

CELL-DYN Emerald System Service and Support Manual

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Revision Status

The Revision Status of the manual is indicated in this table. Be sure that the manual contains the latest revision number of all pages.

Revision	Date	Sections Revised/added	TSBs Incorporated	ISAs Incorporated
202661-101	May 2007	NEW	N/A	N/A

Chapter 1 General Data

(Document Control Number 202663-101)

1.1 How to Use This Manual

Links
<i>Overview</i>
<i>Hazards</i>
<i>Safety Icons and Hazard Symbols</i>
<i>Electrical Safety</i>
<i>Biological Hazards</i>
<i>Chemical Hazards</i>
<i>Physical Hazards</i>
<i>Electrostatic Discharge (ESD)</i>

Note Before installing or maintaining the CELL-DYN Emerald, read the CELL-DYN Emerald System Operations Manual.

Overview

The purpose of this manual is to provide information useful for servicing the CELL-DYN Emerald system and is composed of the following sections:

Section	Topic
General Data	This section contains a product overview, information on manual usage, accident prevention symbols, and system specifications.
Troubleshooting	This section contains reference and normal operation information for the system.
Removal & Replacement	This section contains Removal & Replacement procedures which are indexed by number to the FRU (Field Replaceable Unit) database.
Procedures	This section contains configuration, adjustment, calibration, checks, and test procedures used to setup or verify instrument operation. Procedures are also used to assist in troubleshooting.
Planned Maintenance	This section contains preventative maintenance (PM) recommendation checklists. These recommendations may be subject to change due to local business or regulatory needs.
Pre-Site Specification & Checklist	This section includes the site specifications and a checklist that outlines the activities of the Field Service Engineer/ Representative (FSE/FSR). An open action item summary is included in the checklist.
Installation	This section outlines the activities required to install or relocate a system.

Hazards

Introduction

Operation, maintenance and servicing of CELL-DYN Emerald system may expose individuals to potential safety and health hazards. All work must be performed in accordance with procedures described in the Abbott operations or service manuals. This section describes the types and locations of potential hazards that could cause physical harm to service personnel. Warnings are inserted throughout this manual to alert service personnel to potential hazards. Standard warning conventions including hazard signal words (example, Danger) and symbols are described below.

Definitions

Hazard signal word definitions are described below.

Signal Word	Definition
DANGER!	Denotes an immediate hazard which, if not avoided, could result in serious injury or death. This signal word represents the highest level of any hazardous situation.
WARNING	Denotes a hazard which could result in moderate to serious personal injury.
Caution	Denotes potential hazards that could result in minor injury. Also used for conditions or activities that could interfere with proper functioning or performance of the instrument.
Note	Denotes operator or service information.

Safety Icons and Hazard Symbols

Safety hazard symbols are used in this manual and on instrument labels to identify potentially dangerous conditions or situations. In this manual and on some instrument labels, text accompanies the safety symbol to describe the hazard, or symbols may be used in lieu of text. For other instrument labels, the operator is to refer to the manual for specific information, or you must recognize the symbols and understand the type and degree of potential hazard.

Symbol	Hazard	Description
	DANGER! High Voltage	Prior to servicing power supply assemblies, verify that the system is powered off and the power cord to the analyzer is disconnected.
	WARNING Electrical Shock Hazard	Identifies the possibility of electrical shock if procedural or engineering controls are not observed.
	WARNING Potential Biohazard	Identifies an activity or area where potentially infectious materials may be present. Follow procedures as outlined below in <i>Biological Hazards Section</i> .
	WARNING Probe Stick Hazard	Identifies an activity or area where probes may be present.
	WARNING Splash/ Spray Hazard	Identifies an activity where fluids may be under pressure.
	WARNING Chemical Hazard	Identifies an activity or an area where hazardous chemicals are present. Refer to the Material Safety Data Sheet (MSDS) or package insert for specific safety information.
	Caution Lifting Hazard	Identifies an activity where it may be required to lift or move a heavy object. Obtain assistance when moving and/or use appropriate lifting devices.
	Caution Moving Parts	Identifies an activity or an area where moving parts are present.

Symbol	Hazard	Description
	Caution Electrostatic Discharge	Identifies an area where electrostatic discharge may be present. A ground strap must be worn while servicing the system.

The labeling of CELL-DYN Emerald system reagents/calibrators/controls or liquid consumables may include one or more of the following hazard symbols. The symbols and/or other country specific warnings are used to convey properties of the chemical or chemical mixture, and to notify the user that precautions should be taken when handling the material. Always consult the specific package insert or Material Safety Data Sheet for further information.

Hazard Symbol	Definition / Description (with Standard Abbreviation)
	Indicates that the material is Harmful (Xn) or Irritant (Xi).

Electrical Safety

The CELL-DYN Emerald system does not pose uncommon electrical hazards to operators if it is installed and operated without alteration, and is connected to a power source that meets required specifications.

Basic electrical hazard awareness is essential to the safe operation of any system. Only qualified field service personnel should perform electrical servicing. Elements of electrical safety include, but are not limited to the following:

- Periodically inspect electrical cabling into and on the system for signs of wear and damage.
- Turn the instrument OFF before disconnecting the power cord and before cleaning, servicing, or performing maintenance on any electrical or internal component.
- In the event of a blown fuse or thrown circuit breaker, determine the cause and correct the problem before attempting to resume operation of the equipment. Replace only the fuses that are externally accessible and labeled. Only use replacement fuses of the specified type and electrical rating.
- Assure the power to the instrument is turned OFF. A high voltage charge may remain on the power supply with the power OFF. Use an electrically insulated tool to disconnect the power supply and short (both male pins) to the instrument chassis.
- Keep liquids away from all connectors of electrical or communication components. Unplug the instrument before clean-up of major liquid spills. Clean spilled fluids immediately.
- Do not touch any switches or outlets with wet hands.
- Keep the floor dry and clean under and around the system.
- Use only approved power cords and electrical accessories, such as those supplied with the instrument, to protect against electric shock. Connect power cords only to properly grounded outlets.
- It is recommended that a ground fault circuit interrupter be used when working in a wet environment.

Mechanical Hazards

The CELL-DYN Emerald system is an automated system that operates under computer control. As with most automated equipment, there is potential for injury and bodily harm from moving mechanical components whenever the instrument is in operation. The system minimizes mechanical hazards by providing guards to protect against accidental contact with moving components, and encoding the software with safety features.

Operators of the CELL-DYN Emerald system are potentially exposed to moving mechanical components such as the syringe panel. Use caution when performing any maintenance procedure on the syringe panel as moving parts can pinch.

Basic elements of mechanical equipment safety include but are not limited to:

- Never bypass or override a safety device.
- Keep all protective covers and barriers in place.
- Never perform manual tasks on the work surface of the System.
- Never allow any part of your body to enter a range of mechanical movement during System operation.
- Do not wear articles of clothing or accessories that could catch on the System.
- Keep pockets free of items that could fall into the System.
- Be especially cautious when performing adjustment, maintenance, cleaning, or repair procedures.
- Use caution when loading reagents.
- In the event of an instrument malfunction or an unexpected sequence of movements, be aware that unexpected field service personnel reflex actions could occur, causing injury.

Biological Hazards

The following activities may involve the presence of biological materials:

- Handling samples, reagents, calibrators, and controls
- Cleaning spills
- Handling and disposing of waste
- Moving the System
- Performing maintenance procedures
- Performing decontamination procedures
- Performing component replacement procedures

Precautions

Consider all clinical specimens, reagents, controls, and calibrators that contain human sourced material and instrument surfaces or components that have come in contact with human sourced material as potentially infectious. No known test method can offer complete assurance that products derived from human sourced material or instrument components exposed to human sourced material will not transmit infection. Therefore, all products derived from human sourced materials and instrument components exposed to human sourced material should be considered potentially infectious. It is recommended that all potentially infectious materials be handled in accordance with the OSHA Bloodborne Pathogens Rule (29 CFR Part 1910.1030) or other equivalent biosafety procedures.

Precautions include, but are not limited to the following:

- Wear gloves, lab coats, and protective eye wear when handling human sourced material or contaminated instrument components.
- Do not pipet by mouth.
- Do not eat, drink, smoke, apply cosmetics, or handle contact lenses when handling human sourced material or contaminated instrument components.
- Clean spills of potentially infectious materials and contaminated instrument components with an appropriate tuberculocidal disinfectant, such as 0.5% sodium hypochlorite or other suitable disinfectant.
- Decontaminate and dispose of all specimens, reagents, and other potentially contaminated materials in accordance with local, state, and federal regulations.

If you are exposed to biohazardous or potentially infectious materials you should seek medical attention immediately and take the following steps to cleanse the affected area:

- Eyes-rinse with water for 15 minutes.
- Mouth-rinse with water.
- Skin-wash the affected area with soap and water.
- Puncture wound-allow to bleed freely. Wash the affected area with soap and water.

Sharps

Probes, needles, aspiration probes are sharp and potentially contaminated with infectious materials. Avoid contact with the tips of these parts.

Handling Spills

Clean spills in accordance with established biosafety practices. In general, safe work practices for cleaning spills include:

1. Wear appropriate personal protective equipment.
2. Absorb the spill with absorbent material.
3. Wipe the spill area with detergent solution.
4. Wipe the area with an appropriate tuberculocidal disinfectant such as a 0.5% sodium hypochlorite solution.
5. Dispose of spilled and contaminated material in accordance with local, state, and federal regulations.

Instrument or Part Decontamination

Always wear appropriate personal protective equipment (protective eye wear, gloves, lab coat) while performing decontamination activities. Prior to service or maintenance, the instrument should be decontaminated in accordance with the following:

1. Remove and dispose of contaminated disposables in a regulated medical waste container.
2. Clean and decontaminate the exterior of the instrument using a detergent solution followed by a 0.5% sodium hypochlorite solution or other tuberculocidal disinfectant. Flush the fluid pathway as specified in the CELL-DYN Emerald System Operations Manual. For information on preparing the proper concentration of sodium hypochlorite solution, refer to Appendix C in CELL-DYN Emerald Operator's Manual.

Caution Under normal circumstances, printed circuit boards do not require decontamination. Field Replaceable Units (FRUs) enclosed inside the skins of computer and peripheral equipment are not considered to be contaminated. Decontamination may affect the performance of a printed circuit board or internal computer component.

Handling Waste

Dispose of all potentially infectious materials (clinical specimens, reagents, controls, calibrators, standards, cuvettes, liquid consumables, and contaminated gloves, wipes, swabs, and other disposables that may be contaminated) in accordance with local, state, and federal regulations.

Sharps, such as probes, needles, broken glass, slides and other sharps that are contaminated with potentially infectious substances, should be placed in an appropriately labeled, puncture resistant and leak proof container before treatment and disposal.

Chemical Hazards

You may be exposed to hazardous chemicals when handling reagents, calibrators, controls, or liquid consumables. Exposure to hazardous chemicals is minimized by following instructions provided in the assay-specific Package Inserts and Material Safety Data Sheets (MSDS). Exposure levels are further reduced by the design features of the instrument when it is used properly.

Precautions

In general, observe the following precautions when handling chemicals:

- Consult Material Safety Data Sheets for safe use instructions and precautions.
- Avoid contact with skin and eyes. If contact with material is anticipated, wear impervious gloves and protective eye wear and clothing.
- Always maintain good housekeeping. Do not eat, drink, or store food and beverages in areas where chemicals are used.
- If irritation or signs of toxicity occur after exposure, seek medical attention.

Hazard symbols that display on CELL-DYN Emerald system product labeling are accompanied by Risk (R) and Safety (S) numbers and represent specific risk and safety phrases as defined by European Community Directives. The risk and safety phrases describe precautions to be used when working with a particular chemical or chemical mixture. For all (R) and (S) numbers that display on product labeling, refer to the corresponding phrases indicated in the Package Insert or similar document.

Physical Hazards

Sharps and Probes

The probe, vent needle, and aspiration probe are sharp and potentially contaminated with infectious materials. Avoid contact and handle cautiously to prevent injury. Never reach into the instrument while it is in operation.

In general, use of sharps and glassware should be minimized. Use mechanical means to remove contaminated broken glassware. Dispose of sharps in an appropriately marked, puncture-resistant, and leakproof container before treatment and disposal.

Heavy Objects

The waste container is heavy when full. Use care when handling the container to reduce the risk of injury.

The system is heavy and has unsupported sections of the shell. Ensure that you have adequate help before attempting to move the system.

Push only on solid sections of the housing; do not exert pressure on unsupported sections of the shell.

Use proper lifting techniques when moving the System.

Trip Hazard

The System is equipped with a power cord and various computer connectors. To avoid a tripping hazard, ensure cords in high traffic areas are properly stowed.

Electrostatic Discharge (ESD)

Many of the electronic components on the System circuit boards are susceptible to electrostatic discharge (ESD). Static discharge of as little as 100 - 200 volts can damage or destroy a component. To put that in perspective, depending on the floor covering, relative humidity and other factors, walking across a floor generates between 250 - 35,000 electrostatic volts. Attempts to ground oneself and remove the static charge by grasping the instrument chassis provides only momentary resolution.

Static Hazard

Static protective procedures are used during the manufacture of PC boards. Replacement PC board assemblies are also protected by use of static protective packaging as well as boxed to prevent physical damage. Assemblies that have failed and are returned for repair are also handled at the repair shop under static protection procedures.

Handling Guidelines - PC Subassemblies

These guidelines assure protection against failures created by static.

- Retain spare PC board subassemblies in the static-protective bags.
- Use an approved static-protective field service kit, or the ground strap shipped with the board, whenever a board is removed from an instrument or protective bag.
- Replace the defective PC board in the same protective bag to return for repair.

Continued use of the protective shipping boxes, both during shipping and storage, eliminates most failures caused by physical damage.

ESD Procedure

Note Use where ESD symbol is present and static protective equipment is not shipped with replacement part.



1. Place the work mat on a solid surface close to the instrument, allow the ground strap to reach the instrument.
2. Attach the ground clip to the instrument chassis.
3. Attach the other end of the ground clip cable and the connector from the wrist strap to the work mat. (Exception: Some wrist strap cables provide a clip to connect to the same ground source as the mat cable).
4. Attach wrist strap to your wrist, make sure the metallic button on the inside of the wrist strap is in direct contact with your skin.
5. Place PC boards, removed from the instrument, on the work mat.
6. Replacement PC boards should be placed on the work mat before removing from the protective bag and remain on the mat until installation.
7. Defective PC boards should be replaced in the static-protective bag before removal from the work mat area.

1.2 Electrical System

Overview

The CELL-DYN Emerald consists of three electronic boards:

- the main board
- the preamplifier board
- and the IHM board

Caution *In the case of replacement of the main board or preamplifier board, be aware of the sensibility of this board to the electrical static discharge (ESD).*

Caution *Before operating check the earth connection and use the antistatic bag supply with the board.*

Caution *Be careful with the edge of the metal sheets after having dismantled the covers.*

Electric Parts View

CPU Board

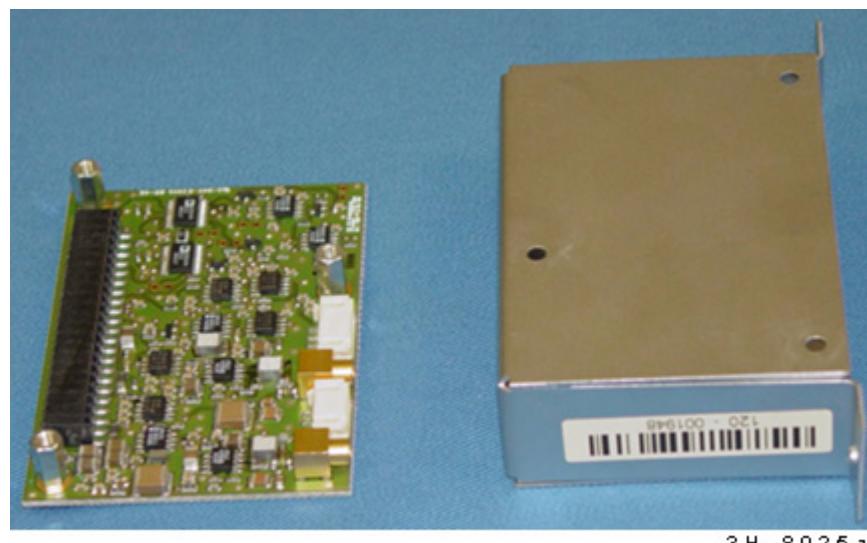
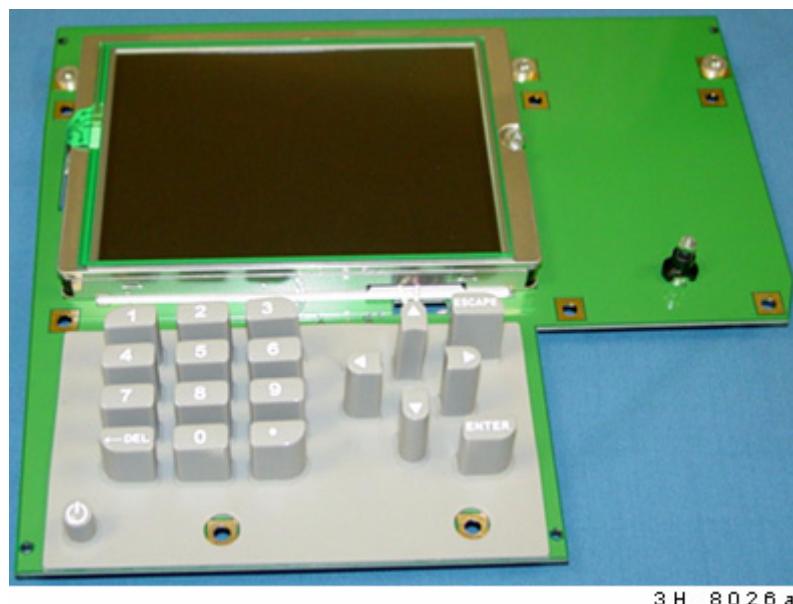


3 H_8024 a

The mono electronic board is located between the hydraulic part and the reagent tray.

The board, driven by a 32-bit processor, manages the following parts:

- Sample needle, rocker, syringe block motors.
- Display and keyboard.
- Connection mode (RS232, Ethernet, ...).
- Printer.
- Measurement (Counting, hemoglobin measurement).
- Data processing.
- External barcode reader.

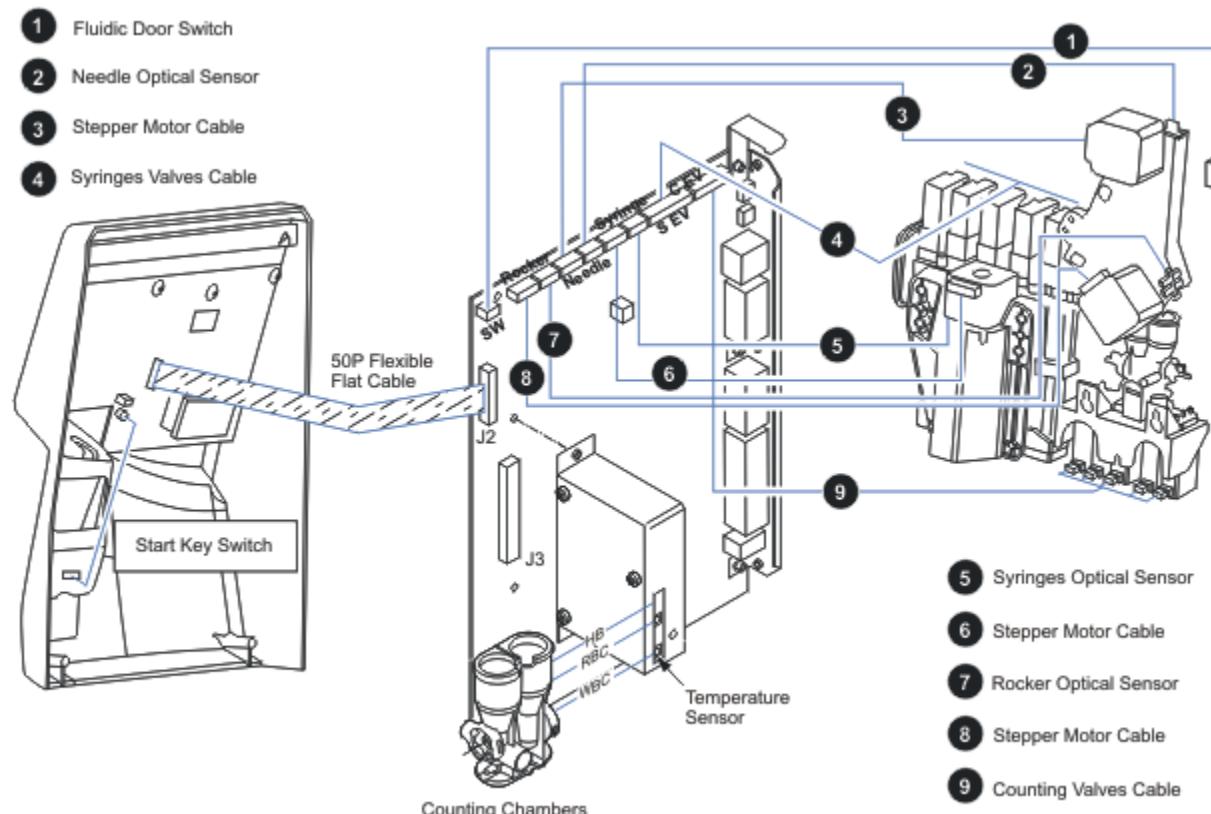
Pre-Amplifier Board and Cover**IHM Printed Circuit Board****Power Supply Assembly**

CELL-DYN Emerald is supplied with an external power supply block.

- If the main power wire supplied with the CELL-DYN Emerald is replaced, the new one must comply with the local regulation.
- The CELL-DYN Emerald has been certified with the power supply box provided with the instrument. The use of another external power supply box is not guaranteed.

Wiring Diagram

General View



3H_6008b

1.3 Fluidics

CELL-DYN Emerald is a fully automated analyzer performing hematological analysis on whole blood.

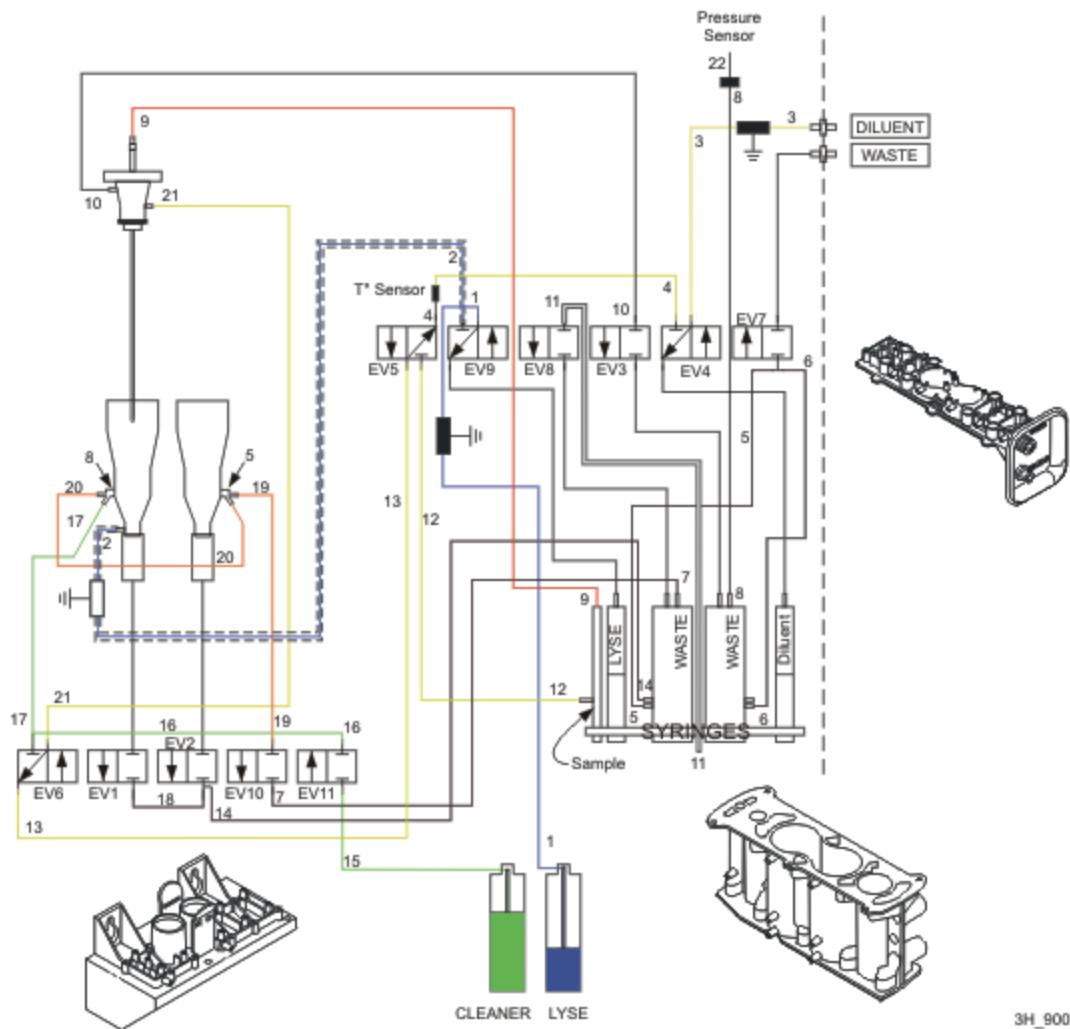
The human blood venous sample must be correctly homogenized before analysis. It is recommended to use a rotary agitator turning between 20 to 30 turns/mn during **10 minutes**.

Note An insufficient volume of blood for the quantity of anticoagulant or poor mixing could produce an error.

Two dilution rates are performed:

- 1:244 for WBC/HB
- 1:15,000 for RBC/PLT

Fluidics Diagram



3H_9002a

Fluidics Flow Sequence Description

Sampling Sequence

1. Syringes down: (no valve)
 - Less than 9.80 µl of blood sample are drawn into the sampling needle
 - Diluent prime
 - Vacuum prime
2. Needle up and syringe up (valve 3 and 4). Needle outside cleaning with diluent and waste vacuum
3. Rocker move above the WBC counting chamber and the syringes up to drain the waste (valve 7)
4. Needle down to the rinsing position

5. Syringe down
 - WBC counting chamber drain (valve 1)
6. Syringe up
 - Second outside needle cleaning (valve 4)
 - Waste syringe drain (valve 7)
7. Syringe down
 - WBC counting chamber drain (valve 1)
8. Syringe up
 - Waste syringe drain (valve 7)

WBC Dilution

9. Needle down to the dilution position and the syringes down to prime the diluent (valve 8)
10. Syringe up for the WBC dilution (~2 mL)
 - Diluent outside of the needle (valve 4)
 - Diluent inside the needle (valve 4 and 5)
 - Bubble to mix the dilution (valve 1)

RBC Dilution and Lysing

11. Syringe down (no valve)
 - Drawing sample of the first dilution (~20 µl)
 - Diluent prime
 - Vacuum prime
12. Needle up and syringe up
 - Rocker move above the RBC counting chamber
 - Needle outside cleaning with diluent and waste vacuum (valve 3 and 4)
13. Needle down to the rinsing position
14. Syringe up
 - Second outside needle cleaning (valve 4 and 8)
 - Lysis in the WBC counting chamber (0.30 to 0.50 mL) (valve 9)
 - Bubble to mix the dilution (valve 1)
15. Syringe down
 - RBC counting chamber drain (valve 2)
16. Needle down to the dilution position
17. Syringe up for the RBC dilution (~1.50 mL)
 - Waste syringe drain (valve 7)
 - Diluent outside of the needle (valve 4 and 8)
 - Diluent inside the needle (valve 5)
 - Bubble to mix the dilution and diluent to rinse the counting head (valve 6 and 10 and 2)

Measurements

18. Syringe down to process the vacuum counting (valve 10)
19. First measurement sequences (valve 10)
20. Syringe up
 - Diluent back pressure (valve 4 and 6)
21. Syringe down to perform the vacuum counting (valve 10)
22. Second measurement sequences (valve 10)

Drain and Rinse Counting Chamber

23. Syringe down
 - Cleaning the apertures (valve 11)
 - WBC counting chamber drain (valve 1)
 - RBC counting chamber drain (valve 2)
24. Syringe up
 - RBC counting chamber rinse diluent (valve 4)
 - Waste syringe drain (valve 7)
25. Needle up and syringes up for back flush (valve 4 and 6)
26. Rocker move above the WBC counting chamber
27. Syringe up
 - WBC counting chamber rinse diluent (valve 4)
 - Waste syringe drain (valve 7)

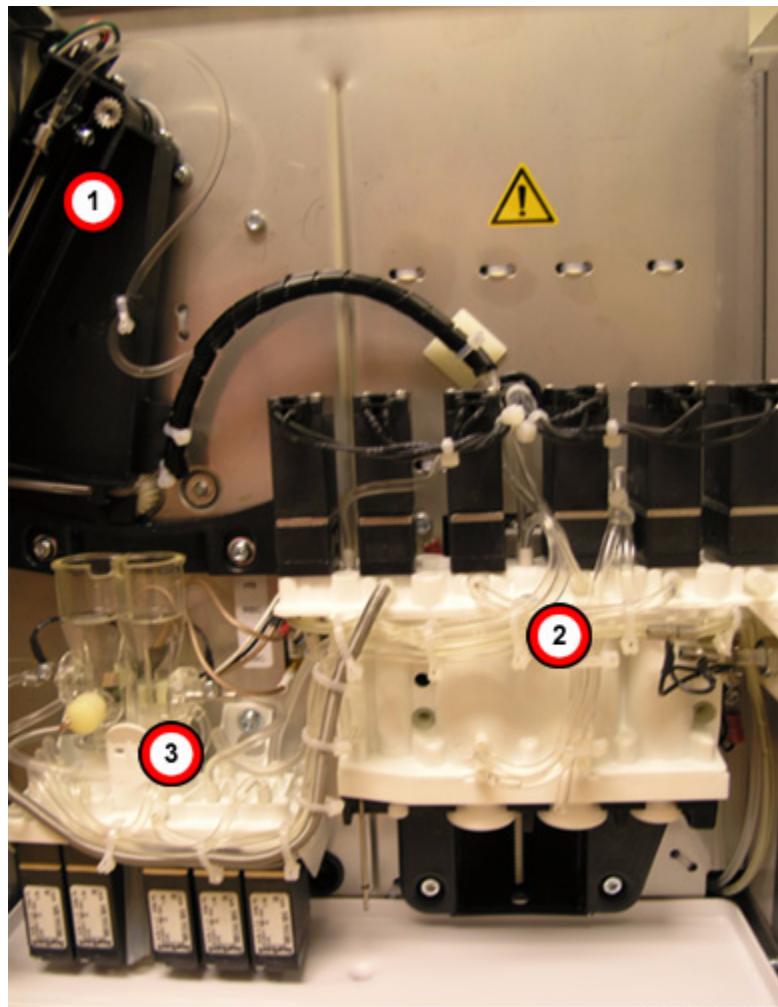
Needle Back and Waste Drain

28. Syringe down
 - Dry the outside of the needle (valve 3)
29. Rocker move in the sampling position
30. Syringe up
 - Waste syringe drain (valve 7)
31. Needle down in sampling position
32. Ready for next sample.

Fluidics Components Description

The fluidics component is on the right side of the instrument and consists of three modules:

- *Sampling Module [1]*
 - Rocker: Manages the rise and descent of the needle.
- *Syringe Module [2]* (consists of one block)
 - Reagent syringes (diluent, lyse), sampling and air syringes.
 - Liquid valve manifold assembly and tubing.
- *Counting Module [3]*
 - WBC and RBC counting chambers and hemoglobin measurement.
 - Liquid valve manifold assembly and tubing.

Fluidics Modules

Sampling Module [1]

This module facilitates drawing the sample and performing the WBC and RBC/PLT dilutions. It is assembled with a rotating rocker moving around a support which allows the system to move up and down the sampling needle. A system of rack-gear moves the rocker. The cleaning system of the sampling needle and the o-ring of the needle, included in the cleaning system can be removed without tools, making maintenance of the module easy to perform.

Syringe Module [2]

This module:

- draws the sample
- distributes the reagents
- drains the counting chambers
- performs vacuum necessary for counting
- and pushes the waste to the waste container.

It is made with a manifold maintaining the fluid commutation valves and with the syringes block including five syringes:

- The sampling syringe
- The lysis syringe
- The two waste and vacuum/pressure syringes
- And the diluent syringe.

Only one motor drives the five syringes.

The diluent input and the waste output are also included in this module.

Counting Module [3]

This module allows to count the WBC and RBC/PLT and to measure the HGB. It is made with a manifold maintaining the reagent commutation valves and the counting block with their measurement block including the apertures.

1.4 Instrument Alarms, Operational Alerts, and Data Flags

Note Refer to the *CELL-DYN Emerald Operator's Manual, Principles of the Operation* (Section 3).

1.5 Software

Note Refer to the CELL-DYN Emerald System Operations Manual for explanation of the software operation.

Emerald Analyzer USB Key Data Format

This section describes the use of a USB key for storing and writing automaton data.

Security Specifications

To avoid the exchange of private data between different analyzers via USB, such specific files contain the serial numbers of analyzer and CRC. So, verification can be made before upload on data analyzer. The data could only be uploaded onto the right analyzer.

Interface Specification

The file system type is FAT16. The file and folder names are limited to 8 characters +3 for the file extension. The content files are ASCII and some fields are coded in UTFB: SID, PID, ID, Blood Type, operator, target name.

Root Folder

The USB key can contain data for multiple automaton. The limit is its capacity. At the root folder level of the USB key, a folder contains all Emerald data type: **AB18**.

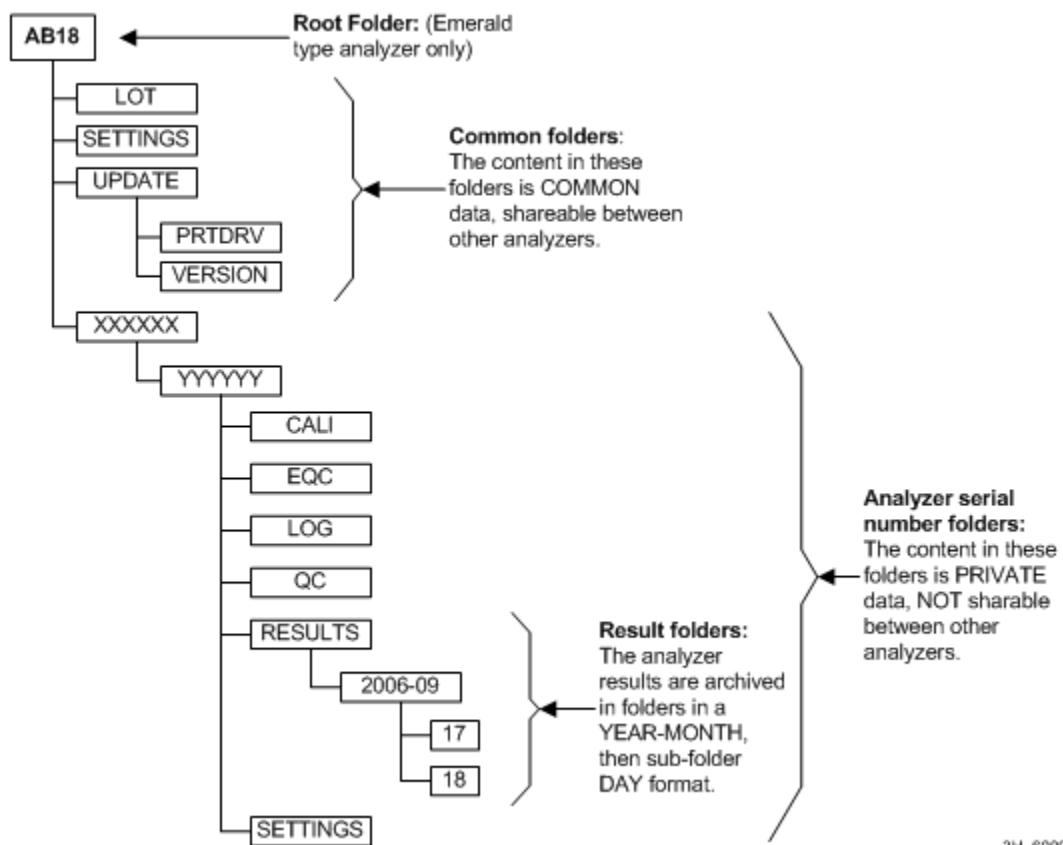
Automaton ID Folder

Each automaton data group is stored on the USB key inside a unique sub-folder: xxxxxx\yyyyyy = 12 digit Emerald serial number. Inside this sub-folder, the data is private. An automaton can only access its own private and all common data. Private data exchange between two automatons is impossible.

USB Key Folder Overview

The analyzer serial number is coded as xxxxxx-yyyyyy (MSB-LSB). The root folder (**AB18**) contains only Emerald type analyzer data only, *USB Key Structure* shows the file structure of the USB key:

USB Key Structure



USB Key Data Files Overview

The USB key contains both PRIVATE and COMMON data.

PRIVATE Data Inside AB18\XXXXXX\YYYYYY Folder

Folder	File Name	Contents	Comments	Format, unit	Analyzer Read/Write	CRC Control
CALI	2210Gb.CAL (calibration date DDMMYY)	Calibration report = calibration factors + target + results	One file per calibration date	Ascii + UTF-8 current unit	YES/NO	NO
LOGS	LOG_ERRCSV LOG.CSV	Error + Service Logs	Two files	Ascii	YES/NO	NO
QC	CRXV6875QCN (target name.level)	QC report = target + results	One file per QC target and level	Ascii + UTF-8 STD unit	YES/YES	YES
EQC	ID.DAT LOWQCDAT NORMQCDAT HIQCDAT	ID file + EQC results	One sub folder per target. One file per level + ID file	Ascii ABBOTT format STD (USA)	YES/NO	NO
RESULTS	0047CSV (sequence number CSV)	Result analysis	One sub folder per Year/month (YYYY-MM), One sub folder per day (DD), One file per result Limited to 510 files	Ascii + UTF-8 current unit	YES/YES	YES
SETTINGS	TECH.SET	Private analyzer settings	One file	Ascii + UTF-8	YES/YES	YES
REAGENTS	REAGLOGS.CSV	Private reagents log	One file	Ascii	YES/YES	YES

COMMON Data Inside AB18 Folder

Folder	File Name	Contents	Comments	Format, unit	Analyzer Read/Write	CRC Control
LOTS	MXC1234.QCN MXBC02174.QCL (target name.level) CAL0233.CAL (target name.CAL)	QC target values and Calibration target values	One file per target, limited to 100 files	Ascii ABBOTT format STD (USA)	NO/YES	NO
SETTINGS	USER.SET	Common settings	One file	Ascii + UTF-8	YES/YES	YES
UPDATE\VERSION	V100-004.b (version release software name.b)	Software release	One file per software release	binary	NO/YES	YES
UPDATE\PRVDRV	HP6122.LPT (prn_name.port LPT or USB)	Printer drivers	One file per printer driver	binary	NO/YES	YES

Specific Technician Display

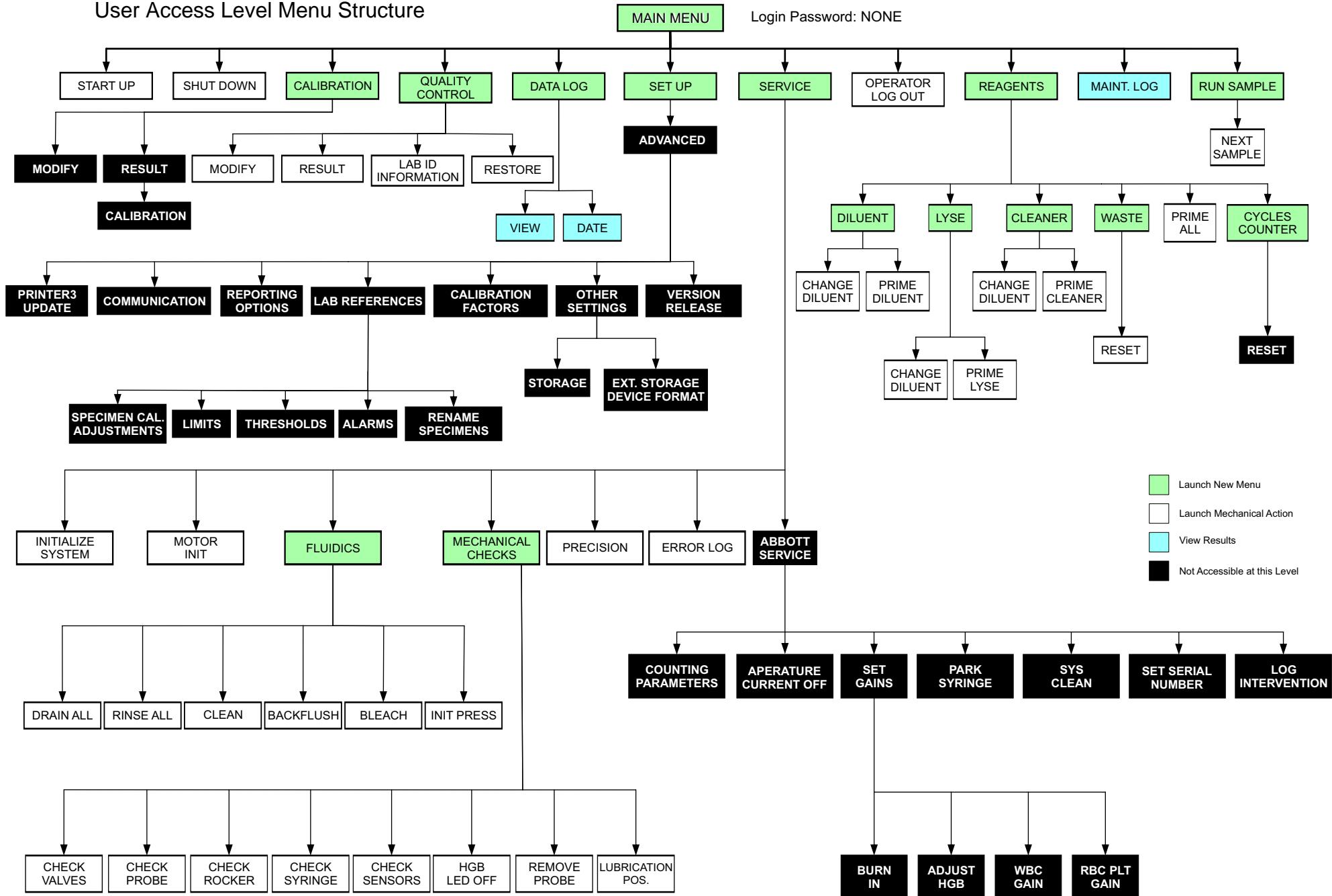
This section describes the software operations which are only accessible with the technician and super technician passwords.

User Access Menus

Links	
User Access Level Menu Structure	3H_6004.PDF
Lab Tech/Supervisor Access Level Menu Structure	3H_6005.PDF
Service Access Level Menu Structure	3H_6006.PDF

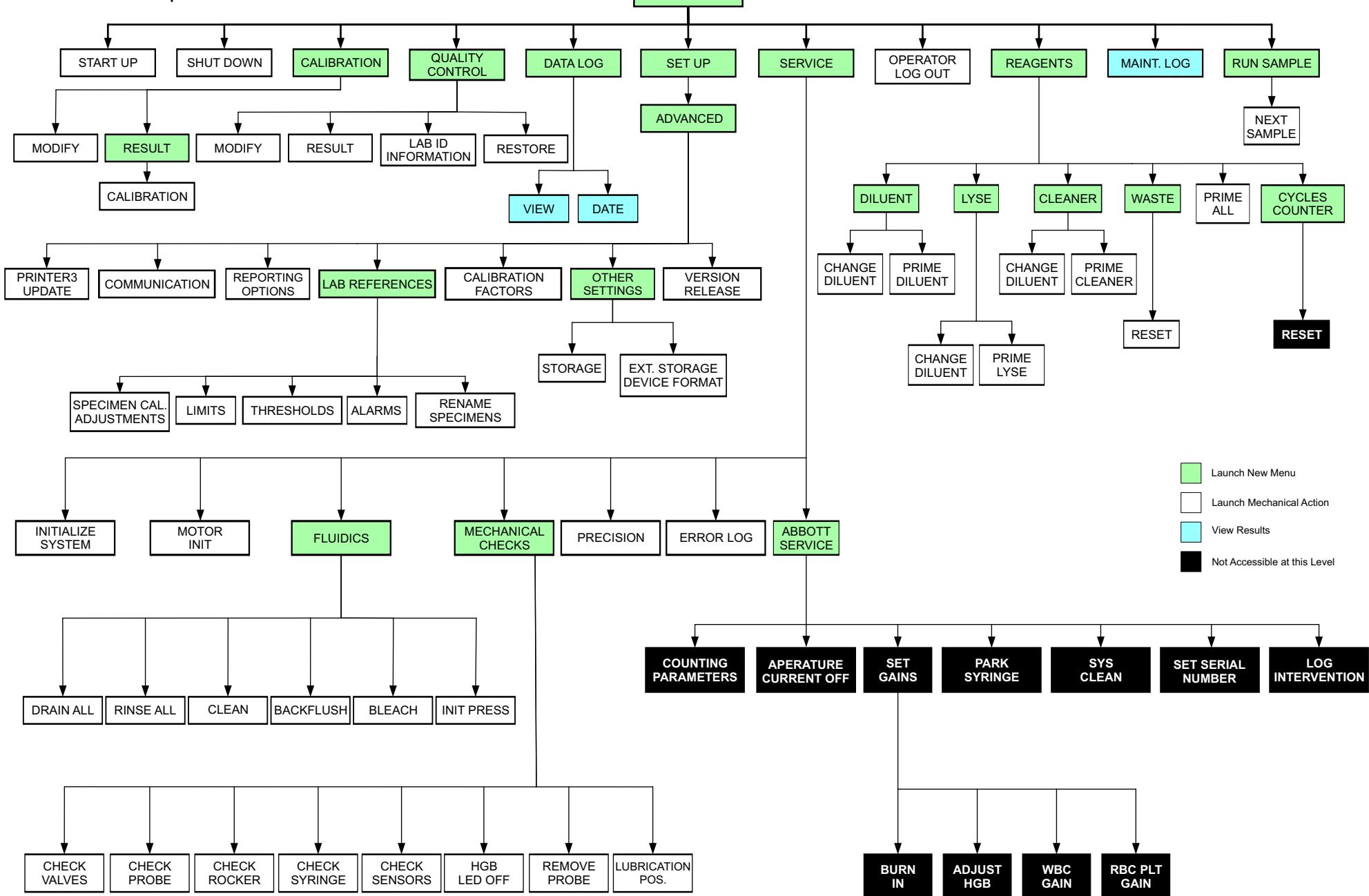
User Access Level Menu Structure

Login Password: NONE



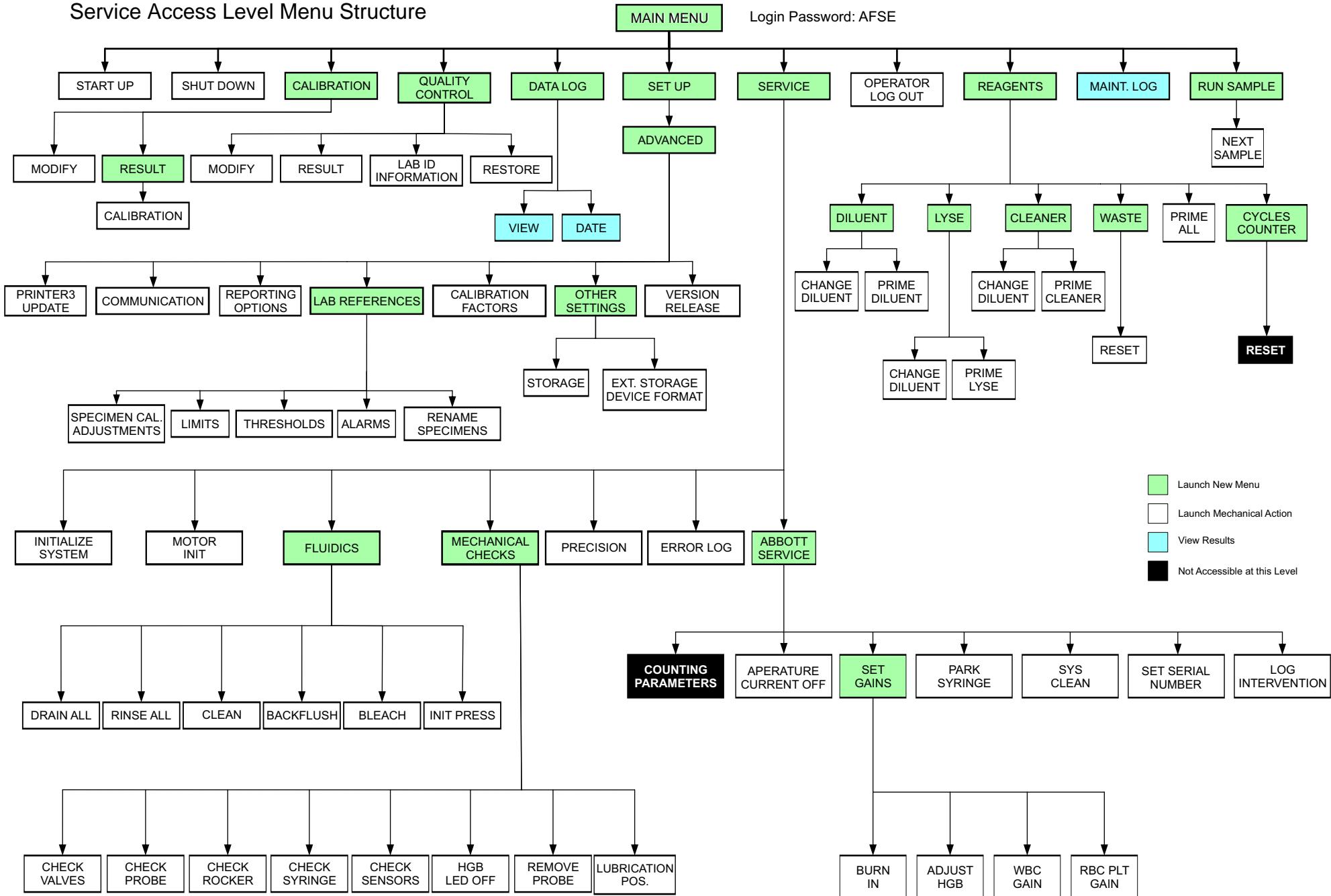
Lab Tech/Supervisor Access Level Menu Structure

Login Password: 123



Service Access Level Menu Structure

Login Password: AFSE



Service Password

The service password is: **AFSE**.

Note *It is strictly forbidden to disclose the password to the customer.*

The service displays are accessible from MAIN SCREEN then SERVICE then ABBOTT SERVICE.

Service Screen

The following activities are available in the service screen:

- **COUNTING PARAMETERS** - adjustment of the counting parameters and lyse quantity. These adjustments are possible with the Factory Access Level only.
- **SET GAINS** - latex adjustment and HGB blank adjustment.
- **APERTURE CURRENT OFF** - test the aperture current.
- **PARK SYRINGE** - 
- **LOG. INTERVENTION** - fill up the log accessible from the MAIN MENU.
- **SYS CLEAN** -
- **SET SERIAL NUMBER** -

Counting Parameters Screen

Note *The display is only available with the Factory Access Level password.*

Note *Completion of specific training is required before modifying these parameters.*

The following activities are available in the counting parameters screen:

- Twenty types of blood can be changed and selected with the **STANDARD** type window.
- Modification of the HGB, WBC, RBC and PLT gain (in the upper window) and the counting pulse parameters (in the lower window).

Note *When using a different lyse, the lyse quantity can be modified (in the lowest window located on the right).*

Set Gains Screen

The following activities are available in the set gains screen:

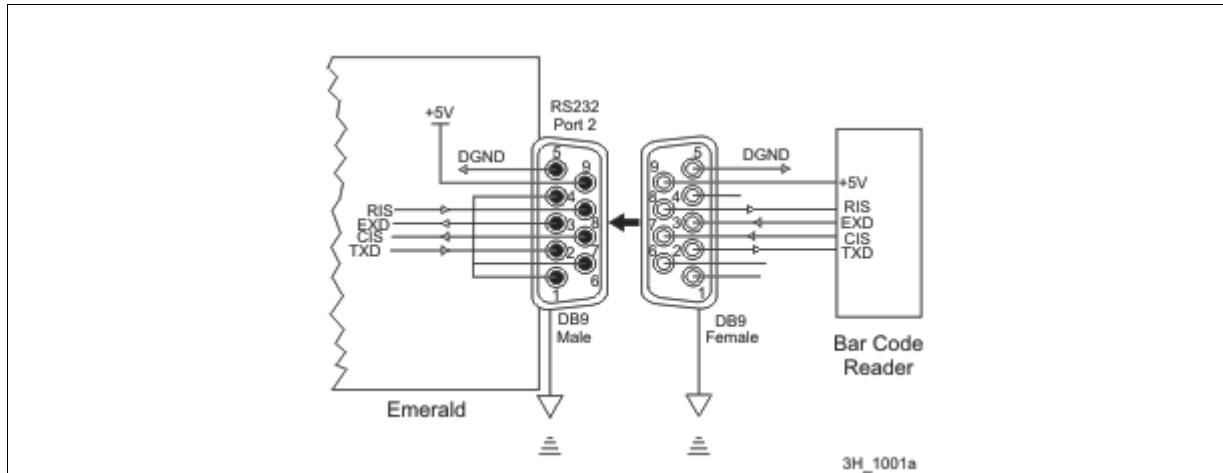
- **BURN-IN** - Not available: manufacturing parameters.
- **ADJUST HGB** - adjust the HGB blank level.
- **WBC GAIN** - adjust the WBC gain with the use of special latex particles.
- **RBC PLT GAIN** - adjust the RBC and PLT gain with the use of special latex particles.
- **AUTO** (check box) - when checked, adjustments are automatically performed.

1.6 Bar Code Reader

The CELL-DYN Emerald accepts any brand of bar code reader that conforms to the following specifications.

RS232 Specification

Pin Functions



Pin	Description
GND	Signal Ground: Reference point for power supply and interface signals. This connection is mandatory.
TXD	Transmitted Data: Transmits data from the reader to the CELL-DYN Emerald. This connection is mandatory.
RXD	Received Data: Receives data from the CELL-DYN Emerald to the reader. This connection is optional.
RTS	Request To Send: A general purpose output to the CELL-DYN Emerald used for hardware flow control. This connection is optional.
CTS	Clear To Send: A general purpose input to the bar code reader used for hardware flow control. This connection is optional.
+5V	5V power supply to the reader. This pin powers the bar code reader (max 100mA). This connection is optional when using an external power supply.

RS232 Settings

The bar code reader should be set to:

- Baud Rate: 9600
- Data: 8 bits
- Parity: none
- Stop bits: 1

Code Options

The CELL-DYN Emerald is able to read UPCA, EAN 13, EAN 128, Code 39, Code 93, Code 128, Codabar, Industrial 20f5, Interleaved 20f5, UPC E, Chinese Post, EAN 8, IATA, MARTRIX 20f5, ITALIAN Pharmaceutical, Telepen, and TRI Optic.

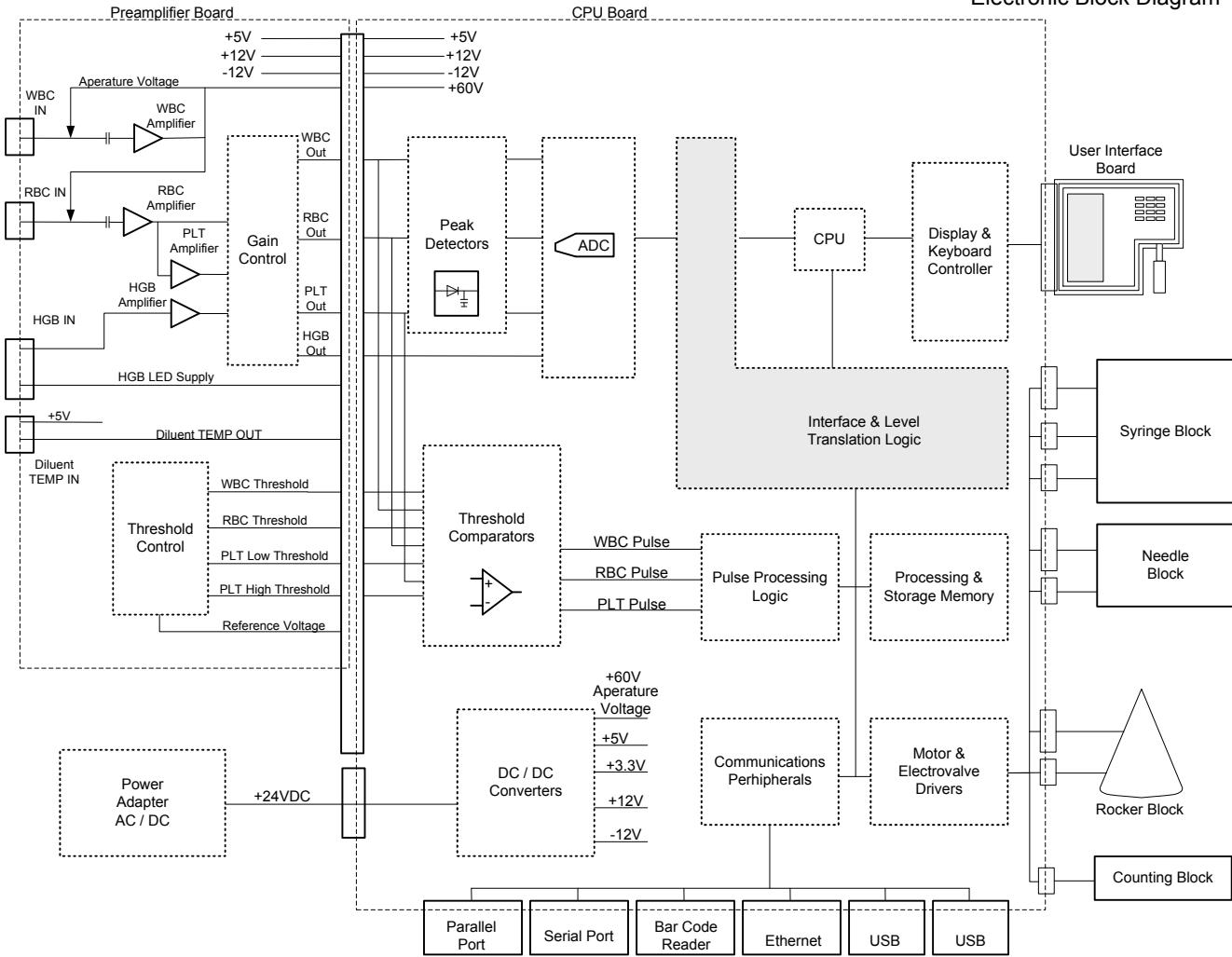
Chapter 2 Troubleshooting

(Document Control Number 202664-101)

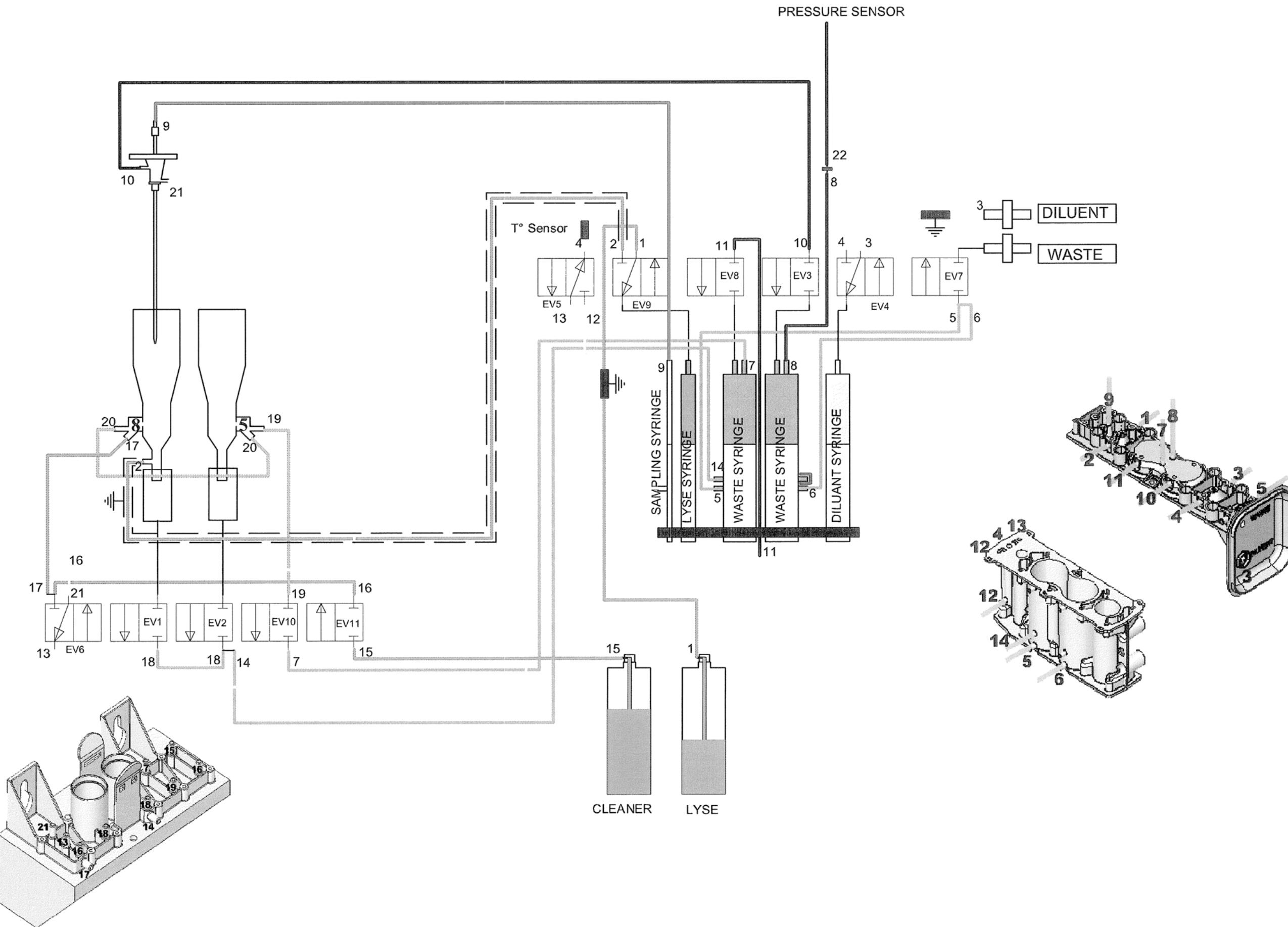
2.1 Drawings and Schematics

Drawing/Schematic Name	Link
Electronic Diagram	3H_9001.PDF
Fluidics Block Diagram	3H_9005.PDF
Wiring Diagram- General View	3H_9003.PDF
Wiring Diagram - Physical View	3H_9004.PDF

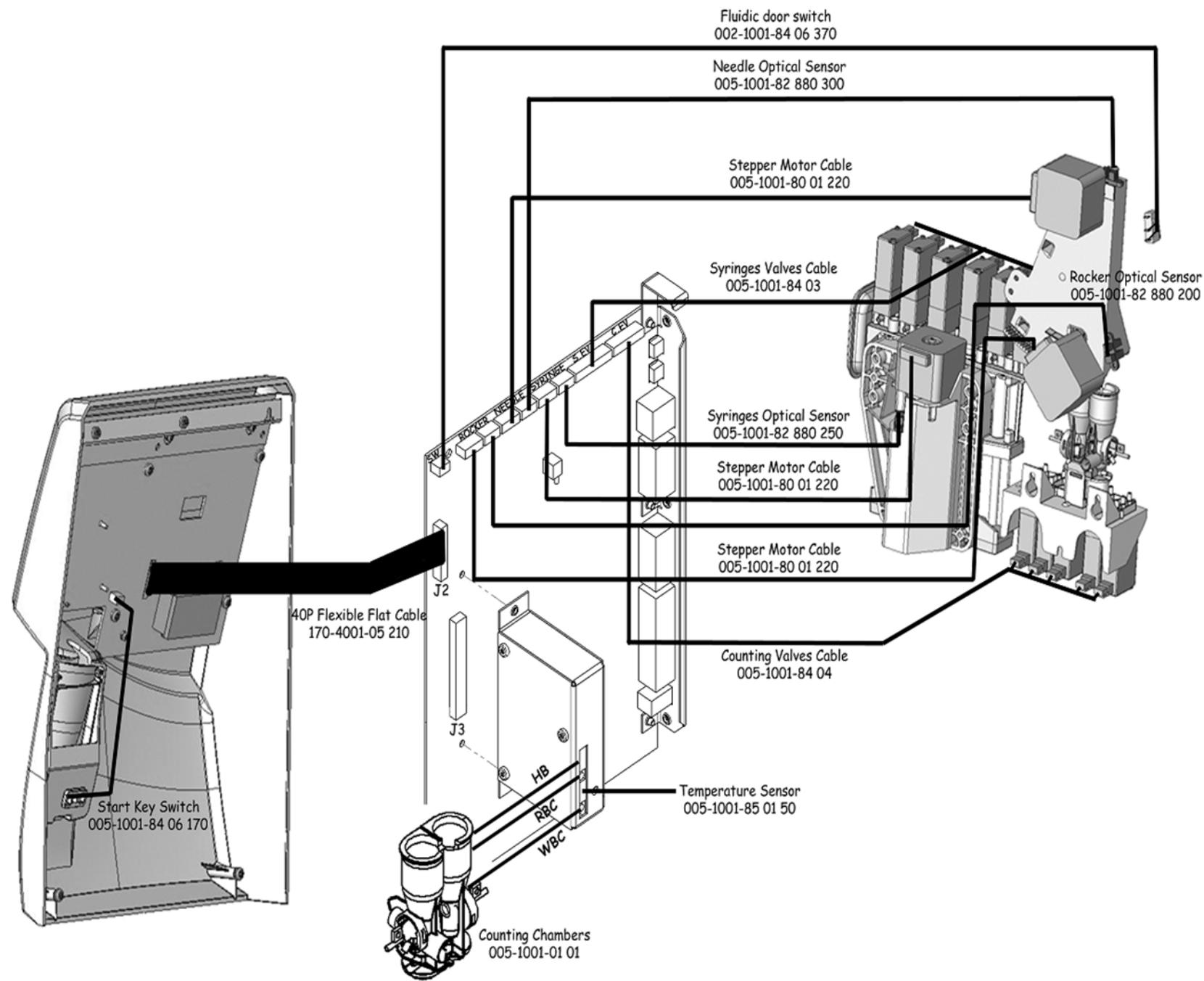
Electronic Block Diagram



FLUIDICS DIAGRAM

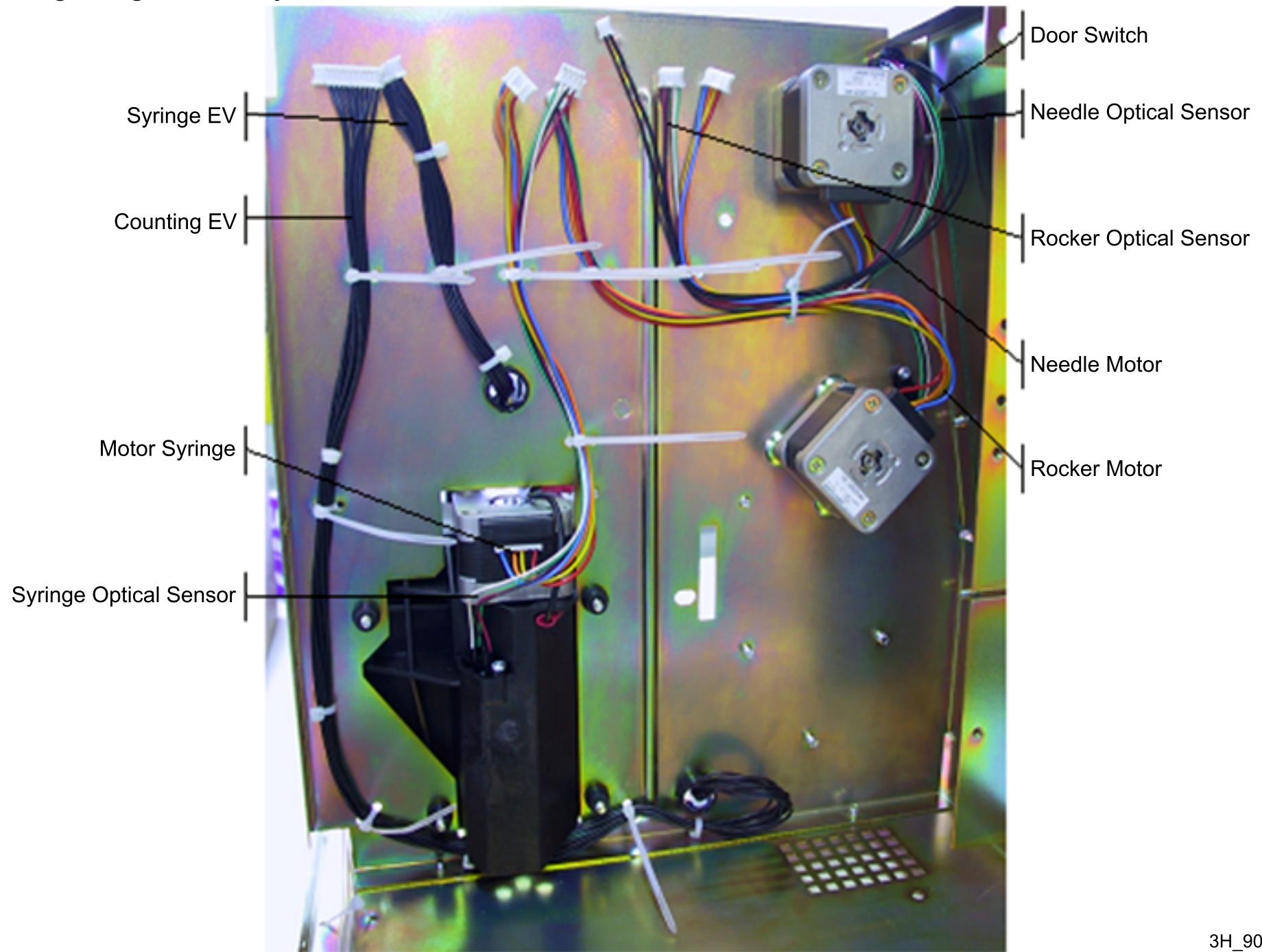


Wiring Diagram - General View



3H_9003a

Wiring Diagram - Physical View



3H_9004a

Chapter 4 Removal & Replacement

(Document Control Number 202666-101)

Part Name	Part #	R & R
Sampling module	7016881	A1.01 Sampling Module
Counting Chambers	7016859	B1.01 Counting Module: Counting Chamber
O-ring DIA 13.1x1.6	7016846	B1.01 Counting Module: Counting Chamber
O-ring Grease	09H58-01	B1.01 Counting Module: Counting Chamber
O-ring DIA 13.1x1.6	7016846	B1.02 Counting Module: Counting Chamber O-Ring
O-ring Grease	09H58-01	B1.02 Counting Module: Counting Chamber O-Ring
WBC Counting Head	7016897	B1.03 Counting Module: Counting Heads
RBC Counting Head	7016877	B1.03 Counting Module: Counting Heads
O-ring DIA 5x1	7016848	B1.03 Counting Module: Counting Heads
O-ring Grease	09H58-01	B1.03 Counting Module: Counting Heads
ELECTROVALVES 2/2	7016862	B1.04 Counting Module - Electrovalves
ELECTROVALVES 3/2	7016863	B1.04 Counting Module - Electrovalves
ELECTROVALVES 3/2 - 1.6 mm	7016864	B1.04 Counting Module - Electrovalves
Syringe Body	7016888	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
Seal Plate	7016883	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
Piston DIA 1.6	7016889	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
Piston DIA 16	7016893	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
Piston DIA 22	7016892	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
Piston DIA 6.5	7016903	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
O-ring DIA 15.54x2.62	7016839	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
O-ring DIA 21.89x2.62	7016841	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
O-ring DIA 6.3x2.4	7016843	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
O-ring DIA 1.4x1.25	7016847	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
O-ring spacer	7016875	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
Screw K30x10	7016838	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
O-ring Grease	09H58-01	C1.01 Syringe Module: Pistons, Seal Plate, O-rings
Syringe Body	7016888	C1.02 Syringe Module: Syringe Body Access
Electrovalves 2/2	7016862	C1.03 Syringe Module: Electrovalves
Electrovalves 3/2	7016863	C1.03 Syringe Module: Electrovalves
Electrovalves 3/2 - 1.6mm	7016864	C1.03 Syringe Module: Electrovalves
EMERALD IHM BOARD	7016870	D1.01 IHM Board
CD Emerald CPU Board	7016869	D1.02 Emerald CPU Board
Littelfuse NANO Slo-Blo fuse model 0454 004	Locally Sourced	D1.03 Emerald CPU Board Fuse
Maxell battery model CR2016	Locally Sourced	D1.04 Emerald CPU Board Battery
CD Emerald Preamplifier Board	7016872	D1.05 Preamplifier Board

4.1 Sampling Module (Emerald - A1)

A1.01 Sampling Module

Time Required	1 hr.	Parts	
Tools/Materials	TORX T10 Tool	7016881	Sampling module

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:

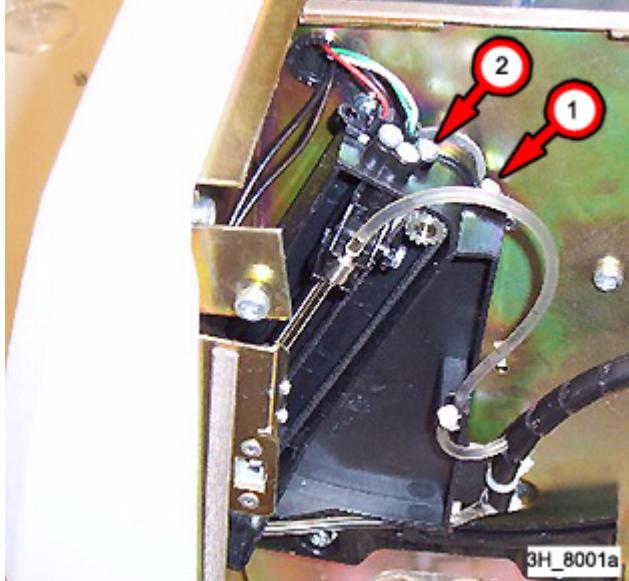
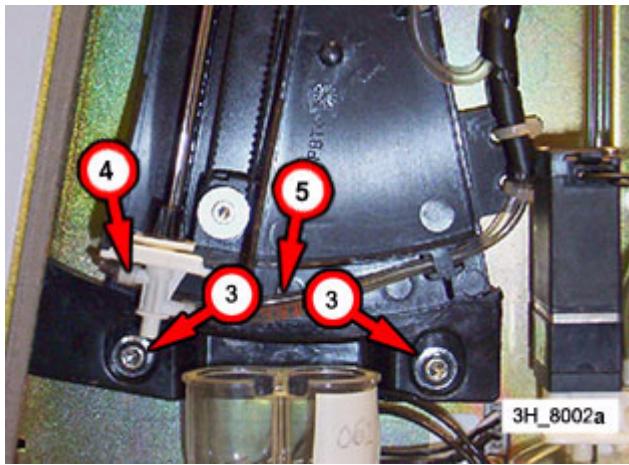


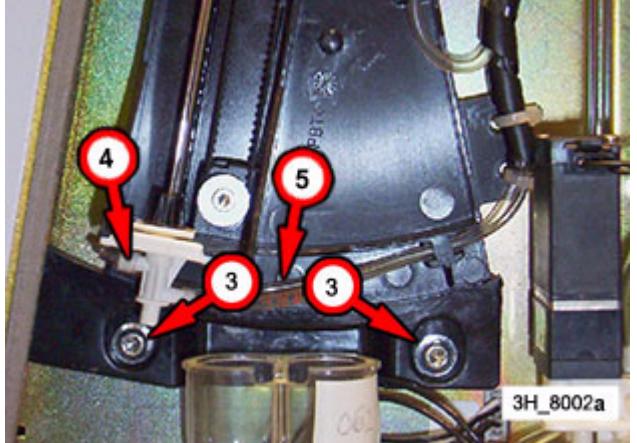
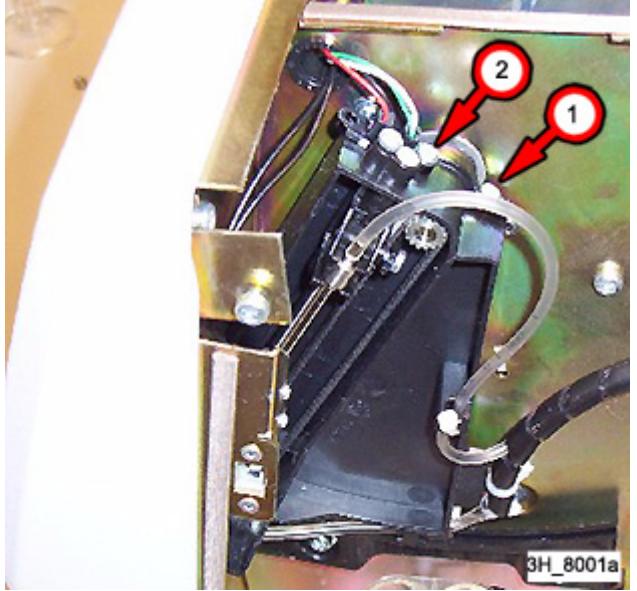
WARNING Potential Biohazard

Caution Chemical Hazard



Removal		
Action	Steps	Reference
Prerequisite	<ol style="list-style-type: none"> 1. Perform DRAIN ALL (MAIN MENU, SERVICE, FLUIDICS, DRAIN ALL). 2. Power OFF the instrument and disconnect the power supply. 3. Open the door on the right side of the instrument (hydraulic area access). 	 3H_5007a
Remove Upper Cover	<ol style="list-style-type: none"> 1. Loosen the three (3) screws securing the upper cover to the front and back of the instrument and remove the cover. 2. Remove the sampling needle. 	

Removal		
Action	Steps	Reference
Remove Sampling Module	<ol style="list-style-type: none"> 1. Loosen (do not remove) the screw securing the sampling module. [1] 2. Remove the screw securing the probe optical sensor. [2] 3. Disconnect the two (2) tubes [4, 5] and cut the tie wraps (as needed). 4. Loosen (do not remove) the two (2) guide screws. [3] 5. Slide the guide downward. 6. Remove the sampling module. 	 

Replacement		
Action	Steps	Reference
Install Sampling Module	<ol style="list-style-type: none"> 1. Install the sampling module onto the guide. 2. Push the guide up to make contact with the sampling module. 3. Tighten the two (2) guide screws. [3] 4. Connect the tubing [4, 5] and attach new tie wraps (as needed). 5. Install the screw [2] securing the probe optical sensor. 6. Tighten the screw [1] securing the sampling module. 	 
Install Sampling Needle	1. Install the sampling needle.	
Install Upper Cover	1. Install the upper cover to the front and back of the unit using three (3) screws.	
Power ON Instrument	1. Connect the instrument to the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Perform Start Up	<ol style="list-style-type: none"> 1. Log in as AFSE and press Confirm. 2. Press OK on log in window. 3. Touch Start Up. 4. Verify that no Sampling Module faults or fluid spills occur during the Start Up cycle. 5. Close the right side door. 	

4.2 Counting Module (Emerald - B1)

B1.01 Counting Module: Counting Chamber

Time Required	1 hr.	Parts	
Tools/Materials	Standard Tool Kit TORX T10 Tool	7016859	Counting Chambers
		7016846	O-ring DIA 13.1x1.6
		09H58-01	O-ring Grease

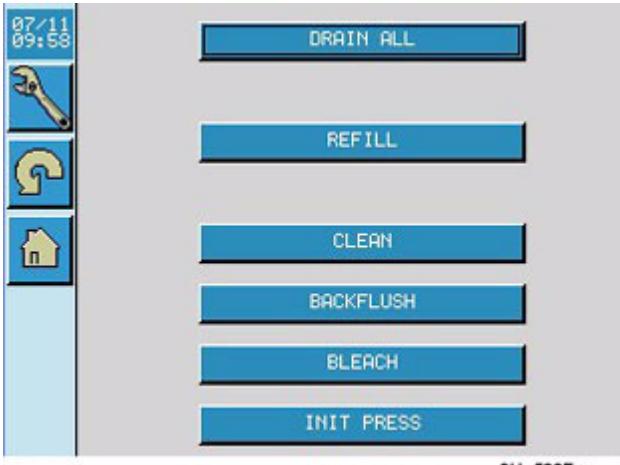
While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:

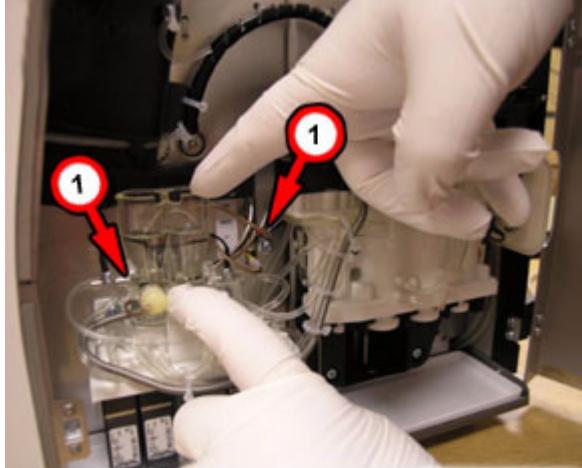


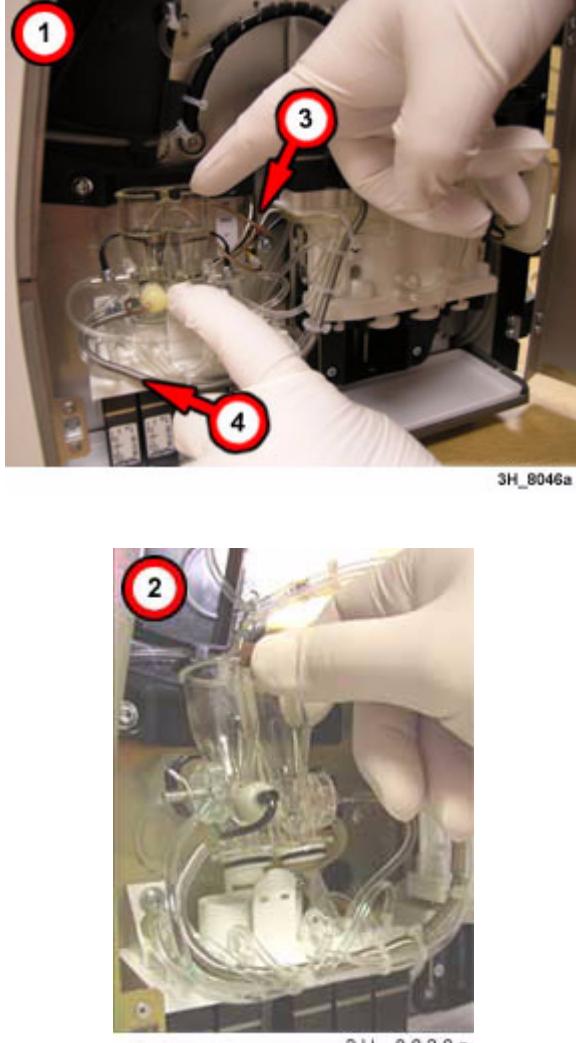
WARNING Potential Biohazard

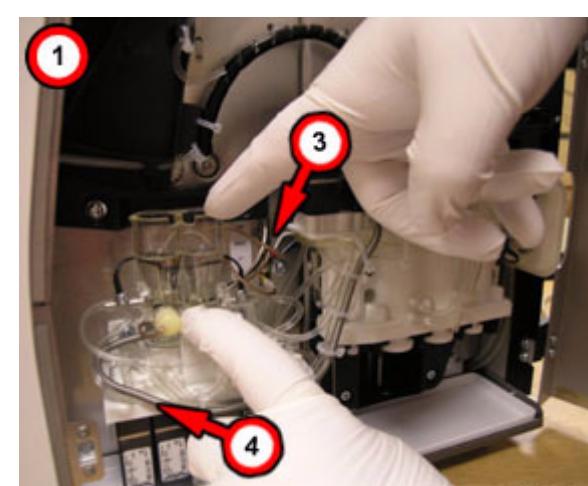
Caution Chemical Hazard

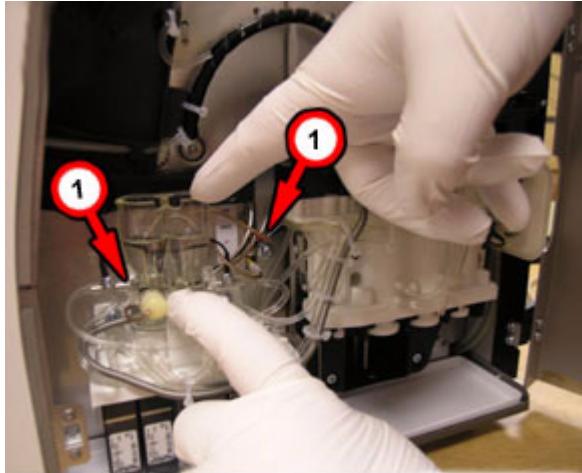


Removal		
Action	Steps	Reference
Preparation	<ol style="list-style-type: none"> 1. Perform DRAIN ALL (MAIN MENU, SERVICE, FLUIDICS, DRAIN ALL). 2. Power OFF the instrument and disconnect the power supply. 3. Open the door on the right side of the instrument (hydraulic area access). 	 3H_5007a

Removal		
Action	Steps	Reference
Remove Counting Heads	<p>1. Remove the screws and disconnect the GND cables from the WBC and RBC counting heads. [1]</p> <p>2. Remove the counting heads.</p> <p>Note <i>The right (RBC) counting head is labeled 5. The left (WBC) counting head is labeled 8. They are not interchangeable.</i></p> <p>Note <i>Move each counting head one quarter of a turn counter clockwise (CCW) to remove it.</i></p>	 3H_8045a

Removal		
Action	Steps	Reference
Remove Counting Chamber	<ol style="list-style-type: none"> Disconnect the HGB, RBC, and WBC cables from the Preamplifier Board (PAM). [3] Remove the lyse tubing from the counting chamber. [4] Pull gently on the clip, while pushing the top of the counting chamber toward the inside of the instrument. [1] Raise the counting chamber and remove it. [2]. 	 <p>3H_8046a</p> <p>3H_8030a</p>

Replacement		
Action	Steps	Reference
Install Counting Chamber	<p>1. Lower the counting chamber into position. [2]</p> <p>Note Ensure that the counting chamber is fitted with a set of O-rings. The O-rings should be greased before installation onto the counting chamber.</p> <p>2. Push on the top of the counting chamber, securing the clip into the proper position. [1]</p> <p>3. Connect the HGB, RBC, and WBC cables to the PAM. [3]</p> <p>4. Connect the lyse tubing to the counting chamber. [4]</p>	 <p>3H_8030a</p>  <p>3H_8046a</p>

Replacement		
Action	Steps	Reference
Install Counting Heads	<p>1. Install the counting heads.</p> <p>Note <i>The right (RBC) counting head is labeled 5. The left (WBC) counting head is labeled 8. They are not interchangeable.</i></p> <p>Note <i>Move each counting head one quarter of a turn clockwise (CW) to install it.</i></p> <p>2. Connect the GND cables [1] to the WBC and RBC counting heads and tighten the screws.</p>	 3H_8045a
Power ON Instrument	1. Connect the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Verification	<p>1. Log in as AFSE and press Confirm.</p> <p>2. Press OK on log in window.</p> <p>3. Touch Start Up.</p> <p>4. Verify that there are no leaks in or around the counting module area.</p> <p>5. Close the right side door.</p> <p>6. Perform gain verification and/or adjustment.</p> <p>7. Perform a calibration.</p>	

B1.02 Counting Module: Counting Chamber O-Ring

Time Required	20 min.	Parts	
Tools/Materials	Standard Tool Kit	7016846	O-ring DIA 13.1x1.6
		09H58-01	O-ring Grease

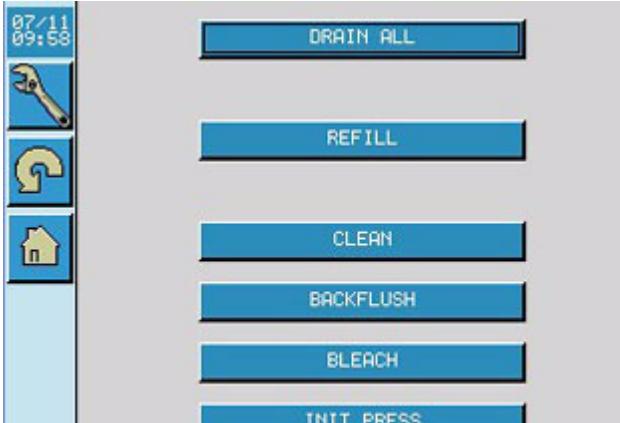
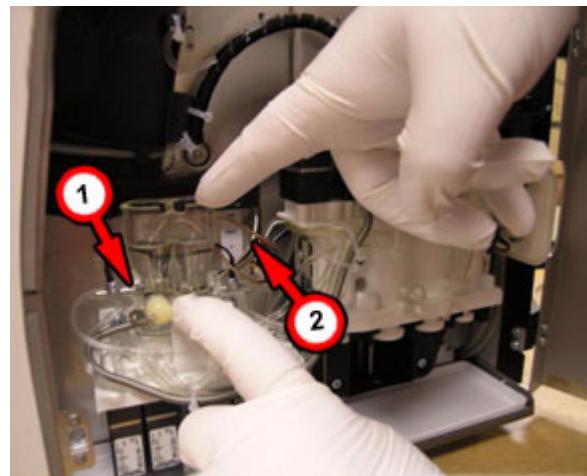
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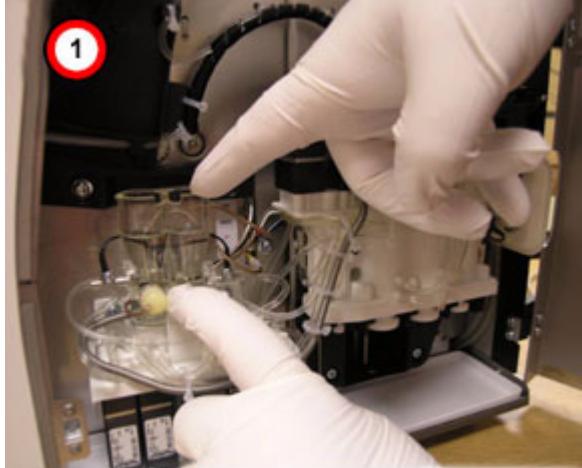
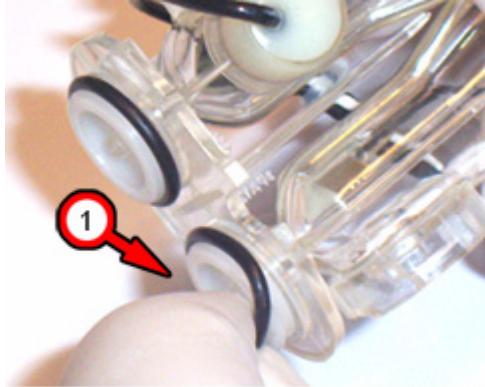


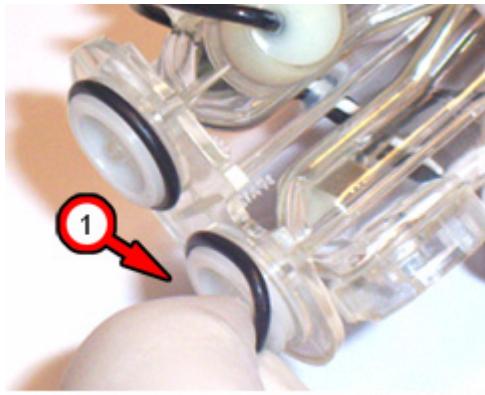
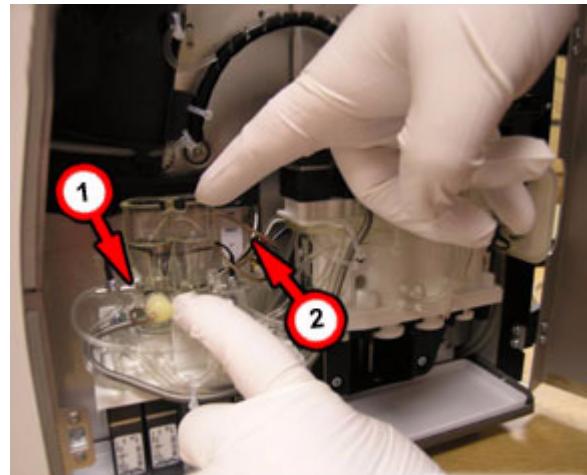
WARNING Potential Biohazard

Caution Chemical Hazard



Removal		
Action	Steps	Reference
Preparation	<ol style="list-style-type: none"> 1. Perform DRAIN ALL (MAIN MENU, SERVICE, FLUIDICS, DRAIN ALL). 2. Power OFF the instrument and disconnect the power supply. 3. Open the door on the right side of the instrument (hydraulic area access). 4. Disconnect the HGB, RBC, and WBC cables from the PAM. [2] 	 <p>3H_5007a</p>  <p>3H_8048a</p>

Removal		
Action	Steps	Reference
Remove Counting Chamber	<ol style="list-style-type: none"> Pull gently on the clip, while pushing the top of the counting chamber toward the inside of the instrument. [1] Raise the counting chamber and remove it. [2] 	 3H_8050a
Remove O-ring	<ol style="list-style-type: none"> Remove the O-ring [1] from the counting chamber module. 	 3H_8034a

Replacement		
Action	Steps	Reference
Install O-ring	<p>1. Apply a light film of grease on the O-ring [1] and install it on the counting chamber.</p> <p>Note Avoid damage to the O-ring by carefully placing the O-ring on the counting chamber.</p> <p>Note The O-rings should be replaced as a set to reduce service calls.</p>	 3H_8034a
Install Counting Chamber	<p>1. Lower the counting module into position. [2]</p> <p>2. Push gently on the top of the counting chamber to ensure the clip secures the chamber in the proper position. [1]</p> <p>3. Connect the HGB, RBC, and WBC cables to the PAM. [2]</p>	 3H_8030a
Power ON Instrument	<p>1. Connect the power supply and power ON the instrument.</p>	 3H_8048a

Verification		
Action	Steps	Reference
Verification	<ol style="list-style-type: none">1. Log in as AFSE and press Confirm.2. Press OK on log in window.3. Touch Start Up.4. Verify normal instrument operation. Note <i>Check for leaks around the counting module area.</i>5. Close the right side door.	

B1.03 Counting Module: Counting Heads

Time Required	40 min.	Parts	
Tools/Materials	TORX T10 Tool	7016897	WBC Counting Head
		7016877	RBC Counting Head
		7016848	O-ring DIA 5x1
		09H58-01	O-ring Grease

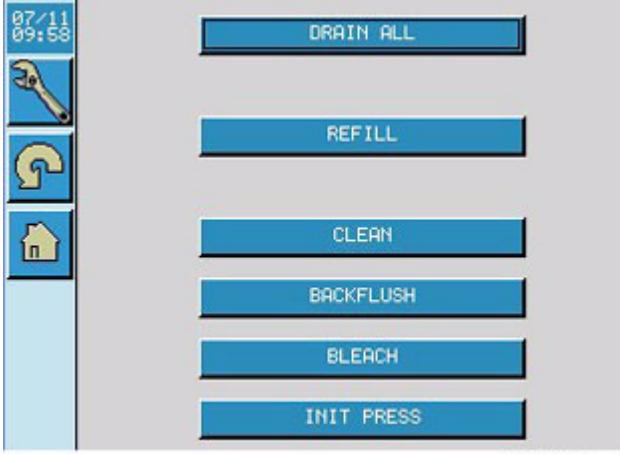
While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:

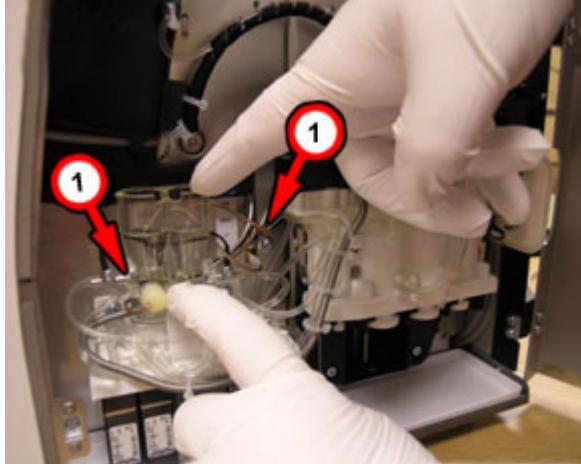


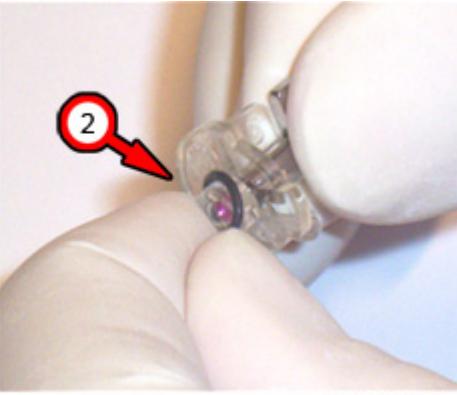
WARNING Potential Biohazard

Caution Chemical Hazard



Removal		
Action	Steps	Reference
Preparation	<ol style="list-style-type: none"> 1. Perform DRAIN ALL (MAIN MENU, SERVICE, FLUIDICS, DRAIN ALL). 2. Power OFF the instrument and disconnect the power supply. 3. Open the door on the right side of the instrument (hydraulic area access). 	 3H_5007a

Removal		
Action	Steps	Reference
Remove Counting Heads	<p>1. Remove the screws and disconnect the GND cables from the WBC and RBC counting heads. [1]</p> <p>2. Remove the counting heads, tubing, and O-ring.</p> <p>Note <i>The right (RBC) counting head is labeled 5. The left (WBC) counting head is labeled 8. They are not interchangeable.</i></p> <p>Note <i>Move each counting head one quarter of a turn counter clockwise (CCW) to remove it.</i></p>	 3H_8045a

Replacement		
Action	Steps	Reference
Install Counting Heads	<p>1. Install an O-ring [2] onto the counting head and connect the tubing.</p> <p>2. Install the counting head into the counting chamber.</p> <p>Note <i>The right (RBC) counting head is labeled 5. The left (WBC) counting head is labeled 8. They are not interchangeable.</i></p> <p>Note <i>Move each counting head one quarter of a turn clockwise (CW) to install it.</i></p> <p>3. Connect the GND cable to the WBC or RBC counting head and tighten the screw. [1]</p>	 3H_8037a
Power ON Instrument	1. Connect the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Verification	<p>1. Log in as AFSE and press Confirm.</p> <p>2. Press OK on log in window.</p> <p>3. Touch Start Up.</p> <p>4. Verify normal instrument operation.</p> <p>Note <i>Check for leaks around the counting module area.</i></p> <p>5. Close the right side door.</p> <p>6. Perform a gain verification and/or adjustment.</p> <p>7. Perform a calibration.</p>	

B1.04 Counting Module - Electrovalves

Time Required	1.5 hr.	Parts	
Tools/Materials	TORX T6 Tool TORX T20 Tool	7016862	ELECTROVALVES 2/2
		7016863	ELECTROVALVES 3/2
		7016864	ELECTROVALVES 3/2 - 1.6 mm

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:

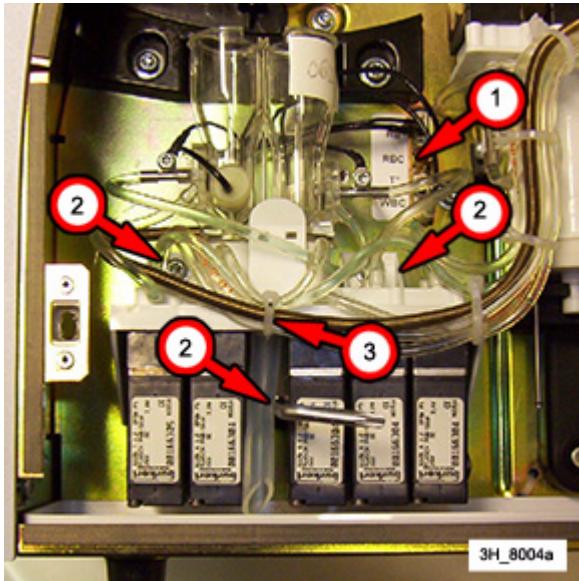
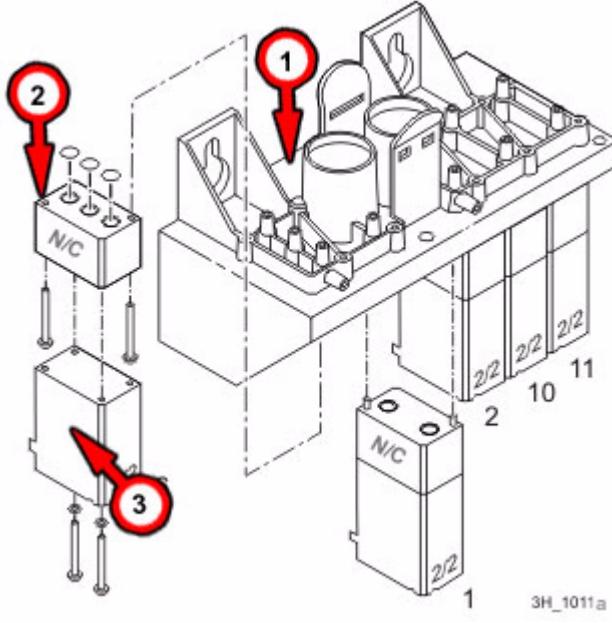


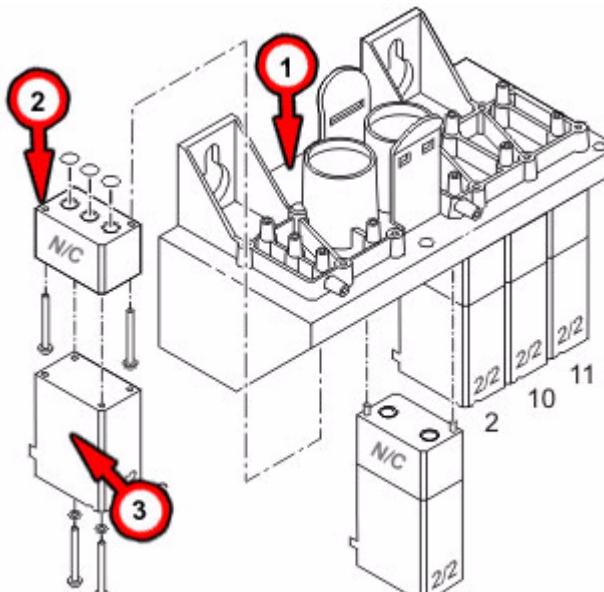
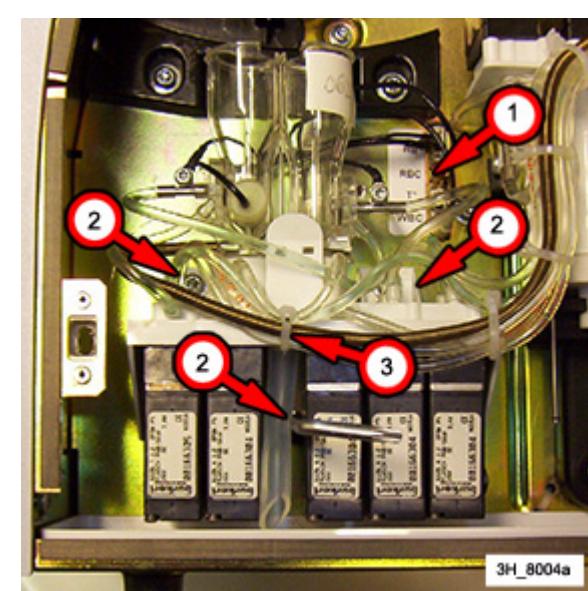
WARNING Potential Biohazard

Caution Chemical Hazard



Removal			
Action	Steps	Reference	
Prerequisite	<ol style="list-style-type: none"> 1. Drain the tubing. <ul style="list-style-type: none"> • Remove the diluent straw • Remove the cleaner [1] and lyse [2] straws • Perform PRIME ALL three (3) times (MAIN MENU, REAGENTS, PRIME ALL). 2. Power OFF the instrument and disconnect the power supply. 3. Remove the lyse and cleaner bottles. 4. Open the door on the right side of the instrument (hydraulic area access). 		3H_8047a

Removal		
Action	Steps	Reference
Remove Counting Module	<ol style="list-style-type: none"> Remove the counting chamber cable connections: [1] <ul style="list-style-type: none"> HGB WBC coaxial RBC coaxial Thermal captor <p>Note Loosen, do not remove, the screws that secure the counting module.</p> Loosen the three (3) screws [2] securing the counting module. Note The third screw is located behind the overflow tubing. Disconnect the GND cable for the HGB lyse tubing shield. Note This connection is located on the wall to the left of the WBC chamber. Cut the tie wraps and disconnect the tubing from the counting manifold and counting chamber. [3] Slide up and remove the module. Disconnect the electrovalve cables. 	
Remove Counting Module Electrovalve	<ol style="list-style-type: none"> Use a TORX T6 tool to remove the two (2) screws securing the solenoid [3] to the electrovalve base. [2] (Put the solenoid aside.) Note Small washers are part of the solenoid. Take care not to lose these washers, or drop them into the instrument. Use a TORX T6 tool to remove the two (2) screws securing the electrovalve base [2] to the counting manifold. [1] (Put the electrovalve base aside.) 	

Replacement		
Action	Steps	Reference
Install Counting Module Electrovalve	<p>Note The NC stamp on the electrovalve base [2] is positioned to the left for all electrovalves mounted on the counting manifold [1].</p> <ol style="list-style-type: none"> Separate the solenoid [3] from the electrovalve base. [2] <p>Note Ensure that the O-rings are installed in the electrovalve base [2] before performing the next step.</p> <ol style="list-style-type: none"> Use a TORX T6 tool to secure the electrovalve base [2] to the counting manifold [1] with two (2) screws (45 cNm). (3.98 lb.-in) Place the solenoid [3] on the electrovalve base. [2] Use a TORX T6 tool to secure the solenoid with two (2) screws (20 cNm). (1.77 lb.-in) 	 <p>1 2 3</p> <p>3H_1011a</p>
Install Counting Module	<ol style="list-style-type: none"> Connect the electrovalve cables. Slide the counting module into position. Connect the tubing to the counting manifold and the counting chamber. <p>Note Take care with the tubing reconnection. If necessary, cut the tubing 2-3 mm at the ends or replace them.</p> <ol style="list-style-type: none"> Add new tie wraps, as needed, to secure the tubing. [3] Connect the GND cable for the HGB lyse tubing shield. <p>Note This connection is located on the wall to the left of the counting chamber.</p> <ol style="list-style-type: none"> Connect the counting chamber cables: [1] <ul style="list-style-type: none"> HGB WBC coaxial RBC coaxial Thermal Captor Tighten the three (3) screws [2] to secure the counting module. <p>Note The third screw is located behind the overflow tubing.</p>	 <p>1 2 2 3 3 3 3H_8004a</p>

Replacement		
Action	Steps	Reference
Prepare for Operation	<ol style="list-style-type: none"> 1. Return the instrument to the upright position. 2. Install the lyse and cleaner bottles. 3. Replace the diluent, lyse [2], and cleaner straws. [1] 4. Connect the instrument to the power supply and power ON the instrument. 	 3H_8047a

Verification		
Action	Steps	Reference
Verification	<ol style="list-style-type: none"> 1. Log in as AFSE and press Confirm. 2. Press OK on log in window. 3. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL). 4. Verify normal instrument operation. Note Check for leaks around the counting module area. 5. Close right side door. 	

4.3 Syringe Module (Emerald - C1)

C1.01 Syringe Module: Pistons, Seal Plate, O-rings

Time Required	1 hr.	Parts	
Tools/Materials	TORX T10 Tool TORX T20 Tool	7016888	Syringe Body
		7016883	Seal Plate
		7016889	Piston DIA 1.6
		7016893	Piston DIA 16
		7016892	Piston DIA 22
		7016903	Piston DIA 6.5
		7016839	O-ring DIA 15.54x2.62
		7016841	O-ring DIA 21.89x2.62
		7016843	O-ring DIA 6.3x2.4
		7016847	O-ring DIA 1.4x1.25
		7016875	O-ring spacer
		7016838	Screw K30x10
		09H58-01	O-ring Grease

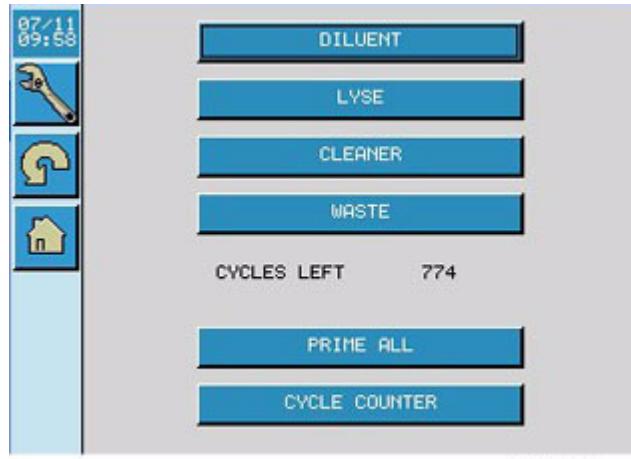
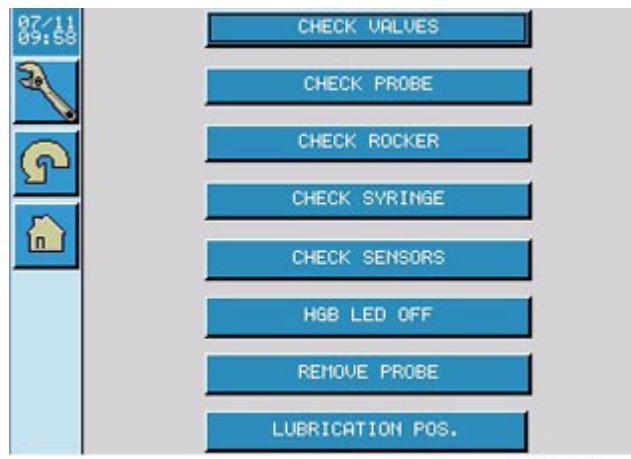
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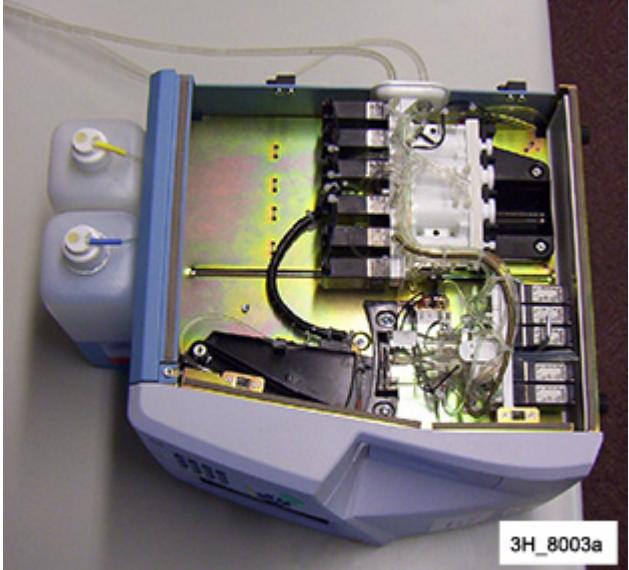
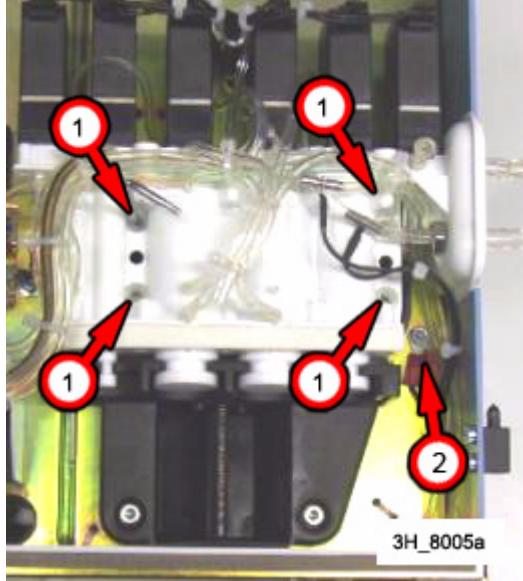


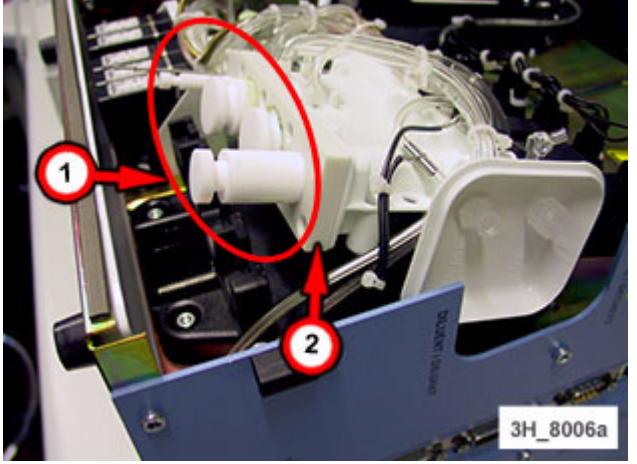
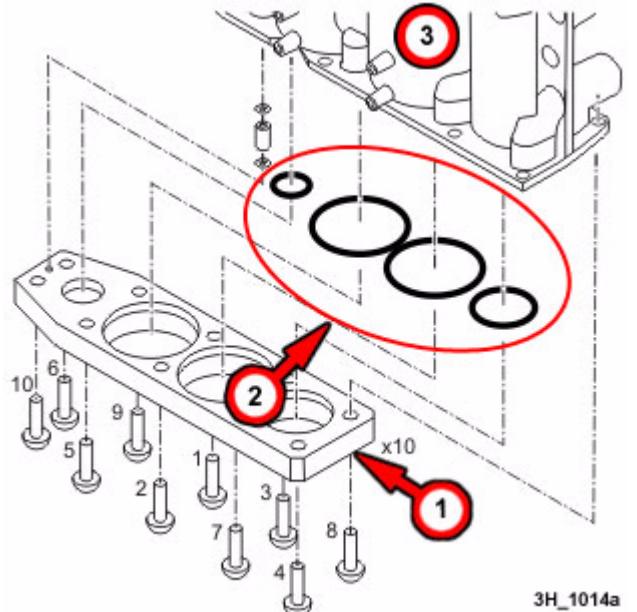
WARNING Potential Biohazard

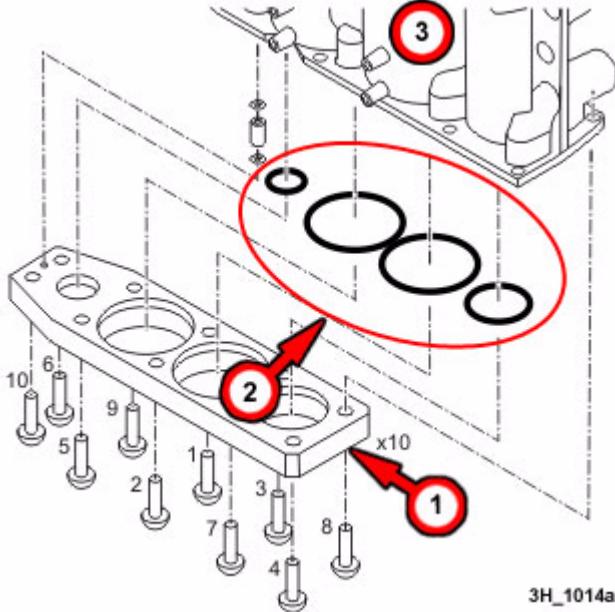


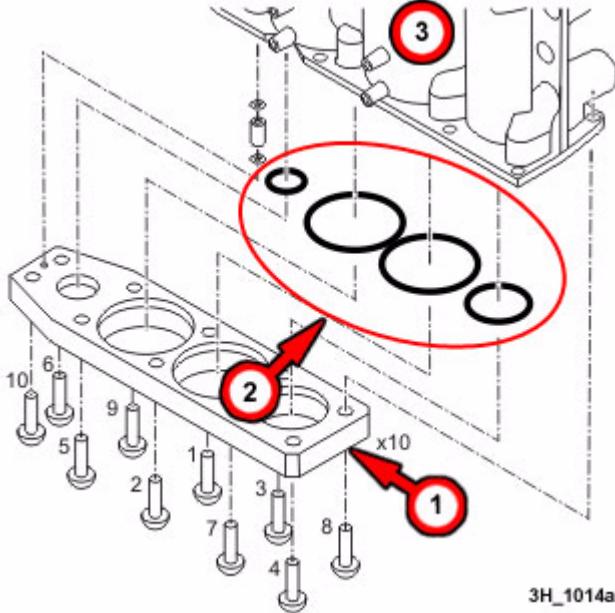
Caution Chemical Hazard

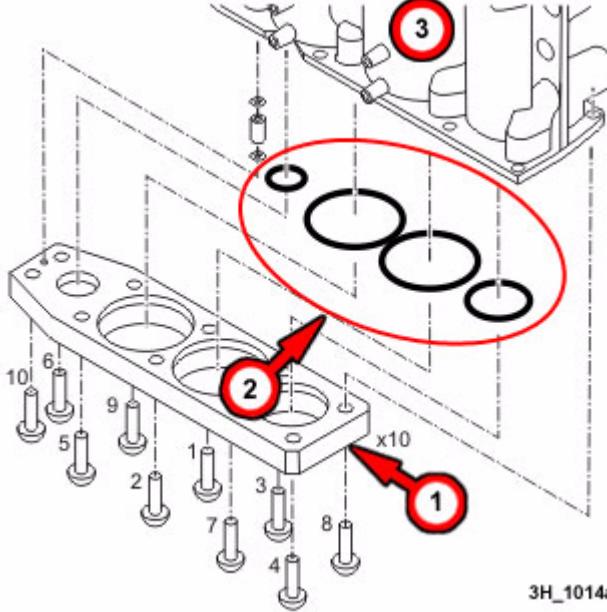
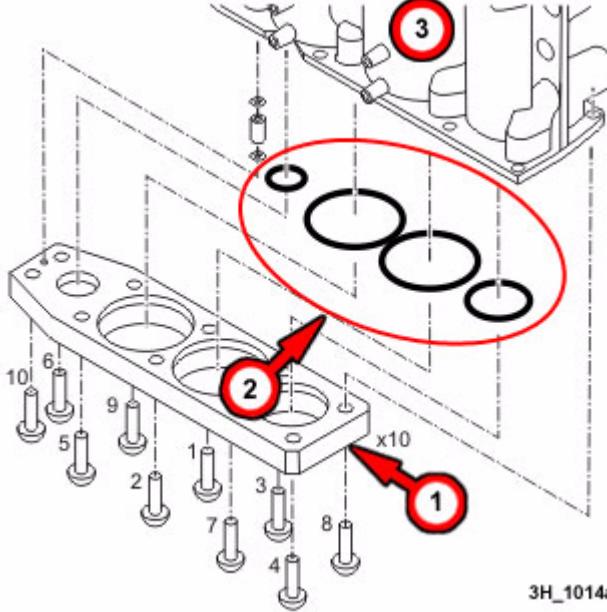
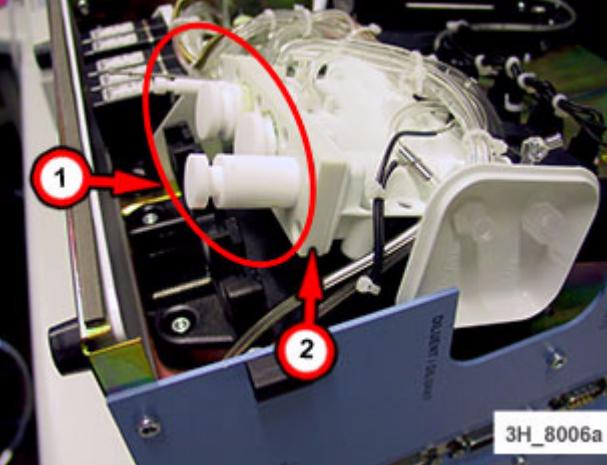
Removal		
Action	Steps	Reference
Prerequisite	<p>1. Drain the tubing:</p> <ul style="list-style-type: none"> • Remove the diluent straw • Remove the cleaner [1] and lyse [2] straws • Perform PRIME ALL three (3) times (MAIN MENU, REAGENTS, PRIME ALL). 	  3H_8047a
Prerequisite (continued)	<p>1. Place the syringe in lubrication position. (MAIN MENU, SERVICE, MECHANICAL CHECKS, LUBRICATION POS.)</p> <p>2. Power OFF the instrument and disconnect the power supply.</p> <p>3. Remove the lyse and cleaner bottles.</p> <p>4. Open the door on the right side of the instrument (hydraulic area access).</p>	 3H_5002a

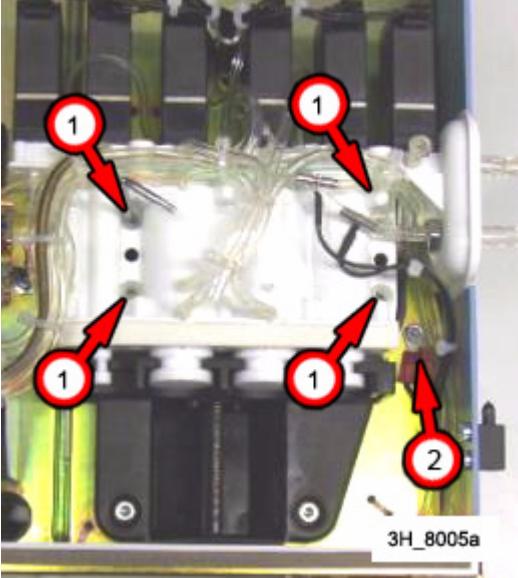
Removal(continued)		
Action	Steps	Reference
Preparation	1. Turn the instrument on its left side.	 3H_8003a
Access O-rings and Pistons	<p>Note <i>Do not remove the screws that secure the syringe module, only loosen them.</i></p> <ol style="list-style-type: none"> 1. Use a TORX T10 tool to loosen the four (4) screws securing the syringe module. [1] 2. Remove the screw securing the ground wire and move the wire out of the way. [2] 	 3H_8005a

Removal(continued)		
Action	Steps	Reference
Remove Pistons	<p>1. Lift the syringe module and remove the four (4) pistons [1] from the seal plate. [2]</p>	 3H_8006a
Remove Seal Plate	<p>Note <i>There is a sequence to removing the screws securing the seal plate. Not following this sequence can result in damage to the assembly.</i></p> <p>1. Using a TORX T10 tool, gently loosen the screws, in the correct sequence, securing the seal plate. [1] 2. Remove the seal plate. [1]</p>	 3H_1014a

Removal(continued)		
Action	Steps	Reference
Remove O-rings	1. Remove the O-rings [2] from the seal plate. [1]	 3H_1014a

Replacement		
Action	Steps	Reference
Install O-rings	<p>Note Make sure that the O-rings are greased before installation into the seal plate.</p> <p>2. Install the new O-rings [2] into the seal plate. [1]</p>	 3H_1014a

Replacement(continued)		
Action	Steps	Reference
Install Seal Plate	<p>Note There is a sequence to installing the screws securing the seal plate. Not following this sequence can result in damage to the assembly.</p> <ol style="list-style-type: none"> Using a TORX T10 tool, carefully tighten the screws, in the correct sequence, to secure the seal plate [1] to the syringe body. [3] (45 cNm) (3.98 lb.-in) 	 3H_1014a
Install Pistons	<ol style="list-style-type: none"> Install the syringe pistons [1] into the seal plate [2] and lower the syringe module into position. <p>Note Replace piston, if needed.</p>	 3H_8006a

Replacement(continued)		
Action	Steps	Reference
Secure Syringe Module	<ol style="list-style-type: none"> Using a TORX T10 tool, tighten four (4) screws to secure the syringe module. [1] Install the ground wire. [2] 	 3H_8005a
Prepare for Operation	<ol style="list-style-type: none"> Return the instrument to the upright position. Install the lyse and cleaner bottles. Replace the diluent, lyse [2], and cleaner straws. [1] Connect the instrument to the power supply and power ON the instrument. 	 3H_8047a

Verification		
Action	Steps	Reference
Perform Prime All	<ol style="list-style-type: none"> Log in as AFSE and press Confirm. Press OK on log in window. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL). Verify normal instrument operation. Note Check for leaks around the counting and syringe module areas. Close right side door. 	

C1.02 Syringe Module: Syringe Body Access

Time Required	1 hr.	Parts	
Tools/Materials	TORX T10 Tool TORX T20 Tool	7016888	Syringe Body

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:

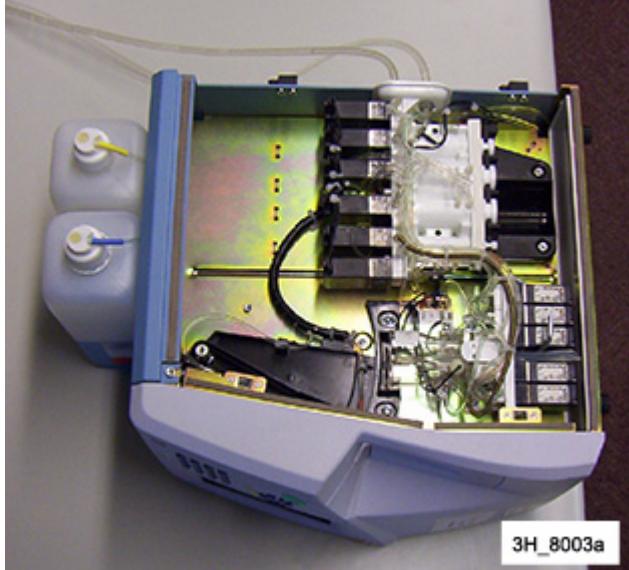
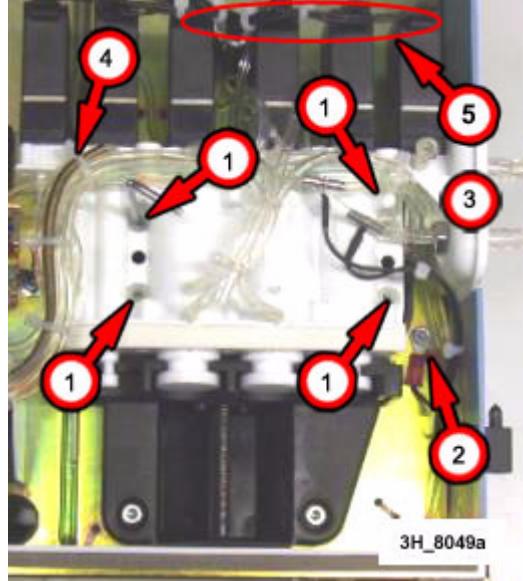


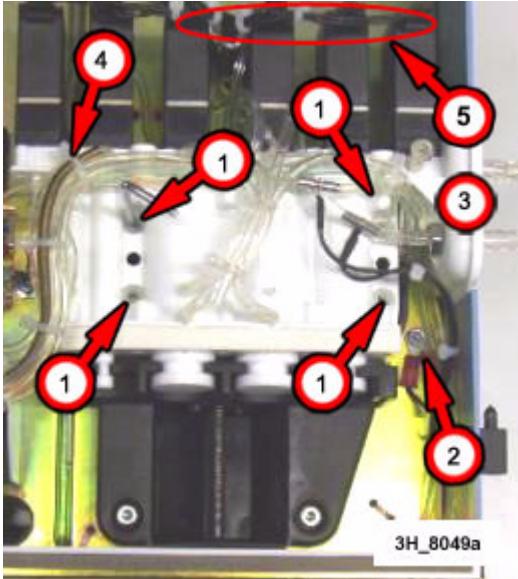
WARNING Potential Biohazard

Caution Chemical Hazard



Removal			
Action	Steps	Reference	
Prerequisite	<ol style="list-style-type: none"> 1. Drain the tubing: <ul style="list-style-type: none"> • Remove the diluent straw • Remove the cleaner [1] and lyse [2] straws • Perform PRIME ALL three (3) times (MAIN MENU, REAGENTS, PRIME ALL). 2. Power OFF the instrument and disconnect the power supply. 3. Remove the lyse and cleaner bottles. 4. Open the door on the right side of the instrument (hydraulic area access). 		3H_8047a

Removal(continued)		
Action	Steps	Reference
Preparation	1. Turn the instrument on its left side.	 3H_8003a
Remove Syringe Module	<p>1. Disconnect the electrovalves cables. [5]</p> <p>Note Do not remove the screws that secure the syringe module, only loosen them.</p> <p>2. Loosen the four (4) screws securing the syringe module with a TORX T10 tool. [1]</p> <p>3. Disconnect the waste and diluent tubing externally. [3]</p> <p>4. Cut the tie wraps securing the tubing routed to the syringe module [4].</p> <p>5. Remove the screw securing the ground wire and move the wire out of the way. [2]</p> <p>6. Disconnect the tubing routed to the syringe module.</p> <p>7. Disconnect the temperature sensor.</p> <p>8. Lift the syringe module out of the instrument.</p>	 3H_8049a

Replacement		
Action	Steps	Reference
Install Syringe Module	<ol style="list-style-type: none"> Lower the syringe module into the instrument. Connect the tubing routed to the syringe module. <p>Note If a tubing does not fit snugly, cut 2 to 4mm off of the ends of the tubing, or replace it.</p> <ol style="list-style-type: none"> Install the ground wire [2]. Dress the tubing and secure it to the syringe module with tie wraps [4] Connect the waste and diluent tubing externally. [3] Using a TORX T10 tool, tighten four (4) screws to secure the syringe module. [1] Connect the electrovalve cables. [5] 	
Prepare for Operation	<ol style="list-style-type: none"> Connect the temperature sensor. Return the instrument to the upright position. Install the lyse and cleaner bottles. Install the diluent, lyse [2], and cleaner straws. [1] Connect the instrument to the power supply and power ON the instrument. 	

Verification		
Action	Steps	Reference
Perform Prime All	<ol style="list-style-type: none"> Log in as AFSE and press Confirm. Press OK on log in window. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL). Verify normal instrument operation. <p>Note Check for leaks around the counting and syringe module areas.</p> <ol style="list-style-type: none"> Close right side door. 	

C1.03 Syringe Module: Electrovalves

Time Required	2.5 hr.	Parts	
Tools/Materials	TORX T6 Tool TORX T10 Tool TORX T20 Tool	7016862	Electrovalves 2/2
		7016863	Electrovalves 3/2
		7016864	Electrovalves 3/2 - 1.6mm

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:

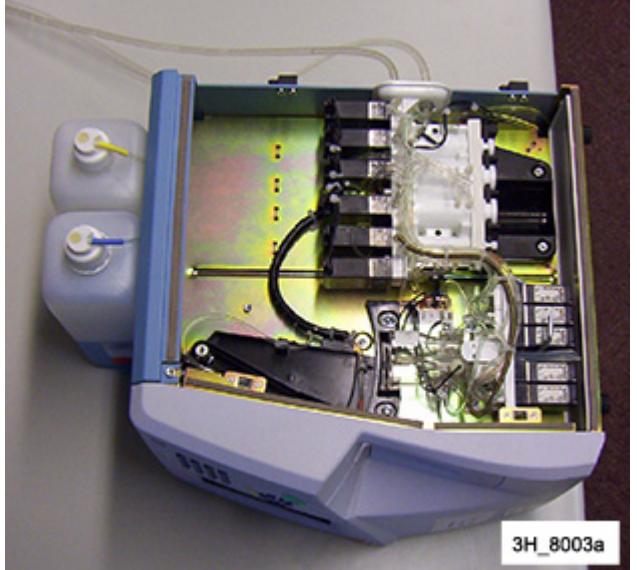
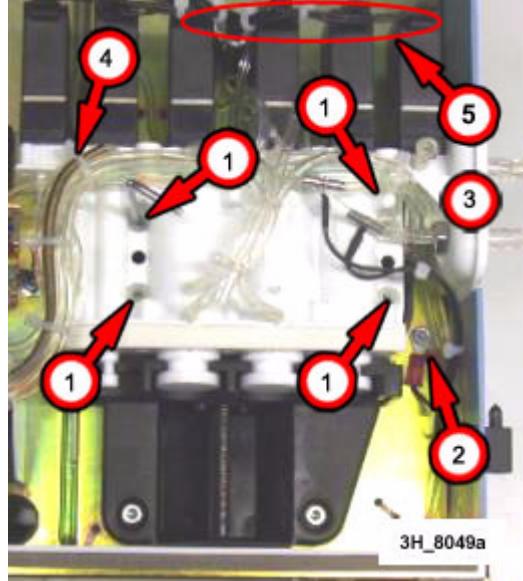


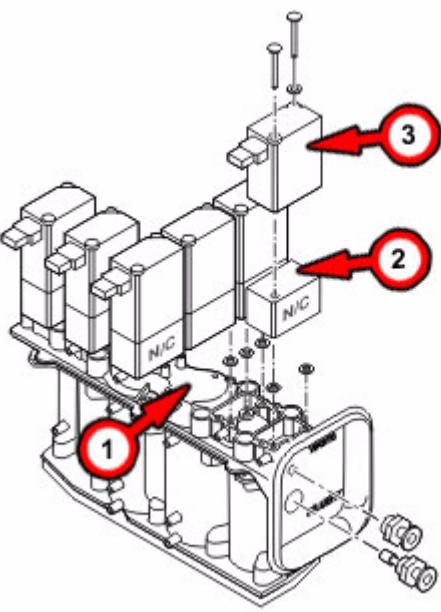
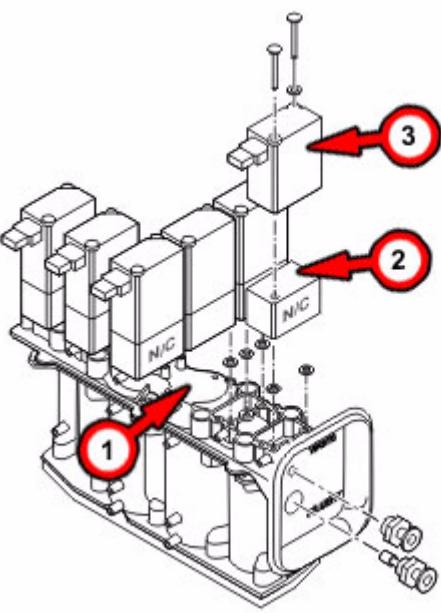
WARNING Potential Biohazard

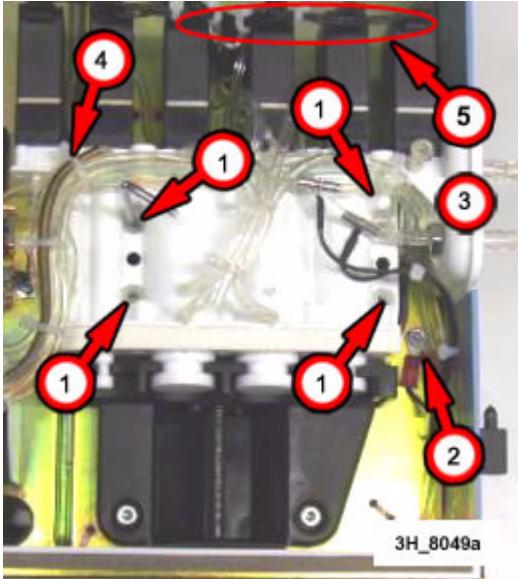
Caution Chemical Hazard



Removal			
Action	Steps	Reference	
Prerequisite	<ol style="list-style-type: none"> 1. Drain the tubing: <ul style="list-style-type: none"> • Remove the diluent straw • Remove the cleaner [1] and lyse [2] straws • Perform PRIME ALL three (3) times (MAIN MENU, REAGENTS, PRIME ALL). 2. Power OFF the instrument and disconnect the power supply. 3. Remove the lyse and cleaner bottles. 4. Open the door on the right side of the instrument (hydraulic area access). 		3H_8047a

Removal		
Action	Steps	Reference
Preparation	1. Turn the instrument on its left side.	 3H_8003a
Remove Syringe Module	<p>Note <i>Do not remove the screws that secure the syringe module, only loosen them.</i></p> <ol style="list-style-type: none"> 1. Disconnect the electrovalve cables. [5] 2. Loosen the four (4) screws [1] securing the syringe module with a TORX T10 tool. 3. Remove the waste and diluent tubing externally. [3] 4. Cut the tie wraps securing the tubing routed to the syringe module. [4] 5. Remove the screw [2] securing the ground wire and move the wire out of the way. 6. Disconnect the tubing routed to the syringe module. 7. Disconnect the temperature sensor. 8. Lift the syringe module out of the instrument. 	 3H_8049a

Removal		
Action	Steps	Reference
Remove Syringe Module Electrovalve	<p>1. Use a TORX T6 tool to remove the two (2) screws securing the solenoid [3] to the electrovalve base. [2] (Put the solenoid aside.)</p> <p>Note Small washers are part of the electrovalve assembly. Take care not to lose these washers, or drop them into the instrument.</p> <p>2. Use a TORX T6 tool to remove the two (2) screws securing the electrovalve base [2] to the syringe manifold. [1] (Put the electrovalve base aside.)</p>	 3H_1012a
Replacement		
Install Syringe Module Electrovalve	<p>Note The NC stamp on the electrovalve base [2] is positioned to the right for all electrovalves mounted on the syringe manifold [1].</p> <p>1. Separate the solenoid [3] from the electrovalve base. [2]</p> <p>Note Ensure that the O-rings are installed in the electrovalve base [2] before performing the next step.</p> <p>2. Use a TORX T6 tool to secure the electrovalve base [2] to the syringe manifold [1] with two (2) screws (45 cNm). (3.98 lb-in)</p> <p>3. Place the solenoid [3] on the electrovalve base. [2] Use a TORX T6 tool to secure the solenoid with two (2) screws (20 cNm). (1.77 lb-in)</p>	 3H_1012a

Replacement		
Action	Steps	Reference
Install Syringe Module	<ol style="list-style-type: none"> Lower the syringe module into the instrument. Connect the tubing routed to the syringe module. <p>Note If a tubing does not fit snugly, cut 2 to 4mm off of the ends of the tubing, or replace it.</p> <ol style="list-style-type: none"> Install the ground wire [2]. Dress the tubing and secure it to the syringe module with tie wraps [4]. Connect the waste and diluent tubing externally. [3] Tighten four (4) screws to secure the syringe module [1], using a TORX T10 tool. Connect the electrovalve cables. [5] 	
Prepare for Operation	<ol style="list-style-type: none"> Connect the temperature sensor. Return the instrument to the upright position. Install the lyse and cleaner bottles. Install the diluent, lyse [2], and cleaner straws. [1] Connect the instrument to the power supply and power ON the instrument. 	

Verification		
Action	Steps	Reference
Verification	<ol style="list-style-type: none"> Log in as AFSE and press Confirm. Press OK on log in window. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL). Verify normal instrument operation. <p>Note Check for leaks around the counting and syringe module areas.</p> <ol style="list-style-type: none"> Close right side door. 	

4.4 Boards (Emerald - D1)

D1.01 IHM Board

Time Required	30 min.	Parts	
Tools/Materials	Standard Tool Kit TORX T20 Tool	7016870	EMERALD IHM BOARD

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:



WARNING Potential Biohazard

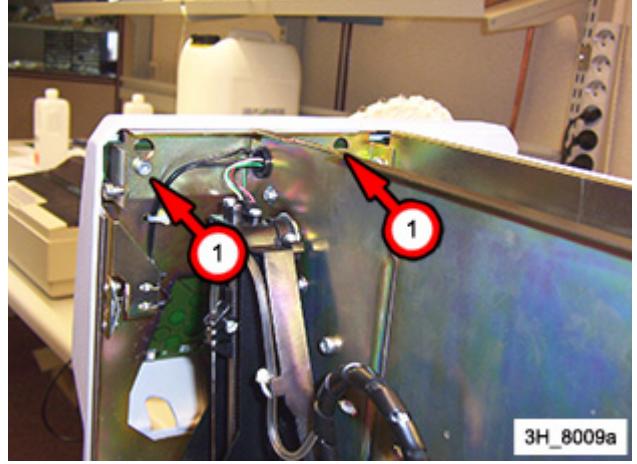
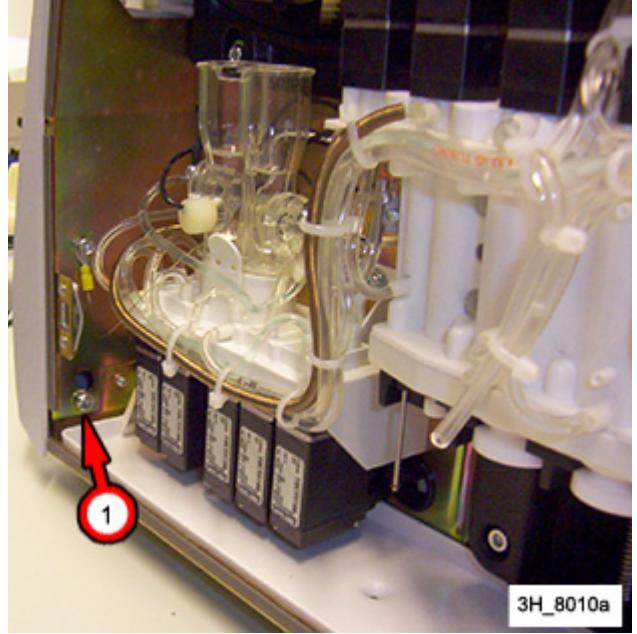


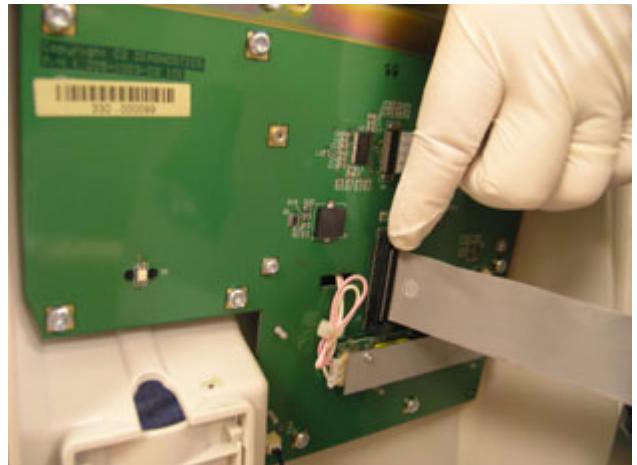
Caution Chemical Hazard



Caution Electrostatic Discharge

Removal		
Action	Steps	Reference
Preparation	1. Power OFF the instrument and disconnect the power supply.	
Open Right Side Door	1. Open the door on the right side of the instrument (hydraulic area access).	
Remove Upper Cover	1. Remove the three (3) screws securing the upper cover to the front and back of the instrument and remove the cover.	

Removal		
Action	Steps	Reference
Remove Front Panel Screws	<p>Note Do not remove the screws, only loosen them.</p> <ol style="list-style-type: none"> 1. Loosen the two (2) upper screws and the lower screw which secure the front panel. [1] 	 <p>3H_8009a</p>  <p>3H_8010a</p>

Removal		
Action	Steps	Reference
Remove Front Panel	<p>1. Lift the front panel upward and then pull it toward the front of the instrument.</p>	 3H_8011a
Remove IHM Board	<p>Caution <i>Carefully push on the upper and lower sides of the connector. If the connector socket is damaged, the entire IHM board must be replaced.</i></p> <ol style="list-style-type: none"> 1. Remove the IHM board connector by pushing up on the upper side of the connector, then push down on the lower side of the connector. 2. Slowly pull the flat cable out of the connector socket. 3. Remove the screws securing the IHM board. 4. Remove the IHM board. 	 3H_8012a

Replacement		
Action	Steps	Reference
Install IHM Board	<ol style="list-style-type: none"> 1. Install the IHM board and secure. 2. Connect the IHM board connector. 	
Install Front Panel	<ol style="list-style-type: none"> 1. Position the front panel on the instrument and secure it with three (3) screws (two upper screws and one lower screw). 	

Replacement		
Action	Steps	Reference
Install Upper Cover	1. Install the upper cover to the front and back of the instrument and secure with three (3) screws.	
Close Right Side Door	1. Close the door on the right side of the instrument (hydraulic area access).	
Power ON Instrument	1. Connect the instrument to the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Perform PRIME ALL	1. Log in as AFSE and press Confirm . 2. Press OK on log in window. 3. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL).	

D1.02 Emerald CPU Board

Time Required	1.5 hr.	Parts	
Tools/Materials	TORX T20 Tool	7016869	CD Emerald CPU Board

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:



WARNING Potential Biohazard

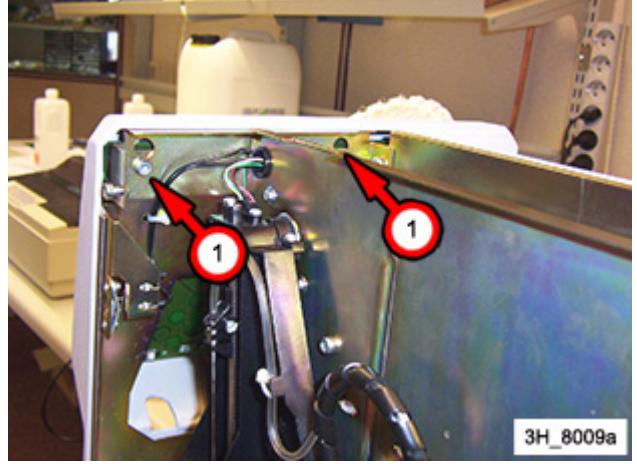
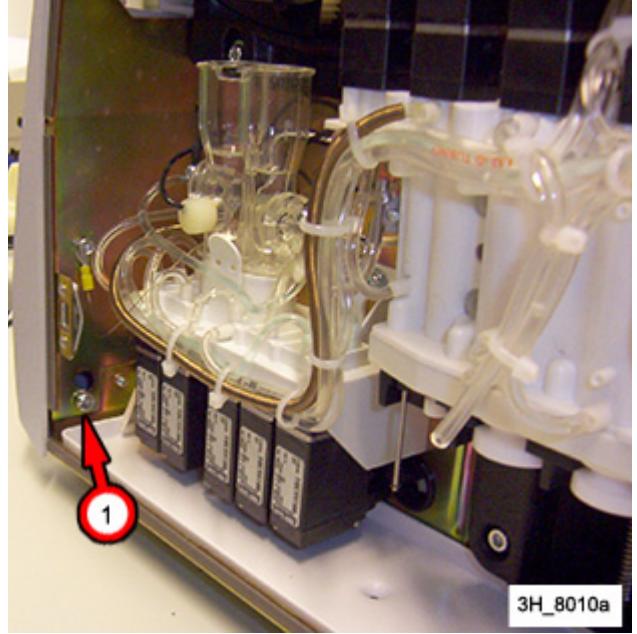


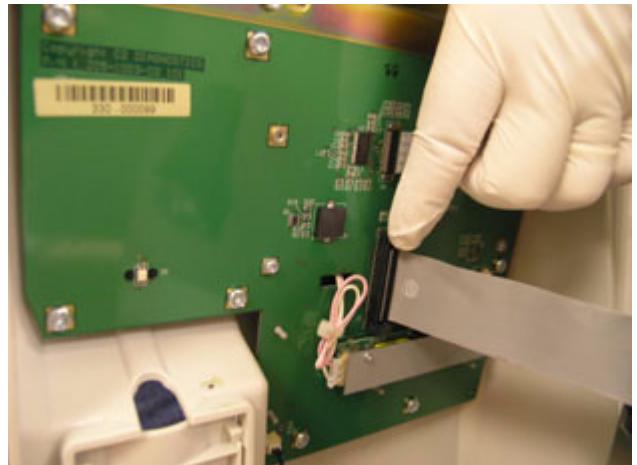
Caution Chemical Hazard

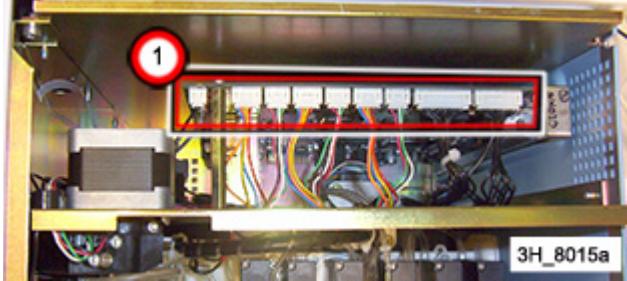
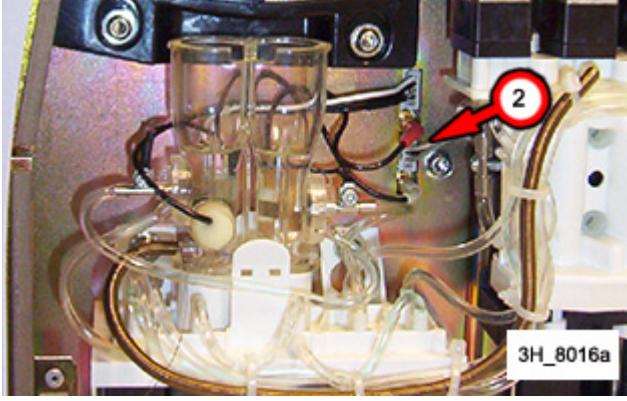
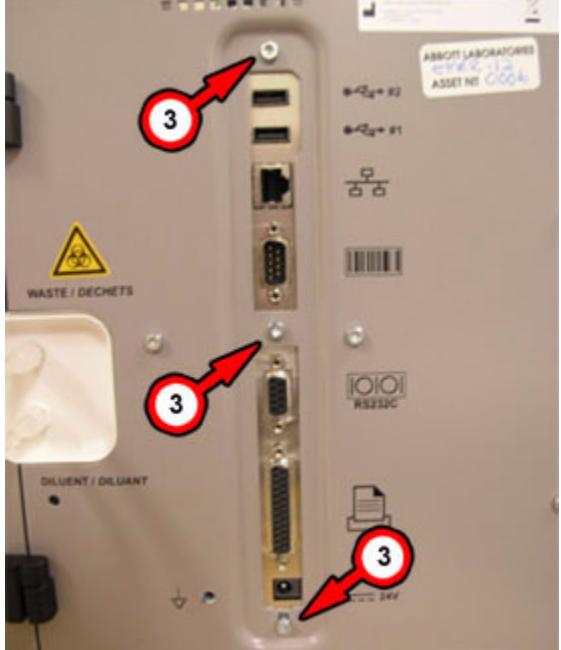


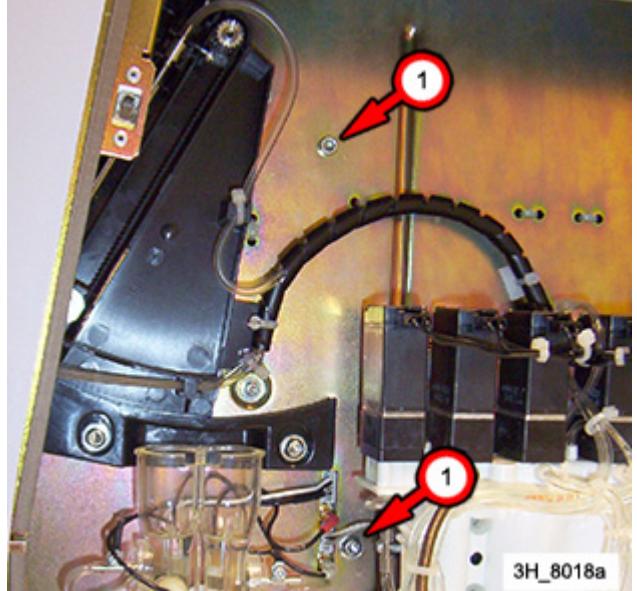
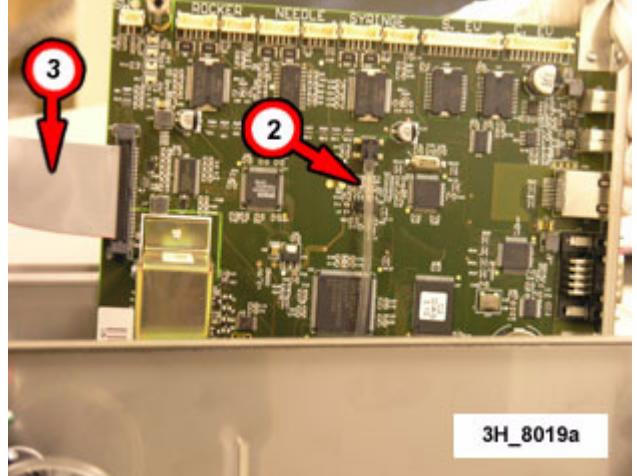
Caution Electrostatic Discharge

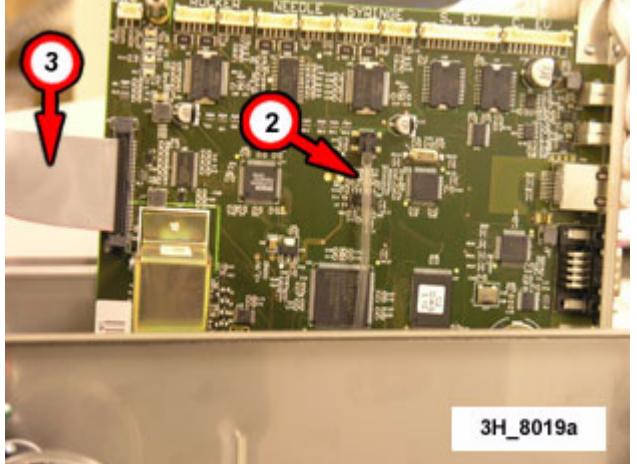
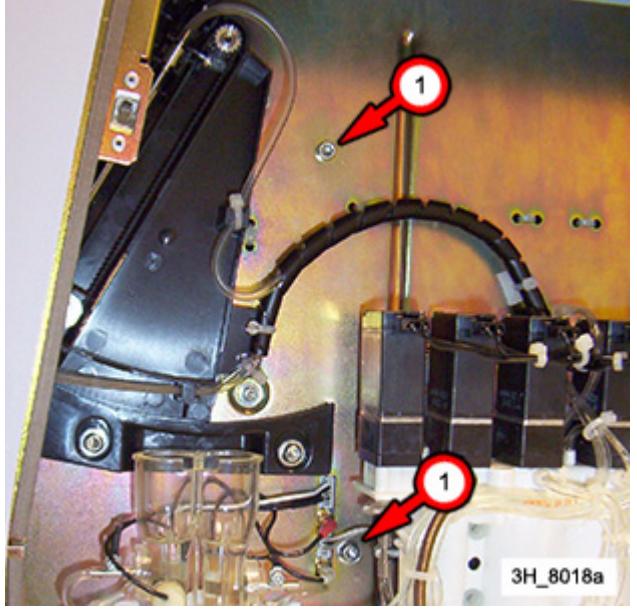
Removal		
Action	Steps	Reference
Preparation	1. Power OFF the instrument and disconnect the power supply.	
Open Right Side Door	1. Open the door on the right side of the instrument (hydraulic area access).	
Remove Upper Cover	1. Remove the three (3) screws securing the upper cover to the front and back of the instrument and remove the cover.	

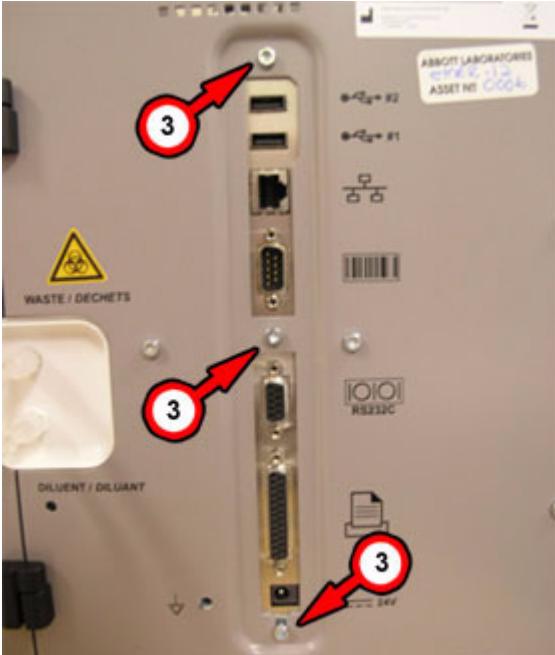
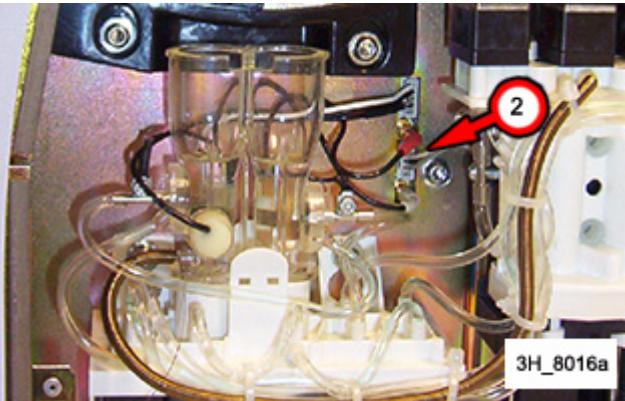
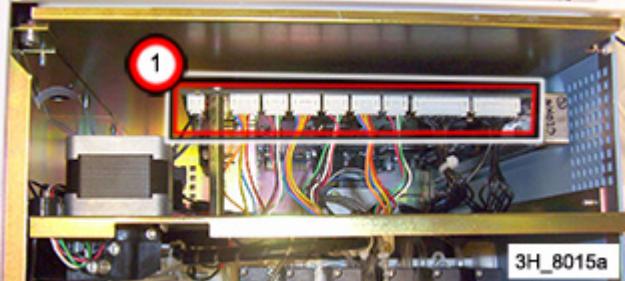
Removal		
Action	Steps	Reference
Remove Front Panel Screws	<p>Note Do not remove the screws, only loosen them.</p> <ol style="list-style-type: none"> 1. Loosen the two (2) upper screws and the lower screw which secure the front panel. [1] 	 

Removal		
Action	Steps	Reference
Remove Front Panel	<p>1. Lift the front panel upward and then pull it toward the front of the instrument.</p>	 3H_8011a
Remove IHM Cable	<p>Caution Carefully push on the upper and lower sides of the connector. If the connector socket is damaged, the entire IHM board must be replaced.</p> <ol style="list-style-type: none"> 1. Remove the IHM board connector by pushing up on the upper side of the connector, then push down on the lower side of the connector. 2. Slowly pull the flat cable out of the connector socket. 3. Put the front panel aside. 	 3H_8012a

Removal		
Action	Steps	Reference
Remove Connectors	<ol style="list-style-type: none"> 1. Remove the nine (9) connectors [1] on the top of the CPU board. 2. Remove the preamplifier board connections: [2] <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor 3. At the back of the instrument, remove the three (3) screws [3] securing the CPU board. 	 3H_8015a  3H_8016a  3H_8017a

Removal		
Action	Steps	Reference
Remove CPU Board	<ol style="list-style-type: none"> 1. Remove the two (2) screws [1] (on the flow panel) securing the CPU board. 2. Lift the board and carefully disconnect the tubing from the pressure sensor. [2] 3. Disconnect the IHM cable. [3] 4. Remove the board from the assembly. 	 <p>3H_8018a</p>  <p>3H_8019a</p>

Replacement		
Action	Steps	Reference
Install CPU Board	<ol style="list-style-type: none"> 1. Install the board into the assembly. 2. Connect pressure sensor tube. [2] 3. Connect the IHM cable. [3] 4. Install the two (2) screws [1] located at the flow panel. 	 <p>3H_8019a</p>  <p>3H_8018a</p>

Replacement		
Action	Steps	Reference
Install CPU Board Connectors	<ol style="list-style-type: none"> 1. Install three (3) screws [3] at the back of the instrument. 2. Install the preamplifier board connections: [2] <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor 3. Install the nine (9) connectors on the top of the CPU board. [1] 	 <p>3H_8017a</p>
Install IHM Cable	<ol style="list-style-type: none"> 1. Connect the IHM cable to the front panel IHM board. 	 <p>3H_8016a</p>  <p>3H_8015a</p>

Replacement		
Action	Steps	Reference
Install Front Panel	1. Position the front panel on the instrument and secure it with three screws (two upper screws and one lower screw).	
Install Upper Cover	1. Install the upper cover to the front and back of the instrument and secure with three (3) screws.	
Close Right Side Door	1. Close the door on the right side of the instrument (hydraulic area access).	
Power ON Instrument	1. Connect the instrument to the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Perform PRIME ALL	1. Log in as AFSE and press Confirm . 2. Press OK on log in window. 3. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL). 4. Verify application software and update if necessary. 5. Adjust gain. 6. Perform a calibration.	

D1.03 Emerald CPU Board Fuse

Time Required	30 min.	Parts	
Tools/Materials	TORX T20 Tool	Locally Sourced	Littelfuse NANO Slo-Blo fuse model 0454 004

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:



WARNING Potential Biohazard

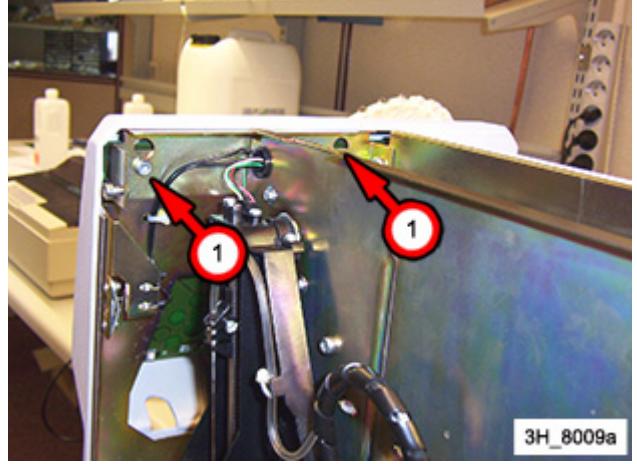
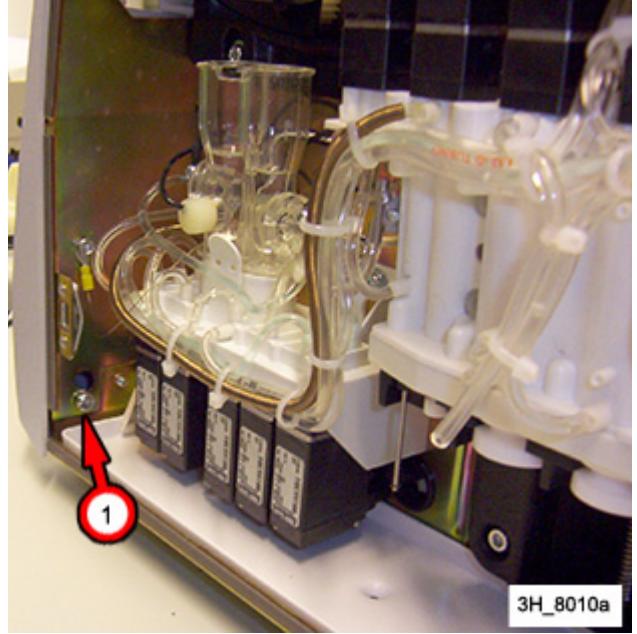


Caution Chemical Hazard

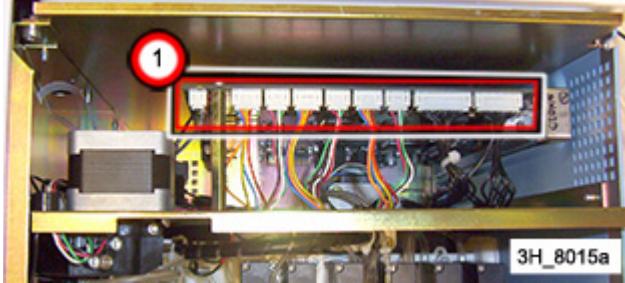
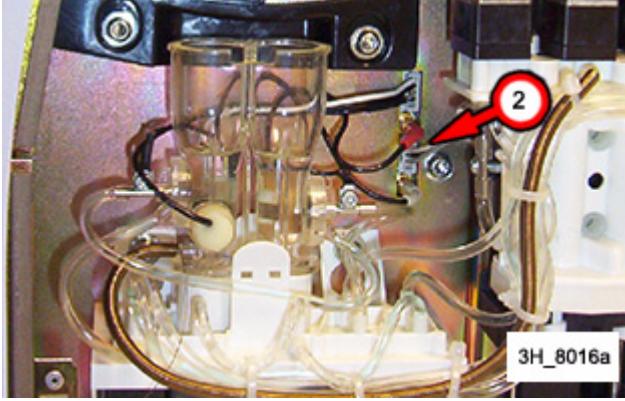
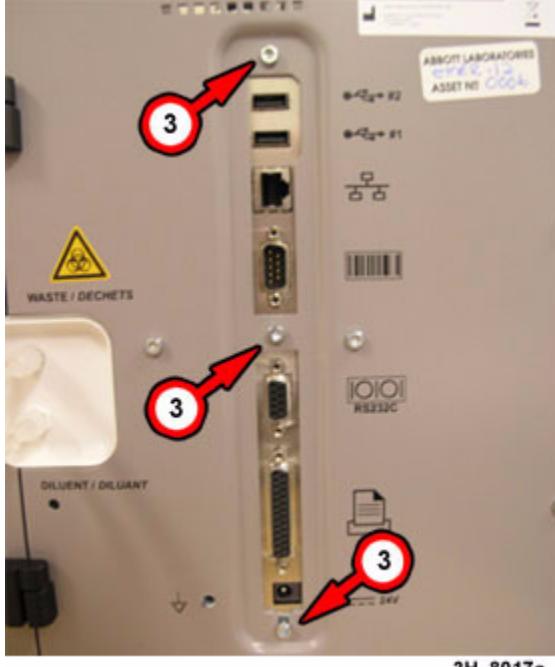


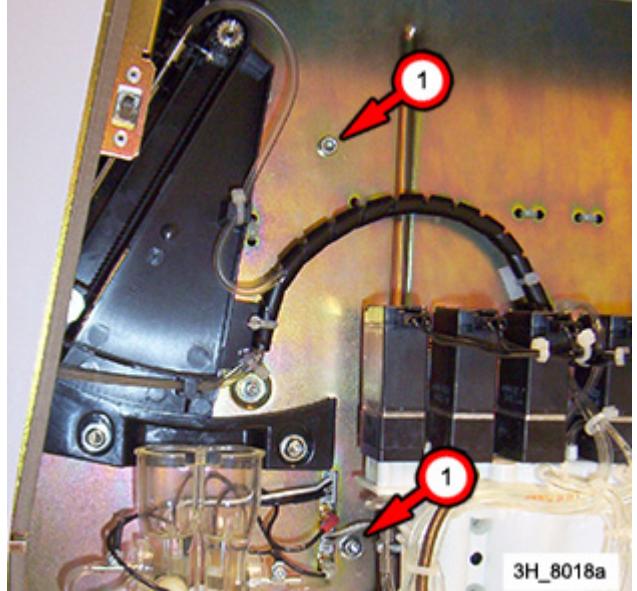
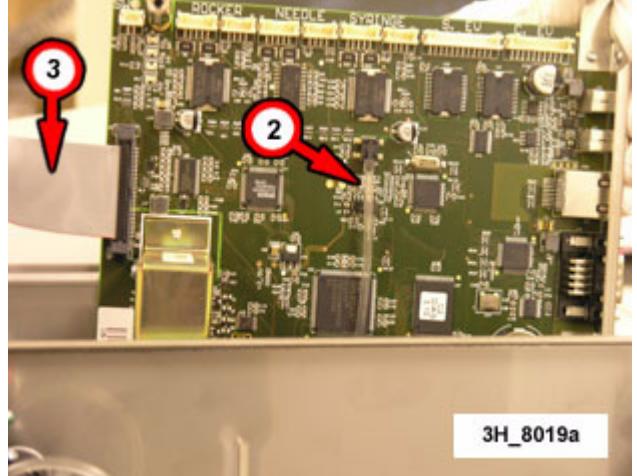
Caution Electrostatic Discharge

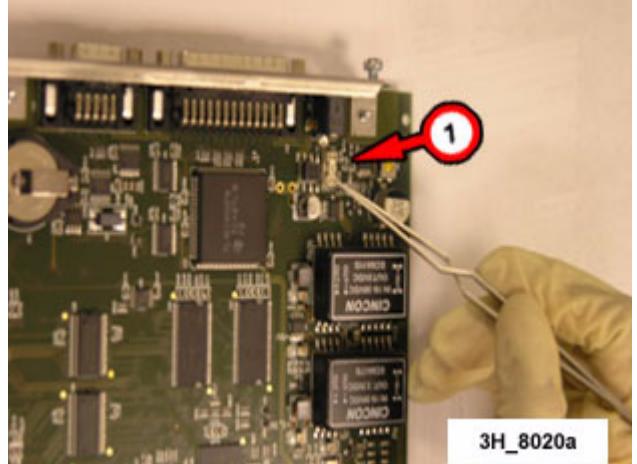
Removal		
Action	Steps	Reference
Prerequisite	1. Power OFF the instrument and disconnect the power supply.	
Open Right Side Door	1. Open the door on the right side of the instrument (hydraulic area access).	
Remove Upper Cover	1. Remove the three (3) screws securing the upper cover to the front and back of the instrument and remove the cover.	

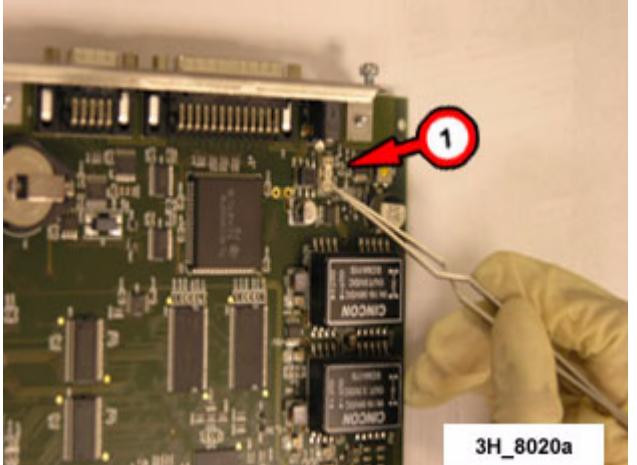
Removal		
Action	Steps	Reference
Remove Front Panel Screws	<p>Note Do not remove the screws, only loosen them.</p> <ol style="list-style-type: none"> 1. Loosen the two (2) upper screws and the lower screw which secure the front panel. [1] 	 <p>3H_8009a</p>  <p>3H_8010a</p>

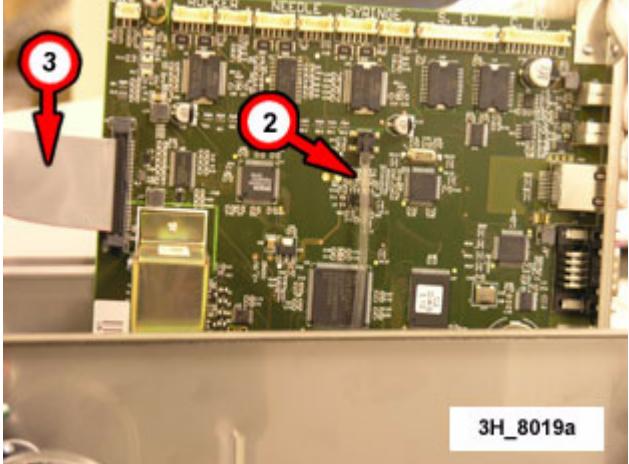
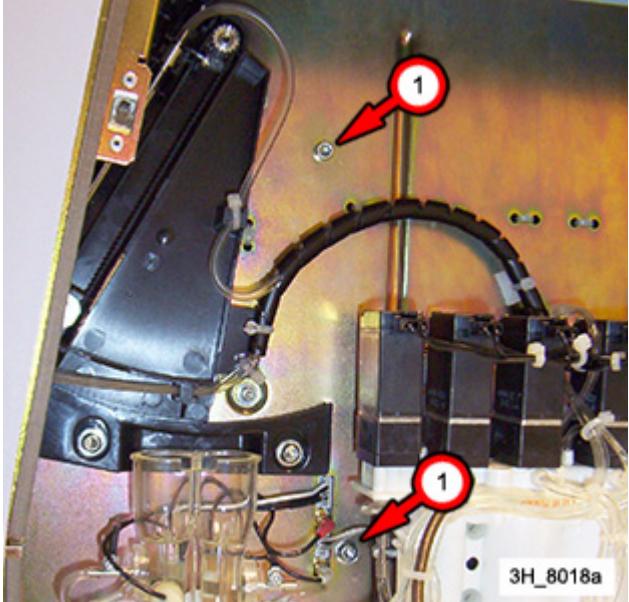
Removal		
Action	Steps	Reference
Remove Front Panel	<p>1. Lift the front panel upward and then pull it toward the front of the instrument.</p>	 3H_8011a
Remove IHM Cable	<p>Caution Carefully push on the upper and lower sides of the connector. If the connector socket is damaged, the entire IHM board must be replaced.</p> <ol style="list-style-type: none"> 1. Remove the IHM board connector by pushing up on the upper side of the connector, then push down on the lower side of the connector. 2. Slowly pull the flat cable out of the connector socket. 3. Put the front panel aside. 	 3H_8012a

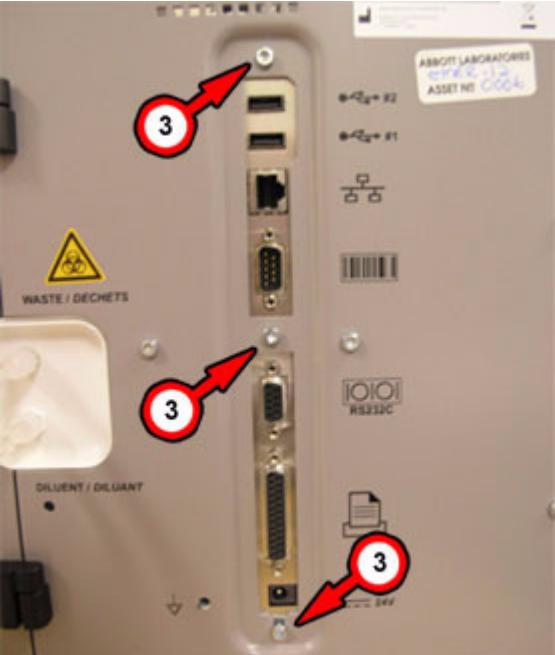
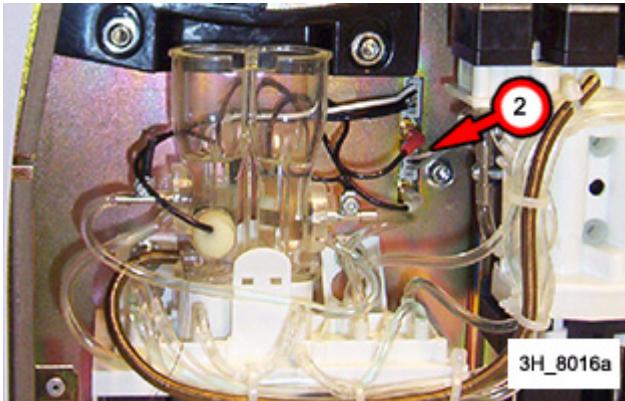
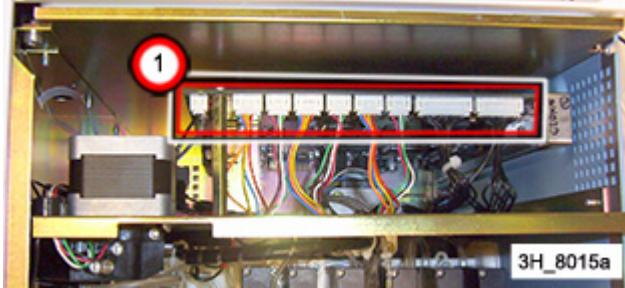
Removal		
Action	Steps	Reference
Remove Connectors	<ol style="list-style-type: none"> 1. Remove the nine (9) connectors on the top of the CPU board. [1] 2. Remove the preamplifier board connections: [2] <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor 3. At the back of the instrument, remove the three (3) screws [3] securing the CPU board. 	  

Removal		
Action	Steps	Reference
Remove CPU Board	<ol style="list-style-type: none"> 1. Remove the two (2) screws [1] (on the flow panel) securing the CPU board. 2. Lift the board and carefully disconnect the tubing from the pressure sensor. [2] 3. Disconnect the IHM cable. 4. Remove the board from the assembly. 	  <p>3H_8018a</p> <p>3H_8019a</p>

Removal		
Action	Steps	Reference
Remove Fuse	<p>Note This fuse protects the 24v circuit.</p> <ol style="list-style-type: none"> 1. Remove the fuse [1] from its holder with an approved tool. 	 3H_8020a

Replacement		
Action	Steps	Reference
Install Fuse	1. Install a new fuse. [1]	 3H_8020a

Replacement		
Action	Steps	Reference
Install CPU Board	<ol style="list-style-type: none"> 1. Install the board into the assembly. 2. Connect pressure sensor tube. [2] 3. Connect the IHM cable. [3] 4. Install the two (2) screws [1] located at the flow panel. 	 <p>3H_8019a</p>  <p>3H_8018a</p>

Replacement		
Action	Steps	Reference
Install Connectors	<ol style="list-style-type: none"> 1. Install three (3) screws [3] at the back of the instrument. 2. Install the preamplifier board connections: [2] <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor 3. Install the nine (9) connectors on the top of the CPU board. [1] 	 <p>3H_8017a</p>  <p>3H_8016a</p>  <p>3H_8015a</p>
Install IHM Cable	<ol style="list-style-type: none"> 1. Connect the IHM cable to the front panel IHM board. 	

Replacement		
Action	Steps	Reference
Install Front Panel	1. Position the front panel on the instrument and secure it with three (3) screws (two upper screws and one lower screw).	
Install Upper Cover	1. Install the upper cover to the front and back of the instrument and secure with three (3) screws.	
Close Right Side Door	1. Close the door on the right side of the instrument (hydraulic area access).	
Power ON Instrument	1. Connect the instrument to the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Perform PRIME ALL	1. Log in as AFSE and press Confirm . 2. Press OK on log in window. 3. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL).	

D1.04 Emerald CPU Board Battery

Time Required	30 min.	Parts	
Tools/Materials	TORX T20 Tool	Locally Sourced	Maxell battery model CR2016

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:



WARNING Potential Biohazard

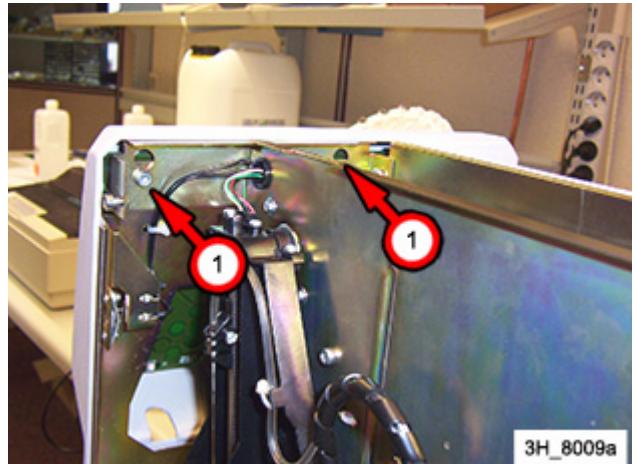
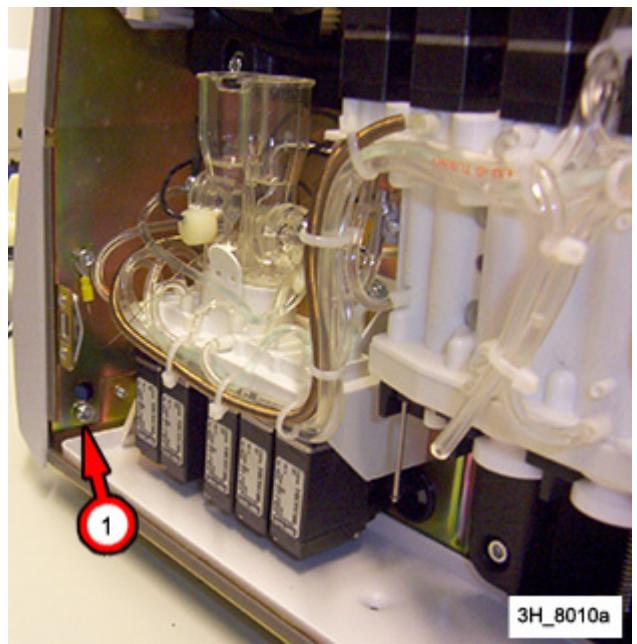


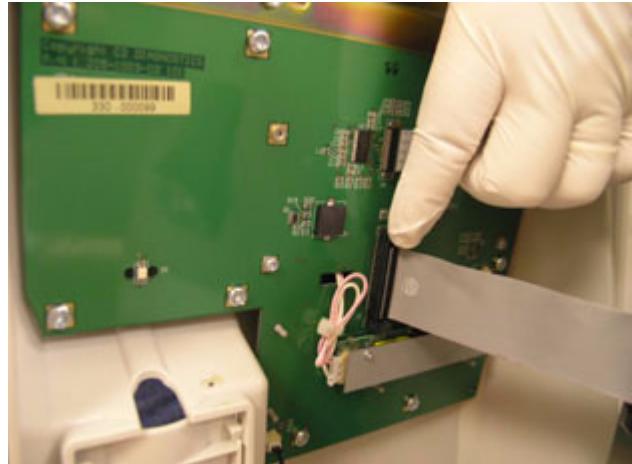
Caution Chemical Hazard

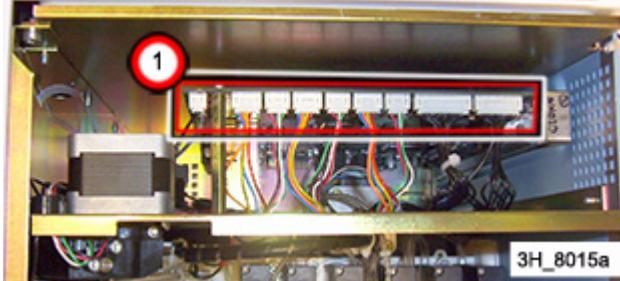
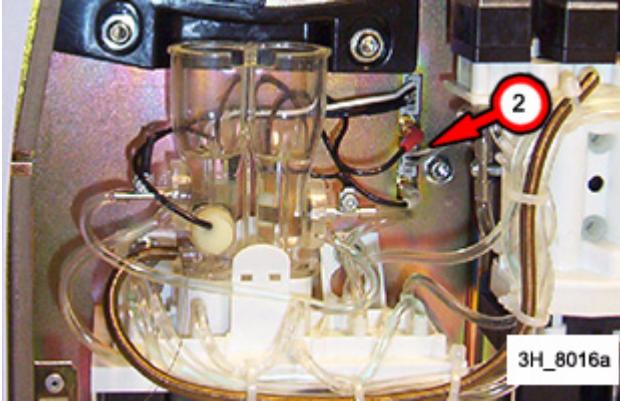
Caution Electrostatic Discharge

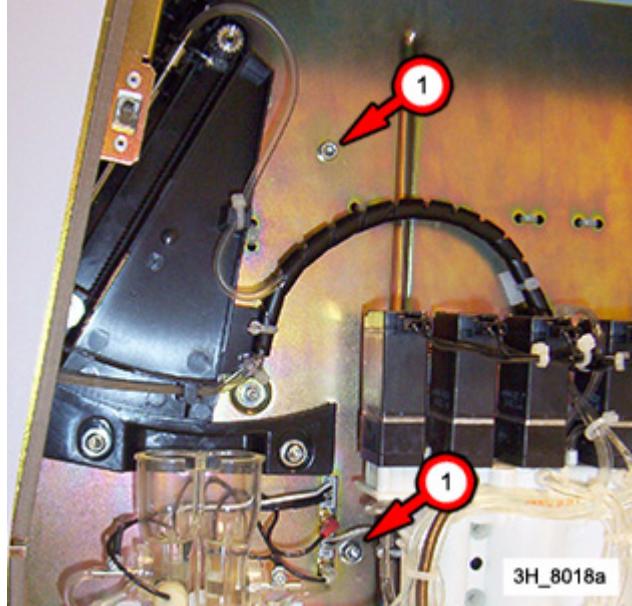
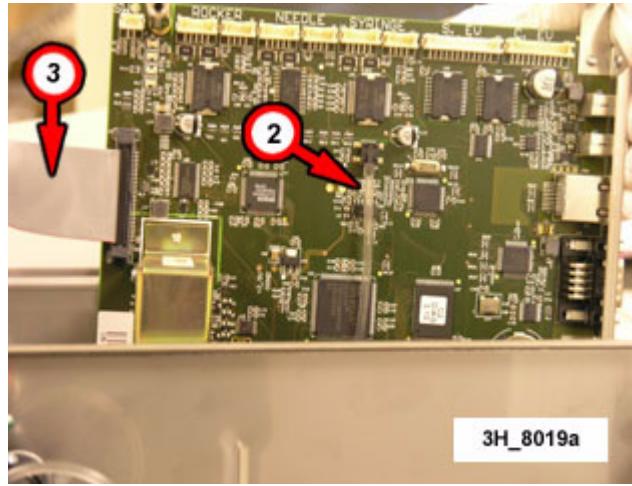


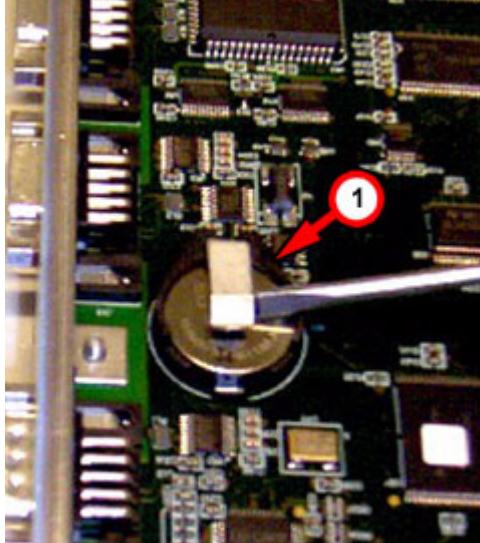
Removal		
Action	Steps	Reference
Prerequisite	1. Power OFF the instrument and disconnect the power supply.	
Open Right Side Door	1. Open the door on the right side of the instrument (hydraulic area access).	
Remove Upper Cover	1. Remove the three (3) screws securing the upper cover to the front and back of the instrument and remove the cover.	

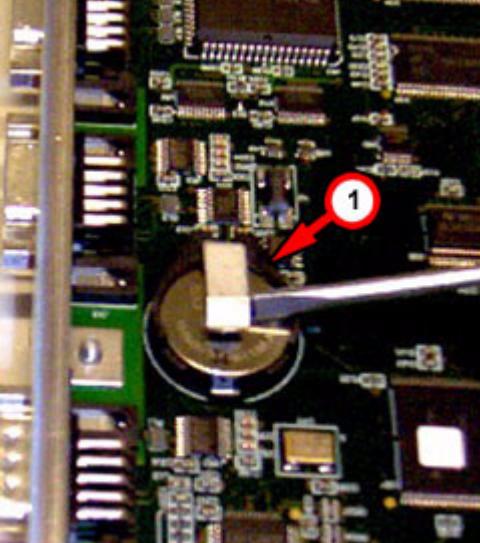
Removal(continued)		
Action	Steps	Reference
Remove Front Panel Screws	<p>Note Do not remove the screws, only loosen them.</p> <ol style="list-style-type: none"> 1. Loosen the two (2) upper screws and the lower screw which secure the front panel. [1] 	 

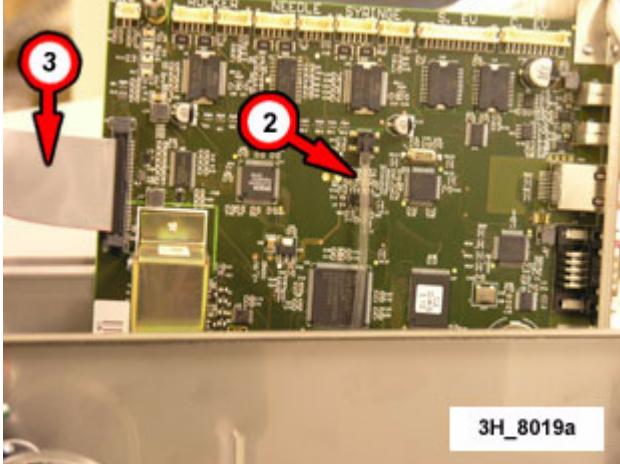
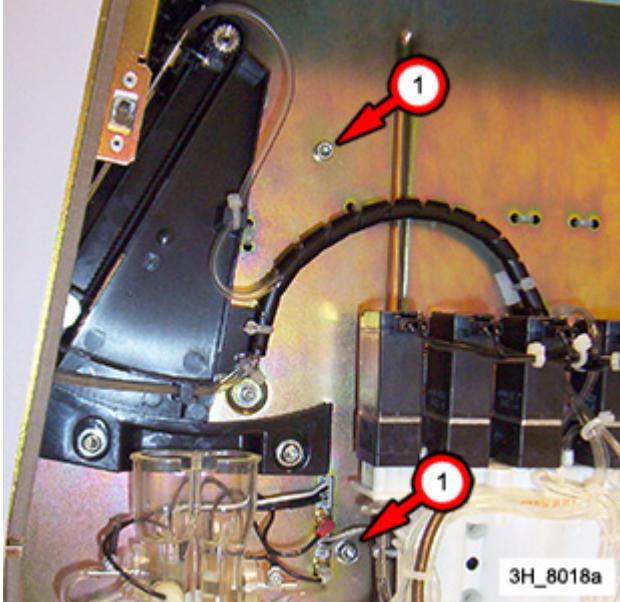
Removal(continued)		
Action	Steps	Reference
Remove Front Panel	<p>1. Lift the front panel upward and then pull it toward the front of the instrument.</p>	 3H_8011a
Remove IHM Cable	<p>Caution Carefully push on the upper and lower sides of the connector. If the connector socket is damaged, the entire IHM board must be replaced.</p> <ol style="list-style-type: none"> 1. Remove the IHM board connector by pushing up on the upper side of the connector, then push down on the lower side of the connector. 2. Slowly pull the flat cable out of the connector socket. 3. Put the front panel aside. 	 3H_8012a

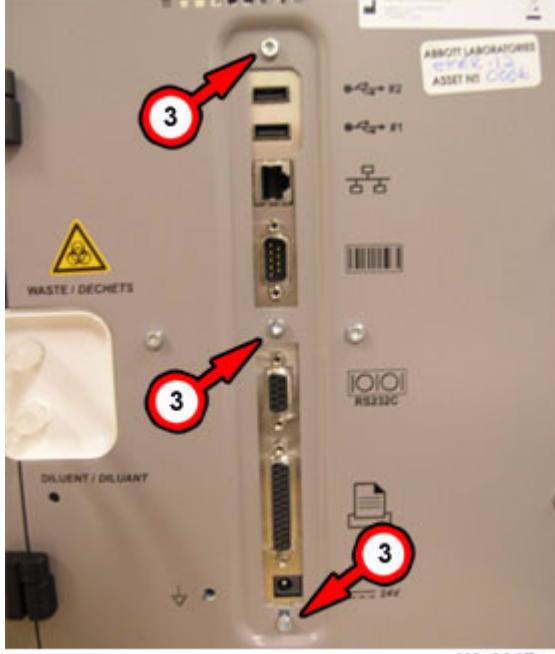
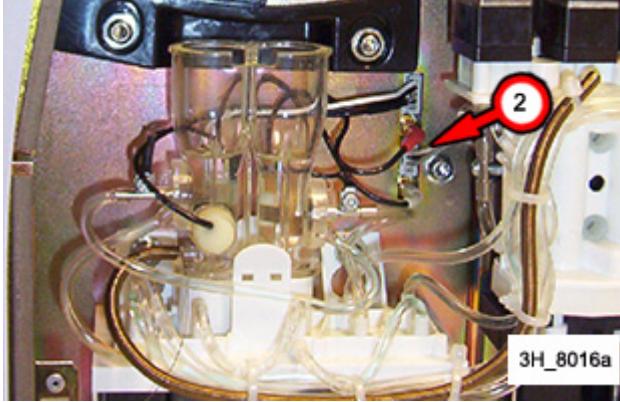
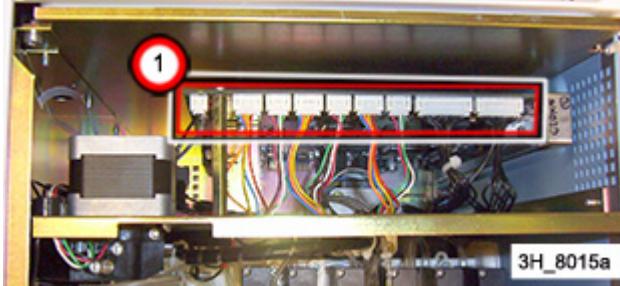
Removal(continued)		
Action	Steps	Reference
Remove Connectors	<ol style="list-style-type: none"> 1. Remove the nine (9) connectors on the top of the CPU board. [1] 2. Remove the preamplifier board connections: [2] <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor 3. At the back of the instrument, remove the three (3) screws [3] securing the CPU board. 	 <p>3H_8015a</p>  <p>3H_8016a</p>  <p>3H_8017a</p>

Removal(continued)		
Action	Steps	Reference
Remove CPU Board	<ol style="list-style-type: none"> 1. Remove the two (2) screws [1] (on the flow panel) securing the CPU board. 2. Lift the board and carefully disconnect the tubing from the pressure sensor. [2] 3. Disconnect the IHM cable. [3] 4. Remove the board from the assembly. 	 

Removal(continued)		
Action	Steps	Reference
Remove Battery	<p>Note This battery is only used to supply power to the real time clock.</p> <ol style="list-style-type: none"> 1. Lift the clip that secures the battery, using a screwdriver. [1] 2. Remove the battery by sliding it downward from under the raised clip. 	 3H_8038a

Replacement		
Action	Steps	Reference
Install Battery	<ol style="list-style-type: none"> 1. Lift the clip that secures the battery, using a screwdriver. [1] 2. Slide the new battery upward under the raised clip. 3. Lower clip to secure battery. 	 3H_8038a

Replacement(continued)		
Action	Steps	Reference
Install CPU Board	<ol style="list-style-type: none"> 1. Install the board into the assembly. 2. Connect pressure sensor tube. [2] 3. Connect the IHM cable. [3] 4. Install the two (2) screws [1] located at the flow panel. 	 

Replacement(continued)		
Action	Steps	Reference
Install Connectors	<ol style="list-style-type: none"> 1. Install three (3) screws [3] at the back of the instrument. 2. Install the preamplifier board connections: [2] <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor 3. Install the nine (9) connectors on the top of the CPU board. [1] 	 <p>3H_8017a</p>  <p>3H_8016a</p>  <p>3H_8015a</p>
Install IHM Board	<ol style="list-style-type: none"> 1. Connect the IHM cable to the front panel IHM board. 	

Replacement(continued)		
Action	Steps	Reference
Install Front Panel	1. Position the front panel on the instrument and secure it with three (3) screws (two upper screws and one lower screw).	
Install Upper Cover	1. Install the upper cover to the front and back of the instrument and secure with three (3) screws.	
Close Right Side Door	1. Close the door on the right side of the instrument (hydraulic area access).	
Power ON Instrument	1. Connect the instrument to the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Perform PRIME ALL	1. Log in as AFSE and press Confirm . 2. Press OK on log in window. 1. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL).	

D1.05 Preamplifier Board

Time Required	1.5 hr.	Parts	
Tools/Materials	Standard Tool Kit TORX T20 Tool	7016872	CD Emerald Preamplifier Board

While performing this procedure, if you are exposed to reagents, calibrators or controls, the following statements may apply:



WARNING Potential Biohazard

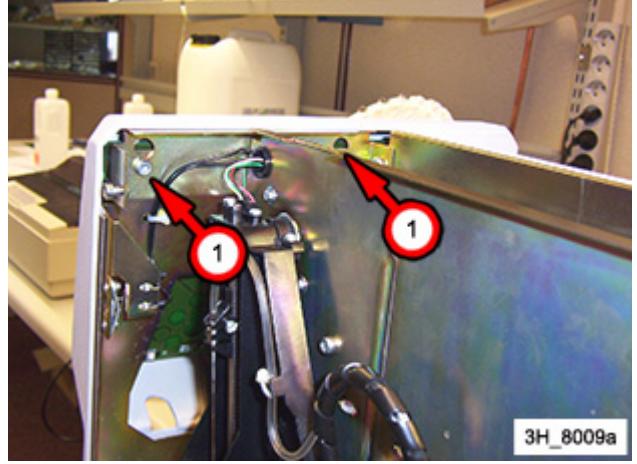
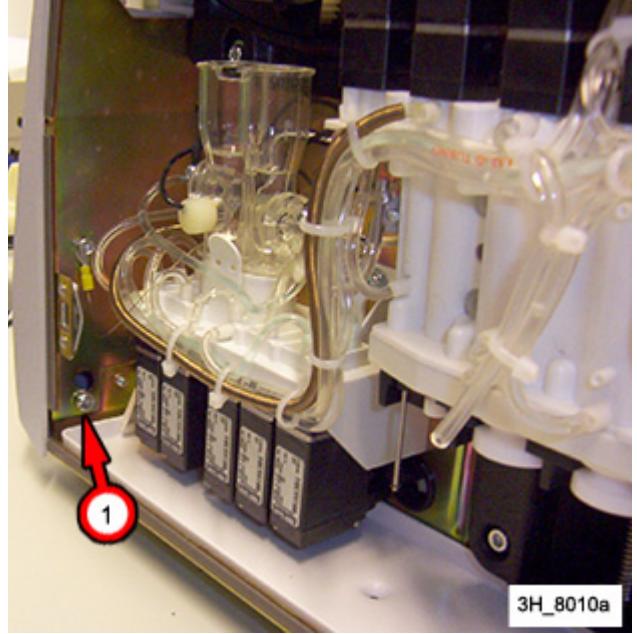


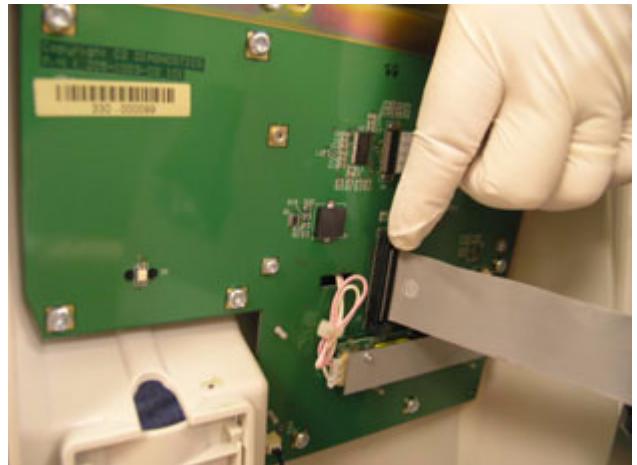
Caution Chemical Hazard

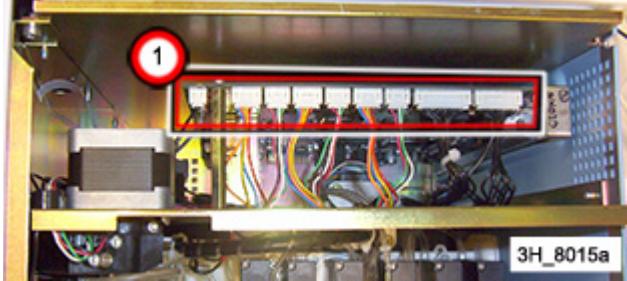
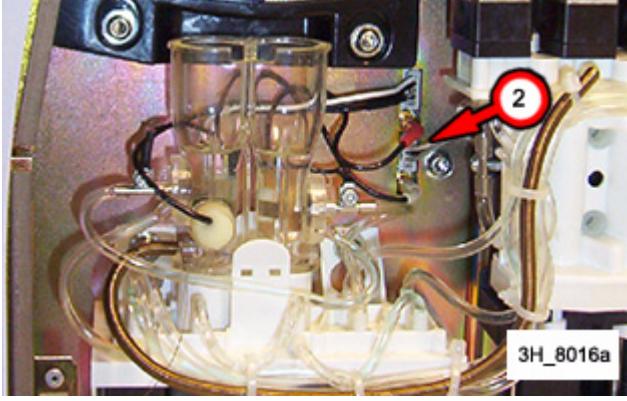
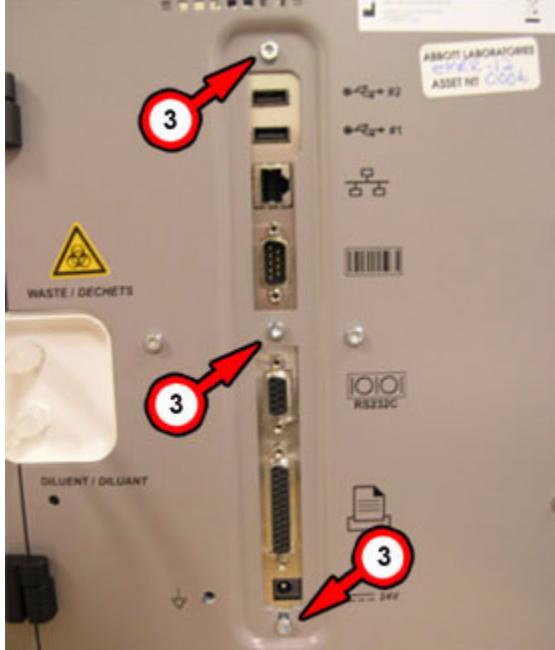
Caution Electrostatic Discharge

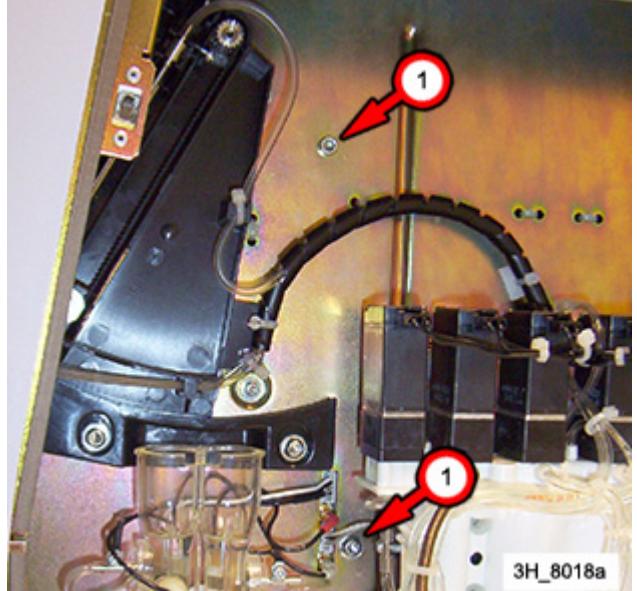
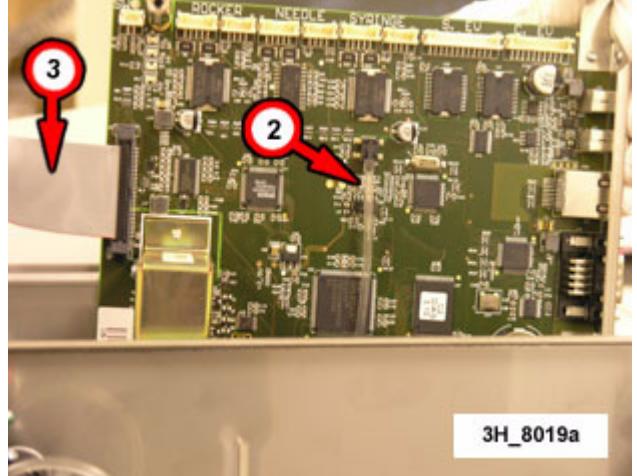


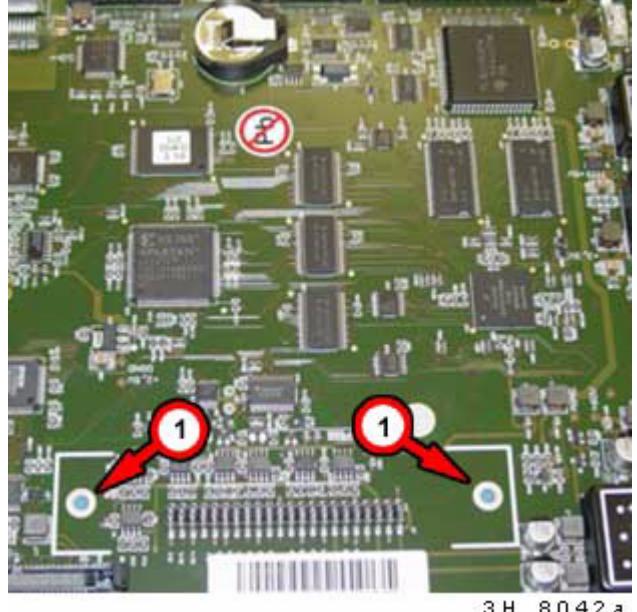
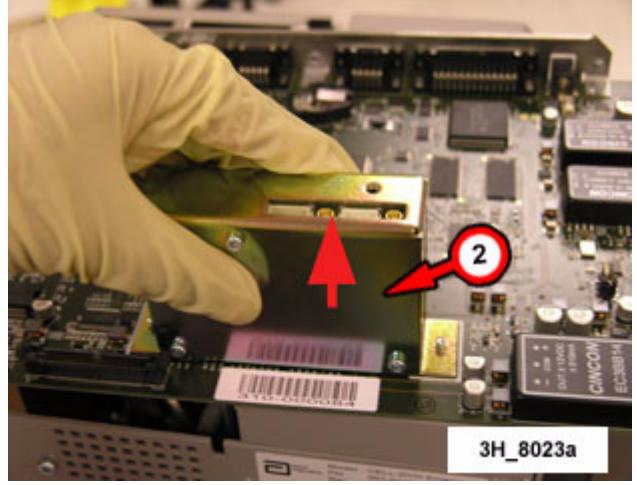
Removal		
Action	Steps	Reference
Preparation	1. Power OFF the instrument and disconnect the power supply.	
Open Right Side Door	1. Open the door on the right side of the instrument (hydraulic area access).	
Remove Upper Cover	1. Remove the three (3) screws securing the upper cover to the front and back of the instrument and remove the cover.	

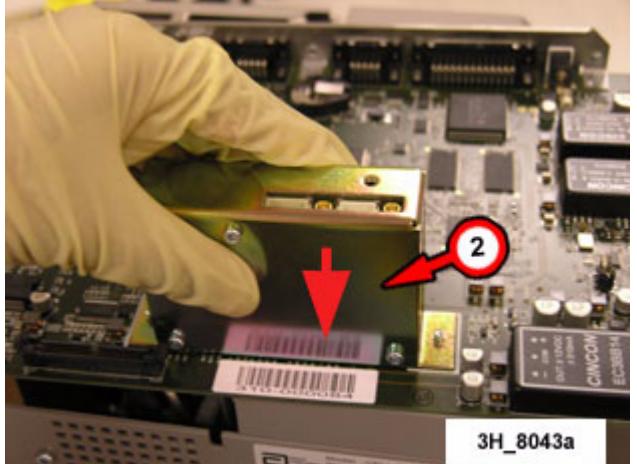
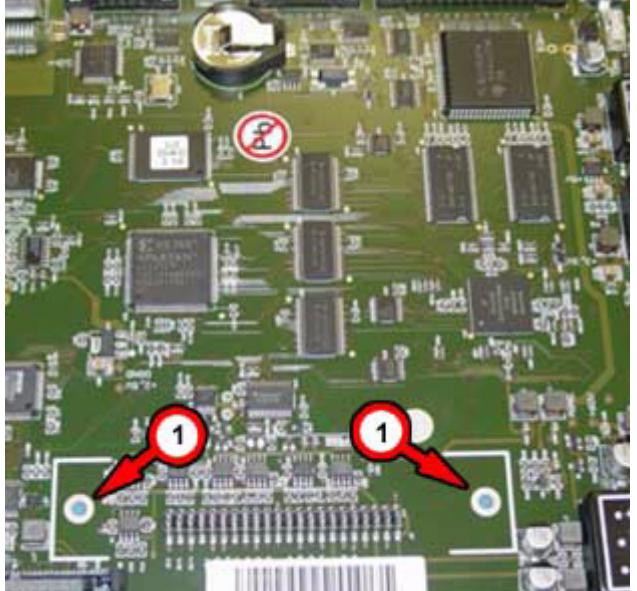
Removal(continued)		
Action	Steps	Reference
Remove Front Panel Screws	<p>Note Do not remove the screws, only loosen them.</p> <ol style="list-style-type: none"> 1. Loosen the two (2) upper screws and the lower screw which secure the front panel. [1] 	 3H_8009a  3H_8010a

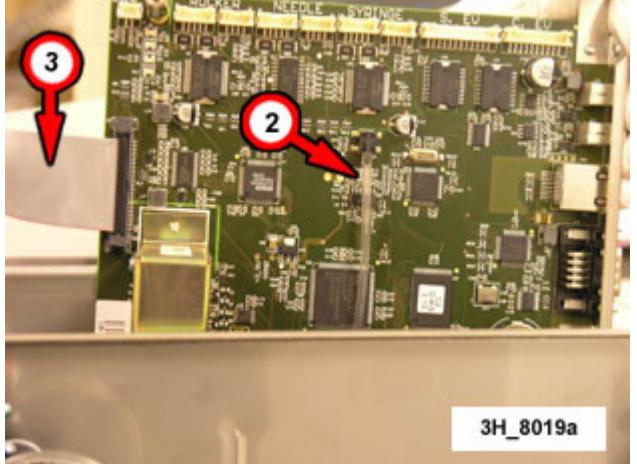
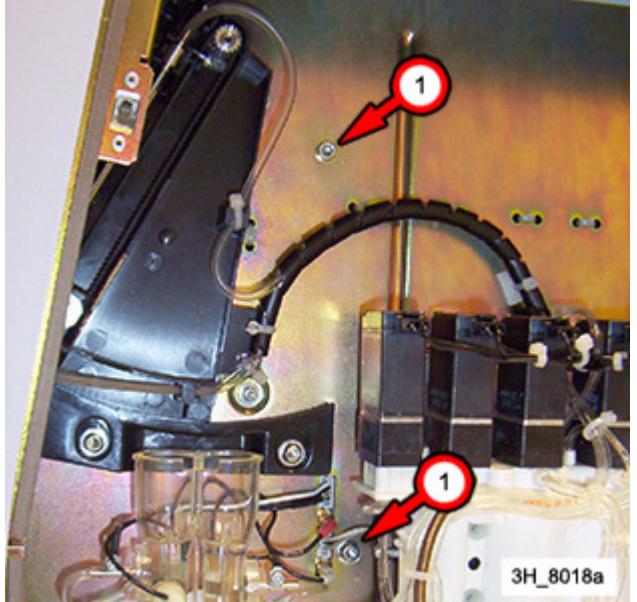
Removal(continued)		
Action	Steps	Reference
Remove Front Panel	1. Lift the front panel upward and then pull it toward the front of the instrument.	 3H_8011a
Remove IHM Cable	<p>Caution <i>Carefully push on the upper and lower sides of the connector. If the connector socket is damaged, the entire IHM board must be replaced.</i></p> <ol style="list-style-type: none"> 1. Remove the IHM board connector by pushing up on the upper side of the connector, then push down on the lower side of the connector. 2. Slowly pull the flat cable out of the connector socket. 3. Put the front panel aside 	 3H_8012a

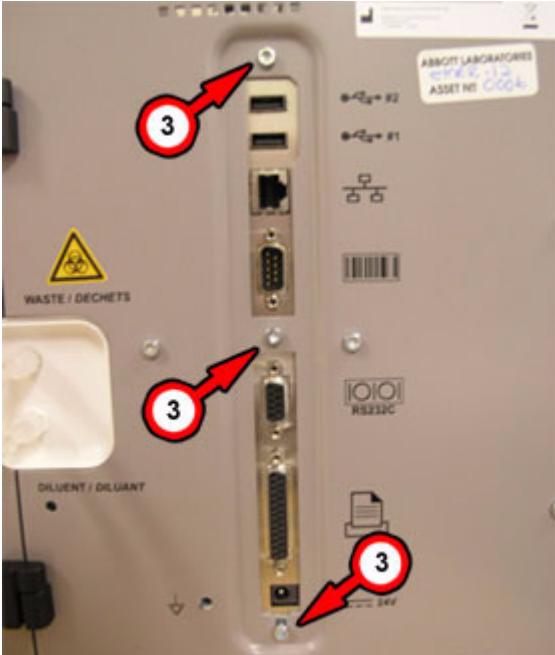
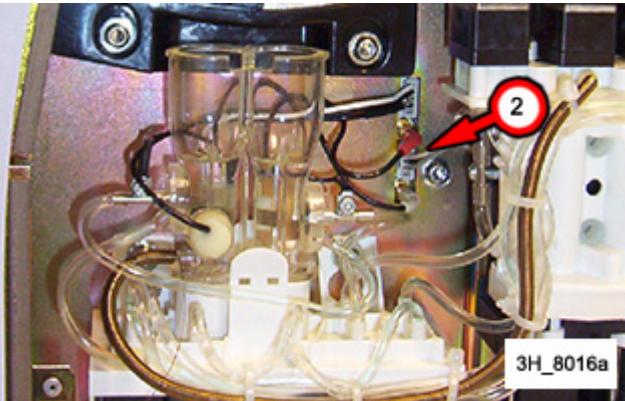
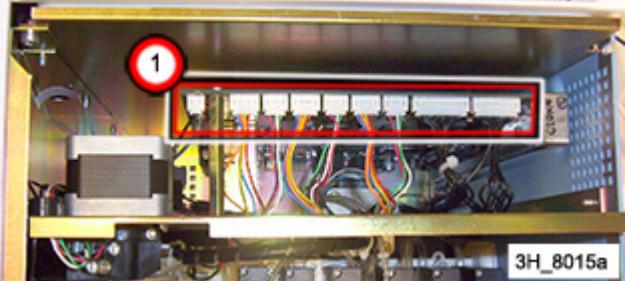
Removal(continued)		
Action	Steps	Reference
Remove Connectors	<p>1. Remove the nine (9) connectors on the top of the CPU board. [1]</p> <p>2. Remove the preamplifier board connections: [2]</p> <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor <p>3. At the back of the instrument, remove the three (3) screws [3] securing the CPU board.</p>	 3H_8015a  3H_8016a  3H_8017a

Removal(continued)		
Action	Steps	Reference
Remove CPU Board	<ol style="list-style-type: none"> 1. Remove the two (2) screws [1] (on the flow panel) securing the CPU board. 2. Lift the board and carefully disconnect the tubing from the pressure sensor. [2] 3. Disconnect the IHM cable. [3] 4. Remove the board from the assembly. 	  <p>3H_8018a</p> <p>3H_8019a</p>

Removal(continued)		
Action	Steps	Reference
Remove Preamplifier Box	<ol style="list-style-type: none"> 1. Remove the two (2) screws [1] located on the solder side (back side) of the CPU Board. 2. Turn the CPU Board over to the front side. 3. Lift the preamplifier box [2] upward to remove from the main board. 	 <p>3H_8042a</p>  <p>3H_8023a</p>

Replacement		
Action	Steps	Reference
Install Preamplifier Box	<ol style="list-style-type: none"> 1. Insert the preamplifier box [2] into the connector on the CPU board. 2. Turn the CPU Board over to the back side. 3. Install two (2) screws [1] that secure the preamplifier box to the CPU Board. 	 <p>3H_8043a</p>  <p>3H_8042a</p>

Replacement		
Action	Steps	Reference
Install CPU Board	<ol style="list-style-type: none"> 1. Install the board into the assembly. 2. Connect pressure sensor tube. [2] 3. Connect the IHM cable. [3] 4. Install the two (2) screws [1] located at the flow panel. 	 <p>3H_8019a</p>  <p>3H_8018a</p>

Replacement		
Action	Steps	Reference
Install Connectors	<ol style="list-style-type: none"> 1. Install three (3) screws [3] at the back of the instrument. 2. Install the preamplifier board connections: [2] <ul style="list-style-type: none"> • HGB • WBC coaxial • RBC coaxial • Temperature Sensor 3. Install the nine (9) connectors on the top of the CPU board. [1] 	 <p>3H_8017a</p>  <p>3H_8016a</p>  <p>3H_8015a</p>
Install IHM Board	<ol style="list-style-type: none"> 1. Connect the IHM cable to the front panel IHM board. 	

Replacement		
Action	Steps	Reference
Install Front Panel	1. Position the front panel on the instrument and secure it with three (3) screws (two upper screws and one lower screw).	
Install Upper Cover	1. Install the upper cover to the front and back of the instrument and secure with three (3) screws.	
Close Right Side Door	1. Close the door on the right side of the instrument (hydraulic area access).	
Power ON Instrument	1. Connect the instrument to the power supply and power ON the instrument.	

Verification		
Action	Steps	Reference
Perform PRIME ALL	1. Log in as AFSE and press Confirm . 2. Press OK on log in window. 3. Perform a PRIME ALL (MAIN MENU, REAGENTS, PRIME ALL). 4. Perform gain verification and/or adjustment. 5. Perform a calibration.	

Chapter 5 Verification Procedures

(Document Control Number 202667-101)

5.1 Procedure Locator Table

Procedure Link	Peripheral/ Module	Time	Materials Required	Purpose
VP-01 Cleaning Procedure	CELL-DYN Emerald	20 min.	Sodium Hypochlorite Solution (5%)	Perform this procedure as needed when measurand is repeatedly rejected.
VP-03 Electronics Gain Adjustment	CELL-DYN Emerald	30 min.	WBC Latex (7 µm undiluted) RBC/PLT Latex (7 µm undiluted)	To adjust the WBC and RBC/PLT gain.

VP-01 Cleaning Procedure

Purpose	Perform this procedure as needed when measurand is repeatedly rejected.	Module	CELL-DYN Emerald
Materials Required	Sodium Hypochlorite Solution (5%)	Time	20 min.

Action	Steps	Reference
Perform Cleaning Cycle	<p>Note Perform each cycle with a 5% hypochlorite solution.</p> <ol style="list-style-type: none"> 1. Perform a cleaning cycle (MAIN MENU, SERVICE, FLUIDICS, CLEAN). 2. Respond to the warnings. 3. Perform a bleach (MAIN MENU, SERVICE, FLUIDICS, BLEACH). 4. Respond to the warnings. 5. Perform another cleaning cycle (MAIN MENU, SERVICE, FLUIDICS, CLEAN). 6. Respond to the warnings. 	 3H_5007a
Perform PRIME DILUENT	<ol style="list-style-type: none"> 1. Perform a PRIME DILUENT (MAIN MENU, REAGENTS, DILUENT, PRIME DILUENT). 2. Respond to the warnings. 	
Perform START UP	<ol style="list-style-type: none"> 1. Perform a START UP cycle. 	
Verify Background Values	<ol style="list-style-type: none"> 1. Verify the background values meet the specification. <ul style="list-style-type: none"> • If the background values meet the specification, the procedure is complete. • If the background values do not meet the specification troubleshoot accordingly. 	

VP-02 PLACEHOLDER

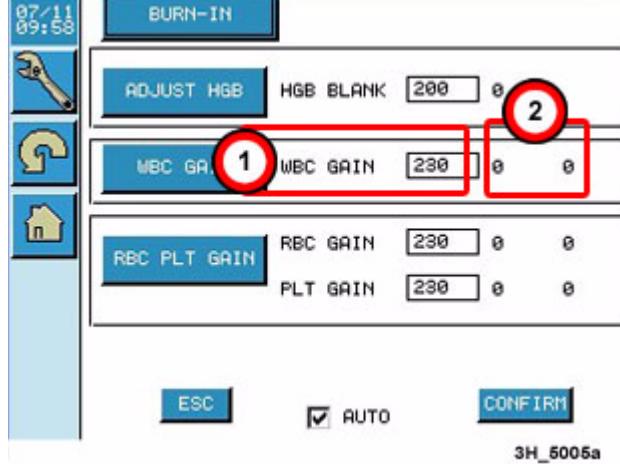
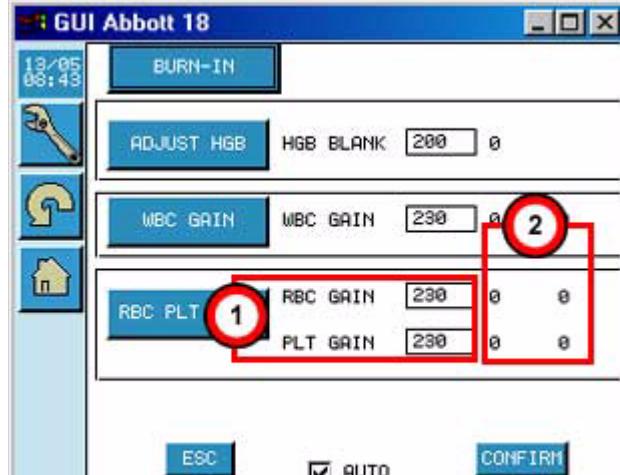
Purpose		Module	
Materials Required		Time	

Action	Steps	Reference
	1.	

VP-03 Electronics Gain Adjustment

Purpose	To adjust the WBC and RBC/PLT gain.	Module	CELL-DYN Emerald
Materials Required	WBC Latex (7 µm undiluted) RBC/PLT latex (7 µm undiluted)	Time	30 min.

Note This procedure is only for electronics potentiometer adjust on the preamplifier board and to calibrate the instrument.

Action	Steps	Reference
Perform Super Technician Logon	1. Logon to the system using the super technician password AHFA .	
Verify WBC Gain Value	<p>1. From the MAIN MENU, select SERVICE, ABBOTT SERVICE, SET GAINS.</p> <p>2. Shake the WBC latex (7 µm undiluted) with a vortex system.</p> <p>3. Place the tube under the sample needle and select WBC GAIN. [1]</p> <p>4. At the end of the cycle, verify the following:</p> <ul style="list-style-type: none"> • WBC GAIN: > 210 and < 245 [1] • V WBC: > 66 and < 72 [2] <p>5. Select CONFIRM.</p> <p>Note To exit the screen without changing the value(s), select ESC.</p>	
Verify RBC/PLT Gain Value	<p>1. From the MAIN MENU, select SERVICE, ABBOTT SERVICE, SET GAINS.</p> <p>2. Shake the RBC/PLT latex (7 µm undiluted) with a vortex system.</p> <p>3. Place the tube under the sample needle and select RBC PLT GAIN. [1]</p> <p>4. At the end of the cycle, verify the following:</p> <ul style="list-style-type: none"> • RBC GAIN: > 210 and < 245 [1] • V RBC: > 40 and < 44 [2] • PLT GAIN: > 210 and < 245 [1] • V PLT: > 51 and < 55 [2] <p>5. Select CONFIRM.</p> <p>Note To exit the screen without changing the value(s), select ESC.</p>	

Chapter 6 Maintenance

(Document Control Number 202668-101)

This section contains maintenance procedures and a maintenance schedule for the CELL-DYN Emerald module. The quality of the results and the reliability of the CELL-DYN Emerald are directly linked to strict adherence to the maintenance and frequency of maintenance contained in this section.

Note When performing the maintenance and the repair described in this section, take the appropriate safety precautions.

Maintenance Schedule

Note This table is valid for an average number of 50 samples per day. For more, proportionally increase the frequency of maintenance.

Maintenance	Daily		Weekly		Monthly		Half A Year		Annually	
	User	Tech	User	Tech	User	Tech	User	Tech	User	Tech
Automatic cleaning	X									
Concentrate cleaning					X					
Cover cleaning	X									
Motor screw greasing										X
Needle o-ring replacement										X
Piston greasing							X			X
Reagents level	X									
SHUT DOWN	X									
START UP	X									
Syringes o-ring replacement										X
Sampling Module Rocker Greasing										X

Chapter 7 Pre-Site Specification

(Document Control Number 202669-101)

For site requirements, refer to CELL-DYN Emerald Operator's Manual, Section 2, Site Requirements.

For system specification, refer to CELL-DYN Emerald Operator's Manual, Section 4, Performance Characteristics and Specifications.