 50.0 (when it is ON: 29.0)	

Setting Item		Settings (___: Default Setting)	Description
Pathological flags	Abnormal MCHC	ON, OFF	Set the positive flagging ON/OFF and the flagging criteria. If the flagging criteria is met, the analyzer judges it as a positive.
	Thrombocytosis (10^4µL)	ON, OFF 0 to 149.00 (when it is ON: 60.00)	
	Thrombocytopenia (10^4µL)	ON, OFF 0 to 149.00 (when it is ON: 6.00)	
	PLT Clumps	ON, OFF	
	PLT-RBC Interference	ON, OFF	

8-1-6. Quality Control

You can set the quality control settings.

Setting Item				Settings (___: Default Setting)	Description
Quality Control	Quality control operation			Every login, Every day	Set the quality control operation.
	Auto judgment method	Assay value/limit		ON, OFF	Set whether to use the assay values and limits.
		Average/SD		ON, OFF	Set whether to use the average and standard deviations.
		Westgard Multirules		ON, OFF	Set whether to use Westgard multirules.
	Auto judgment details	Average/SD	X Limit	±2SD, ±3SD	Set the calculation method for X limit.
		Westgard Multirule	1-2S	ON, OFF	When set to ON, the run is rejected if a single measurement exceeds the mean ±2SD. 
			1-3S	ON, OFF	When set to ON, the run is rejected if a single measurement exceeds the mean ±3SD. 
			2-2S	ON, OFF	When set to ON, the run is rejected if two consecutive measurements exceed the mean +2SD or the mean −2SD. 

Setting Item				Settings (___: Default Setting)	Description
Quality Control	Auto judgment details	Westgard Multirule	R-4S	ON, OFF	When set to ON, the run is rejected if one measurement in the group exceeds the mean +2SD and another measurement in the same group exceeds the mean −2SD. 
			4-1S	ON, OFF	When set to ON, the run is rejected if four consecutive measurements exceed the mean +1SD or four consecutive measurements exceed the mean −1SD. 
			10-X	ON, OFF	When set to ON, the run is rejected if ten consecutive measurements are above the mean or ten consecutive measurements are below the mean. 
		Statistical calculation	Batch number	20 to 100 (20)	Set the number of data in one batch for the $\overline{X}$B control.
			MCV Median (fL)	20.0 to 199.0 (89.5)	Set the median and the limit for the $\overline{X}$B control. NOTE: Set the median + limit does not exceed the maximum value of median (MCV: 199.0 and MCH and MCHC: 50.0) and the median − limit does not lower the median of the minimum value (MCV: 20.0 and MCHC: 10.0) for the limit of each parameter.
			MCV Limit (fL)	0 to 100 (3.0)	
			MCH Median (pg)	10.0 to 50.0 (30.5)	
			MCH Limit (pg)	0 to 10.0 (1.0)	
			MCHC Median (g/dL)	10.0 to 50.0 (33.8)	
			MCHC Limit (g/dL)	0 to 10.0 (1.0)	
		QC Graph Other Items	Select parameter 1	WBC, RBC, HGB, HCT, MCV, MCH, MCHC, RDW-CV, RDW-SD, PLT, PCT, MPV, PDW, P-LCR, P-LCC, NE%, LY%, MO%, EO%, BA%, NE, LY, MO, EO, BA, RET%, RET, IRF, LFR, MFR, HFR	Select the parameters to display on the QC Graph window when [Other] is touched.
			Select parameter 2		
			Select parameter 3		
			Select parameter 4		
			Select parameter 5		

How to calculate limits for the L-J control chart

The upper and lower limits for the L-J control chart are calculated as follows.

X: mean σ: standard deviation

Upper limit (+3SD) = X+3σ

Lower limit (−3SD) = X−3σ

8-1-7. Reagent Management

Setting Item			Settings (___: Default Setting)	Description
Reagent Management	Show units	ISOTONAC•3/4	mL, L	Set the units for each reagent on the Reagent Management window.
		CLEANAC•710	mL, L	
		HEMOLYNAC•310	mL, L	
		HEMOLYNAC•510	mL, L	
		RETICULONAC	mL, L	
		Waste	mL, L	
	Waste sensor		ON, OFF	Set the optional waste fluid sensor to ON (use) or OFF (do not use). The waste fluid volume count operation depends on this setting. Operator's Manual: "Registering Reagents" in Section 8 • ON: The waste fluid sensor takes priority and the waste fluid capacity count is not performed. Measurement continues even if the warning value is exceeded. • OFF: The waste fluid capacity count is performed. Measurement is stopped if the warning value is exceeded. When the waste fluid tank is not used and the waste fluid is not managed, the waste fluid capacity is not counted if the waste fluid capacity is set to 0 L.

8-1-8. Auto Clean

Setting Item			Settings (___: Default Setting)	Description
Auto Clean	1st	Clock hour	00 to 23	Set the operation to perform (automatic cleaning or self checking) and the clock time and number of times to perform the set operation. NOTE • Cleaning or self checking begins automatically at the set time. If measurement is being performed or settings are changed during the scheduled time, the auto clean or self check is not performed. • If the analyzer power is continuously on for longer than 24 hours, do cleaning and self-checking once every day. Auto clean settings can be set so that the cleaning and self-check are performed once every day.
		Clock minute	00 to 59	
		Operation	Self check, Clean, None	
	2st	Clock hour	00 to 23	
		Clock minute	00 to 59	
		Operation	Self check, Clean, None	
	3rd	Clock hour	00 to 23	
		Clock minute	00 to 59	
		Operation	Self check, Clean, None	
	4th	Clock hour	00 to 23	
		Clock minute	00 to 59	
		Operation	Self check, Clean, None	

8-1-9. Date and Time

Setting Item			Settings (___: Default Setting)	Description
Date and Time	Format		YY/MM/DD, DD/MM/YY, 'YY MM DD, DD MM 'YY, DD MMM 'YY, MMM DD 'YY	Set the date and time format.
	Date and Time	Year, Month, Day, Hour, Minute	YYYY, MM, DD, hh, mm (Current date and time)	Set the date and time.

8-1-10. Work Orders

Setting Item			Settings (___: Default Setting)	Description
Work Orders	LIS connection		None, Order request + warning, Order received + warning, Warning only	Set the order request condition.
	Order key		Sample ID, Aspiration tube	Set the item which is associated with the patient information and measuring sample tube. NOTE: If there is an unprocessed and scheduled order, the setting cannot be changed. While changing the setting, the analyzer cannot be connected to the LIS.
	Action If order failure		Default order, Cancel	Set the action if a work order is not acquired.
	Unrecognized sample ID		Up to 20 alphanumeric characters (UNIDENTIFIED ID)	Set the ID for unidentified samples on the analyzer.
	Default Settings	Parameters	CBC+DIFF, CBC, CBC+DIFF+RET, CBC+RET	Set the test item when [Action if order failure] is set to [Default order].

8-1-11. External Output

Setting Item				Settings (___: Default Setting)	Description
External Output	LAN	Communication format		HL7, ASTM	Set the communication format. NOTE: No order can be received when ASTM is set.
		Host IP address		Up to 15 alphanumeric characters (192.168.2.10)	Set the IP address of the host device such as LIS.
		Device IP address		Up to 40 alphanumeric characters (192.168.2.11)	Set the IP address of the analyzer.
		sub-net mask		Up to 15 alphanumeric characters (255.255.255.0)	Set the subnet mask of the analyzer.
		default gateway		Up to 15 alphanumeric characters (Blank)	Set the IP address of the analyzer default gateway.
		Work order request port		0 to 65535 (50001)	Set the communication port to request orders to a system such as HIS or LIS.
		Receive work order port		0 to 65535 (50002)	Set the communication port to receive order from a system such as HIS or LIS.
		Send results port		0 to 65535 (50003)	Set the communication port to send measurement results to a system such as HIS or LIS.
		HL7 start bit		ON, OFF	Set whether to add a start bit at the beginning of the measurement data.
		HL7 graph output		ON, OFF	Output image data of histograms and scattergrams in BASE64 format.
		ASTM graph output		ON, OFF	Output image data of histograms and scattergrams in BASE64 format.
	RS-232C	Communication protocol		WA-461V, MEK-8222 (V02-03) compatible, MEK-8222 (V02-07) compatible, MEK-8222 (V03-01) compatible	Set the protocol to communicate with the device connected to the serial port of the analyzer.
		Ports	Baud rate	19200, 9600, 4800, 2400	Set the data send format to the device connected to the serial port.
			Parity	Even, Odd, None	
			Data bits	7, 8	
			Stop bits	1, 2	

Setting Item					Settings (___: Default Setting)	Description
External Output	Auto Output After Meas	Print after Measurement			Yes, No	Set whether to automatically print the measurement results on the printer connected to the analyzer after measurement.
			Negative	Auto Print	ON, OFF	Select ON to turn on auto printing of the negative measurement results. Select OFF to turn off auto printing of the negative measurement results.
				Only print validated data	ON, OFF	Select ON to turn on the auto print of the checked (validated) negative measurement results. Select OFF to turn off the auto print of the checked (validated) negative measurement results.
			Positive	Auto Print	ON, OFF	Select ON to turn on auto printing of the positive measurement results. Select OFF to turn off auto printing of the positive measurement results.
				Only print validated data	ON, OFF	Select ON to turn on auto printing of the checked (validated) positive measurement results. Select OFF to turn off auto printing of the checked (validated) positive measurement results.
			Error	Auto Print	ON, OFF	Select ON to turn on auto printing of the measurement results with errors. Select OFF to turn off auto printing of the measurement results with errors.
				Only print validated data	ON, OFF	Select ON to turn on auto printing of the checked (validated) measurement results with errors. Select OFF to turn off auto printing of the checked (validated) measurement results with errors.
			QC	Auto Print	ON, OFF	Select ON to turn on auto printing of the quality control measurement results. Select OFF to turn off auto printing of the quality control measurement results.
			Self Check	Auto Print	ON, OFF	Select ON to turn on auto printing of the self check results. Select OFF to turn off auto printing of the self check results.
		Send After Measurement			Yes, No	Set whether or not to automatically send measurement results to a system such as LIS after measurement. NOTE: Unchecked (Unvalidated) measurement results are not sent to the system.
			QC	Item	ON, OFF	Select ON to turn on auto sending of the quality control measurement results. Select OFF to turn off auto sending of the quality control measurement results.
			Self Check	Item	ON, OFF	Select ON to turn on auto sending of the self check results. Select OFF to turn off auto sending of the self check results.

8-1-12. Report Format

Setting Item			Settings (___: Default Setting)	Description
Report format	Header text		Up to 20 characters (Blank)	Enter text for printed headers.
	Footer text		Up to 20 characters (Blank)	Enter text for printed footers.
	Measurement result report	Research Parameters	ON, OFF	Select ON to print the research parameters on the measurement result report. Select OFF not to print the research parameters on the measurement result report.
		Manual Diff. results	ON, OFF	Select ON to print the manual diff. results on the measurement result report. Select OFF to not print the manual diff. results on the measurement result report.
		Histogram	ON, OFF	Select ON to print the histogram on the measurement result report. Select OFF to not print the histogram on the measurement result report.
		Scattergram	ON, OFF	Select ON to print the scattergram on the measurement result report. Select OFF to not print the scattergram on the measurement result report.
		RET Graph	ON, OFF	Select ON and set the Manual Diff. results setting to OFF to print the reticulocyte graph in the manual diff. results area on the measurement result report. Select OFF to not print the reticulocyte graph on the measurement result report.
	QC Report Format		Lot report, Monthly report	Select the number of quality control data printed on a page when printing QC trendgraphs. • Lot report: 200 data are printed on a page. • Monthly report: 31 data are printed on a page.

8-1-13. Data List Items

Setting Item				Settings (___: Default Setting)	Description
Data List Items	Show/hide	View 1	Sample ID, Patient ID, Patient Name, Date, Posi/Err, Validation, A/M, Rack Position, Date of Birth, Gender, Department, Physician, Operator, WBC, RBC, HGB, HCT, MCV, MCH, MCHC, RDW-CV, RDW-SD, PLT, PCT, MPV, PDW, P-LCR, P-LCC, NE%, LY%, MO%, EO%, BA%, NE, LY, MO, EO, BA, RET%, RET, IRF, LFR, MFR, HFR	ON, OFF	Set the items to display on the Data List window.
		View 2	Sample ID, Patient ID, Patient Name, Date, Posi/Err, Validation, A/M, Rack Position, Operator, WBC, RBC, HGB, HCT, MCV, MCH, MCHC, RDW-CV, RDW-SD, PLT, PCT, MPV, PDW, P-LCR, P-LCC, NE%, LY%, MO%, EO%, BA%, NE, LY, MO, EO, BA, RET%, RET, IRF, LFR, MFR, HFR	ON, OFF	
		Work Order	Sample ID, Patient ID, Patient Name, Work Order Received Date and Time, Rack Position, Test Result Time, Test Items, Date of Birth, Gender, Department, Physician	ON, OFF	Set the items to display on the Work Order window.
	Normally Displayed	Sample ID		ON, OFF	Set the items that are always displayed on the Data List window or Work Order window.
		Patient ID, Patient Name		ON, OFF	

8-1-14. Flag Details

Setting Item			Settings (___: Default Setting)	Description
Flag details	Mode Select		STEP, FREE	Toggle the detection mode between STEP or FREE for the flags below. • Blasts • Atypical Ly • Immature Granulocyte • Left Shift - Ne-Eo Interference - PLT Clumps - PLT-RBC Interference
	Blast	Area Counts >	0 to 30000 (15)	Set the threshold for detecting blasts.
		155 Ratio Low >	0 to 100 (50)	
		155 Ratio High >	0 to 100 (50)	
		Mononuclear% >	0 to 10000 (8000)	
		|PeakDiff-90| >	0 to 255 (30)	
	AtypicalLy	WOC/WIC <	0 to 100 (40)	Set the threshold for detecting atypical lymphocytes.
		LY# >	0 to 29990 (1000)	
		155 Ratio Low >	0 to 100 (50)	
		155 Ratio High >	0 to 100 (80)	
		|PeakDiff-90| >	0 to 255 (34)	
	Immature Granulocytes	Area Ratio >	0 to 1000 (95)	Set the threshold for detecting immature granulocytes.
	LeftShift	Area Counts >	0 to 30000 (40)	Set the threshold for detecting left shift.
	NE-Eo Interference	Area Counts >	0 to 30000 (50)	Set the threshold for detecting Ne-Eo interference.
	PLT Clumps	Difference >=	0 to 9999 (600)	Set the threshold for detecting PLT clumps.
	PLT-RBC Interference	Ratio >	0 to 100 (30)	Set the threshold for detecting PLT-RBC interference.

8-1-15. Measurement Conditions

Setting Item		Settings (___: Default Setting)	Description
Measurement Conditions	WBC Sensitivity	1 to 15 (5)	Set the electrical sensitivity for WBC impedance measurement.
	WBC Threshold	1 to 15 (4)	Set the ghosts threshold for the WBC histogram.
	RBC Sensitivity	1 to 15 (5)	Set the electrical sensitivity for RBC/PLT impedance measurement.
	RBC Threshold	auto or 1 to 15 (auto)	Set the ghosts threshold level for RBC and PLT. When set to auto, this will be set automatically.
	PLT Threshold	1 to 15 (5)	Set the ghosts threshold for the PLT histogram.
	Optical FS Gain	0 to 255 (100)	Set the electrical sensitivity for FS (forward small-angle scatter).
	Optical FL Gain	0 to 255 (127)	Set the electrical sensitivity for FL (forward large-angle scatter).
	Optical SD Gain	0 to 255 (127)	Set the electrical sensitivity for SD (side scatter).
	Optical FS Threshold	0 to 255 (20)	Set the ghosts threshold for the FS scattergram.
	RET FS Gain	0 to 255 (127)	Set the electrical sensitivity for FS (forward small-angle scatter).
	RET FL525 Gain	0 to 255 (35)	Set the electrical sensitivity for FL525 (525nm band fluorescence).
	RET FL650 Gain	0 to 255 (127)	Set the electrical sensitivity for FL650 (650nm band fluorescence).
	RET FS Threshold	0 to 255 (25)	Set the ghosts threshold for the FS scattergram.
	Highland Mode	ON, OFF	Set to ON when the analyzer is used at a high altitude. When the analyzer is used at a high altitude, use MK-RE hematology control for reticulocytes to evaluate carryover. If the carryover with the TFC fails and cleaning the RET flow cell does not resolve the problem, set to ON. NOTE • For information on how to evaluate carryover, contact your Nihon Kohden representative. • The measurement time of auto measurement (CBC+DIFF+RET, CBC+RET) becomes longer. (Counting time when setting is ON: 47 samples/hr (76 s/sample))
	Ghost cut	ON, OFF	Toggle exclusion of unnecessary portions for 5 part differential ON or OFF.
	Detergent port	0 to 255 (127)	Set the gain value for adjusting CLEANAC•710 fluid sensor voltage.
	CBC lysing reagent port	0 to 255 (127)	Set the gain value for adjusting HEMOLYNAC•310 fluid sensor voltage.
	DIFF lysing reagent port	0 to 255 (127)	Set the gain value for adjusting HEMOLYNAC•510 fluid sensor voltage.
	HGB Gain	0 to 255 (127)	Set the gain value for adjusting HGB voltage.
	SS gain	0 to 255 (127)	Set the gain value for adjusting SS voltage.
	Laser output	ON, OFF	Toggle MO-910W laser output ON or OFF.

Setting Item		Settings (___: Default Setting)	Description
Measurement Conditions	Sample tube type	Normal bottom, Raised bottom	This setting is required when the YZ-008B1 SARSTEDT kit or YZ-008B2 KABEVETTE G kit is used with the analyzer. Set the sample tube type. The maximum downward extension of the sampling needle depends on the sample tube type. NOTE: If the setting is incorrect, an abnormal measurement value may be displayed or the analyzer may be damaged. For details, refer to the installation guide of YZ-008B1 SARSTEDT kit or YZ-008B2 KABEVETTE G kit.

8-1-16. Setting of Graphview

Setting Item			Settings (___: Default Setting)	Description
Setting of Graphview	WBC, RBC, PLT Histogram	Display type	Particle size distribution, Histogram	Toggle display between particle size distribution and histogram.
		Smoothing	ON, OFF	Toggle histogram smoothing ON and OFF.
	Optical Scattergram	Show dividing line	ON, OFF	Toggle display of dividing line.
		Show ghosts	ON, OFF	Toggle ghost display.

8-1-17. Print Settings

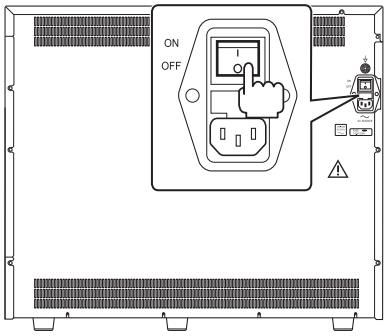
Setting Item		Settings (___: Default Setting)	Description
Print	Paper Size	Letter, A4	Select the paper size used for printing.
	Color Mode	Monochrome, Color	Select the color mode used for printing.
	PCL output	OFF, PCL3GUI, PCL5/5e/5c	Select output by PCL (Printer Control Language).

NOTE: Connect to the printer compatible with PCL.

8-1-18. Advanced Settings

Setting Item			Settings (___: Default Setting)	Description
Advanced Settings	Language		English, Japanese	Select the display language.
	Show cursor		ON, OFF	Toggle display of the mouse cursor.
	Maintenance system connection setting	Output	ON, OFF	Select the connection of the maintenance system.
		IP address	Up to 15 alphanumeric characters (192.168.0.85)	Set the IP address of the maintenance system.
		Port	0 to 65535 (57545)	Set the communication port number to communicate with the maintenance system.
	Sample ID increment mode		ON, OFF	Assign a unique sample ID (0001 -) to the sample when the bar code on the sampling tube cannot be read during measurement. Equivalent workflow is provided for the users using the increment mode of MEK-8222. For the use of this function, contact your Nihon Kohden representative. NOTE: When turning off the main power, the next sample ID to be assigned will reset to 0001.
	Execution deadline days of Clean Protein		10 to 35 (35)	Specify the deadline of cleaning protein. NOTE: The specified deadline is exceeded, the “Clean Protein” in the self check items is judged FAIL.
	High Dilution Mode		ON, OFF	Minimize the amount of blood discharge during 5 part difference sample dispensing and resist poor hemolysis. For the use of this function, contact your Nihon Kohden representative.
	ROUTE setting		0 to 255 (2)	Set the communication path 1.
	ROUTE setting #2		0 to 255 (3)	Set the communication path 2.

8-2. Backing Up System Settings



You can back up the system settings onto an SD card.

NOTE • One SD card can only hold one backup set.

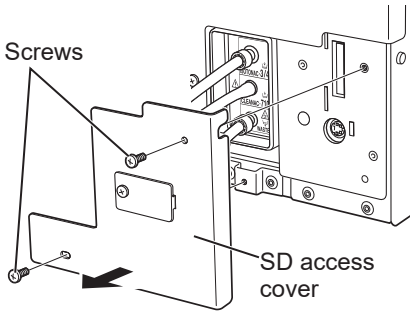
• If you try to back up to an SD card which already contains backup data, the previous backup data will be overwritten.

1 Turn off the analyzer and switch off (to ○) the main power on the rear of the analyzer.

Operator's Manual:
"Turning Off the Analyzer" in Section 5

2 Remove the two screws from the right side panel of the analyzer and remove the SD access cover.

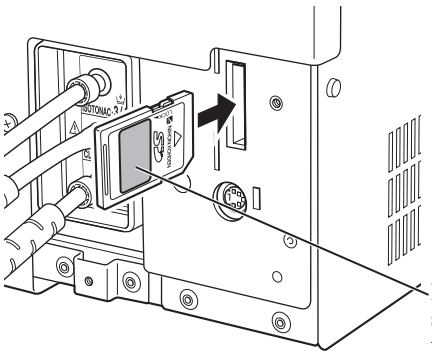
NOTE: Keep the two screws to reattach the cover later.



3 Insert the SD card into the analyzer SD card slot.

NOTE: Handle the SD card according to "SD Card Precautions" in the operator's manual.

Operator's Manual: "SD Card" in Section 3



4 Turn on the analyzer.

Operator's Manual: "Turning On the Analyzer" in Section 5

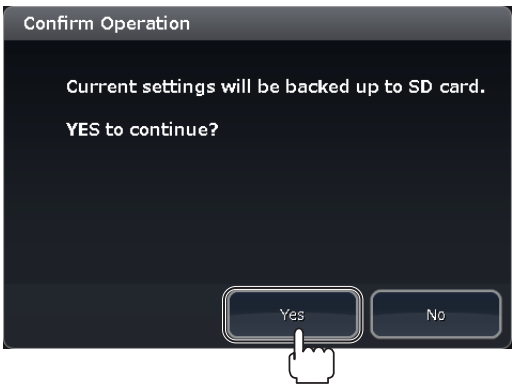
5 Back up the system settings.

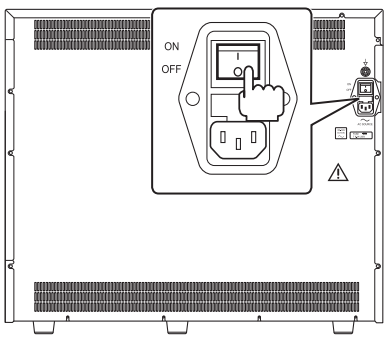
1) Open the Settings window and touch [Configuration].

2) Touch [BACKUP SETTINGS] on the Configuration window.

NOTE: Be careful not to touch [RESTORE SETTINGS].

6 When the Confirm Operation window appears, touch [Yes].

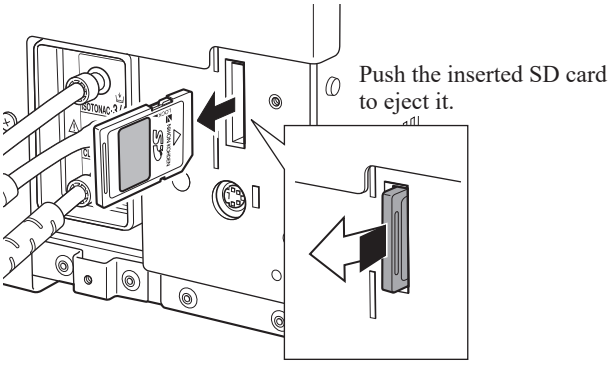


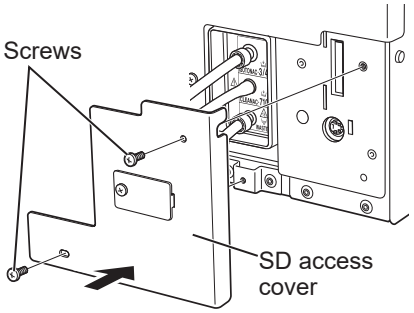


7 Turn off the analyzer and switch off (to ○) the main power on the rear of the analyzer.

Operator's Manual:
"Turning Off the Analyzer" in Section 5

8 Eject the SD card.





9 Attach the SD access cover to the right side of the analyzer and fix it with the two screws removed in step **2**.

8-3. Restoring System Settings

You can restore the previously backed up data from an SD card.

Section 8-2 (p. 8-17)

1 Refer to steps **1** to **3** in “Backing Up System Settings” (p. 8-17) and insert the SD card with the backed up data into the SD card slot of the analyzer.

2 Turn on the analyzer.

Operator’s Manual: “Turning On the Analyzer” in Section 5

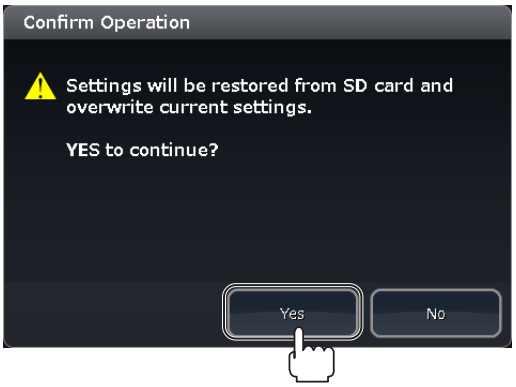
3 Restore the backed up settings.

1) Open the Settings window and touch [Configuration].

2) Touch [RESTORE SETTINGS] on the Configuration window.

NOTE: Be careful not to touch [BACKUP SETTINGS].

4 When the Confirm Operation window appears, touch [Yes].



5 Refer to steps **7** to **9** in “Backing Up System Settings” (p. 8-17) and eject the SD card and attach the SD access cover to the right side of the analyzer.

8-4. Initializing System Settings

You can initialize the system settings to the factory default settings.

1 Turn on the analyzer.

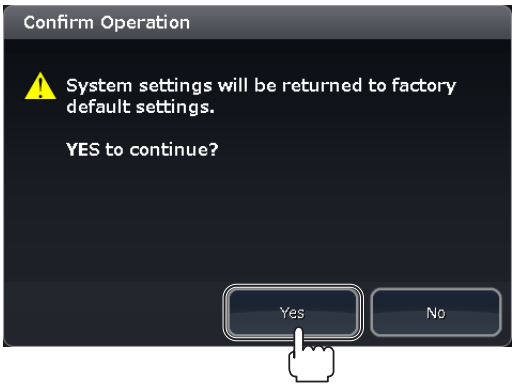
Operator's Manual: "Turning On the Analyzer" in Section 5

2 Initialize the system settings.

1) Open the Settings window and touch [Configuration].

2) Touch [FACTORY SETTING] on the Configuration window.

3 When the Confirm Operation window appears, touch [Yes].



9 Maintenance Procedure

9-1. Periodic Inspection

This product is a hematology analyzer. Any reduction or loss in the analyzer function may affect measurement accuracy.

Perform periodic maintenance to check that the analyzer functions normally and replace the consumables.

The periodic inspection should be performed once every six months or at the period specified by local law. Make sure that the analyzer operates properly and replace the consumables.

If the periodic inspection is not performed, degradation or loss of function may go unnoticed and lead to misdiagnosis.

The following sections contain details on the inspection contents and inspection procedures required to keep the analyzer operating correctly. Periodic inspections should be performed by qualified service personnel, and the results of the inspections should be written in the “Maintenance Check Sheet” at the end of this manual. Keep the “Maintenance Check Sheet” in a safe place as a record of the analyzer periodic inspections. Make copies of the “Maintenance Check Sheet” at the end of the manual for use. The item numbers listed in the “Maintenance Check Sheet” correspond to the numbers of the check items in “Inspection Procedure” (p. 9-3).

9-1-1. Required Equipment

Periodic Inspection for the Analyzer

Parameter	Equipment and Cables	
Power cord	Measuring instrument	digital multimeter

NOTE • For maintenance inspection, use tools and equipment for which quality control has been performed.

• For details on operating the tools and equipment used in maintenance inspection, refer to the manual provided with the equipment or tool.

Jig for Inspection

Repair Part Name	Repair Part No.	Qty
JIG. MC-910W manual cleaning jig	RPK-9000068732	1

9-2. Inspection Procedure

Parts Requiring Periodic Replacement

Repair Part Name	Replacement Parts	Supply Code	Repair Part No.	Qty	Schedule
Assy. Sample tube l265	Sample tube	YZ-011B2	—	1	Every 12,000 measurements
Assy. release tube	Venting needle	T449C	—	1	
Assy. WBC filter	WBC filter assy	T802A	—	2	
Assy. RET filter	RET filter assy	YZ-011B1	—	1	Every 12,000 measurements
Assy. hemoglobin filter	Hemoglobin filter assy	T802	—	4	Every 12,000 measurements
Valve for MP-910W	Lelief valve tube assy	—	RPA-6114936370	1	Around every 1 year

Cleaning

(1) Cleaning Protein

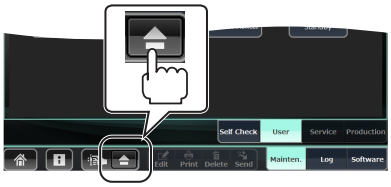
Clean the fluid path inside the analyzer with CLEANAC•810 (sodium hypochlorite).

Do this whenever normal cleaning was not effective.

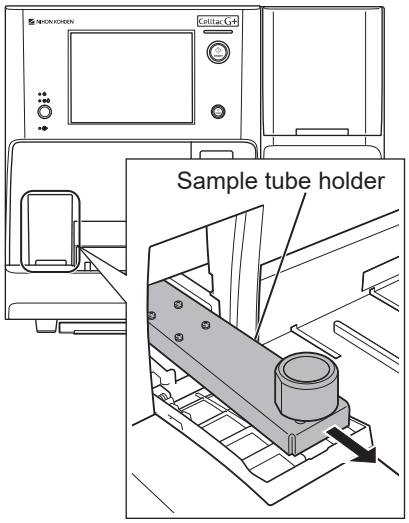
NOTE: Do the protein cleaning at least once every month (required after around 2000 measurements).

1 Open the User Maintenance window and place the CLEANAC•810 detergent on the sample tube holder.

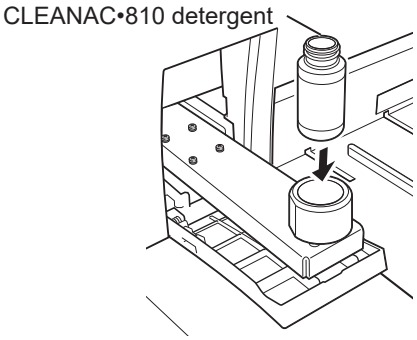
Section 7-2-1 (p. 7-4)



1) Touch [⏏] to eject the sample tube holder.



2) Check that the detergent adapter is attached on the ejected sample tube holder.



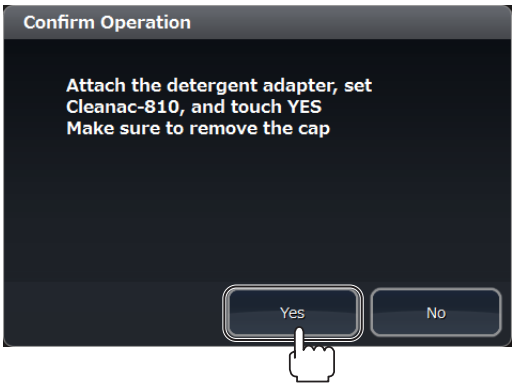
3) Remove the cap from the CLEANAC•810 detergent bottle and insert the bottle into the sample tube holder adapter.

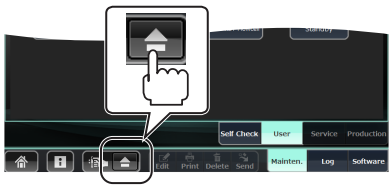
NOTE • Insert the detergent into the adapter until it stops at the end.

• Make sure to remove the cap.

2 Touch [Clean Protein] on the User Maintenance window.

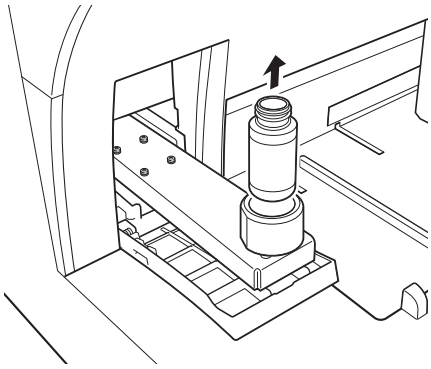
3 Touch [Yes] on the Confirm Operation window.





4 When the protein cleaning operation is complete, the sample tube holder is ejected.

Remove the CLEANAC•810 detergent, and touch [⏏] to slide in the sample tube holder.



(2) Cleaning with sodium hypochlorite

This is a procedure of MC-910W and JQ-922W internal cleaning with sodium hypochlorite.

Perform this operation at least once a year as periodic maintenance.

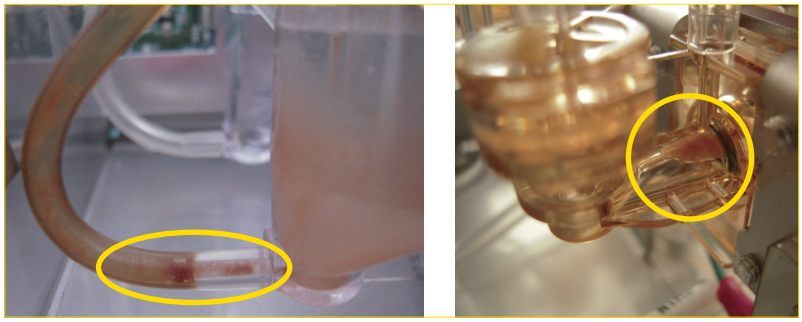
The cleaning frequency varies depending on the use condition.

Perform this operation before “Calibration”.

NOTE: When the following two alarms occur, do not perform this operation, but perform the cleaning procedure of abnormal state.

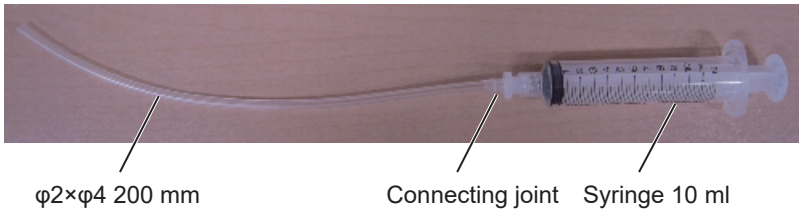
- WBC Noise
- WBC Time-Series Message

Example of dirt inside of the MC-910W



Required tools:

- RPK-9000068732 Syringe 10 mL
- Connecting tube
- Pean 2 pcs
- Phillips screwdriver



Detergent:

- MK-810W (T438T) 10 mL
- MK-710W (T438H) 12 mL

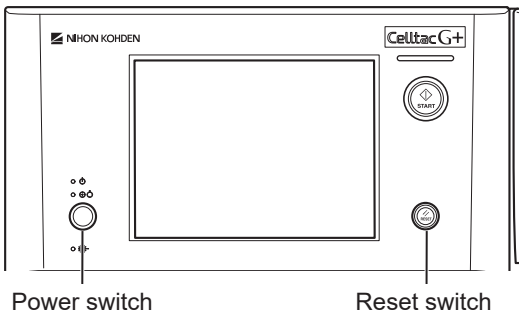
NOTE
- This operation needs to touch the fluid path which blood passes through. Always wear rubber gloves to protect yourself from infection.
- This operation includes a procedure of manually injecting the detergent with syringe. Always wear protective glasses to prevent the detergent from entering your eyes.

1 Draining and removal of exterior parts

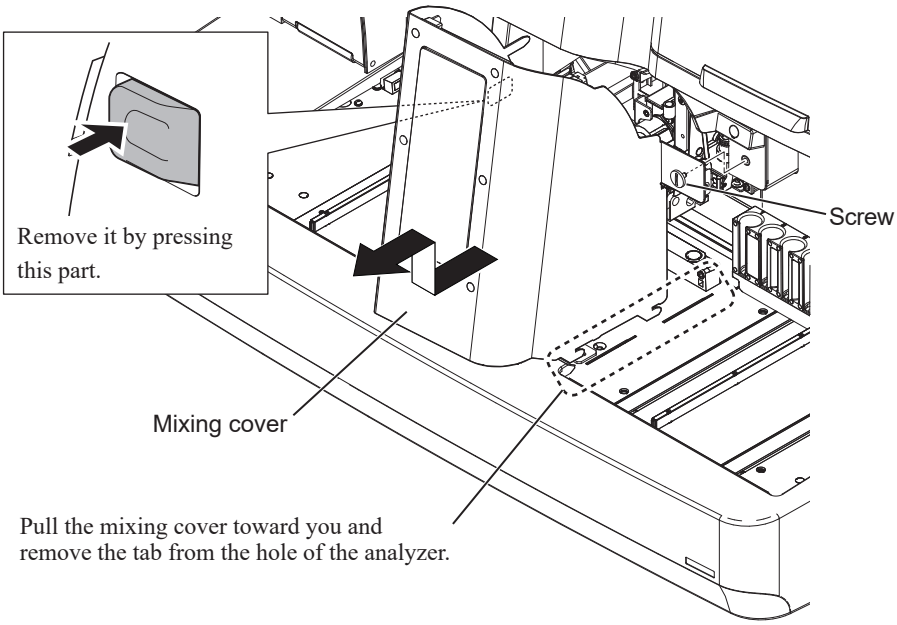
1) Open the Service Maintenance window and touch [Drain MC].

2) Touch [Yes] to remove dirt and bubbles from the MC.

3) Press and hold the Reset button and press the power switch to shut down the analyzer.

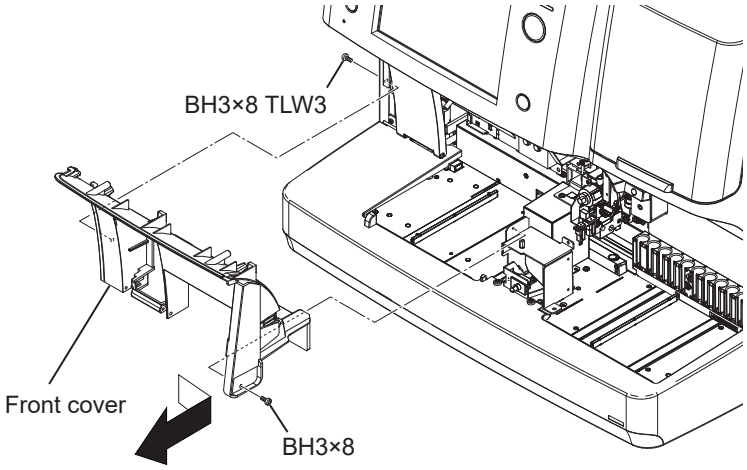


4) Loosen the screw on the front panel of the analyzer to remove the mixing cover.

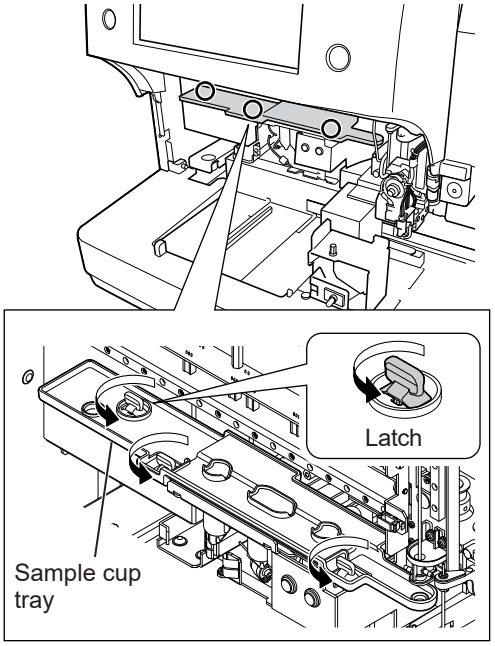


5) Remove the BH3×8 TLW3 screw and BH3×8 screw.

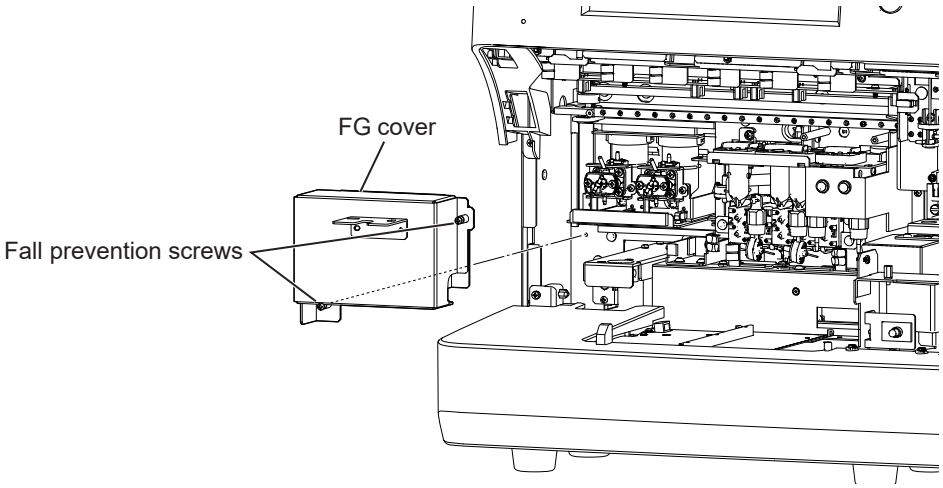
6) Hold the right side of the front cover, move it a little to the right and pull it towards you to remove the front cover.



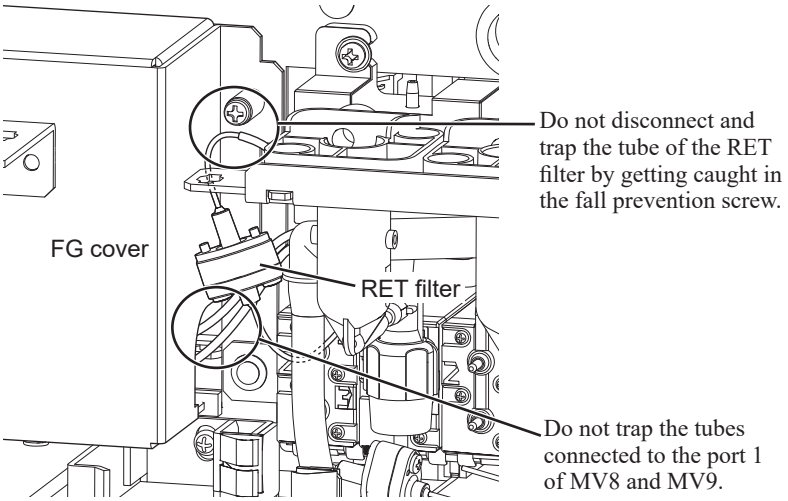
7) Turn the three latches counter-clockwise and remove the sample cup tray.



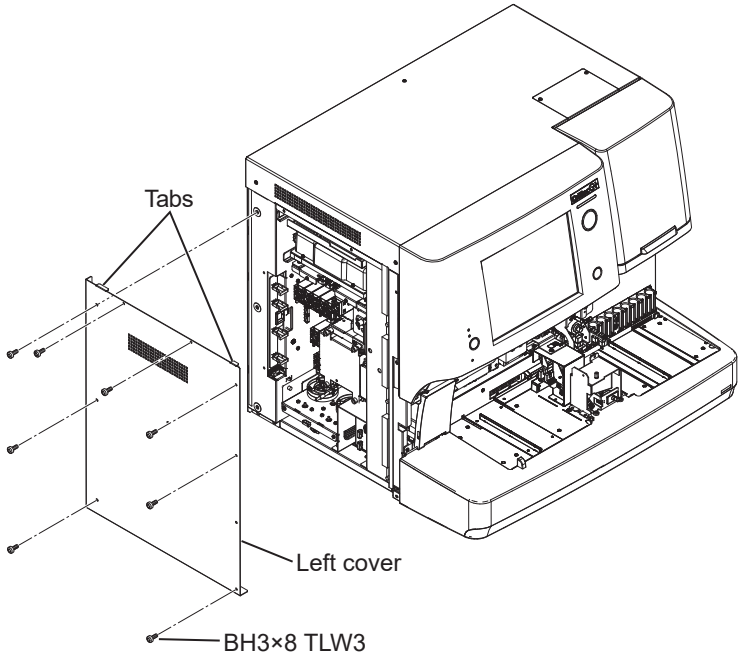
8) Loosen the two fall prevention screws, and remove the FG COVER by moving it upward and sliding it toward you.
If the FG cover is hard to remove, loosen the washers on the rear of the screws and loosen the screws more.



NOTE: When removing or attaching the FG cover, cover the RET filter with fingers so that the RET filter is not trapped.



9) Remove the eight BH3×8 TLW3 screws and remove the left cover.

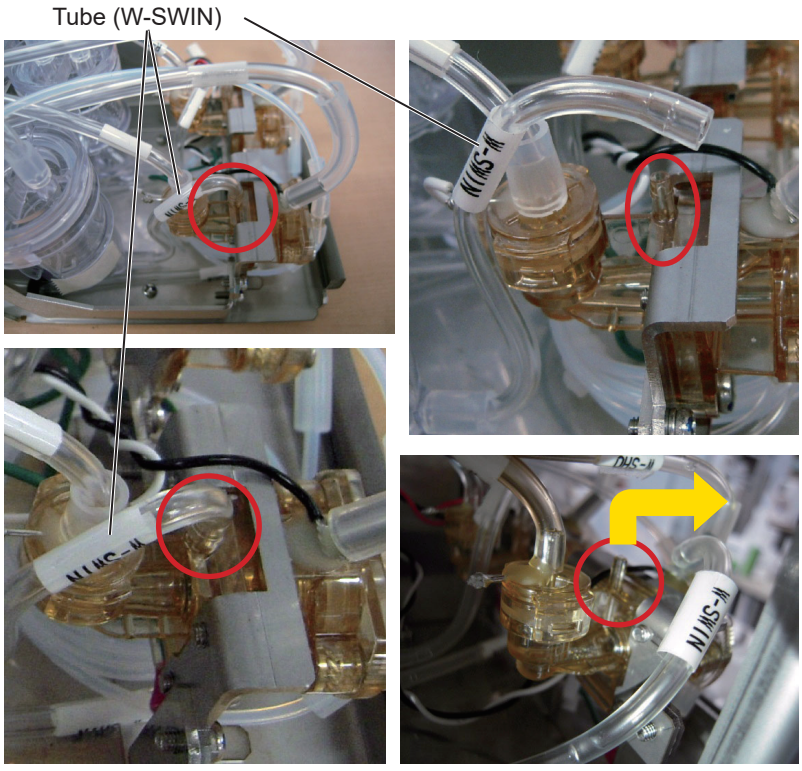


NOTE: Do not drop the left cover while removing the screws.

2 Checking clogs

1) Disconnect the upper tube (W-SWIN) at the back of the WBC detection hole.

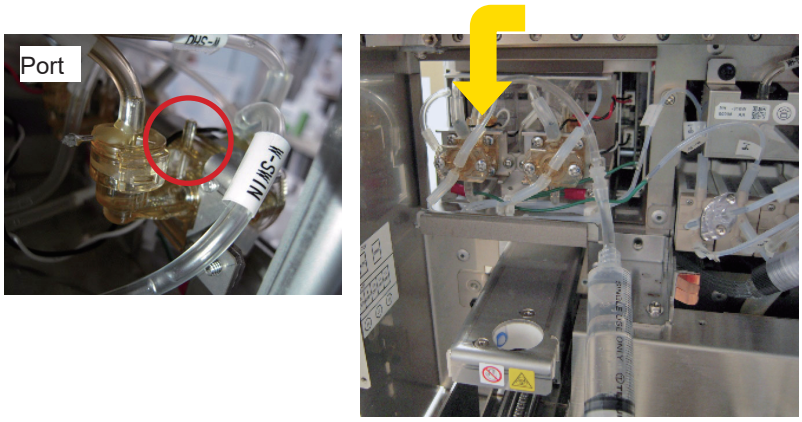
NOTE: When disconnecting the tube, cover the periphery with waste cloth to prevent contamination with the fluid.



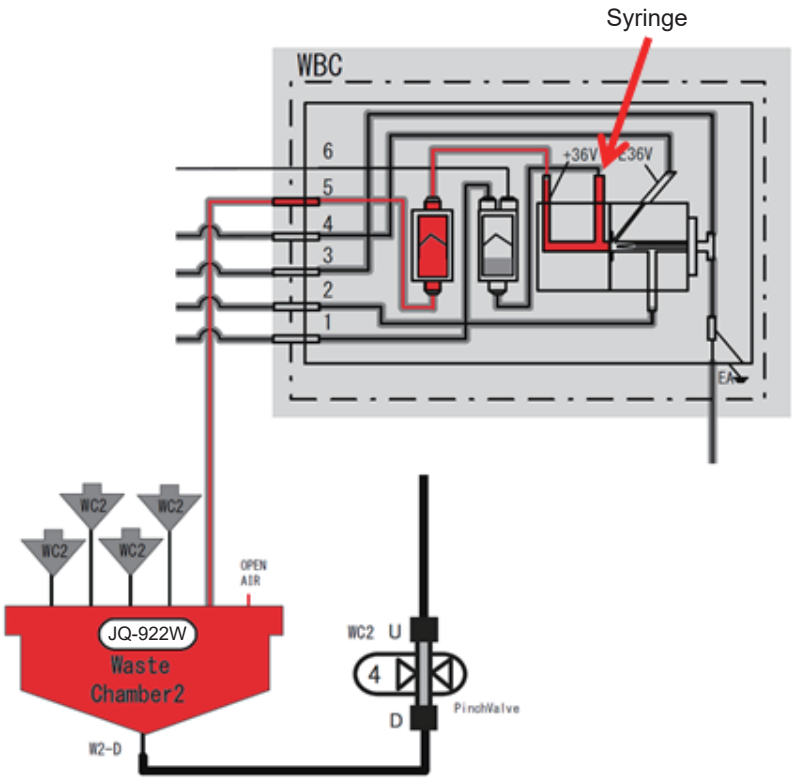
The pictures above are taken with the MC-910W removed from the analyzer to provide explanation.

2) Connect the syringe with connecting tube to the port.

NOTE: When removing the tube, cover the periphery with waste cloth to prevent contamination with the fluid.



3) Use the syringe to check the clog in the fluid path shown below.

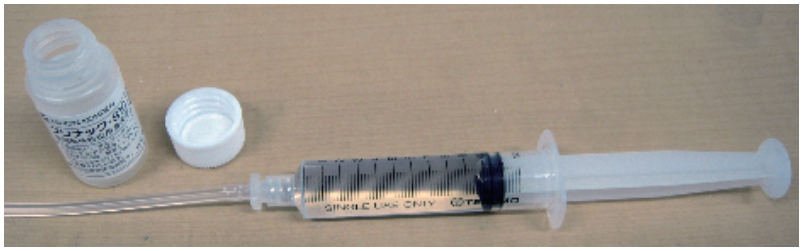


NOTE
- When pushing the syringe and the syringe is not pushed back, it is judged as no complete clogs. In that case, perform the cleaning.
- If the syringe is pushed back, it is judged as complete clog. Remove the MC-910W and remove clogs.
- If clogs are detected, always remove the clogs before proceeding to the next procedure.

3 Cleaning MC-910W with sodium hypochlorite (MK-810W: T438T)

1) Aspirate MK-810W 10 ml in the 10 ml syringe.

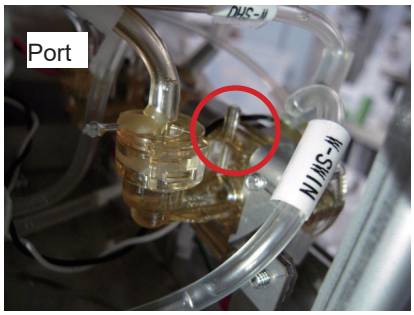
NOTE: To prevent the excessive injection of the detergent, use the 10 ml syringe

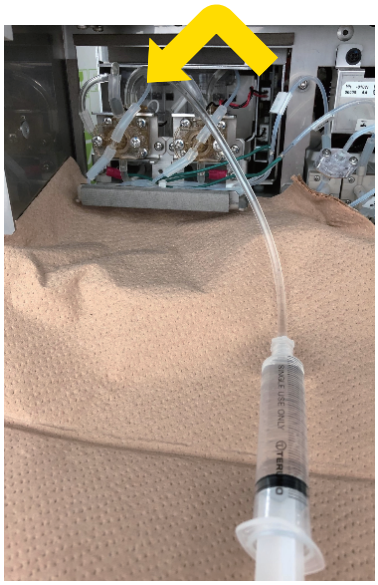


2) Cover the periphery with waste cloth.

3) Connect the syringe with the connecting tube to the port.

NOTE: When connecting the tube to the port, cover the periphery with waste cloth.

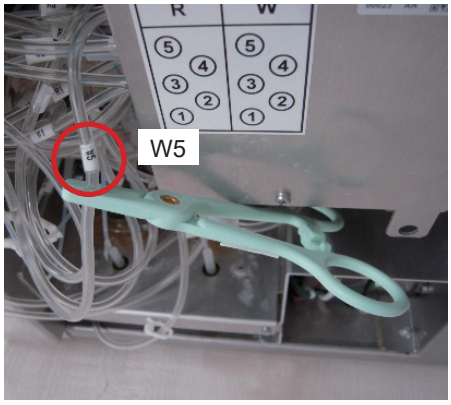


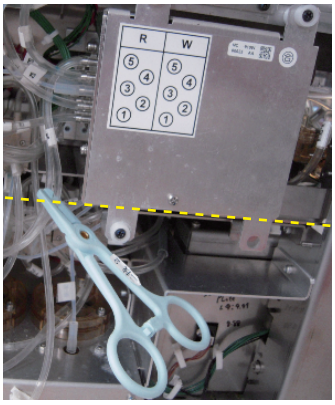


4) Clamp the tube (W5) of the W5 port on the left of the MC-910W with pean.

NOTE • Clamp the tube at the position referring to the yellow dotted line in the figure.

• Be careful not to clamp the other tubes.

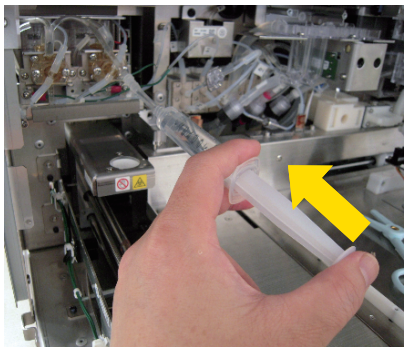


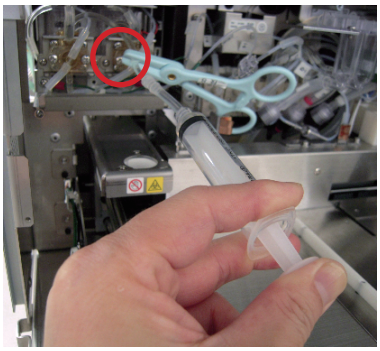


5) Slowly inject all the 10 ml detergent over at least three seconds, and then hold the piston rod and clamp the connecting tube with pean.

NOTE • To prevent accidental disconnection of the tube, slowly push the syringe over at least three seconds.

• When injecting the detergent, the syringe can be pushed back, but push the syringe to the end.



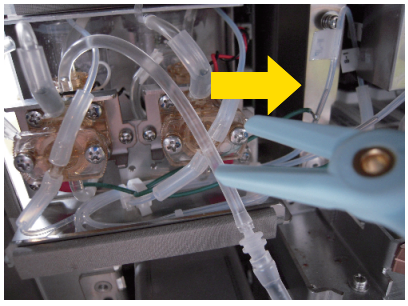


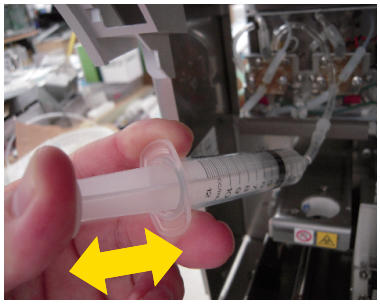
6) Leave in this state for five minutes.

7) Remove the pean at the connecting tube, and push and pull the syringe ten times slowly.

NOTE • Slowly push and pull the syringe over at least six seconds per one stroke.

• Be sure to follow the syringe capacity and the operation time. This may cause damage the parts of the unit.



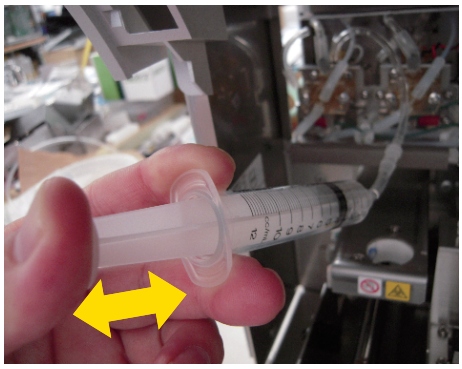


4 Cleaning JQ-922W (WASTE CHAMBER 2) with sodium hypochlorite (MK-810W)

1) Remove the pean at the tube (W5).

2) Push and pull the syringe five times slowly to drain the detergent in the MC-910W into the WASTE CHAMBER 2.

NOTE
- Slowly push and pull the syringe over at least six seconds per one stroke.
- Be sure to follow the syringe capacity and the operation time. This may cause damage the parts of the unit.

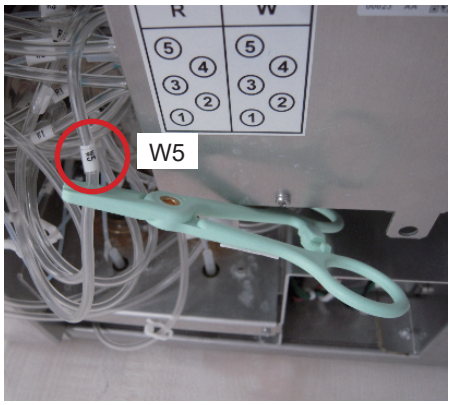


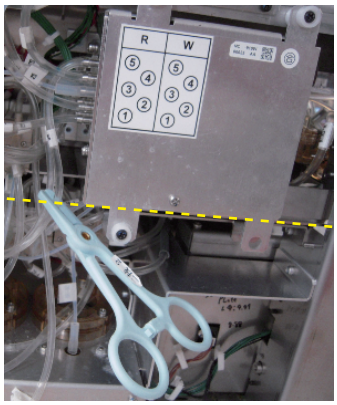
3) Leave in this state for five minutes to clean the bottom of the WASTE CHAMBER2.

5 Cleaning MC-910W with CLEANAC•710W (MK-710W : T438H)

1) Clamp the tube (W5) of the W5 port on the left of the MC-910W with pean.

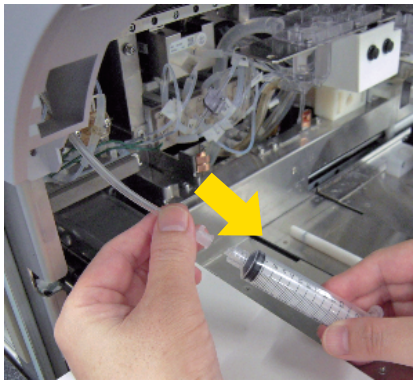
NOTE
- Clamp the tube at the position referring to the yellow dotted line in the figure.
- Be careful not to clamp the other tubes.



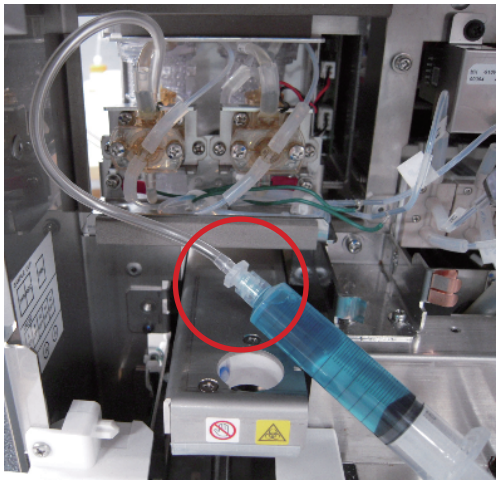


2) Disconnect the syringe at the joint shown below and aspirate the MK-710W 12 ml.

NOTE: MK-710W is mixed with MK-810W and changes its color.

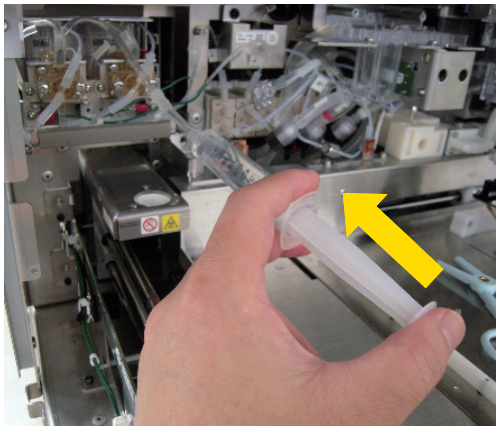


3) Connect the syringe to the connecting tube.



4) Slowly inject all the 12 ml detergent over at least three seconds.

NOTE
- To prevent accidental disconnection of the tube, slowly push the syringe over at least three seconds.
- When injecting the detergent, the syringe can be pushed back, but push the syringe to the end.



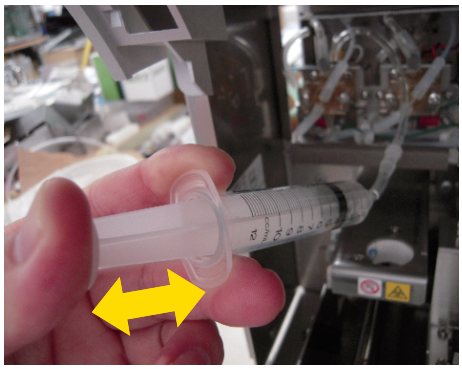
- Do not push and pull the syringe for cleaning due to the occurrence of bubbles.

5) Remove the pean at the tube (W5).

6) Push and pull the syringe five times slowly to drain the detergent in the MC-910W into the WASTE CHAMBER 2.

NOTE • Slowly push and pull the syringe over at least six seconds per one stroke.

• Be sure to follow the syringe capacity and the operation time. This may cause damage the parts of the unit.

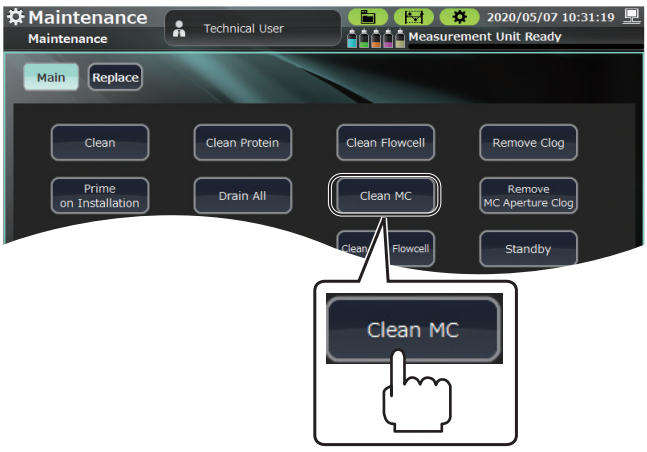


6 Cleaning by the MC-910W function

1) Return to the tubes and the removed parts to their original position.

NOTE: When connecting and disconnecting the tubes, cover the periphery with waste cloth to prevent contamination with the fluid.

2) Open the User Maintenance window and touch [Clean MC].



3) Touch [Yes] to perform the MC cleaning.

Checking Reagents

(3) Check that Nihon Kohden products are used as reagents.

> ⚠ **CAUTION**
>
> Only use Nihon Kohden specified reagents and consumables. Otherwise the measurement result cannot be guaranteed and incorrect reagent concentration can cause equipment damaged.

For the analyzer, use the reagents listed in the following table.

Name and Model		Supply Code	Packing Unit
Diluent	ISOTONAC•3/4	T436D	18 L
Detergent	CLEANAC•710	T438H	2 L
	CLEANAC•810	T438R	15 mL×3
Lysing reagent (CBC)	HEMOLYNAC•310	T493D	250 mL
Lysing reagent (DIFF)	HEMOLYNAC•510	T496D	250 mL
Reticulonac stain	Reticulonac	MK-110W-1M	250 mL

(4) Check that the diluent (ISOTONAC•3/4) is not past the expiration date.

(5) Check that the detergent (CLEANAC•710) is not past the expiration date.

(6) Check that the detergent (CLEANAC•810) is not past the expiration date.

(7) Check that the hemolysing reagent (HEMOLYNAC•310) is not past the expiration date.

(8) Check that the hemolysing reagent (HEMOLYNAC•510) is not past the expiration date.

(9) Check that the staining reagent (Reticulonac) is not past the expiration date.

Check that all the used reagents are not past the expiration date.

Checking Appearance

(10) Check the appearance.

Check the following items visually. Actually press switches and keys to check that a pressing sensation is present, and check that cables are connected securely.

- Check that the exterior is not damaged, dirty or scratched.
- Check that fluid is not leaking.
- Check that the overflow tray does not contain residue from a fluid leak.
- Check that the racks are not dirty.
- Check that the rack barcodes are not dirty or peeling.
- Check that the adapter is not dirty.
- Check that the sample conveyor (autoloader) is not dirty.
- Check that the display or switch is not cracked or loose.
- Check that the labels are not dirty or peeling.
- Check that the reagents are connected correctly, and the tubes are not broken, bent or clogged.
- Check that the peripheral devices are connected correctly, and the connection cables are not damaged.
- Check that consumables such as recording paper have not run out.

Checking AC Power Cord and Safety

(11) Check that a 3-prong AC power cord is used and the prongs are not deformed.

Check that the AC power cord and earth wire are not bent and the core wires are not exposed, and check visually that the AC power cord is a 3-prong type and the prongs are not deformed.

Checking Basic Operations

(12) Check that the analyzer starts normally.

Check that when the analyzer power is turned on, the analyzer starts normally and the Alarm window does not appear on the display.

Section 2-1 (p. 2-3)

(13) Check that the self check operation is normal.

Select [Technical User] on the Operator Management window and run the self check.

Check that there is no FAIL result (all of the statuses are PASS).

Section 7-2-6 (p. 7-13)

(14) Check that the date and time are correct.

Check that the date and time at the top right of the screen are correct. When incorrect, correct on the [System] > [Date and Time] window.

(15) Check the display.

Check that no locations are missing from the display and that no locations are significantly discolored.

(16) Check that the touch positions of the touch screen are correct.

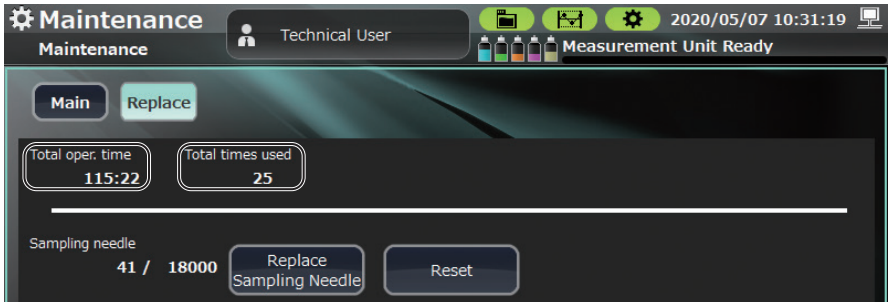
Check that when the keys on the screen are touched, the key display matches the touch positions of the touch screen. When the touch positions are misaligned, adjust the touch screen.

Calibrating the Touch Panel
Section 7-3-8 (p. 7-41)

(17) Check the total operation time and the total times used.

Open [Maintenance] > [User] > [Replace] window.

Write down the values displayed on the window.



Checking Inside the Analyzer

Change, clean and replace the parts in the analyzer. The sampling needle, venting needle and filter are replaced in a batch with a batch operation.

(18) Checking and replacing the sampling needle

See “7-5-1-7. Replacing Maintenance Parts in Batches (p. 7-102)” and replace the sampling needle.

Section 7-5-1-7 (p. 7-103)

(19) Checking and replacing the venting needle

See “7-5-1-7. Replacing Maintenance Parts in Batches (p. 7-102)” and replace the venting needle.

Section 7-5-1-7 (p. 7-103)

(20) Checking and replacing the filters (7 pcs)

See “7-5-1-7. Replacing Maintenance Parts in Batches (p. 7-102)” and replace each of the filters.

Section 7-5-1-7 (p. 7-103)

(21) Checking and replacing the relief valve tube assy

See “7-5-1-7. Replacing Maintenance Parts in Batches (p. 7-102)” and replace the relief valve tube assy.

Section 7-5-1-7 (p. 7-103)

(22) Checking and replacing the two rinse chassis

Cleaning schedule: When replacing the sampling needle

After removing the sampling needle, clean the sampling needle rinsing cup with a cotton swab.

Section 7-6-1-6 (p. 7-111)

Cleaning schedule: When replacing the venting needle

After removing the venting needle, clean the venting needle rinsing cup with a cotton swab.

Section 7-6-1-7 (p. 7-112)

(23) Cleaning the sample rotator for barcode

Cleaning schedule: When the sample rotator for barcodes is not clean (when replacing the sampling needle or the venting needle)

Check for dirt when replacing the sampling needle or the venting needle. When the sample rotator for barcode is not clean, clean the sample rotator for barcode.

Section 7-5-1-7 (p. 7-103)
Section 7-6-1-8 (p. 7-112)

(24) Checking and cleaning the sample cup tray

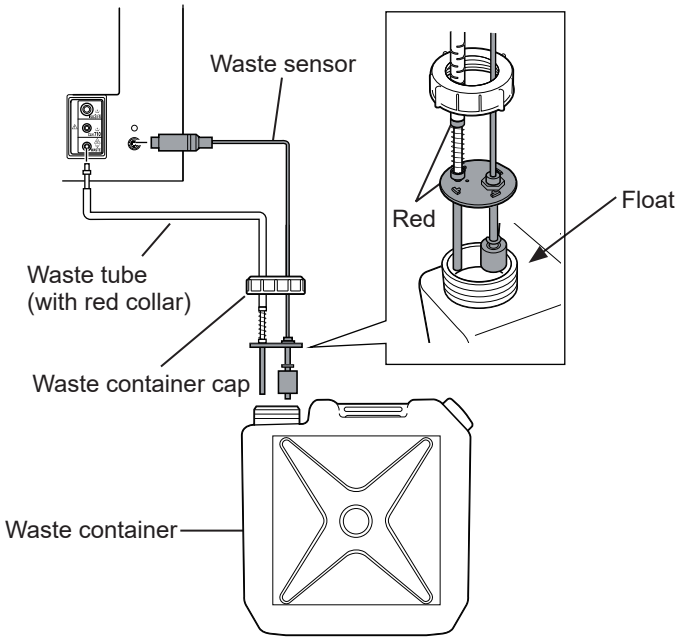
See “7-5-1-7. Replacing Maintenance Parts in Batches (p. 7-102)” and remove the sample cup tray and wash it with tap water.

Section 7-5-1-7 (p. 7-103)

(25) Checking the waste container sensor

Check that the float of the waste container sensor moves smoothly, and check that when the float is pushed up, the message “23030 Waste Bottle Full” appears on the analyzer screen.

After confirming this, touch the “RESTORE” key to start the restore operation.



(26) Checking the aperture caps

Check for error logs related to the aperture caps.

When the error code “21050 WBC Detection Hole Clog” or “21051 RBC Detection Hole Clog” occurs frequently, clean the aperture caps.

Section 7-6-1-9 (p. 7-113)

(27) Checking the aperture caps

Clean the fluid path inside the analyzer with CLEANAC•710.

Section 7-2-2-1 (p. 7-5)

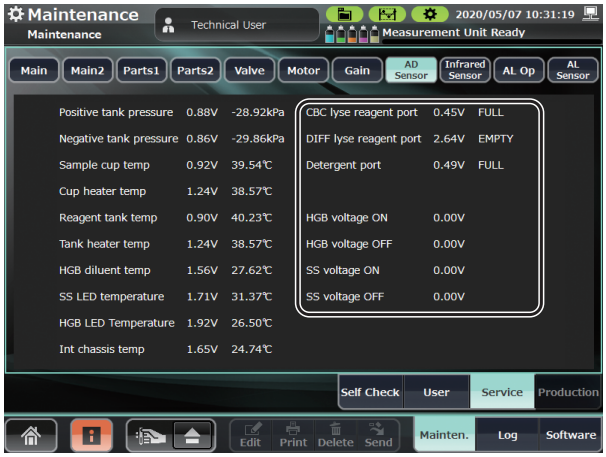
Checking AD Sensors

(28) Checking the AD sensors

Check the voltage with HEMOLYNAC•310, HEMOLYNAC•510, CLEANAC•710 and Reticulonac fluid, HBG voltage ON and OFF, and SS voltage ON and OFF.

1 Open [Maintenance] > [Service] > [Gain] window, check that HGB voltage and SS voltage ON and touch [HGB LED ON] at the lower left of the window to light the HGB LED.

2 Open [Maintenance] > [Service] > [AD Sensor] window, and check and write down the voltage of the HEMOLYNAC•310 port, HEMOLYNAC•510 port, CLEANAC•710 port and Reticulonac port, HBG voltage ON and OFF, and SS voltage ON and OFF.



3 Perform adjustment when any voltage is outside the range.

Adjusting Gain
Section 6-4 (p. 6-19)

Item		Expected Value
CLEANAC•710	With fluid	0.3 to 0.5 V
HEMOLYNAC•310	With fluid	0.3 to 0.5 V
HEMOLYNAC•510	With fluid	0.3 to 0.5 V
Reticulonac	With fluid	0.3 to 0.5 V
HGB voltage	ON	4.00 ±0.50 V
	OFF	0.05 to 0.15 V
SS voltage	ON	4.00 ±0.50 V
	OFF	0.05 to 0.15 V

4 Return to the Gain window after checking the voltage of AD sensors. Touch [HGB LED OFF] to turn off the HGB LED and stop acquiring the measurement values.

Self Check Results

(29) Checking the temperature items

Open the [Maintenance] > [Self Check] > [Details1] window, and check and write down the temperature items.

Temperature Items	Expected Value
Cup Temperature	37.00 to 43.00°C (98.60 to 109.40°F)
Cup Heater Temperature	35.00 to 45.00°C (95.00 to 113.00°F)
Tank Temperature	37.00 to 43.00°C (98.60 to 109.40°F)
Tank Heater Temperature	35.00 to 45.00°C (95.00 to 113.00°F)
HGB diluent Temperature	10.00 to 50.00°C (50.00 to 122.00°F)
HGB LED Temperature	10.00 to 50.00°C (50.00 to 122.00°F)
SS LED Temperature	10.00 to 50.00°C (50.00 to 122.00°F)
Internal Temperature	10.00 to 50.00°C (50.00 to 122.00°F)
RET tank temp	37.00 to 43.00°C (98.60 to 109.40°F)
RET tank heater temp	35.00 to 45.00°C (95.00 to 113.00°F)
RET LD temp	10.00 to 60.00°C (50.00 to 140.00°F)
RET MO temp	10.00 to 60.00°C (50.00 to 140.00°F)

(30) Checking the pressure items

(31) Checking the circuit check items

Open the [Maintenance] > [Self Check] > [Details2] window, and check and write down the pressure items and circuit check items.

Pressure Items		Expected Value
ISO Chamber	Air Pressure	–8.00 to 8.00 kPa
	Positive Pressure	57.96 to 80.04 kPa
	Negative Pressure	–35.00 to 25.00 kPa
Waste Chamber	Air Pressure	–8.00 to 8.00 kPa
	Positive Pressure	57.96 to 80.04 kPa
	Negative Pressure	–35.00 to 25.00 kPa

Circuit Check Items	Expected Value	
WBC	73.9 ±5%	(70.2 to 77.5)
RBC	56 ±5%	(53 to 59)
MCV	39.7 ±5%	(37.7 to 41.7)
DIFF	6000 ±5%	(5700 to 6300)
BTOC	6000 ±5%	(5700 to 6300)
WBC Voltage	18.1 V ±0.6%	(17.5 to 18.7 V)
RBC Voltage	18.1 V ±0.6%	(17.5 to 18.7 V)
HGB ON Voltage	4.00 V ±0.50 V	(3.50 to 4.50 V)
HGB OFF Voltage	0.10 V ±0.05 V	(0.05 to 0.15 V)
SS ON Voltage	4.00 V ±0.50 V	(3.50 to 4.50 V)
SS OFF Voltage	0.10 V ±0.05 V	(0.05 to 0.15 V)

(32) Checking the background check items

Open the [Maintenance] > [Self Check] > [Details3] window, and check and write down the pressure items and background check items.

Background Check Items	Expected Value
WBC	2.0×10^{2}/µL or less
RBC	2.0×10^{4}/µL or less
HGB	0.10 g/dL or less
PLT	1.00×10^{4}/µL or less
TOC	100 count or less
TFC	100 count or less

Checking Particle Distribution

(33) Checking the particle measurement

1. Touch [⏏] to eject the sample tube holder.
2. Move the 7 µm standard particles (T905) to a clean sample tube and set the tube on the sample tube holder.
3. Touch [Measure Particles] on the [Maintenance] > [Main] window to start particle measurement.

4 After measurement is completed, return to the Home screen, select sample ID [PARTICLE] on the [Data List] window and check the data. Check and write down the values of FS CV, FL CV and TOC on the [Research] window of the Data window.

Particle Distribution	Expected Value
FS CV	5.0% or less
FL CV	5.0% or less
TOC	2000 count or more

5 See “6-6-2. Adjusting Optical Sensitivity” and measure the particle distribution by R1 particle and check the particle distribution range.

Adjusting Optical Sensitivity
Section 6-6-2 (p. 6-24)

Particle Distribution	Expected Value
FSC CV%	5.0% or less
FL525 CV%	5.0% or less
FL650 CV%	5.0% or less
BTOC	2000 count or more

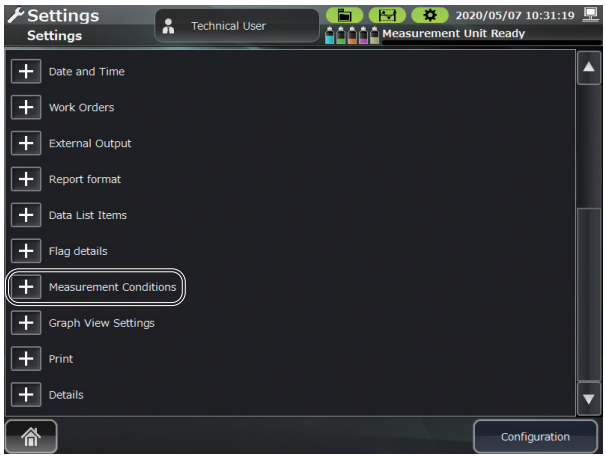
Checking Calibration Values and Gain Values

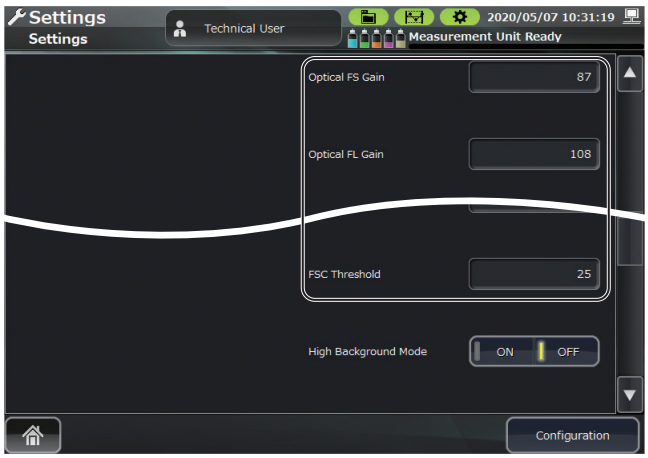
(34) Checking the current calibration coefficients and gain values

Write down the current normal and pre-dilution settings.

1 Check and write down the calibration coefficients for each item displayed on the [QC] > [Calibration] window.

2 Return to the Home screen, touch [System] > [Measurement Conditions], and check and write down the gain values.





(35) Checking the measurement values, calibration coefficients and gain values after calibration

NOTE: When changing the calibration coefficient, check with the customer before changing it.

1 Touch [CAL] on the QC window. The Calibration window opens.

Operator's Manual:
"Opening the QC Window" in Section 6

2 See "6-6-2. Adjusting Optical Sensitivity" and check the gain values of each setting and check that the average value of FSC, FL525 and FL650 is within ±20%.

Items	Target Value
FSC	320
FL525	650
FL650	525

Adjusting Optical Sensitivity
Section 6-6-2 (p. 6-24)

3 Select a measurement mode (Normal or Pre-dilution) and touch [Calibration Measurement].

Check the measurement method to use and select the calibration mode.

Calibration Mode	Auto Measurement	Manual Measurement		
		Whole Blood	Pre-dilution	WBC High
Normal	✓	✓	–	✓
Pre-dilution	–	–	✓	–

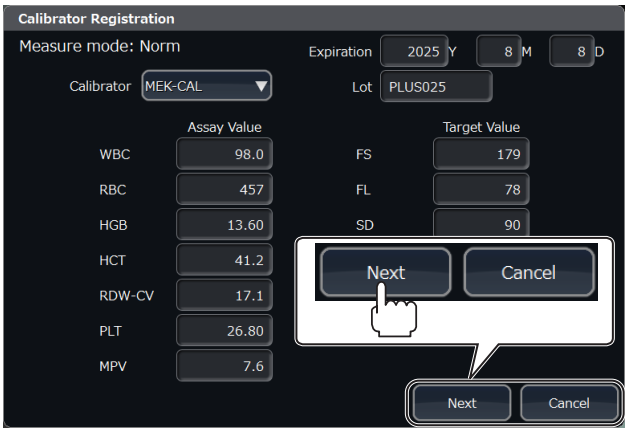
- The aspirating position is different for auto and manual measurement (except pre-dilution) but it uses the same nozzle. Use normal mode for calibration. The reagent needs to be prepared in Pre-dilution measurement. Use pre-dilution mode for calibration.
- The calibration is not required for the measurement of high WBC dilution. For details, refer to "5-3. Forced Calibration" (p. 5-10).

4 After the Calibrator Registration window appears, scan the QR code on the assay sheet of the calibrator with the barcode reader.

The information of the read calibrator is set and displayed on the window.

The information can also be entered directly by touching the setting parameter.

5 After checking the information on the window, touch [Next] to open the Auto Calibration window.

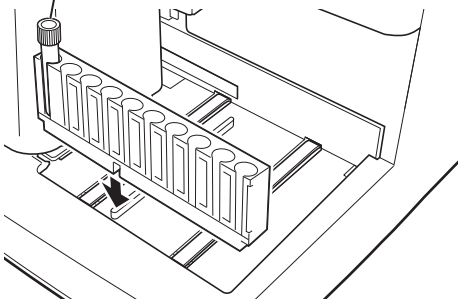


6 Measure the calibrator.

Normal mode:

Normal mode

Hematology calibrator (MEK-CAL)

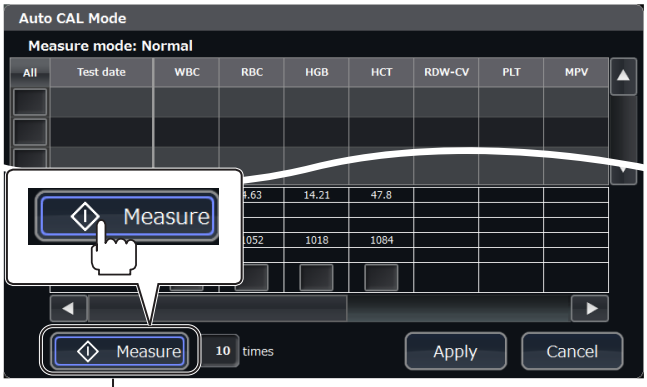


1) Insert the calibrator into the left end (first position) of the rack.

2) Place the rack with the calibrator in the analyzer, and touch [Measure]. Measure the calibrator 10 times.

Operator's Manual:
"Performing Auto Measurement" in Section 5

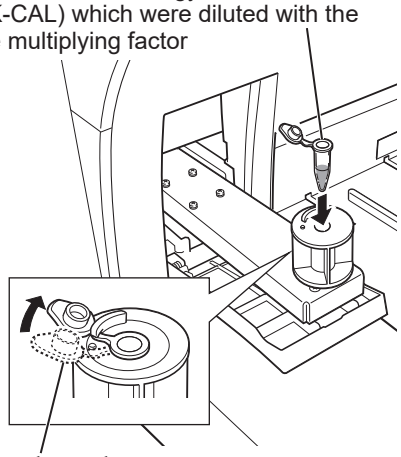
You can measure the calibrator from 1 to 20 times. Enter the number of times to automatically measure the calibrator.



You can measure the calibrator from 1 to 20 times.

Pre-dilution mode

20 µL of the hematology calibrator (MEK-CAL) which were diluted with the same multiplying factor



Secure the cap by inserting the cap under the tab of the adapter.

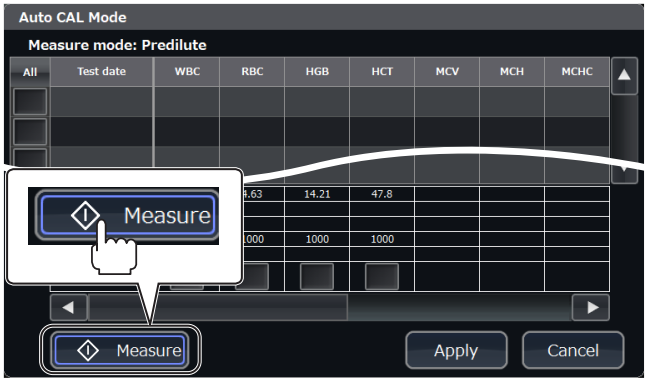
Pre-dilution mode:

1) Prepare 10 samples of 20 µL of MEK-CAL hematology calibrator which were diluted with 120 µL of diluent (ISOTONAC•3/4).

Operator's Manual:
"Performing Pre-dilution Measurement" in Section 5

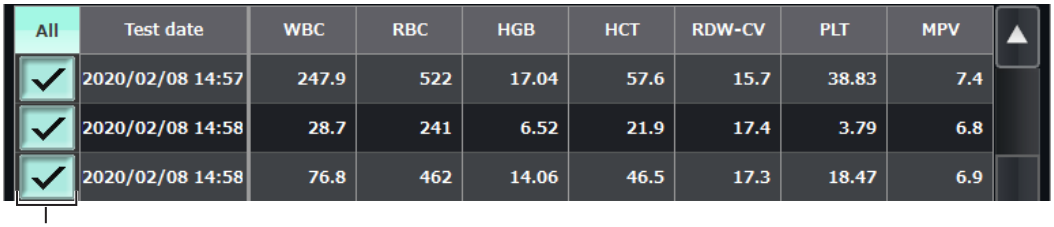
2) Uncap the micro tube, insert it into the adapter of the sample tube holder, and touch [Measure]. Perform manual measurement 10 times.

Operator's Manual:
"Performing Manual Measurement" in Section 5



When measurement is complete, the measurement results appear on the screen.

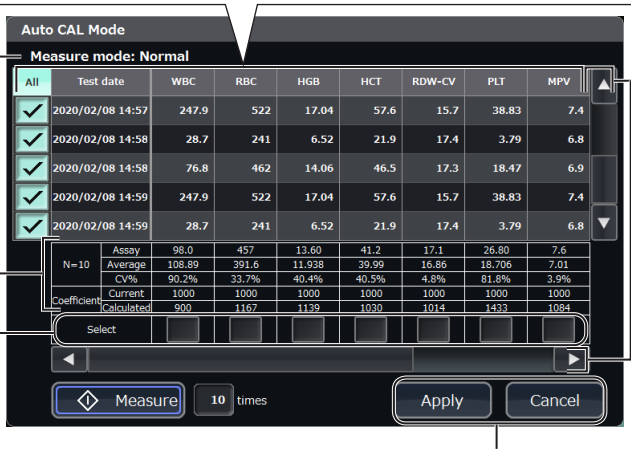
When the number of measurement data exceeds 20, the oldest data is overwritten in order to keep the latest 20 data.



All	Test date	WBC	RBC	HGB	HCT	RDW-CV	PLT	MPV
✓	2020/02/08 14:57	247.9	522	17.04	57.6	15.7	38.83	7.4
✓	2020/02/08 14:58	28.7	241	6.52	21.9	17.4	3.79	6.8
✓	2020/02/08 14:58	76.8	462	14.06	46.5	17.3	18.47	6.9

Check box

- Touch to select the measurement data to perform statistical calculation. The check icon appears in the box.
- To unselect, touch the selected data again.
- Touch [All] to select or unselect all items.



Measurement mode

Touch [▲], [▼], [◀] or [▶] to scroll the list vertically or horizontally.

Statistical data

Displays the results of the statistical calculation.

Select

Touch to select the parameter to change the calibration coefficient.

The check icon appears in the box.

[Apply]: Applies the revised calibration coefficient to the selected parameters.

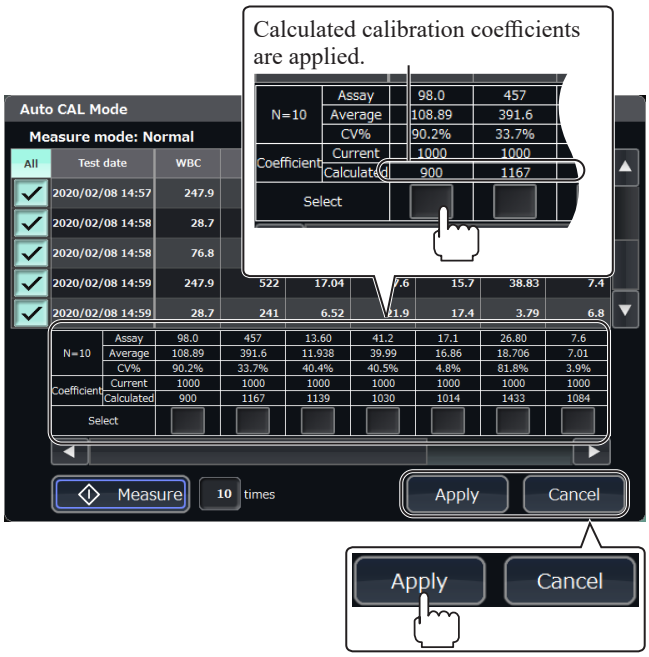
[Cancel]: Discards all data including the measurement data and returns to the Calibration window.

7 Select 10 or more sets of measurement data to do a statistical calculation.

NOTE: If the number of measurement data is less than 10, repeat measurement.

- To unselect, touch the selected data again.
- Touch [All] to select or unselect all items.

8 Check the data, select the parameter column to change the calibration coefficient, and touch [Apply].



9 Check that the calibration coefficient is correctly applied on the Calibration window.

Write down the changed measurement values, calibration coefficients and gain.

Checking QC and Precision

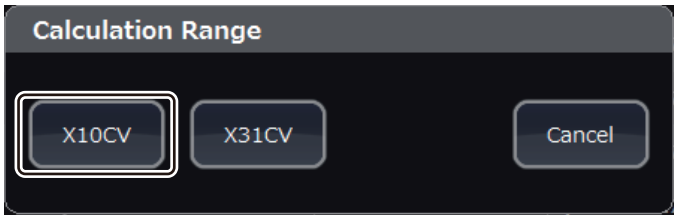
(36) Average values and CV values of each measured parameter on the [Calculation] window

1 Set the MEK-5DN hematology control in the first position of the sample tube rack and touch the [Measure 10 Times] key on the [Maintenance] > [Service] window.

2 The analyzer consecutively measures the hematology control 10 times.

3 Return to the [Home] screen, select the last data measured at this time on the [Data List] window and touch the [Calculation] key.

4 Touch the [X10CV] key on the [Calculation Range] window.



5 Check and write down the average values and CV values of each measured parameter on the [Calculation] window.

6 Measure the MK-RE2 hematology control for reticulocytes 10 times in the same way and check and write down the average values and CV values of each measured parameter.

9

Option Related

(37) External printer

Check that paper feeding is normal.

Check that recording quality is normal.

(38) Communication

Check that data is transferred correctly.

(39) Internal barcode reader

Check that barcodes are read correctly.

(40) External barcode reader

Check that barcodes are read correctly.

Others

(41) Check the software version.

Touch the [Software] key at the lower right of the [Maintenance] window to open the Software window.

Check and write down the software version.

MEK-9200
Maintenance Check Sheet

Issuance No. _____

Facility name	Installation site	Date of purchase	Date of maintenance check

Model	Serial number	Version number	Maintenance number	Sign by engineer who did the maintenance check

Cleaning		Result	Action
1	Protein cleaning		
2	Cleaning with sodium hypochlorite		

Checking Reagents		Result	Action
3	Nihon Kohden products are used as reagents.		
4	The diluent (ISOTONAC•3/4) is not past the expiration date.		
5	The detergent (CLEANAC•710) is not past the expiration date.		
6	The detergent (CLEANAC•810) is not past the expiration date.		
7	The hemolysing reagent (HEMOLYNAC•310) is not past the expiration date.		
8	The hemolysing reagent (HEMOLYNAC•510) is not past the expiration date.		
9	The staining reagent (Reticulonac) is not past the expiration date.		

Checking Appearance		Result	Action
10	There is no damage, dirt or scratch in the exterior.		
	There is no fluid leakage.		
	The waste tray does not contain residue from a fluid leak.		
	The racks are not dirty.		
	The rack barcodes are not dirty or peeling.		
	The adapter is not dirty.		
	The sample conveyor (autoloader) is not dirty.		
	The display or switche is not cracked or loose.		
	The labels are not dirty or peeling.		
	The reagents are connected correctly, and the tubes are not broken, bent or clogged.		
	The peripheral devices are connected correctly, and the connection cables are not damaged.		
	Consumables such as recording paper have not run out.		

Checking AC Power Cord and Safety		Result	Action
11	A 3-prong AC power cord is used and the prongs are not deformed.		

Checking Basic Operations		Result	Action
12	The analyzer starts normally.		
13	The self check operation is normal.		
14	The date and time are correct.		
15	The display is normal.		
16	The touch positions of the touch screen are correct.		
17	Check the total operation time and the total times used.		
	Total oper. time hours		
	Total times used times		

Checking Inside the Analyzer		Result	Action
18	The sampling needle is checked and replaced.		
19	The venting needle is checked and replaced.		
20	The seven filters are checked and replaced.		
21	The relief valve tube assy is checked and replaced.		
22	The two rinse chassis are checked.		
23	The sample rotator for barcode is cleaned.		
24	The sample cup tray is checked and replaced.		
25	The waste container sensor is checked.		
26	The aperture caps are checked.		
27	The cleaning operation is checked.		

Checking AD Sensors			Value	Result	Action
28	Checking AD Sensors				
	CLEANAC•710 (filled with liquid)	0.3 to 0.5 V	V		
	HEMOLYNAC•310 (filled with liquid)	0.3 to 0.5 V	V		
	HEMOLYNAC•510 (filled with liquid)	0.3 to 0.5 V	V		
	Reticulonac (filled with liquid)	0.3 to 0.5 V	V		
	HGB Voltage ON	4.00±0.50 V	V		
	HGB Voltage OFF	0.05 to 0.15 V	V		
	SS Voltage ON	4.00±0.50 V	V		
	SS Voltage OFF	0.05 to 0.15 V	V		

Self Check Results				Value	Result	Action
29	Checking the temperature items					
	Cup Temperature	37.00 to 43.00 °C	°C			
		98.60 to 109.40 °F	°F			
	Cup Heater Temperature	35.00 to 45.00 °C	°C			
		95.00 to 113.00 °F	°F			
	Tank Temperature	37.00 to 43.00 °C	°C			
		98.60 to 109.40 °F	°F			
	Tank Heater Temperature	35.00 to 45.00 °C	°C			
		95.00 to 113.00 °F	°F			
	HGB diluent Temperature	10.00 to 50.00 °C	°C			
		50.00 to 122.00 °F	°F			
	HGB LED Temperature	10.00 to 50.00 °C	°C			
		50.00 to 122.00 °F	°F			
	SS LED Temperature	10.00 to 50.00 °C	°C			
		50.00 to 122.00 °F	°F			
	Internal Temperature	10.00 to 50.00 °C	°C			
		50.00 to 122.00 °F	°F			
	RET tank temp	37.00 to 43.00 °C	°C			
		98.60 to 109.40 °F	°F			
	RET tank heater temp	35.00 to 45.00 °C	°C			
		95.00 to 113.00 °F	°F			
	RET LD temp	10.00 to 60.00 °C	°C			
		50.00 to 122.00 °F	°F			
	RET MO temp	10.00 to 60.00 °C	°C			
		50.00 to 122.00 °F	°F			

30	Checking the pressure items					
	ISO Chamber	Air Pressure -8.00 to 8.00 kPa	kPa			
		Positive Pressure 57.96 to 80.04 kPa	kPa			
		Negative Pressure -35.00 to 25.00 kPa	kPa			
	Waste Chamber	Air Pressure -8.00 to 8.00 kPa	kPa			
		Positive Pressure 57.96 to 80.04 kPa	kPa			
		Negative Pressure -35.00 to 25.00 kPa	kPa			

31	Checking the circuit check items				
	WBC	70.2 to 77.5			
	RBC	53 to 59			
	MCV	37.7 to 41.7			
	DIFF	5700 to 6300			
	BTOC	5700 to 6300			
	WBC Voltage	17.5 to 18.7 V	V		
	RBC Voltage	17.5 to 18.7 V	V		
	HGB ON Voltage	3.50 to 4.50 V	V		
	HGB OFF Voltage	0.05 to 0.15 V	V		
	SS ON Voltage	3.50 to 4.50 V	V		
	SS OFF Voltage	0.05 to 0.15 V	V		

32	Checking the background check items				
	WBC	$2.0\times10^2/\mu L$ or less	$10^2/\mu L$		
	RBC	$2.0\times10^4/\mu L$ or less	$10^4/\mu L$		
	HGB	0.10 g/dL or less	g/dL		
	PLT	$1.00\times10^4/\mu L$ or less	$10^4/\mu L$		
	TOC	100 counts or less	counts		
	TFC	100 counts or less	counts		

Facility name	Model	Serial number	Version number	Maintenance number

Checking Particle Distribution			Value	Result	Action
33	7 μm standard particles	LOT.No.			
	FS CV	5.0% or less	%		
	FL CV	5.0% or less	%		
	TOC	2000 counts or more	counts		
	R1 particle	LOT.No.			
	FSC CV%	5.0% or less	%		
	FL525 CV%	5.0% or less	%		
	FL650 CV%	5.0% or less	%		
	BTOC	2000 counts or more	counts		

Checking Calibration Values and Gain Values		Result	Action
34	Checking the current calibration coefficients and gain values (Fill in the table below)		
35	Checking the measurement values, calibration coefficients and gain values after calibration (Fill in the table below)		
Checking QC and Precision		**Result**	**Action**
36	Average values and CV values of each measured parameter on the [Calculation] window (Fill in the table below)		

Checking Calibration Values and Gain Values

MEK-CAL LOT.No.

R1 particle LOT.No.

34 Checking the current calibration coefficients and gain values

	Normal	Pre-dilution	WBC High
WBC			
RBC			—
HGB			
HCT			—
RDW-CV			—
PLT			—
MPV			—
NE%			
LY%			
MO%			
EO%			
BA%			
RET%		—	—
IRF		—	—
Gain			
FS GAIN			
FL GAIN			
SD GAIN			
FSC GAIN			
FL525 GAIN			
FL650 GAIN			

35 Checking the measurement values, calibration coefficients and gain values after calibration

	Measurement value	Calibration coefficient
WBC		
RBC		
HGB		
HCT		
RDW-CV		
PLT		
MPV		
NE%		
LY%		
MO%		
EO%		
BA%		
RET%		
IRF		
Gain		
FS GAIN		
FL GAIN		
SD GAIN		
FSC GAIN		
FL525 GAIN		
FL650 GAIN		

	Target value	Average value (within ±20%)
FSC		
FL525		
FL650		

Checking QC and Precision

36 Average values and CV values of each measured parameter on the [Calculation] window

MEK-5DN

MEK-5DN LOT.No.

Item	Average value	CV value	Item	Average value	CV value
WBC			MO%		
RBC			EO%		
HGB			BA%		
HCT			NE		
MCV			LY		
MCH			MO		
MCHC			EO		
RDW-CV			BA		
RDW-SD	—	—	TOC	—	—
PLT			RET%	—	—
PCT	—	—	RET	—	—
MPV			IRF	—	—
PDW	—	—	LFR	—	—
P-LCR	—	—	MFR	—	—
P-LCC	—	—	HFR	—	—
NE%			TFC	—	—
LY%					

MK-RE2

MK-RE2 LOT.No.

Item	Average value	CV value	Item	Average value	CV value
WBC	—	—	MO%	—	—
RBC	—	—	EO%	—	—
HGB	—	—	BA%	—	—
HCT	—	—	NE	—	—
MCV	—	—	LY	—	—
MCH	—	—	MO	—	—
MCHC	—	—	EO	—	—
RDW-CV	—	—	BA	—	—
RDW-SD	—	—	TOC	—	—
PLT	—	—	RET%		
PCT	—	—	RET		
MPV	—	—	IRF	—	—
PDW	—	—	LFR	—	—
P-LCR	—	—	MFR	—	—
P-LCC	—	—	HFR	—	—
NE%	—	—	TFC	—	—
LY%	—	—			

Facility name	Model	Serial number	Version number	Maintenance number

Option Related		Result	Action
37	Paper feeding is normal. (External printer)		
	Recording quality is normal. (External printer)		
38	Data is transferred correctly. (Communication)		
39	Barcodes are read correctly. (Internal barcode reader)		
40	Barcodes are read correctly. (External barcode reader)		

Others		Version	Result	Action
41	Check the software version.			

Measuring instrument	Product name	Control No. (Serial No.)	Expiration date	Product name	Control No. (Serial No.)	Expiration date

Component equipment	Accessories and supplies	
	Product name	Qty
Proposal item		
Process item		
Unprocessed item		

Overall determination

☐ No abnormalities. Continue usage.

☐ Although there is no impediment to usage, repairs should be scheduled.

☐ A usage problem was found. Repair immediately.

Notes

Inspection date	Inspection time			Inspector	Approved by
	Start	HH	MM		
Date	End	HH	MM		

Company name

Address

Emergency contact information

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Contact information is accurate as of May 2021. Visit https://www.nihonkohden.com/ for the latest information.

The model and serial number of your device are identified on the rear or bottom of the unit.
Write the model and serial number in the spaces provided below. Whenever you call your representative concerning this device, mention these two pieces of information for quick and accurate service.

Model _____ Serial Number _____

Your Representative

Note for users in the territory of the EEA and Switzerland:
Any serious incident that has occurred in relation to the device should be reported to the European Representative designated by the manufacturer and the Competent Authority of the Member State of the EEA and Switzerland in which the user and/or patient is established.

MEK-9200_0634-901107A

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1st Edition: 22 Feb 2021
2nd Edition: 24 May 2021